Intended for
Aviva Life & Pensions UK Limited

Date
February 2020

Project Number
1700003910

READING STATION PARK
ENVIRONMENTAL STATEMENT

RAMBOLL

Volume 1: Environmental Statement Main Report
Table of Contents

1 Introduction
Introduction 1-1
Development Context 1-1
Planning Context 1-4
Application Details 1-4
Applicant 1-4
Project Team 1-5
Environmental Statement 1-5

2 EIA Process and Methodology
Introduction 2-1
Environmental Impact Assessment 2-1
EIA Process 2-2
Scope of EIA 2-2
EIA Approach 2-3
Technical Assessment Chapters 2-9

3 Alternatives and Design Evolution
Introduction 3-1
Development Objectives 3-1
Development Considerations 3-1
Environmental Considerations 3-1
Alternatives 3-2
Public Engagement and Consultation 3-4
Conclusion 3-4

4 Proposed Development Description
Introduction 4-1
Proposed Development Description 4-1
Site Arrangement and Land Use 4-2
Open Space and Public Realm 4-9
Access and Egress 4-9
Parking 4-9
Waste Management 4-12
Proposed Development Plant and Ventilation 4-12
Proposed Development Utilities 4-13
Proposed Development Resources, Emissions and Residues 4-15
Proposed Development Sustainability 4-15
Proposed Development Operational Provisions and Controls 4-16

5 Demolition and Construction
Introduction 5-1
Programme of Works 5-1
Description of Works 5-2
Enabling Works 5-2
Demolition Works 5-3
Construction Works 5-3
Open Space, Public Realm and Road Works 5-4
Utilities and Services Installation 5-4
Demolition and Construction Contracting Strategy 5-5
Materials and Resource Use 5-6
Trips, Access and Routing Arrangements 5-8
Environmental Controls and Mitigation 5-10
Cumulative Demolition and Construction Effects 5-17
Summary 5-17

6 Socio-Economics
Introduction 6-1
Methodology 6-1
Baseline Conditions 6-6
Assessment of Effects 6-14
Assessment of Residual Effects 6-17
Summary of Residual Effects 6-17
Cumulative Effects 6-18

7 Air Quality
Introduction 7-1
Methodology 7-1
Baseline Conditions 7-5
Assessment of Effects 7-8
Assessment of Residual Effects 7-11
Summary of Residual Effects 7-11
Cumulative Effects 7-12

8 Noise and Vibration

Introduction 8-1
Methodology 8-1
Baseline Conditions 8-5
Assessment of Effects 8-9
Assessment of Residual Effects 8-3
Summary of Residual Effects 8-10
Cumulative Effects 8-10

9 Wind Microclimate

Introduction 9-1
Methodology 9-1
Baseline Conditions 9-5
Assessment of Effects 9-6
Assessment of Residual Effects 9-9
Summary of Residual Effects 9-10
Cumulative Effects 9-11

10 Daylight, Sunlight, Overshadowing and Solar Glare

Introduction 10-1
Methodology 10-1
Baseline Conditions 10-6
Assessment of Effects 10-8
Assessment of Residual Effects 10-12
Summary of Residual Effects 10-13
Cumulative Effects 10-13

11 Cumulative Effects

Introduction 11-1
Intra-Project Cumulative Effects 11-1
Conclusions 11-4

12 Residual Effects and Mitigation

Introduction 12-1
Additional Mitigation and Enhancement 12-1
Residual Effects 12-1

Glossary of Terms

Volume 2: Townscape, Visual and Built Heritage
Table of Contents

1 Townscape and Visual

Introduction 1-1
Methodology 1-1
Baseline Conditions 1-5
Assessment of Effects 1-10
Assessment of Residual Effects 1-15
Summary of Residual Effects 1-16
Cumulative Effects 1-17
Townscape and Visual Appendix 1.1: Planning Policy
Townscape and Visual Appendix 1.2: Baseline Conditions and Figures
Townscape and Visual Appendix 1.3: Townscape Effects Table
Townscape and Visual Appendix 1.4: Visual Effects Table
Townscape and Visual Appendix 1.5: Cumulative Assessment
Townscape and Visual Appendix 1.6: AVR Methodology

2 Built Heritage

Introduction 2-1
Methodology 2-1
Baseline Conditions 2-4
Assessment of Effects 2-5
Assessment of Residual Effects 2-6
Summary of Residual Effects 2-6
Cumulative Effects 2-6
Built Heritage Appendix: Heritage Statement

1 TOWNSCAPE AND VISUAL

Introduction

1.1 This chapter of the ES reports on the likely significant townscape and visual effects associated with the demolition and construction stage and the completed development/operational stage of the proposed development.

1.2 The chapter describes the methods used to assess the potential impacts; the baseline conditions currently existing at the application site and the study area; as well as the potential impacts and likely effects on townscape character and visual amenity, taking into consideration embedded mitigation measures. Where appropriate, additional mitigation measures required to prevent, reduce, or offset the likely effects, are identified and the chapter concludes with a summary of the likely residual effects.

1.3 This chapter is supported by the following appendices in ES Volume 2:

- Appendix 1.1: Planning Policy;
- Appendix 1.2: Baseline Conditions and Figures;
- Appendix 1.3: Townscape Assessment;
- Appendix 1.4: Visual Assessment;
- Appendix 1.5: Cumulative Assessment; and
- Appendix 1.6: Verified View Methodology.

1.4 Baseline views are presented in Appendix 1.2. Wirelines of the proposed development are presented in Appendix 1.4 and Cumulative Wirelines are presented in Appendix 1.5.

Methodology

1.5 The Townscape and Visual impact assessment (TVIA) methodology has been drawn from The Landscape Institute and The Institute of Environmental Management and Assessment's 'Guidelines for Landscape and Visual Impact Assessment Third Edition'[1](GLVIA 3), 2013. The aim of these guidelines is to set high standards for the scope and content of landscape/townscape and visual impact assessments and to establish certain principles that will help to achieve consistency, credibility, transparency and effectiveness throughout the assessment.

1.6 The assessment has been informed by the following legislation, policies and published guidance, details of which is set out within Appendix 1.1 – Planning Policy:

- NPPF[2];
- PPG[3];
- Reading Borough Local Plan 2019;
- Reading Station Area Framework 2010;
- Reading City Centre Framework 2008; and
- Reading Borough Housing and Economic Land Availability 2017.

Consultation

1.7 At the time of undertaking this assessment, the EIA Scoping Opinion remains outstanding. Table 1.1 summarises the consultation that has been undertaken with respect to the TVIA and that have further refined the scope of the assessment, as presented in EIA Scoping Report.

Table 1.1: Summary of Consultation

Consultee and Form / Date of Consultation	Summary of Comments	Action Taken
Principal Planner (Brian Conlon) Email exchange 17 October 2019	Email sent requesting comments/suggestions on assessment viewpoint selection. Brian responded via email requesting an additional three viewpoints - to the south-west on Greyfriars Road; to the south in front of Thames Tower; and to the south-east on Blagrave Street.	Viewpoints 24, 25 and 26 added as assessment view-points.
Principal Planner (Brian Conlon) Email exchange and telephone conversation 28 November 2019	Email sent requesting confirmation on view-point selection for production of verified views.	15 viewpoints were agreed upon, including viewpoint 3 and 25 (in place of viewpoint 20 and 15).

Assessment Scope

1.8 The assessment has been based on a set of development parameters, commitments and assumptions as described in Chapter 2: EIA Process and Methodology; Chapter 4: Proposed Development Description; and Chapter 5: Demolition and Construction Environmental Management. Due to the flexibility being sought in respect of land use classes and associated development scenarios, the townscape and visual assessments have been undertaken of the worst-case massing proposals represented by the mixed use scheme, as shown in Parameter Plan PP-105.

Technical Scope

1.9 The overall aim of the TVIA is to assess the likely effects of the proposed development on the features and character of the existing townscape (townscape receptors); and on the visual amenity of identified viewers of the application site (visual receptors) and study area, which include views from locations such as residential or business properties, public buildings, public open spaces, roads and Public Rights of Way (PRoW).

1.10 The TVIA does not address effects of the proposed development on built heritage, which is discussed in ES Volume 2, Chapter 2: Built Heritage. However built heritage features have been considered in so far as their contribution to the sensitivity (value and susceptibility) of townscape character and views.

1.11 In order to explain the potential of the application site to accommodate the proposed development, the key objectives of this assessment have been to:

- appraise the townscape features and character of the application site and its context;

[1] Landscape Institute and Institute of Environmental Management and Assessment, 2013. Guidelines for Landscape and Visual Impact Assessment, 3rd Edition. Abingdon. Routledge.
[2] Secretary of State for Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework.
[3] https://www.gov.uk/government/collections/planning-practice-guidance

- appraise the visibility of the application site from the surrounding study area and the nature and quality of existing views; and
- consider the likely townscape and visual effects of the proposed development.

1.12 The assessment of townscape and visual effects, in common with the assessment of many environmental effects as set out in the ES, includes a combination of objective and subjective judgements, and it is therefore important that a structured and consistent approach is adopted to ensure that the assessment undertaken is as objective as possible.

1.13 A townscape assessment is the systematic description and analysis of the features within the townscape, such as landform; vegetation cover; settlement pattern; building forms; transport patterns; and land use; which create a particular sense of place. A visual assessment considers visual receptors, which are the views of and within the townscape, and includes locations such as residential and business properties; public buildings; transport routes; Public Rights of Way (PRoW) and public open space.

1.14 The assessment has considered the following potential impacts and associated likely effects during the construction of the proposed development:

- Development works and associated visibility of machinery, cranes and other equipment used in construction works; and the hoarding and site lighting which would be visible at street level.

1.15 The assessment has considered the following potential impacts and associated likely effects of the completed proposed development:

- Visibility of the proposed development in local views (including RBC designated views), effects on the quality of local views and on viewers;
- Impacts on the townscape character and quality of the application site; and
- Impacts on the townscape character and quality of the townscape character areas within which it would be likely to result in perceived changes.

1.16 An assessment of inter-project cumulative effects has also been undertaken that considers the proposed development in addition to the identified cumulative schemes, as well as the proposed development in addition to the identified cumulative schemes and reasonably foreseeable cumulative schemes, in order to assess the different cumulative scenarios.

1.17 As set out in Table 1.1, 26 representative viewpoint locations were agreed with Reading Borough Council. Wirelines of the proposed development were modelled in 15 of those views, as agreed with Reading Borough Council. Wirelines of the cumulative schemes and reasonably foreseeable cumulative schemes were modelled in the same 15 viewpoints.

Spatial Scope

1.18 The study area for the TVIA was determined through the consideration of the existing influence and visibility of the application site, as well as the anticipated influence of the proposed development on townscape character and visual amenity. This was determined by means of desk study and field study. Zone of Theoretical Visibility (ZTV) mapping was not undertaken due to the urban nature and location of the application site meaning that results would be difficult to interpret.

1.19 The extents for the study area are shown in TVIA Figure 1: Site Context Plan, Appendix 1.2.

Temporal Scope

1.20 The assessment has considered the following scenarios:

- Existing baseline;
- Existing baseline + proposed development;
- Existing baseline + proposed development + cumulative schemes; and
- Existing baseline + proposed development + cumulative schemes + reasonably foreseeable cumulative schemes.

Baseline Characterisation Method

Desk Study

1.21 A detailed desktop analysis of landscape policy, mapping, published landscape and townscape character assessments and evidence base was undertaken to inform the baseline evaluation of both landscape and townscape character, and visual amenity.

Field Study

1.22 Field surveys were undertaken to verify the desktop review of the baseline landscape/townscape character and visual amenity, and in order to inform the determination of effects upon the landscape/townscape resource and visual amenity witnessed by visual receptors as a result of the proposed development and to determine the study area. ZTV mapping was not undertaken due to the urban nature and location of the application site meaning that results would be difficult to interpret.

Assessment Method

1.23 The methodology for the TVIA is summarised below.

Methodology

1.24 GLVIA 3 paragraph 1.1 states that:

"Landscape and Visual Assessment is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and on people's views and visual amenity."

1.25 Paragraph 2.6 outlines that the definition of landscape applies to townscapes, and is therefore interchangeable with the term 'landscape', with paragraph 2.7 stating:

"Townscape means the landscape within the built-up area, including the buildings, the relationship between them, the different types of urban spaces, including green spaces, and the relationship between buildings and open space…"

1.26 The guidelines contained within GLVIA 3 are not intended as a prescriptive set of rules, and have been adapted for the context and nature of the proposed development.

1.27 TVIAs are often undertaken by professionals who are involved in the design of the public realm and preparation of management proposals. This can allow the assessment to proceed as an integral part of the overall proposed development. Judgements are based on training and experience, and supported by clear evidence and reasoned argument.

1.28 The purpose of the TVIA is to identify the potential for, and assess the likely effects of, change resulting from development. Townscape and visual assessments are separate, although linked, procedures. A distinction is made between:

- Townscape - townscape character and the elements and features that contribute to it (townscape receptors); and
- Visual - people who experience views within the townscape (visual receptors).

1.29 A TVIA is typically accompanied by illustrative material, including baseline mapping and photographs of the application site itself and from the surrounding area.[

Viewpoint Selection

1.30 In order to assess the effects on visual receptors and inform the change that is likely to occur within townscape character areas, a selection of publicly accessible viewpoints is made, which could include

representative viewpoints (e.g. representing views of users of a particular footpath) and specific viewpoints (e.g. a key view from a specific visitor attraction). Views are identified through the interrogation of baseline data and consultation with relevant stakeholders and are then refined through ground testing on site visits. The variety of viewpoints aim to provide a representative selection of views available in the study area in terms of direction and distance, as well as receptor type.

1.31 Views are categorised as either near-distance, medium-distance or long-distance with the relevant distances dependant on the size and nature of the development, based on professional judgement.

1.32 The type of view is typically described firstly as transient (i.e. in passing) or fixed (i.e. from a static location) and then in relation to being filtered (i.e. through intervening vegetation), oblique (i.e. not within the direct field of view), or open (i.e. uninterrupted).

1.33 Photographs of representative viewpoints are taken at eye level, using a digital SLR camera, with reference to the Landscape Institute Advice Note 01/11 'Photography and photomontage in landscape and visual impact assessment'.

1.34 There are typically three key stages to TVIA, namely:

- Baseline Studies to establish the existing townscape and visual situation;
- Consideration of the proposed development and any primary mitigation that has been designed into the proposals; and
- Assessment of Townscape and Visual Effects, that considers the impact of the proposed development on the townscape and visual receptors identified through the baseline studies.

Assessment Criteria

1.35 The criteria used to assess if an effect is significant or not, is set out in subsequent sub-sections. This is determined by consideration of the sensitivity of the receptor, magnitude of impact, duration of the effect, geographical extent of the effect and application of professional judgement.

Townscape Effects

1.36 GLVIA 3 paragraph 5.1 states:

"An assessment of landscape effects deals with the effects of change and development on landscape as a resource."

1.37 In order to assess the townscape effects, the sensitivity of the townscape receptor and the magnitude of impact experienced as a result of the proposed development is assessed.

Townscape Receptor Sensitivity

1.38 The sensitivity of a townscape receptor is a combination of the value of the townscape receptor and the susceptibility of the townscape receptor to the type of change proposed, using professional judgement.

Townscape Value

1.39 The GLVIA 3 Glossary defines landscape [townscape] value as:

"The relevant value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a variety of reasons"

1.40 Townscapes, including their character and features, may be designated at a range of levels (international, national, county and local level), examples of which are set out below. The assessment of value is based on a combination of the importance of townscape-related planning designations and the following attributes:

- Townscape quality (condition): the measure of the physical state of the townscape. It may include the extent to which typical townscape character is represented in individual areas, the intactness of the townscape and the condition of individual elements;
- Scenic quality: the extent that the townscape receptor appeals to the visual senses;
- Perceptual aspects: the extent that the townscape receptor is recognised for its perceptual qualities (e.g. remoteness or tranquillity);
- Rarity: the presence of unusual elements or features;
- Representativeness: the presence of particularly characteristic features;
- Recreation: the extent that recreational activities contribute to the townscape receptor; and
- Association: the extent that cultural or historical associations contribute to the townscape receptor.

1.41 The overall value for each townscape receptor is categorised as High, Medium, Low or Very Low, as presented in Table 1.2.

Table 1.2: Townscape Value Criteria

Value	Criteria
Very Low	Features or areas with little or no evidence of being valued by the community and are not designated.
Low	Features likely to be of importance to the local community but have little or no wider recognition of their value and are not designated.
Medium	Features or areas likely to be of county or borough importance, designated at county or borough level.
High	Features or areas likely to be of international or national importance, designated at national or international level.

Townscape Susceptibility

1.42 The GLVIA 3 Glossary defines landscape [townscape] susceptibility as:

"The ability of a defined landscape…receptor to accommodate the specific proposed development without undue negative consequences"

1.43 The following criteria is taken into consideration in the assessment of townscape susceptibility, although not all criteria are equally applicable or important within a given townscape / type of development proposed:

- Landform;
- Pattern/Complexity;
- Composition;
- Landcover; and
- Relationship of a given townscape area to any existing settlements or developments.

1.44 Susceptibility of the character of the townscape / of the townscape features is categorised as High, Medium or Low, as set out in the Table 1.3. Townscape susceptibility can also be considered in the context of the capacity of townscape / townscape features to accommodate change.

Table 1.3: Townscape Susceptibility Criteria

Susceptibility	Criteria
Low	The receptor is likely to be able to accommodate the type of change proposed with little or no effect upon its overall integrity.
Medium	The receptor is likely to have some scope to accommodate the type of change proposed without undue effects upon its overall integrity.
High	The receptor is likely to have little scope to accommodate the type of change proposed without undue effects upon its overall integrity.

1.45 Based on the combination of value and susceptibility, an assessment of townscape sensitivity is reached, defined as High, Medium or Low.

Townscape Magnitude of Impact

1.46 The townscape magnitude of impact is informed by judgements about the size and extent of the change brought about by the proposed development both in terms of the existing townscape character and townscape elements / features and the addition of new townscape elements / features, and its duration and reversibility, as set out in Table 1.4.

Table 1.4: Townscape Magnitude of Impact Criteria

Magnitude	Criteria
None	No direct change to the existing townscape receptor or a change that is so inconsequential that it does not alter the existing townscape receptor.
Very Small	Very slight alteration to the existing townscape receptor; may also affect a limited area.
Small	Slight alteration to the existing townscape receptor; may also affect a restricted area.
Medium	Partial alteration to the existing townscape receptor; may also affect a wide area.
Large	Total alteration to the existing townscape receptor; may also affect an extensive area.

Visual Effects

1.47 The GLVIA 3 paragraph 6.1 states:

"An assessment of visual effects deals with the effects of change and development on the views available to people and their visual amenity."

1.48 In order to assess the visual effects, the sensitivity of the visual receptor and the magnitude of impact experienced as a result of the proposed development are assessed.

Visual Receptor Sensitivity

1.49 The sensitivity of a visual receptor is a consideration of the value of the view and the susceptibility of the visual receptor to the type of change proposed, using professional judgement. The assessment of value is based on the criteria set out in Table 1.5.

Table 1.5: Visual Value Criteria

Value	Criteria
Low	A location that is not designated, with minimal or no cultural associations.
Medium	A location that is likely to be of local importance, either designated or with local cultural associations, where the view obtained forms part of the experience.
High	A location that is likely to be of national importance, either designated or with national cultural associations, where the view obtained forms an important part of the experience.

1.50 The assessment of visual susceptibility is based on the criteria set out in Table 1.6.

Table 1.6: Visual Susceptibility Criteria

Susceptibility	Criteria
Low	• People travelling on major roads; and • People at their place of work.
Medium	• People engaged in outdoor sport and recreation, where their appreciation of their surroundings is incidental to their enjoyment; and • People travelling on secondary roads of lanes, rail or other recognised transport routes
High	• People at their place of residence;
	• People engaged in outdoor recreation, whose attention is likely to be focussed on the townscape; and • People travelling along recognised scenic routes or where their appreciation of the view contributes to the amenity experience of their journey

1.51 Based on the combination of value and susceptibility, an assessment of visual sensitivity is reached, defined as High, Medium or Low.

Visual Magnitude of Impact

1.52 The magnitude of visual impact is typically described with reference to the:

- Scale of change in the view with respect to the loss or addition of features in the view and changes in its composition;
- Duration and nature of the impact;
- Angle of view;
- Distance of the viewer; and
- Extent of the area over which the changes would be visible.

1.53 The magnitude of visual impact classifications are set out in Table 1.7.

Table 1.7: Visual Magnitude of Impact Criteria

Magnitude	Criteria
None	No change discernible in the view.
Very Small	The proposals would cause a barely perceptible change in the view.
Small	The proposals would cause an unobtrusive change in the view.
Medium	The proposals would cause a noticeable change in the view.
Large	The proposals would cause a pronounced change to the view.

Significance Criteria

1.54 In order to draw conclusions about the scale and significance of townscape or visual effects, the combination of the sensitivity of the receptors and the magnitude of impact are considered for the proposed development at the demolition and construction stage and upon completion, as shown in Table 1.8.

1.55 Table 1.8 provides a matrix that represents how receptor sensitivity is combined with the magnitude of impact to derive the significance of effect.

Table 1.8: Significance of Effect Matrix

Sensitivity of Receptor	Magnitude of Impact				
	None	Very Small	Small	Medium	Large
Low	Neutral	Negligible	Negligible/ Minor	Minor	Minor/ Moderate
Medium	Neutral/ Negligible	Negligible/ Minor	Minor	Minor/ Moderate	Moderate
High	Negligible	Minor	Minor/ Moderate	Moderate	Major

1.56 The criteria that have informed the significance of effects are set out in Table 1.9.

Table 1.9: Significance of Effect Criteria

Scale and Nature of Effect	Townscape Effects Criteria	Visual Effects Criteria
Major Beneficial	Alterations that result in a considerable improvement of the existing townscape resource. Valued characteristic features could be restored or reintroduced as part of the proposed development.	Alterations that typically result in a pronounced improvement in the existing view.
Moderate Beneficial	Alterations that result in a partial improvement of the existing townscape resource. Valued characteristic features could be largely restored or reintroduced.	Alterations that typically result in a noticeable improvement in the existing view.
Minor Beneficial	Alterations that result in a slight improvement of the existing townscape resource. Characteristic features could be partially restored.	Alterations that typically result in a limited improvement in the existing view.
Negligible Beneficial	Alterations that result in a very slight improvement to the existing townscape resource, not uncharacteristic within the townscape	Alterations that typically result in a barely perceptible improvement in the existing view.
Neutral	No alteration to any of the components that contribute to the existing townscape resource; or an alteration that does not beneficially or adversely affect the existing townscape receptor.	No change to the view, or a change which on balance neither results in an improvement or deterioration to the existing view.
Negligible Adverse	Alterations that result in a very slight deterioration to the existing townscape resource, not uncharacteristic within the townscape.	Alterations that typically result in a barely perceptible deterioration in the existing view.
Minor Adverse	Alterations that result in a slight deterioration of the existing townscape resource. Characteristic features could be partially lost.	Alterations that typically result in a limited deterioration in the existing view.
Moderate Adverse	Alterations that result in a partial deterioration of the existing townscape resource. Valued characteristic features could be largely lost.	Alterations that typically result in a noticeable deterioration the existing view.
Major Adverse	Alterations that result in a considerable deterioration of the existing townscape resource. Valued characteristic features could be wholly lost.	Alterations that typically result in pronounced deterioration in the existing view.

1.57 Duration of effect has been described as short or long-term, in accordance with the criteria set out in Table 1.10.

Table 1.10: Duration of Effects Criteria

Duration	Criteria
Short term, Temporary	0 – 5 Years
Medium Term Temporary	5 – 10 Years
Long term Permanent	10 + Years

1.58 For the purposes of this EIA, effects that are graded as being Major or Moderate are considered significant. Effects that are graded as Minor to None constitute effects that are not considered significant.

Assumptions and Limitations

1.59 Assumptions have been made in relation to the massing of the proposed development, which has been based upon a worst case scenario from a townscape and visual perspective. The height and massing for the proposed development set out within Parameter Plan PP-104 constitutes the worst case scenario due to the orientation of the massing and the maximum development height.

1.60 Whilst an indicative demolition and construction programme has been prepared for the proposed development, and presented in ES Volume 1, Chapter 5: Demolition and Construction Environmental Management, the construction timetables for the cumulative schemes and reasonably foreseeable schemes that have been considered within the cumulative assessment are currently unknown and as such, the cumulative assessment for the demolition and construction stage has been estimated as a worst case of the demolition and construction stage for all cumulative schemes occurring concurrently.

Baseline Conditions

1.61 This section provides an overview of the existing townscape and visual baseline conditions, with a more detailed description of both townscape and visual baseline conditions presented at Appendix 1.2: Baseline Conditions and Figures.

Townscape Baseline

Land Use and Pattern

1.62 The urban area of central Reading generally occupies the River Thames valley floor and in broad terms is contained in a narrow area of land between the River Thames and River Kennet. The east-west route of the Great Western Mainline currently provides further containment of the urban centre of Reading, which sits to the south of the railway line.

1.63 As a result of the topographical pattern and the transport corridors that follow it, urban development extends in a broadly east-west pattern along the valley floor. This is evident in the coalescence of smaller settlements as development has spread along the corridors from the urban centre of Reading. A mixture of industrial, retail and residential development has also extended north and north-west of Reading Station, infilling broadly flat land between the railway line and River Thames. However, the linkages between Reading and Caversham remain vehicle dominated and focussed around the Caversham Bridge crossing point, which is at a distance from the centre of Reading. Reading Bridge to the east of the application site acts as an additional route between central Reading and Caversham but is also physically and visually separated from central Reading by built form and transport corridors.

1.64 The many strategic movement routes have long influenced the land use within Reading and its wider suburbs, notably areas immediately adjacent to the route of the Great Western Mainline, which are formed predominantly by large industrial, business and transport infrastructure uses with limited small-scale residential development.

1.65 The application site lies immediately to the north of the recently constructed northern Reading Station entrance. Large-scale commercial and office uses are evident along Vastern Road, Forbury Road and Napier Road to the south-east of the application site. Continuing east along the route of the Great

Western Mainline further large scale industrial, commercial and office buildings have been constructed with the Thames Valley Park estate representing a substantial large-scale development located on land between the railway line and River Thames. These form part of a pattern of large-scale land uses extending along either side of the railway line corridor from the suburb of Tilehurst to the north-west of the application site, as far as the Thames Valley Park to the east. Reading town centre includes extensive commercial, business and transport infrastructure uses.

1.66 Surrounding the industrial/business core, in which the application site is located, wider Reading includes extensive areas of residential development, interspersed with areas of open space. The latter includes Christchurch Meadows and Hill Meadow to the north-east of the application site and the playing fields of Kings Meadow to the south-east, which are accessible via the Thames Path. Small-scale residential properties along Lynmouth Road and De Montfort Road sit immediately adjacent to the north of the application site; however, they are situated in an area predominantly characterised by large scale and low grain built form.

1.67 As is evident from the above, the application site lies within a very well-established framework of significant large-scale built development land uses, surrounded by residential development, all set within a network of regional strategic transport corridors.

Access Routes and Rights of Way

1.68 No Public Rights of Way (PRoW) cross or lie immediately adjacent to the application site. PRoW No.1, known as the Thames Path, extends north-west to south-east following the course of the River Thames and lies 160 m to the north-east of the application site. The recently constructed Christchurch Bridge connects the Thames Path to Christchurch Meadows and PRoW No. 24 to the north-east. Further PRoW and cycle routes extend throughout the urban area of Reading to the south of the application site and to the north within Caversham.

Topography and Hydrology

1.69 At a regional scale, Reading sits within the low-lying Thames Valley at an elevation of approximately between 30 – 40 m above ordnance datum (AOD)To the north lie the Chiltern Hills Area of Outstanding Natural Beauty. Two localised prominent landforms within the Thames Valley, adjacent to the urban centre of Reading, rise to the south-west towards Tilehurst at an elevation of 90 m AOD and the south-east towards Whitley and Earley at an elevation of 80 m AOD.

1.70 Locally, the application site lies approximately 180 m south of the River Thames and is broadly level, lying at an elevation of approximately 36 to 38 m AOD. The land immediately surrounding the application site, lying adjacent to the River Thames, sits at approximately the same elevation. Approximately 1 km north of the application site, Caversham Park and surrounding residential properties sit on a localised ridgeline at an approximate elevation of 80-85 m AOD, which extends south-west to Balmore Park before steeply falling towards Hemdean Road, which sits in a narrow valley at an elevation of 40 m AOD. The topography then rises again to the north-west towards Caversham Heights (70 m AOD) and onto Caversham Heath Golf Course (80 m AOD).

1.71 The urban centre of Reading and focus of the historic settlement occupies a slightly elevated area of land to the south of Reading Railway Station, approximately 500 m to the south of the application site. This area sits at between 40-45 m AOD and lies between the River Thames and River Kennet. The River Kennet forms a key feature that passes directly through the town centre, whereas, in contrast, the River Thames is physically and visually separate from central Reading.

Designations

1.72 There are no designations of townscape/landscape quality within or adjoining the application site. The nearest Conservation Area, Market Place/London Street, lies in the urban centre of Reading, approximately 280 m to the south-east of the application site and beyond Reading Railway Station. The Conservation Area of St Peter's lies 480 m to the north-west of the application site and includes Caversham Bridge.

1.73 There are no Registered Parks or Gardens of Special Historic Interest (RPGSHI) in the vicinity of the application site. The nearest RPGSHIs are The Forbury Gardens, approximately 270 m to the south-east from the application site boundary; Caversham Court Gardens, approximately 725 m to the north-west; and Caversham Park, approximately 2 km to the north-east.

1.74 There are no listed buildings or scheduled monuments immediately adjacent to the application site with the nearest being the Main Building of Reading General Station (Grade II), 130 m to the south and is separated from the application site by the recently constructed northern entrance to Reading Railway Station and the railway tracks and platforms within Reading Railway Station. Further to the south and south-east of Reading Railway Station, clusters of listed buildings are located within the Conservation Areas of Market Place/London Street and St Mary's Butts/Castle Street which are considered in ES Volume 2, Chapter 2: Built Heritage.

1.75 The application site lies within the Station Area Boundary as defined in the Reading Station Area Framework (RSAF, 2010). The RSAF sets out the public realm priorities and provides design guidance, of which a number of points provide context to the application site. These include benchmark building heights, area massing and density, screening of external plant and machinery and creation of a north-south spine connecting Christchurch Meadows with central Reading. The application site also falls within the area covered by Policy CR11: Station/River Major Opportunity Area (MOA), which sets out broad guidelines for development in the MOA with further guidelines for the sub-areas of which the application site is within RC1e: North of Station. The application site also sits within Policy RC13a Station Area Cluster as defined in the Reading Tall Buildings Strategy (2008 updated 2018) and CR10a: Station Area Cluster within the Reading Local Plan (2019).

Vegetation

1.76 The application site itself is largely devoid of vegetation except for several small canopy trees along the northern and western boundaries and ornamental planting (predominantly low shrub planting) within the areas of surface car parking.

1.77 In the immediate vicinity of the application site, south of the River Thames, vegetation is limited to sporadic street trees and shrubs along the southern bank of the river supplemented with garden vegetation associated with residential properties (e.g. on De Montford Road and Lynmouth Road). To the north of the River Thames, within Christchurch Meadows, tree cover is more notable with willow and alder species lining the river bank. Dense tree cover and vegetation bounds the course of the River Thames eastwards towards the Thames Valley Park. West of Caversham Bridge, tree cover along the Thames Side Promenade and river is less dense with the transition in the landscape from built edge to grassland.

Published Character

National Landscape Character

1.78 In terms of Landscape and Townscape Character, the application site lies in the eastern part of the National Character Area (NCA) 110: Chilterns, the key characteristics of which, of relevance to the application site, are the following:

- *"The chalk plateau is incised by parallel branching valleys gently shelving to the south-east into the London Basin. The large chalk aquifer is abstracted for water to supply London and its surrounds and also supports flows of springs, chalk streams and the River Thames ...*
- *The River Thames and its flood plain mark a distinctive area in the south. The river is a focus for settlement, abstraction and recreation ...*
- *Major transport routes, including motorways, radiate from adjacent Greater London, associated with significant 20th-century development and extensive urban fringe areas...*

- *Brick and flint are the dominant traditional building materials, with Totternhoe Stone (clunch) being less common, but still a distinctive..."* (p. 7-8).

1.79 There are four Statements of Environmental Opportunity for this NCA, of which SEO4 is of relevance, noting the need for creation of green infrastructure to reduce the impact of development, for example through the following:

- *"Enhance local distinctiveness and create or enhance green infrastructure within existing settlements and through new development, particularly in relation to the urban fringe ...;*
- *Adapt or remove existing development where to do so would significantly strengthen landscape character, enhance views and address barriers to natural processes and public access to the countryside ...;*
- *Addressing deficits in greenspace and access links, integrating the public transport and cycle network and creating new or improved multi-user routes and green spaces working across administrative boundaries as necessary ...;*
- *Maximising the appeal of existing and new green spaces and sustainable transport routes close to people's homes and workplaces, including in the urban fringe where it could also strengthen landscape character ...;*
- *Enhancing the rural and urban scene by promoting the use of traditional local building materials and vernacular styles and utilising appropriate infrastructure"* (p.27).

Country Landscape Character

1.80 Within the West Berkshire Landscape Character Assessment[4], the application site is located within land defined as 'Urban Area' for which no further detail is provided.

Local Level Townscape Character

1.81 Entec Ltd produced the Reading Tall Building Strategy (RTBS)[5] in 2008 on behalf of RBC in order to inform the development of a tall buildings policy and specific guidelines for individual sites, which form part of the Reading Central Area Action Plan. As part of the production of the RTBS, a townscape assessment was undertaken, and the Reading Central Area divided into townscape character areas. The RTBS was updated in March 2018 and the updates are documented below along with the original 2008 commentary.

1.82 As shown on TVIA Figure 3: Townscape Character Plan, the application site and its immediate setting fall within Character Area (CA) 22 - Vastern Road. The north-western edge of the application site immediately abuts CA12 - Caversham Road whilst the north-eastern edge abuts CA23 - King's Meadow. CA1 - Station Hill abuts the boundary of CA22 to the south, whilst CA11 - Napier Road abuts the south-eastern boundary (both of these being located beyond Reading Station and the Great Western Railway Line. The area immediately to the west of CA22 falls outside of the Reading Central Area.

1.83 It is noted on page 13 that "There are 8 character areas which are judged to have a capacity for tall buildings. These areas are largely, but not wholly towards the edges of central Reading, adjacent to major transport routes such as the IDR and the railway line. Within these areas there is an absence of historic built form, and although the building style and heights across these areas is variable, there are characteristically occasional buildings of between 8 and 10 storeys. The buildings were largely constructed during the middle and later stages of the 20th century and have a medium sized or large block size. With the exception of character area 19 'Mallard Row to 'Fobney Street' they all have a predominantly office or industrial land use". This includes CA 22 and CA1 and CA2 immediately to the south.

1.84 The townscape descriptions for each of the RTBS Character Areas are set out within Appendix 1.2: Baseline Conditions and Figures. Table 1.11 sets out the commentary provided in the Reading Tall Building Strategy Townscape Character Assessment (2008, updated 2018) regarding CA:22 - Vastern Road.

Table 1.11: Degree to which Application Site Reflects Published Townscape Assessment

Consideration	Original Tall Buildings Strategy Comment	2018 Update
Land Use	Warehouses and retail park	Major land uses remain the same, although the opening of the northern entrance to the station has brought a public transport interchange into the heart of the site.
Historical significance	Railway town and growth of manufacturing and commerce post 1840	No change.
Architectural style	The predominant material is coloured, metal cladding	No change.
Urban grain and townscape scale	The building blocks have a large floor space, although the buildings are not high rise and there is extensive car parking adjacent to the buildings. These features combine to create a medium scale townscape.	No change.
Townscape condition	The large, blank faces of the warehouses create an unexceptional area of townscape which does not respond well to the surrounding residential land use. Although the buildings are occupied and function well for their purpose, their design is unattractive and creates a weak and uninspiring area of townscape.	Although the new entrance to the station and adjacent square have improved the townscape condition of a small part of the site, the surrounding buildings remain unchanged.
Key views within the character area	There are no key views defined for the character area.	No change.
Key views into the character area	Buildings within the character area contribute to the skyline visible from Oxford Road when approaching Reading from the west. From the elevated position of Caversham Park, Balmore Park and Horse Close, built form within the character area contributes to the view of central Reading.	No change.
Landmark structures and existing tall buildings	The large, warehouse structures create a consistent, unexceptional townscape. There are no landmark structures. Although the warehouses create a roofline which is elevated above the surrounding residential buildings, there is no one structure which is notable as a tall building.	The new northern entrance to the station is a landmark, albeit not particularly high. It will become more prominent as development of surrounding sites allows views of it to open up. The new Christchurch Bridge is a landmark on the river, but is currently visually separated from the rest of the area.
Tall buildings planning applications	N/A	Outline planning permission (110024) was granted on the sorting office site for a major mixed use development including residential, office, hotel and retail. The plot adjacent to the station entrance

[4] Land Use Consultants, August 2018. Berkshire Landscape Character Assessment. Reading Borough Council.

[5] Entec Ltd, 2008. Reading Tall Building Strategy. Reading Borough Council.

Table 1.11: Degree to which Application Site Reflects Published Townscape Assessment		
Consideration	**Original Tall Buildings Strategy Comment**	**2018 Update**
		would have been up to 16 commercial storeys or 21 hotel storeys, with heights decreasing to the west. This permission has now expired.
Townscape sensitivity to the inclusion of tall buildings	Low: The large block size which exists within the character area and the absence of any key views or visual focal point makes this an appropriate location for tall buildings. However, it is proposed that tall structures should not be developed along the north and western boundaries of the character area as these boundaries are shared with small scale residential areas. any proposed built form should respond in terms of height and scale to the residential area. The tallest structures should be located to the south of the character area, adjacent to the railway line. In this area the townscape features are larger scale, and adjacent to large scale features outside of the area e.g. existing station buildings, Thames Tower and Western Tower.	Townscape sensitivity remains low, albeit with the caveats expressed in 2008 continuing to apply.

1.85 In addition to the 2018 character assessment updates, there is no direct access to the site from the northern station entrance. Furthermore, the site inhibits legibility between Vastern Road and the recently upgraded public realm at the northern station entrance, with any physical or perceptual connection between the centre of Reading and the River Thames corridor broken by the vehicle dominated Vastern Road. Views north from the station, as proposed in the Reading Station Area Framework, would contribute significantly to diluting this separation. Buildings within CA 22 do not contribute to the skyline in views towards the centre of Reading, with views of The Blade and Thames Tower being the most recognisable aspects of the built form in views over the site.

Application Site Character

1.86 The application site is approximately 1.77 hectares (ha) in size and is currently occupied by the Reading Station Shopping Centre which comprises a series of retail units set within extensive areas of surface car parking and associated infrastructure such as fencing, signage and lighting columns.

1.87 The existing built forms on the application site comprise a series of low-rise retail units, constructed predominantly in red brick with corrugated metal cladding. The rear and side facades of the retail units generally lack articulation or fenestration, resulting in a blank inactive façade. The front facing aspects of the buildings in contrast feature doors, windows, canopies, recesses and signage, resulting in a more active and articulated façade. Overall the existing built forms are large-scale blocks of utilitarian massing and appearance which, along with the extensive surface car parking, diminishes the visual amenity experience within the application site.

1.88 The northern and western boundaries of the application site are bounded by Vastern Road and Caversham Road respectively. These are busy roads with high volumes of traffic that result in diminished levels of tranquillity within the application site. The application site is contained to the south and east by large-scale built forms: the former Royal Mail sorting office and the recently completed Reading Railway Station building to the south, as well as a multi-storey car park to the east. Whilst the application site is contiguous with the former Royal Mail building, it is separated from the Reading Railway Station building by the northern entrance forecourt; and from the multi-storey car park by Trooper Potts Way.

1.89 The application site is largely devoid of vegetation, although the following on and off-site trees are noted:

- amenity shrubs planted in several small linear groups within the car parking areas;
- three small trees within the car parking area adjacent to the restaurant within the western part of the application site;
- a single canopy tree located within the application site to the south, adjacent to the western end of the retail units; and
- a line of mature street trees along the northern and western application site boundaries (i.e. the Vastern Road frontage and the Caversham Road frontage).

Visual Baseline

1.90 A visual appraisal of the application site and its study area was undertaken in April, May and October 2019, to determine the relationship of the area with its surroundings, the visibility of the application site within the wider townscape and provide a basis for consideration of the effects that the proposed development would have on views and the townscape and visual characteristics of the area.

1.91 The visual appraisal was undertaken from publicly accessible viewpoints within the surrounding townscape, primarily roads, footpaths and public open space, to determine the approximate extent of the area from which the application site is visible from the eye level of a person standing on the ground.

1.92 The visibility of any site is predominantly influenced by landform and the extent and type of vegetation cover and built elements within the application site and the surrounding townscape. The Visual Appraisal exercise demonstrated that the broadly level topography of the application site and study area results in very limited visibility of the application site as it exists, as intervening vegetation and built form in the urban area typically screen views from all but the nearest distances. However, during the visual appraisal, account was taken of the likely scale of the proposed development within the application site, in terms of the potential visibility of the application site.

1.93 In order to represent the nature of identified views, Site Context Photographs 1−26 were selected from those photographs taken during the visual appraisal fieldwork from near (0- approximately 250 m), middle (approximately 250-750 m) and long (approximately 751 m+) distances. A further three viewpoints were requested by Brian Conlon (Principal Planner) at RBC via email on 17 October, all of which were near-distance views from the south and south-east.

1.94 The locations from which these photographs were taken are illustrated on Figure 5: Visual Appraisal Plan in Appendix 1.2, which also shows how visible the application site is from the surrounding area. The extent and nature of views obtained towards the application site are described below, with reference to these representative views.

1.95 The Visual Appraisal demonstrated that the application site and the existing built form is only readily visible from a limited number of locations in the surrounding townscape, owing to containment provided by intervening built form, landform and/or vegetation.

Near-Distance Views

1.96 Clear views of the application site are obtained from the adjoining roads to the north-west, north and north-east. This includes from Caversham Road to the north-west (Site Context Photograph 4); and Vastern Road to the north (Site Context Photograph 1) and north-east (Site Context Photograph 2). Where visible, the application site appears as a utilitarian architecture set within surface car parking, providing limited visual amenity.

1.97 Glimpsed/channelled views are also available where roads are aligned towards the application site, such as along De Montfort Road (Site Context Photograph 5) and Lynmouth Road to the north; along Northfield Road to the west (Site Context Photograph 7); and along Greyfriars road to the south-west

(Site Context Photograph 24); and along Blagrave Street to the south-east (Site Context Photograph 26).

1.98 From other locations in proximity, near-distance views towards the application site are partially restricted by intervening built forms, although views towards the site are available above and beyond these, including views from Reading Bridge to the east (Site Context Photograph 8); from Caversham Road to the south-west (Site Context Photograph 6); and from the southern forecourt of Reading Station to the south (Site Context Photograph 25).

1.99 Although the site itself is not visible due to existing built form on intervening land, views towards it are available in the context of existing large scale built forms in the central Reading area. Many of these built forms are visible against the skyline, notably the 12-storey Reading Bridge House, the 5-storey multi-storey car park on Vastern Road, No.3 Forbury Road, Apex Plaza and Thames Tower.

Middle-Distance Views

1.100 Middle-distance views from the south are obtained from the central area of Reading. These views are invariably channelled along busy urban roads, with associated traffic and infrastructure dominating views, as demonstrated by Site Context Photograph 10, which is focussed north along Station Road towards the Grade II listed Reading Railway Station Building. Views from central Reading invariably feature large-scale built forms and as such have an urban visual character. Similarly, views are also obtained from Forbury Gardens to the south-east (Site Context Photograph 13), albeit the foreground is defined by public open space with numerous mature canopy trees, which filter views and help to reduce the influence of the surrounding large-scale built forms.

1.101 In contrast, middle-distance views from the west are predominantly along streets lined with residential properties of a domestic scale or low-rise commercial/industrial properties, and therefore have either a suburban and/or edge-of-town visual character, albeit with large-scale built forms in central Reading visible in the background, as demonstrated by Site Context Photograph 12.

1.102 Middle-distance views obtained from the north-west, north, north-east and east are generally from green open spaces along the River Thames, as demonstrated by Site Context Photograph 15, 11, 9 and 14. Whilst these views are defined by the open river corridor and/or green open spaces containing large amounts of mature vegetation, the large-scale built forms of central Reading are visible in the background of views, including 'Thames Tower', 'The Blade' and 'Reading Bridge House'.

Long-Distance Views

1.103 Glimpsed long-distance views are obtained from elevated areas to the north and north-east, as demonstrated by application site Context Photograph 16, 18 and 19. Similarly, long-distance glimpsed views are available from certain locations to the south, such as where street orientation allows channelled views north towards the application site, for example Site Context Photograph 17, which demonstrates that the views obtained along Mount Pleasant; and Site Context Photograph 21, which demonstrates the views obtained along the A33. From these views towards the application site are seen in the context of larger scale built forms in the central Reading visible on the skyline, notably The Blade, Thames Tower and Reading Bridge House.

1.104 Views towards the central area of Reading are also available from elevated location further afield, such as the Warren Footpath in the vicinity of Chazey Wood within the Chilterns AONB to the north-west (Site Context Photograph 20); Dunsden Way to the north-east (Site Context Photograph 23); and from London Road, Shepherds Hill to the east (Site Context Photograph 22). In these views the application site is not discernible, owing to intervening topography, built form and vegetation, although several existing tall buildings within central Reading are visible on the skyline.

Policy Considerations

1.105 This section summarises the baseline policy that is relevant to the site and proposed development, while the full baseline assessment presented at Appendix 1.1: Planning Policy.

1.106 National level planning policy is supported at a local level by a number of policy documents produced by RBC, some of which relate specifically to development within Reading town centre and provide guidelines for development. The area that the application site is located within is identified as a MOA, within the Local Plan.

1.107 Of the policies within the Reading Borough Local Plan (2019) of particular relevance is policy 'CR10 - Tall Buildings', which sets out that tall buildings are identified as 10 storeys of commercial floorspace or 12 storeys or residential floorspace and equivalent to 36 m tall. The site is located within the area covered by 'CR10a - Station Area Cluster', which states that:

"A new cluster of tall buildings with the station at its heart will signify the status of the station area as a major mixed-use destination and the main gateway to and most accessible part of Reading. Tall buildings in this area should:

- *Follow a pattern of the tallest buildings at the centre of the cluster, close to the station, and step down in height from that point towards the lower buildings at the fringes;*
- *Contribute to the creation of a coherent, attractive and sustainable cluster of buildings with a high quality of public realm;*
- *Ensure that adequate space is provided between the buildings to avoid the creation of an overly dense townscape and to allow buildings to be viewed as individual forms;*
- Be designed to fit within a wider planning framework or master plan for the area, which allows separate parcels of land to come forward at different times in a coordinated manner." .....

  v) In addition to the area-specific requirements, all tall building proposals should be of excellent design and architectural quality, and should:

- *Enhance Reading's skyline, through a distinctive profile and careful design of the upper and middle sections of the building;*
- *Contribute to a human scale street environment, through paying careful attention to the lower section or base of the building, providing rich architectural detailing and reflecting their surroundings through the definition of any upper storey setback and reinforcing the articulation of the streetscape;*
- *Contribute to high-quality views from distance, views from middle-distance and local views;....."*

1.108 The Reading Tall Buildings Strategy (2018) sets out that in respect of CA 22: Vastern Road, within which the application site is located, is considered to have a Low townscape sensitivity to tall building development due to the absence of any key views of visual focal point. The document states that development should respond in terms of height and scale to the adjacent residential area, with tall structures being located to the south of the character area, adjacent to the railway line.

1.109 The Reading Station Area Framework (2010) sets out benchmark heights for re-development of the application site, which range from 6 storeys in the north-western corner to a landmark building of at least 10 storeys in the south-eastern corner. Although at paragraph 6.23, the document states that:

- *"Benchmark heights may be modified upwards in order to realise certain urban design or other major planning benefits, or where applicants have demonstrated convincingly that the potential impact of higher buildings on the surroundings can be mitigated."*

Sensitive Receptors

1.110 The receptors identified as being sensitive to the proposed development and which have been 'scoped-in' to the assessment are summarised in Table 1.12. Judgements in respect of sensitivity are presented in Appendices 1.3 and 1.4.

Table 1.12: Summary of Sensitive Receptors	
Townscape Receptors	
Receptor	**Sensitivity**
National Landscape Character Area 110: Chilterns	Low
CA 22: Vastern Road	Low
CA 12: Caversham Road	Medium
CA 23: King's Meadow	High
CA 1: Station Hill	Low
CA 2: Reading Station East	Low
CA 7: Reading Station West	Medium
CA 13: Cattle Market and Chatham Place	Low
CA 3: Friar Street	Low
CA 4: Station Road	Low
CA 11: Napier Road	Low
Visual Receptors	
Visual Receptors with Near-Distance Views	Low – High
Visual Receptors with Middle-Distance Views	Low – High
Visual Receptors with Long-Distance Views	Low – High
Viewpoints detailed in the Reading Tall Building Strategy	Low – High

Assessment of Effects

1.111 This section summarises the key townscape and visual effects that are anticipated to arise as a result of the proposed development, setting out only those receptors considered likely to experience significant effects as a result of the proposed development, with the full consideration of townscape effects set out within Appendix 1.3: Townscape Assessment, and full consideration of visual effects set out within Appendix 1.4: Visual Assessment.

Demolition and Construction Effects

Townscape Effects

Application Site Character

1.112 Demolition and construction operations on the application site would cause direct changes to its character through the removal of an existing retail facility and replacement with plant and machinery. The construction traffic and plant movements would constitute discordant elements on the application site. There would be no access to the application site which would be surrounded by hoarding with the construction works being a higher elevation than the existing elements on the application site.

1.113 The temporary demolition and construction works would cause a Large magnitude of impact upon the character of the Low sensitivity application site due to the replacement of the entire application site with construction operations. As such, the temporary construction activities would result in a temporary **Moderate Adverse** effect. This is considered to be a significant effect.

Reading Tall Building Strategy Townscape Character Area

1.114 The temporary demolition and construction stage of the proposed development would cause direct effects upon the Vastern Road CA identified within the Reading Tall Building Assessment that it is located within. Whilst the demolition and construction activities would not take place within the adjacent character areas, they would give rise to indirect, or perceived effects upon these areas. The direct effects of the demolition and construction stage of the proposed development would be greater than the perceived effects, which would diminish as the physical separation between the works and the CA's increases. As such, the effect upon the CA's that the site is located within or immediately adjacent to, are detailed below. The consideration of how the proposed development would impact all character areas assessed is contained within Appendix 1.3: Townscape Assessment.

CA22: Vastern Road

1.115 The construction activities would be located within the north of this CA, occupying a large proportion of its area. The temporary introduction of plant and machinery, construction traffic and construction activities would result in direct changes to the CA where they would be perceived as detracting from the character of the CA for the duration of the construction works. The temporary construction activities would occupy a large proportion of the CA, where the disturbance would be perceptible both horizontally along Vastern Road, as well as vertically as the construction works progress.

1.116 The temporary demolition and construction stage of the proposed development would cause a Large magnitude of impact upon the Low sensitivity CA22. This would result in a temporary **Moderate Adverse** effect for the duration of the demolition and construction stage. This is considered to be a significant effect.

CA12: Caversham Road

1.117 Although the construction activities associated with the proposed development would not cause any direct changes to the CA, the temporarily introduced tall plant and machinery (including cranes) in the adjacent CA would detract from the townscape characteristics of the Caversham Road CA, particularly where street orientation allows channelled views towards the application site. The temporary construction activities would be perceived as intrusive features, which would partially alter the setting of this CA and would be at odds with its over-riding Victorian and Edwardian residential character for the duration of the demolition and construction stage. However, from much of the CA the construction works would not be perceptible due to the high enclosure ratio. On balance, there would be a slight deterioration in the setting of this CA.

1.118 The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact upon the Medium sensitivity CA12. This would result in a temporary **Minor Adverse** effect for the duration of the demolition and construction stage. This is not considered to be a significant effect.

CA23: King's Meadow

1.119 Although the demolition and construction activities associated with the proposed development would not cause any direct changes to the CA, the temporarily introduced tall plant and machinery (including cranes) in the adjacent CA would detract from the large expanse of open meadows. The temporary construction activities would be perceived as intrusive features, which would slightly alter the setting of this CA and would be at odds with the recreational resource of the open meadows. Although immediately adjacent to the Vastern Road CA, the King's Meadow CA is afforded some level of separation from the application site. However, the temporary demolition and construction stage of the proposed development would be imperceptible from large areas of the CA. On balance, there would be a slight deterioration in the setting of this CA where the construction activities appear above the bankside vegetation of the River Thames.

1.120 The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact upon the High sensitivity CA23. This would result in a temporary **Minor Adverse** effect for the duration of the demolition and construction stage. This is not considered to be a significant effect.

CA1: Station Hill

1.121 Given the enclosed nature of this CA, demolition and construction activities associated with the proposed development would not be readily perceptible from the vast majority of the CA. Whilst the uppermost parts of taller construction plant and machinery such as cranes, would be perceptible from the Great Western main line immediately to the north of the application site, these would be perceived in context with existing rail infrastructure which are a defining characteristic of this CA. As such, there would be no alteration to any of the key characteristics of the CA.

1.122 The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact upon the Low sensitivity CA1. This would result in a temporary **Minor Adverse** effect for the duration of the demolition and construction stage. This is not considered to be a significant effect.

CA11: Napier Road

1.123 While the temporary demolition and construction activities of the proposed development would not occur within this CA, the tall plant and machinery (including cranes) would be perceived in its setting from some areas in the CA alongside the existing unremarkable built form adjacent to the railway line. On balance, there would be a slight deterioration in the setting of this CA where construction activities are perceptible.

1.124 The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact upon the Low sensitivity CA11. This would result in a temporary **Negligible Adverse** effect for the duration of the demolition and construction stage. This is not considered to be a significant effect.

Visual Effects

1.125 The temporary demolition and construction stage of the proposed development would alter both the visibility of the application site and the visual amenity experienced in its study area. Much of the ground level demolition and construction activity would be screened from view by hoarding around the application site while the more elevated activities would be clearly visible, to varying degrees, from large parts of the study area where views towards the application site exist.

1.126 Near-distance views – the temporary demolition and construction activities would be seen at close range, where they would likely occupy large amounts of views gained towards the northern station entrance. While some of the ground level activities would be partially screened from view by hoarding around the application site, the large area of construction and the height of the proposed construction works would be clearly visible, occupying a large proportion of views in close range of the application site. Clear views of the construction activities would be available from the immediate vicinity of the application site, such as the adjoining roads of Caversham Road to the north-west (Site Context Photograph 4), Vastern Road to the north (Site Context Photograph 1) and north-east (Site Context Photograph 2). Views from De Montfort Road (Site Context Photograph 5) and Lynmouth Road to the north, along Northfield Road to the west (Site Context Photograph 7), along Greyfriars road to the south-west (Site Context Photograph 24) and along Blagrave Street to the south-east (Site Context Photograph 26) would channel views towards the more elevated construction activities, while the lower aspects would be largely screened from view by intervening elements.

1.127 In other near-distance views towards the application site, the temporary demolition and construction activities would be partially screened by intervening built forms. However, the elevated construction operations would be partially visible above and beyond these, including views from Reading Bridge to the east (Site Context Photograph 8); from Caversham Road to the south-west (Site Context Photograph 6); and from the southern forecourt of Reading Station to the south (Site Context Photograph 25).

1.128 Middle-distance views – the ground level construction activities on the site would be screened from view by existing development on intervening land. Where visible, the elevated aspects of the temporary construction activities would be largely seen in views that are channelled along busy urban roads, where traffic and infrastructure occupy large proportions of the view available such as in Site Context Photograph 10. Views of the demolition and construction stage of the proposed development would be largely screened from view by the existing large-scale built forms that provide an urban character to the visual amenity. Views towards the construction activities from the south-east would also be largely screened by the existing large scale built form such as Apex Plaza and Forbury Place (Site Context Photograph 13). Views of the temporary construction works from the west are predominantly obtained along residential streets, or those with a more domestic scale of built form that the taller elements of construction activities would be seen above (Site Context Photograph 12). In views from the north-west, north, north-east and east; the taller elements of the temporary construction works would appear within the context of views from green open spaces along the River Thames, such as in Site Context Photograph 15, 11, 9 and 14.

1.129 Long-distance views – the ground level construction activities on the site would be screened from view by existing development on intervening land but the more elevated activities would be visible from elevated ground (Site Context Photographs 16, 18, 19, 20, 22 and 23), or where street orientation channels glimpsed views towards the site (Site Context Photographs 17 and 21).

1.130 Views of the temporary construction activities would give rise to larger changes where they are anticipated to occupy a larger proportion of views available, such as close range views. As such, the effect of the demolition and construction stage of the proposed development upon the representative Site Context Photographs where the most significant changes are anticipated are detailed below. The consideration of how the proposed development would impact visual receptors at all representative Site Context Photographs assessed is contained within Appendix 1.4: Visual Assessment.

Site Context Photograph 01: View south from Vastern Road/Lynmouth Road

1.131 During the temporary demolition and construction stage of the proposed development, the ground level activities would be partially screened from view due to hoarding around the application site which would partially limit the amount of clutter visible. However, the taller activities would be visible against the skyline with tall plant and machinery such as cranes being seen at close proximity. Views of the proposed development under construction would slightly erode the visual amenity experience at this location, leading to a limited deterioration to the existing view.

1.132 The temporary demolition and construction stage of the proposed development would cause a Large magnitude of impact upon the Medium sensitivity visual receptors in the vicinity of Site Context Photograph 01. This would result in a temporary **Moderate Adverse** effect for the duration of the demolition and construction stage. This is considered to be a significant effect.

Site Context Photograph 02: View south-west from Vastern Road

1.133 During the temporary demolition and construction stage of the proposed development, the ground level activities would be partially screened from view due to hoarding around the application site which would partially limit the amount of clutter visible. However, the taller activities would be visible against the skyline with tall plant and machinery such as cranes being seen at close proximity. Views of the mass and height of the proposed development under construction would slightly erode the visual amenity experience at this location, leading to a limited deterioration to the existing view.

1.134 The temporary demolition and construction stage of the proposed development would cause a Large magnitude of impact upon the Low sensitivity visual receptors in the vicinity of Site Context Photograph

02. This would result in a temporary **Minor - Moderate Adverse** effect for the duration of the demolition and construction stage. This is considered to be a significant effect.

Site Context Photograph 03: View north from Station Square North

1.135 The temporary demolition and construction stage of the proposed development would largely occupy the foreground of views available from the Northern Reading Railway Station Entrance. Although hoarding would screen views of some ground level clutter, the tall plant and machinery would be visible at close proximity. Demolition and construction works for the proposed development would replace views of the poor quality built form that exhibits little architectural merit but would occupy a greater area of the skyline in views due to the elevated nature of the construction activities.

1.136 The temporary demolition and construction stage of the proposed development would cause a Large magnitude of impact upon the Medium sensitivity visual receptors in the vicinity of Site Context Photograph 03. This would result in a temporary **Moderate Adverse** effect for the duration of the demolition and construction stage. This is considered to be a significant effect.

Site Context Photograph 04: View south-east from Caversham Road

1.137 The temporary demolition and construction stage of the proposed development would appear in views towards the south-east gained by visual receptors along Caversham Road. The taller elements of plant, machinery and the demolition and construction works would be seen in views channelled along the road where they would interrupt views of recognisable townscape elements including The Blade and Thames Tower. Views of ground level activities would be largely screened by hoarding around the application site and foreground elements. Where views of the temporary construction activities are available, they would be seen in the context of traffic and infrastructure associated with the A4155 Caversham Road and the highway clutter of signs and street lights as well as existing buildings and vegetation.

1.138 The temporary demolition and construction stage of the proposed development would cause a Large magnitude of impact upon the Low sensitivity visual receptors in the vicinity of Site Context Photograph 04. This would result in a temporary **Moderate Adverse** effect for the duration of the demolition and construction stage. This is considered to be a significant effect.

Site Context Photograph 05: View south from Thames Path / De Montfort Road

1.139 During the temporary demolition and construction stage of the proposed development, the construction activities would be partially visible above the terraced housing that lines De Montfort Road. The taller elements of plant, machinery and the construction works would be seen in views channelled along the narrow road by the largely two storey development lining the road. The demolition and construction activities would interrupt views towards top floors the City Tower, that can be seen above the existing Siemens building immediately to the south of the application site and development to the south of the railway line. Additionally, the demolition and construction works would add to the visual clutter of streetlights, signs, telegraph wires, aerials, satellite dishes and low quality surfacing that detract from the visual amenity along the residential road.

1.140 The temporary demolition and construction stage of the proposed development would cause a Medium magnitude of impact upon the High sensitivity visual receptors in the vicinity of Site Context Photograph 05. This would result in a temporary **Moderate Adverse** effect for the duration of the demolition and construction stage. This is considered to be a significant effect.

Context Photograph 25: View north from Station Square

1.141 During the temporary demolition and construction stage of the proposed development, the demolition and construction activities would be partially visible above the Main Building of Reading General Station (Grade II Listed). The taller elements of the demolition and construction activities and plant such as cranes would be partially seen against the skyline above both the new station building and the historic station building. The temporary construction works would appear alongside the large advertising screen where they would introduce an additional element of clutter into views over Station Square towards the former station building.

1.142 The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact upon the Medium sensitivity visual receptors in the vicinity of Site Context Photograph 25. This would result in a temporary **Minor Adverse** effect for the duration of the demolition and construction stage. This is not considered to be a significant effect.

Completed Development Effects

1.143 This section includes a summary of the townscape and visual effects of the proposed development which has been undertaken with consideration to Year 1 of the completed development. The full assessment is presented in Appendix 1.3: Townscape Assessment, and Appendix 1.4: Visual Assessment.

1.144 The proposed development is anticipated to comprise of the following:

- Demolition of the existing buildings;
- Construction of approximately four new buildings, up to approximately 75 m (112.9m AOD) in height, indicatively up to 23 storeys;
- Delivery of car parking spaces and cycle storage in line with current policy requirements; and
- Delivery of a mix of public and private open space, including children's play space equivalent to a minimum of approximately 10 % of the application site area.

1.145 New pedestrian and cycle routes would be provided within the proposed development creating permeability through the application site. In addition, vehicular access would be provided.

1.146 The scale and massing of the proposed development is shown within Verified Wirelines 1-15, presented in Appendix 1.4: Visual Assessment.

1.147 The design of the block locations within the proposed development would facilitate the increased integration of the northern entrance of Reading Railway Station into the surrounding urban grain where it would benefit from the improved legibility and navigation that the proposed development would provide. The connection of the northern station entrance to Vastern Road in a more defined manner contributes to the opportunity for the improved legibility of townscape to be extended north to the River Thames corridor, connecting the river and the station, through the application site.

1.148 This more decipherable townscape layout and connectivity of key townscape elements within Reading, would represent a noticeable improvement to the existing urban grain with the quality of townscape in Reading expanding across the currently under-utilised site which is occupied by uninspiring commercial units and large areas of car parking at grade with Vastern Road.

1.149 The proposed development would enhance the locally distinctive built form with variety in massing and heights, urban public realm and wayfinding to the north of the railway line, reflecting the quality of townscape south of the railway line. The block layout would also contribute to the connection of the town centre south of the application site, to the green areas along the River Thames corridor north of the application site.

1.150 The proposed development would contribute to the identity of the centre of Reading by consolidating development in the vicinity of the Reading Railway Station while respecting the existing character of the domestic scale development north of the site within CA12: Caversham Road, providing a transition in townscape character to the expanding urban centre. The rhythm of the proposed development heights would step up from the existing residential edge to the north of Vastern Road, progressively increasing in height towards the railway line, providing a strong transition between the largely two storey development within CA 12, and the recognisable centre of Reading.

1.151 This rhythm of increasing scale of development would improve wayfinding by signifying the centre of Reading that would help to create a strong sense of place for not only the Vastern Road CA, but the town centre as a whole and the wider conurbation of Reading. Furthermore, the use of varied materiality on both the horizontal and vertical axis would break up the perceived massing, assist in the perception of change in scale, increase visual interest and contribute to defining the sense of place.

1.152 The proposed development, landscaping scheme and associated public realm improvements would create a much more positive frontage along Vastern Road as well as forming a landmark in views that are channelled south-east along Caversham Road towards the roundabout.

Townscape Effects

Application Site Character

1.153 The overall form, layout, mass and scale of the introduced built form would provide application site wide improvements to the quality of built form. Whilst the proposed development would increase the mass of building on the application site, it would create a positive built frontage to Vastern Road and the roundabout as well as forming a transition in townscape from the domestic scale of buildings north of the application site, to the town centre beyond the railway line to the south of the application site. The proposed development would also provide improvements to the legibility of the public realm that would relate well to the key townscape features of the northern station entrance, creating a coherent townscape element that positively contributes to the local area. The block arrangement of the proposed development would allow a much clearer legibility of public realm with respect to the northern entrance to the station where improved sightlines would strengthen the relationship between the application site and key townscape elements. The increased building mass along with improvements to legibility and built form through creation of a landmark building by virtue of its scale would constitute a Large magnitude of impact to the Low sensitivity application site. This would result in a **Moderate Beneficial** effect. The effect is considered to be significant.

Reading Tall Building Strategy Townscape Character Area

1.154 The proposed development would give rise to direct changes to the CA22: Vastern Road, that it would be located within and would cause indirect changes to the other character areas where perceived changes are experienced. The Vastern Road CA would experience changes to the material characteristics that define it, while other character areas would be afforded an element of physical separation from changes caused by the proposed development. The improvements in public realm that the proposed development would bring and the improved connectivity between the northern station entrance and the Thames corridor to the north would also be located within CA22, but the benefits that they bring to the townscape would be perceived in adjacent character areas.

1.155 The interrelationships of the elements within adjacent character areas mean that the proposed development would cause perceived changes in other character areas which diminish as the physical separation increases. As such, the effect upon the CAs that the proposed development would be located within or immediately adjacent to, are detailed below. The consideration of how the proposed development would impact all character areas assessed at completion is contained within Appendix 1.3: Townscape Assessment.

CA22: Vastern Road

1.156 At Year 1, the introduced built form would fundamentally alter the fabric of a large part of this CA, helping to establish a strong local identity in the townscape. The proposed development would replace the functional and unattractive retail buildings and associated car parking areas. The change from the retail shed development and large areas of tarmac to a large mass of development in four distinct blocks would increase the level of legibility for townscape in the vicinity of the northern station entrance. The overall form, layout, mass and scale of the introduced built form would provide site wide improvements to the quality of built form. Whilst the proposed development would increase the mass of building in the CA, it would introduce improved architectural form, creating landmark buildings by virtue of their height and scale along the Vastern Road frontage and on the roundabout. The proposed development would also provide improvements to the public realm that would relate well to the buildings, creating a coherent townscape element that positively contributes to the local area.

1.157 The proposed development would create landmark structures in the vicinity of Reading Railway Station, where they would provide positive identifying features for the station area with the massing and height focused closest to the station entrance and railway line, whilst providing smaller built forms adjacent to the existing residential properties north and north-west of the application site. This variety of building heights would be sympathetic to the more domestic scale of the largely 2 storey residential properties north of Vastern Road. The progression of height across the proposed development would enhance the sense of urbanisation in the vicinity of the station, reinforcing the connection between the River Thames corridor and the centre of Reading.

1.158 The legibility of the connection between the Thames corridor and the centre of Reading would be further strengthened by the block arrangement of the proposed development which would allow a connection from the subway that passes under the railway station through the site as far as Vastern Road, to link with the connection envisaged in RBC planning documents between the Thames Path and Christchurch Bridge to Vastern Road. The accessibility of the northern entrance to the station would be much clearer with improved sightlines leading towards the station from Vastern Road.

1.159 At ground level, the benefits that the block structure bring to wayfinding and legibility would be enhanced through a reduction in vehicle dominance that would result from the ground floor frontages to create a more inviting space with greater visual amenity value. The legibility of the northern entrance to the station would be much clearer with improved sightlines leading towards the station and the River Thames. The increased building mass along with improvements to legibility and built form through creation of a landmark building by virtue of its scale would constitute a Large magnitude of impact to the low sensitivity CA, resulting in a **Moderate Beneficial** effect. This is considered to be a significant effect.

CA12: Caversham Road

1.160 At Year 1, the proposed development would be imperceptible from much of the CA due to the existing enclosure provided by the tight urban grain. However, where the taller built forms of the proposed development are perceived, they would contrast with the prevailing 2 to 3 storey Victorian and Edwardian residential development in the CA. The configuration of the proposed development would allow physical and visual permeability between the blocks, thus helping to reduce their perceived mass, helping the proposed development to relate to the street pattern of this adjacent CA. In addition, the progression in height from the predominantly 2 to 3-storey built forms that characterise this CA and the taller forms of the proposed development would be moderated by a stepping up in height, which would help to reduce any sense of physical over-dominance. Where perceived within the setting of the CA, the proposed development would introduce a positive contribution to the skyline that would help to enhance legibility and wayfinding for the northern entrance to the railway station through the connection of the landmark Christchurch Bridge to the north and the northern station entrance to the south that would indirectly cause a Small magnitude of impact upon the Medium sensitivity CA, although the increased building mass would cause a Very Small magnitude of impact. Considering both the beneficial and adverse aspects above, on balance the proposed development would result in a **Negligible Beneficial** effect. This is not considered to be a significant effect.

CA23: King's Meadow

1.161 At Year 1, the proposed development would cause some slight changes to the setting of the CA where it is perceptible above the bankside vegetation of the River Thames. The proposed taller forms would contrast with the open meadows of the CA but would be perceived alongside other tall buildings that identify the centre of Reading which would adversely affect the sense of place which would cause a Very Small magnitude of impact. However, the configuration of the proposed development would allow physical and visual permeability between the blocks, thus helping to reduce their perceived massing.

1.162 Where the proposed taller built forms are perceived in the setting of this CA, they would introduce a positive contribution to the skyline that would help to enhance wayfinding by sign-posting the location of the centre of Reading, as well as connecting the landmark Christchurch Bridge within the CA and the northern station entrance to the south which would cause a Small magnitude of impact upon the High sensitivity CA. Considering both the beneficial and adverse aspects above, on balance the proposed development would result in a **Minor Beneficial** effect. This is not considered to be a significant effect.

CA1: Station Hill

1.163 At Year 1, the proposed development would give rise to some slight changes to the setting of the CA where it is perceptible above the large structure of the station building. The proposed development would be perceived alongside other tall buildings that identify the centre of Reading such as the Thames Tower within the CA. The permeability resulting from the configuration of the proposed development blocks would help to reduce their perceived massing, as well as connecting the Station Hill CA through the site to the River Thames and Thames Path, Christchurch Bridge and Christchurch Meadow recreational area. The perception of building mass in the adjacent CA would cause a Very Small magnitude of effect with the increased legibility of townscape causing a Small magnitude of effect upon the Low sensitivity CA. On balance, there would be an improvement in the setting of this CA and the proposed development would result in a **Minor Beneficial** effect. This is not considered to be a significant effect.

CA 11: Napier Road

1.164 At Year 1, the proposed development would give rise to some slight changes to the setting of the CA where it is perceptible amongst the existing built form and railway infrastructure. The taller forms of the proposed development would introduce a positive contribution to the skyline that would help to enhance wayfinding in the townscape and where perceived, would introduce a locally distinctive built form with variety in massing and heights into the setting of this CA where the under construction development on the former BMW site immediately adjacent to it has a strong influence. The proposed development would cause a Very Small magnitude of impact that would be a slight improvement in the setting of this Low sensitivity CA which would result in a **Negligible Beneficial** effect. This is not considered to be a significant effect.

Visual Effects

1.165 The proposed development would alter both the visibility of the application site and visual amenity in the vicinity due to the blocks of built form of the proposed development. As committed to in the Design Code, the improvements to the quality of built form and public realm on the application site would enhance the experience that visual receptors receive in the vicinity of the proposed development, as well as in views from further afield.

1.166 Near-distance views – the proposed development would be seen at close range, where the large development blocks would occupy large amounts of views south towards the northern station entrance. The new built form and visual interest of the proposed development with a locally distinctive combination of massing and heights, would create a new positive development frontage along the Vastern Road edge of the site with a progression in scale of built form away from the more domestic scale of development that lies to the north of Vastern Road. The increasing height of the proposed development across the site with the higher parts towards Reading Station and the railway line. Clear views of the proposed development would be available from the immediate vicinity of the application site, such as the adjoining roads of Caversham Road to the north-west (Site Context Photograph 4) and Vastern Road to the north (Site Context Photograph 1) and north-east (Site Context Photograph 2). Views towards the proposed development from De Montfort Road (Site Context Photograph 5) and Lynmouth Road to the north, Northfield Road to the west (Site Context Photograph 7), along Greyfriars road to the south-west (Site Context Photograph 24), and along Blagrave Street to the south-east (Site Context Photograph 26) would channel views towards the top of the proposed development, while the lower parts of the development including the improvements to orientation and legibility of the public realm would be largely screened from view by intervening elements.

1.167 In other near-distance views towards the site, proposed development would be partially screened by intervening built forms. The highest parts of the proposed development would be partially visible above and beyond these, including views from Reading Bridge to the east (Site Context Photograph 8), from Caversham Road to the south-west (Site Context Photograph 6) and from the southern forecourt of Reading Station to the south (Site Context Photograph 25). Where the proposed development is visible, it would be seen in the context of existing scale built forms in the central Reading area that are seen against the skyline, notably the 12-storey Reading Bridge House, the 5-storey multi-storey car park on Vastern Road, No.3 Forbury Road, Apex Plaza and Thames Tower.

1.168 Middle-distance views – the lower parts of the proposed development including the legibility of the public realm improvements, would be screened from view by existing development on intervening land. Where visible, the taller parts of the proposed development would be seen in views that are channelled along busy urban roads, where traffic and infrastructure occupy large proportions of the view available (Site Context Photograph 10). The existing large scale built forms that provide an element of visual screening to the proposed development, create an existing urban character to views that the new built form would be seen within.

1.169 The proposed development would be largely screened from view by the existing large scale built form such as Apex Plaza and Forbury Place (Site Context Photograph 13) for visual receptors to the south-east. Views of the proposed development from the west would be largely obtained along residential streets, or those with a more domestic scale of built form, where the proposed development would appear above the foreground elements (Site Context Photograph 12). In views from the north-west, north, north-east and east; the taller parts of the proposed development would appear within the context of views from green open spaces along the River Thames, such as in Site Context Photograph 15, 11, 9 and 14.

1.170 Long-distance views – the ground level improvements to the site such as public realm improvements and the landscape scheme would be screened from view by existing development on intervening land but the higher parts of the proposed development would be visible from elevated ground (Site Context Photographs 16, 18, 19, 20, 22 and 23), or where street orientation channels glimpsed views towards the site (Site Context Photographs 17 and 21). From these locations the proposed development would be seen in the context of larger scale built forms in central Reading that are visible on the skyline, notably The Blade, Thames Tower and Reading Bridge House. The proposed development would be seen alongside these existing townscape elements in views towards the centre of a built up area.

1.171 Views of the proposed development would give rise to larger changes where they are anticipated to occupy a larger proportion of views available, such as close range views. As such, the effect of the proposed development upon the representative Site Context Photographs where the most significant changes are anticipated is detailed below. The consideration of how the proposed development would impact visual receptors at all representative Site Context Photographs assessed is contained within Appendix 1.4: Visual Assessment.

Site Context Photograph 01: View south from Vastern Road/Lynmouth Road

1.172 At Year 1, the large mass of the proposed development would occupy views to the south where it would replace views or car parking and the cluttered brick facades of existing retail units. The proposed development would form a large mass that would shorten views to the south and screen existing buildings south of the railway line such as Thames Tower. The proposed development would form a new skyline element that would alter the composition of views gained at Vastern Road whilst introducing, as committed to in the Design Code, locally distinctive built form with variety in massing and heights, as well as improvements to the public realm that would enhance views of built form and compliment other new tall built form it is seen alongside, such as the currently under construction

development at the former BMW site. The new built form would be seen alongside improvements to the legibility of the public realm which would further enhance the visual amenity experienced. The proposed built forms would also contribute to creating a visual interest and a strong sense of place that would serve to visually signify the urban regeneration of the area around the station. This would cause a Medium magnitude of impact. Considering the scale of the proposed built forms and the proximity of the visual receptors, the proposed development would occupy a large amount of the visual envelope, albeit with new built form. This would cause a Small magnitude of impact. However, taking into account both the beneficial and adverse aspects above, on balance the proposed development would cause a **Negligible Beneficial** effect upon the Medium sensitivity receptors. This is not considered to be a significant effect.

Site Context Photograph 02: View south-west from Vastern Road

1.173 At Year 1, the proposed development would introduce a large mass of built form into views gained from the vicinity of Vastern Road. The height and mass of the proposed development would form a new skyline element that would alter the composition of views gained in the vicinity whilst introducing, as committed to in the Design Code, locally distinctive built form with variety in massing and heights as well as improvements to the legibility of public realm that would enhance views of built form. The arrangement of the proposed development would allow views between the built form that create a visual connection to the railway station northern entrance and underpass that connects to the centre of reading. The improved new development would be seen alongside improvements in the legibility of public realm which would further enhance the visual amenity experience. The proposed built forms would also contribute to creating a visual interest and a strong sense of place that would serve to visually signify the urban regeneration of the area around the station and causing a Medium magnitude of impact. Considering the scale of the proposed built forms and the proximity of the visual receptors, proposed development would occupy a large amount of the visual envelope which would cause a Small magnitude of impact. However, taking into account both the beneficial and adverse aspects above, on balance the proposed development would cause a **Negligible Beneficial** effect upon the Low sensitivity receptors. This is not considered to be a significant effect.

Site Context Photograph 03: View north from Station Square North

1.174 At Year 1, the proposed development would introduce a large mass of built form into the close range views gained from the vicinity of the northern station entrance. The height and mass of the proposed development would occupy the foreground of views although the arrangement of the built form would channel views between the buildings towards the former SSE site and the River Thames to the north. The height and mass of the proposed development would form a new skyline element that would alter the composition of views gained in the vicinity whilst introducing locally distinctive built form with variety in massing and heights as well as improvements to the public realm that would enhance views. The improved arrangement of built form would be seen alongside improvements to the legibility of the public realm which would further enhance the visual amenity experience. As committed to in the Design Code, the proposed built forms would also contribute to creating a visual interest and a strong sense of place that would serve to visually locate the area around the station. This would cause a Medium magnitude of impact while the large mass of development would cause a Small magnitude of impact. Taking into account both the beneficial and adverse aspects above, on balance the proposed development would cause a **Negligible Beneficial** effect upon the Medium sensitivity receptors. This is not considered to be a significant effect.

Site Context Photograph 04: View south-east from Caversham Road

1.175 At Year 1, the proposed development would introduce a large mass of built form into views towards the roundabout where it would form a landmark building and mark the transition from the two storey residential TCA of Caversham Road, to the redevelopment area in the Vastern Road TCA surrounding Reading Railway Station. Existing development along Caversham Road would channel views towards the proposed development where the height and mass of the built form would screen views towards existing buildings south of the railway line such as Thames Tower and The Blade. As committed to in the Design Code, the built form of the proposed development would form a new skyline element that would alter the composition of views gained in the vicinity whilst introducing locally distinctive built form with variety in massing and heights, as well as improvements to the public realm that would enhance views of built form and reduce the amount of clutter in views along Caversham Road. The new built form would be seen alongside the improved legibility of the public realm which would further enhance visual amenity and cause a Medium magnitude of impact. The large mass of built form would cause a Small magnitude of impact. Considering both the beneficial and adverse aspects above, on balance the proposed development would cause a **Negligible Beneficial** effect upon the Low sensitivity receptors. This is not considered to be a significant effect.

Site Context Photograph 05: View south from Thames Path / De Montfort Road

1.176 At Year 1, the proposed development would introduce a large mass of built form into views along the residential road. The mass of built form would occupy a large area of views that are channelled along the narrow residential road towards the application site, although the gap in buildings on the application site would partially align with De Montfort Road, allowing views through the development. The built form of the proposed development would form a new skyline element that would alter the composition of views gained in the vicinity although the new skyline elements would comprise locally distinctive built form with variety in massing and heights. The landmark buildings by virtue of scale and height would be seen alongside the improved legibility of the public realm which would further enhance visual amenity. This would cause a Medium magnitude of impact, whilst the introduced mass of built form would cause a Small magnitude of impact. Considering both the beneficial and adverse aspects above, on balance the proposed development would cause a **Minor Beneficial** effect upon the High sensitivity receptors. This is not considered to be a significant effect.

Site Context Photograph 25: View North from Station Square

1.177 At Year 1, the proposed development would appear as an additional element in views of the Main Building of Reading General Station (Grade II Listed), where it would alter the background of the view. The proposed development would introduce new built form into the view that would create a new skyline element which would contribute to increasing visual interest and add to the juxtaposition between the combination of architectural forms visible from Station Square, causing a Small magnitude of impact. The focus of views gained by visual receptors at Station Square would remain the historic station building seen within the context of an urban area with more modern development complimenting the more historic building where the proposed development. As such, the proposed development would cause a **Minor Adverse** effect upon the Medium sensitivity receptors. This is not considered to be a significant effect.

Assessment of Residual Effects

Additional Mitigation

1.178 At the detailed design stage, the commitments made within the Design Code in regard to high quality design, the delivery of a landmark development, locally distinctive built form, variety in massing and height, articulation of the facade, quality materiality, creation of a distinct sense of place, permeability and high quality public realm and landscape interventions, would be delivered.

1.179 This would help to reduce the scale of effects identified in this assessment. However, as the proposed development is currently at outline stage, this detailed design information is not currently available and therefore cannot be relied upon as additional mitigation.

Enhancement Measures

1.180 There are no enhancement measures identified for the proposed development at this stage. At the detailed design stage of the proposed development, enhancement measures would be identified when further scheme information becomes available.

Demolition and Construction Residual Effects

1.181 Due to the fact that there is no secondary or additional mitigation identified at this stage of the proposed development, the residual effects for the temporary demolition and construction stage of the proposed development would remain as reported above.

Completed Development Residual Effects

1.182 Due to the fact that there is no secondary or additional mitigation identified at this stage of the proposed development, the residual effects for the completed proposed development would remain as reported for the completed development above.

Summary of Residual Effects

1.183 Table 1.13 provides a summary of the residual effects identified for the demolition and construction stage and upon completion of the proposed development.

Table 1.13: Summary of Townscape and Visual Residual Effects

Residual Effect	Additional Mitigation	Receptor	Scale of Effect **	Nature of Residual Effect*				
				+ -	D I	P T	R IR	St Mt Lt
Demolition and Construction								
Application Site Character	Temporary introduction of demolition and construction plant and activities.	N/A	Moderate	-	D	T	R	St
CA 22: Vastern Road		N/A	Moderate	-	D	T	R	St
CA 12: Caversham Road		N/A	Minor	-	I	T	R	St
CA 23: King's Meadow		N/A	Minor	-	I	T	R	St
CA 1: Station Hill		N/A	Minor	-	I	T	R	St
CA 11: Napier Road		N/A	Negligible	-	I	T	R	St
Site Context Photograph 01		N/A	Moderate	-	D	T	R	St
Site Context Photograph 02		N/A	Minor-Moderate	-	D	T	R	St
Site Context Photograph 03		N/A	Moderate	-	D	T	R	St
Site Context Photograph 04		N/A	Moderate	-	D	T	R	St
Site Context Photograph 05		N/A	Moderate	-	D	T	R	St
Site Context Photograph 25		N/A	Minor	-	D	T	R	St
Completed Development								
Application Site Character	Introduction of new large scale built form with large mass and gaps in the blocks.	N/A	Moderate	+	D	P	IR	P
CA 22: Vastern Road		N/A	Moderate	+	D	P	IR	P
CA 12: Caversham Road		N/A	Negligible	+	I	P	IR	P
CA 23: King's Meadow		N/A	Minor	+	I	P	IR	P
CA 1: Station Hill		N/A	Minor	+	I	P	IR	P
CA 11: Napier Road		N/A	Negligible	+	I	P	IR	P
Site Context Photograph 01		N/A	Negligible	+	D	P	IR	P
Site Context Photograph 02		N/A	Negligible	+	D	P	IR	P

Table 1.13: Summary of Townscape and Visual Residual Effects

Residual Effect	Additional Mitigation	Receptor	Scale of Effect **	Nature of Residual Effect*				
				+ -	D I	P T	R IR	St Mt Lt
Completed Development								
Site Context Photograph 03		N/A	Negligible	+	D	P	IR	P
Site Context Photograph 04		N/A	Negligible	+	D	P	IR	P
Site Context Photograph 05		N/A	Negligible	+	D	P	IR	P
Site Context Photograph 25		N/A	Minor	-	D	P	IR	P

Notes:

* - = Adverse/ + = Beneficial/ +/- Neutral; D = Direct/ I = Indirect; P = Permanent/ T = Temporary; R=Reversible/ IR= Irreversible; St- Short term/ Mt –Medium term/ Lt –Long term.

**Negligible/Minor/Moderate/Major

1.184 The assessment concludes that there would be temporary significant adverse effects during the demolition and construction stage on the application site character, the Vastern Road CA, as well as on the visual amenity of views 01-05. For the completed development stage, the introduction of the proposed development would result in significant beneficial effects on the application site character and the Vastern Road CA only.

Cumulative Effects

1.185 Table 2.3 of ES Volume 1, Chapter 2: EIA Process and Methodology presents the list of cumulative schemes which have been considered for additive cumulative effects with the proposed development.

1.186 This section summarises the cumulative effects of the proposed development setting out only those receptors considered likely to experience significant effects as a result of the proposed development. Whilst the cumulative assessment focuses on the same townscape receptors that are likely to experience significant effects as the main assessment, the cumulative visual assessment varies to consider where the addition of the proposed development into views of other cumulative schemes and reasonably foreseeable cumulative schemes would be likely to result in significant effects. A full assessment of the cumulative townscape and visual effects of the proposed development, in combination with cumulative schemes and reasonably foreseeable schemes is set out in Appendix 1.5: Cumulative Assessment, and is supported by cumulative wirelines 1 – 15.

Demolition and Construction Cumulative Effects

Proposed Development in addition to Cumulative Schemes

Townscape Effects

Application Site Character

1.187 Demolition and construction works on the application site would occupy the land currently occupied by the existing retail units and car parking. Any perceived effects on the application site from demolition and construction operations for cumulative schemes on other sites would consolidate the sense of disturbance on the application site. The temporary demolition and construction stage for the proposed development would cause a Small magnitude of impact upon the Low sensitivity application site that would result in a temporary **Negligible Adverse** cumulative effect. This is not considered to be a significant effect.

Reading Tall Building Strategy Townscape Character Area

CA22: Vastern Road

1.188 The temporary demolition and construction stage of the proposed development would introduce plant and machinery into the CA. Should the demolition and construction stage of the proposed development overlap with demolition and construction stage of the approved project of the Former BMW Site, the demolition and construction works would temporarily detract from the character of the Vastern Road CA for a short duration. In addition, any perceived effects from the demolition and construction stages of any other cumulative schemes in adjacent CA's occurring in parallel to demolition and construction of the proposed development would further enhance the level of disturbance within the urban area. The temporary demolition and construction stage for the proposed development would cause a Large magnitude of impact upon the Low sensitivity CA and therefore a temporary **Moderate Adverse** cumulative effect. This is considered to be a significant effect.

CA12: Caversham

1.189 The temporary demolition and construction works of the proposed development would not occur within the Caversham Road CA, nor would the demolition and construction works for other cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other cumulative schemes, the perceived effects of combined demolition and construction activities could result in indirect disturbance to CA 12. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact upon the Medium sensitivity CA and therefore a temporary **Minor Adverse** cumulative effect.

CA23: King's Meadow

1.190 The temporary demolition and construction works of the proposed development would not occur within the King's Meadow CA, nor would the demolition and construction works for other cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other cumulative schemes, the perceived effects of combined demolition and construction activities could result in indirect disturbance to CA 23. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact upon the High sensitivity CA and therefore a **Minor Adverse** cumulative effect.

CA1: Station Hill

1.191 The temporary demolition and construction stage of the proposed development would not occur within the Station Hill CA, but the demolition and construction activities for the cumulative schemes, of Station Hill and 29 Station Road, would. Should the demolition and construction stage of the proposed

development overlap with the demolition and construction stage of these cumulative schemes, the perceived effects of combined demolition and construction activities could result in indirect disturbance to the Station Hill CA. The temporary demolition and construction stage of the proposed development would cause a Minor adverse magnitude of impact that would result in a temporary **Minor Adverse** cumulative effect upon the Low sensitivity CA.

CA11: Napier Road

1.192 The temporary demolition and construction works of the proposed development would not occur within the Napier Road CA, nor would the demolition and construction works for other cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other cumulative schemes, the perceived effects of combined demolition and construction activities could result in indirect disturbance to CA 11. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a temporary **Negligible Adverse** cumulative effect upon the Low sensitivity CA.

Visual Effects

Cumulative Wireline Viewpoint 07: View East from Swansea Road / Northfield Road

1.193 The temporary demolition and construction works of the proposed development may appear in views east from the residential streets in addition to the demolition and construction works for the development at the Former BMW site, and Station Hill should the demolition and construction stages overlap. The demolition and construction works for the proposed development would partially screen some views of demolition and construction activities at the Former BMW site, but would extend the amount of demolition and construction works seen where they appear alongside the activities at Station Hill. Demolition and construction works on the application site in addition to the demolition and construction works at the Former BMW site, and Station Hill would extend demolition and construction activities across a wider amount of views. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact, resulting in a temporary **Minor Adverse** cumulative effect upon the high sensitivity receptors.

Cumulative Wireline Viewpoint 09: View South-west from Christchurch Meadows

1.194 The temporary demolition and construction works of the proposed development would appear in addition to the demolition and construction activities at 29 Station Road, and Station Hill, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would partially screen some views of demolition and construction activities at the Station Hill, but would extend the amount of demolition and construction works seen where they appear alongside the activities at 29 Station Road. Demolition and construction works on the application site in addition to the demolition and construction works at 29 Station Road, and Station Hill, would extend demolition and construction activities across a wider amount of views causing a Medium magnitude of impact. The combined temporary demolition and construction stage effects would result in a temporary **Minor Adverse** cumulative effect upon the high sensitivity receptors.

Cumulative Wireline Viewpoint 11: Views South-east from Christchurch Meadows

1.195 The temporary demolition and construction stage of the proposed development would appear in addition to the demolition and construction activities for the cumulative schemes of Former BMW site, 29 Station Road, and Station Hill, in views south-east along the River Thames should the demolition and construction stages overlap. The demolition and construction activities for the proposed development in addition to the cumulative schemes would contribute to additional visual disturbance that would be seen above the existing development along the southern bank of the river. The addition of the demolition and construction activities for the proposed development would extend the amount of view that demolition and construction works are visible in and the amount of skyline that they occupy, causing a Medium magnitude of impact. This would result in temporary **Moderate Adverse** cumulative effect upon the Medium sensitivity receptors.

Cumulative Wireline Viewpoint 16: View South from Balmore Park

1.196 The temporary demolition and construction stage of the proposed development may appear in views to the south from Balmore Park, in addition to the demolition and construction works for the cumulative schemes at Former BMW site, Station Hill, and 29 Station Road, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would slightly extend the amount of demolition and construction works seen where they appear alongside the activities of the cumulative schemes in views towards the urban area, causing a Small magnitude of impact. This would result in a temporary **Minor Adverse** cumulative effect upon high sensitivity receptors.

Cumulative Wireline Viewpoint 25: View North from Station Square

1.197 The temporary demolition and construction works of the proposed development would be seen in the backdrop against the skyline above the Main Building of Reading General Station (Grade II Listed) in views where any demolition and construction activities for cumulative schemes would be screened from view, should they coincide. The demolition and construction stage of the proposed development would cause a magnitude of impact of None, resulting in a **Minor** cumulative effect upon the medium sensitivity receptors.

Completed Development Cumulative Effects

Proposed Development in addition to Cumulative Schemes

Townscape Effects

Application Site Character

1.198 The proposed development would cause direct changes to the application site in addition to the perceived changes caused by cumulative schemes on other sites. The proposed development in addition to any perceived changes caused by cumulative schemes, would contribute to the increase in mass of development and would cause a Small magnitude of impact. The proposed development, in addition to the other cumulative schemes would combine to provide the perception of increased urbanisation on the application site, as well as an improvement in the legibility of built form and wayfinding, causing a Large magnitude of impact. As such, the proposed development in addition to the cumulative schemes would result in a **Minor Beneficial** cumulative effect on the application site which has a Low sensitivity. This is not considered to be a significant effect.

Reading Tall Building Strategy Townscape Character Area

CA22: Vastern Road

1.199 The proposed development with a height of 23 storeys would be located within the same urban townscape CA as the part 13 and part 23 storey development on the Former BMW Site where the two schemes would frame the station area, helping to establish a strong local identity in the townscape. The two developments would combine to increase wayfinding, articulation and legibility of the townscape of the Vastern Road CA and the vicinity of Reading Station by creating greater permeability and a recognisable scale of built form. The proposed development would cause a Large magnitude of impact upon the Low sensitivity CA that would result in a **Moderate Beneficial** cumulative effect. This is considered to be a significant effect.

CA12: Caversham

1.200 Although neither the proposed development nor any of the cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, would cause some perceived changes to the residential area of Caversham Road. The proposed development, in addition to the other cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's while maintaining the more domestic scale of development within CA 12, causing a Very Small magnitude of impact. The proposed development would combine with the other cumulative schemes to increase the number of landmark buildings perceptible from CA 12, as well as improving wayfinding causing a Small magnitude of impact. As such, the proposed development in addition to the cumulative schemes would result in a **Negligible Beneficial** cumulative effect upon the Medium sensitivity CA. This is not considered to be a significant effect.

CA23: King's Meadow

1.201 Although neither the proposed development nor any of the cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other cumulative schemes such as Station Hill and 29 Station Road in CA1: Station Hill, Station Hill and 52-55 Friar Street in CA3: Friar Street, Kenavon Drive in CA10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA13: Cattle Market, would cause some perceived changes to the residential area of Caversham Road. The proposed development, in addition to the other cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's while maintaining the green spaces of CA23, causing a Very Small magnitude of impact. The proposed development would combine with the other cumulative schemes to increase the number of landmark buildings perceptible from CA23, as well as improving wayfinding, causing a Small magnitude of impact. As such, the proposed development in addition to the cumulative schemes would result in a **Negligible Beneficial** cumulative effect upon the High sensitivity CA. This is not considered to be a significant effect.

CA1: Station Hill

1.202 The proposed development adjacent to the Station Hill CA, would cause perceived changes to the CA in addition to direct changes from the cumulative schemes within the Station Hill CA and those cumulative schemes in adjacent CA's such as Station Hill and 52-55 Friar Street in CA3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA13: Cattle Market which would increase the mass of built form causing a Very Small magnitude of impact. The permeability in the adjacent Vastern Road CA, resulting from the proposed development blocks, would help to connect the Station Hill CA to the River Thames corridor and open spaces at Christchurch Meadows, through the application site which would cause a Small magnitude of impact upon the Medium sensitivity CA. The proposed development would result in a **Negligible Beneficial** cumulative effect. This is not considered to be a significant effect.

CA11: Napier Road

1.203 Although neither the proposed development nor any of the cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other cumulative schemes such as Station Hill and 29 Station Road in CA1: Station Hill, Station Hill and 52-55 Friar Street in CA3: Friar Street, Kenavon Drive in CA10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA13: Cattle Market, would cause some perceived changes to the largely commercial area of Napier Road that would increase the mass of development causing a Very Small magnitude of impact. The proposed development, in addition to the other cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's, as well as an improvement in the legibility of built form and wayfinding perceptible from CA11, causing a Small magnitude of impact. As such, the proposed development in addition to the cumulative schemes would result in a **Negligible Beneficial** cumulative effect.

Visual Effects

Cumulative Wireline Viewpoint 07: View East from Swansea Road / Northfield Road

1.204 The proposed development would screen views of the approved project at the Former BMW site, but would extend the amount of view occupied by tall buildings as the proposed development would be seen in addition to a small part of the approved project at Station Hill, that would be visible above residential properties lining the road, adding to the mass of buildings and causing a Very Small magnitude of impact. The proposed development would combine with other cumulative schemes to deliver built form with variety in massing and heights, as well as improvements to legibility of the public realm that would cause a Small magnitude of impact. As such, the proposed development in addition to the cumulative schemes would cause a Small magnitude of impact, resulting in a **Negligible Beneficial** cumulative effect upon the High sensitivity receptors.

Cumulative Wireline Viewpoint 09: View South-west from Christchurch Meadows

1.205 The proposed development would be seen in addition to the cumulative schemes of 29 Station Road, and Station Hill, where it would occupy the same section of views but would extend the amount of view that tall buildings are visible against the skyline, causing a Small magnitude of impact. Where the proposed development is visible in addition to the cumulative schemes and existing built form, it would provide strong visual interest in views to the south-west. As the proposed development would partially screen views of the cumulative scheme at Station Hill, and increase the height variance of built form, it would cause a Medium magnitude of impact, resulting in a **Negligible Beneficial** cumulative effect upon the High sensitivity receptors.

Cumulative Wireline Viewpoint 11: Views South-east from Christchurch Meadows

1.206 The proposed development would appear against the skyline above the existing built form on the southern bank of the River Thames, where it would constitute an increase in tall buildings seen against the skyline in views towards the centre of Reading, causing a Very Small magnitude of impact. The proposed development in addition to the cumulative schemes of Former BMW site, and Station Hill, would occupy a wide section of the view, while the proposed development would screen views of the approved project at 29 Station Road. The variety of heights and the consolidation of views towards the centre of an urban area where improvements to the legibility of the urban centre would cause a Small magnitude of impact that would result in a **Negligible Beneficial** cumulative effect upon the Medium sensitivity receptors.

Cumulative Wireline Viewpoint 16: View South from Balmore Park

1.207 The proposed development would appear in front of the cumulative schemes of Station Hill and 29 Station Road, as well as alongside the approved project of Former BMW site where it would increase the mass of development visible and cause a Very Small magnitude of impact. The addition of the proposed development to the cumulative schemes in views towards the urban centre of Reading would add to the variety in heights and architectural form visible in the centre of Reading where it would not only mark the urban centre in views but would also add to landmark buildings visible by virtue of its scale and height, causing a Small magnitude of impact. As such, the proposed development would result in a **Negligible Beneficial** cumulative effect upon the Medium sensitivity receptors.

Cumulative Wireline Viewpoint 25: View North from Station Square

1.208 The proposed development would not be seen in addition to any cumulative schemes and so would cause a cumulative magnitude of impact of None, resulting in a **Neutral** cumulative effect upon the Medium sensitivity receptors.

Demolition and Construction Cumulative Effects

Proposed Development in addition to Cumulative Schemes and Reasonably Foreseeable Cumulative Schemes

Townscape Effects

Application Site Character

1.209 Demolition and construction works on the application site would occupy the land currently occupied by the existing retail units and car parking. Any perceived effects on the application site from demolition and construction operations for cumulative schemes and reasonably foreseeable cumulative schemes on other sites would consolidate the sense of disturbance on the application site. The temporary demolition and construction stage for the proposed development would cause a Small magnitude of impact upon the Low sensitivity application site that would result in a temporary **Negligible Adverse** cumulative effect upon the Low sensitivity application site.

Reading Tall Building Strategy Townscape Character Area

CA22: Vastern Road

1.210 The temporary demolition and construction stage of the proposed development would introduce plant and machinery into the CA. Should the demolition and construction stage of the proposed development overlap with demolition and construction stage of the cumulative schemes at the Former BMW Site, Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site, the demolition and construction works would temporarily detract from the character of the Vastern Road CA for the duration of overlapping works. In addition, any perceived effects from the demolition and construction stages of any other cumulative schemes in adjacent CA's occurring in parallel to demolition and construction of the proposed development would further add to the level of disturbance within the urban area. The temporary demolition and construction stage of the proposed development would cause a Large magnitude of impact, resulting in a temporary **Moderate Adverse** cumulative effect upon the low sensitivity CA.

CA12: Caversham

1.211 The temporary demolition and construction works of the proposed development would not occur within the Caversham Road CA, nor would the demolition and construction works for other cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other cumulative schemes, the perceived effects of combined demolition and construction activities could result in indirect disturbance to CA 12. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact and therefore a temporary **Minor Adverse** cumulative effect upon the Medium sensitivity CA.

CA23: King's Meadow

1.212 The temporary demolition and construction works of the proposed development would not occur within the King's Meadow CA, nor would the demolition and construction works for other cumulative schemes or reasonably foreseeable cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other cumulative schemes, the perceived effects of combined demolition and construction activities could result in indirect disturbance to CA23. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact and therefore a temporary **Minor Adverse** cumulative effect upon the High sensitivity CA.

CA1: Station Hill

1.213 The temporary demolition and construction works of the proposed development would not occur within the Station Hill CA, but the demolition and construction activities for the cumulative schemes Station Hill and 29 Station Road, would. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of these cumulative schemes, the perceived effects of combined demolition and construction activities could result in indirect disturbance the Station Hill CA. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a temporary **Minor Adverse** cumulative effect upon the Low sensitivity CA.

CA11: Napier Road

1.214 The temporary demolition and construction works of the proposed development would not occur within the Napier Road CA, nor would the demolition and construction works for other cumulative schemes or reasonably foreseeable schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other cumulative schemes and reasonably foreseeable schemes, the perceived effects of combined demolition and construction activities could result in indirect disturbance to CA11. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a temporary **Minor Adverse** cumulative effect upon the Low sensitivity CA.

Visual Effects

Cumulative Wireline Viewpoint 07: View East from Swansea Road / Northfield Road

1.215 The temporary demolition and construction works of the proposed development may appear in views east from the residential streets in addition to the demolition and construction works for the cumulative scheme at the Former BMW site and Station Hill, as well as the reasonably foreseeable scheme at the Network Rail Thames Valley site office/Former Royal Mail site, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would increase the views of demolition and construction works at the Network Rail Thames Valley site office/Former Royal Mail site, as well as extending the amount of view that demolition and construction works are seen alongside the activities at Station Hill. Demolition and construction works on the application site in addition to the demolition and construction works at the Former BMW site, Station Hill, and Network Rail Thames Valley site office/Former Royal Mail site, would extend demolition and construction activities across a wider amount of views. This would cause a Medium magnitude of impact and therefore a temporary **Moderate Adverse** cumulative effect upon the High sensitivity receptors.

Cumulative Wireline Viewpoint 09: View South-west from Christchurch Meadows

1.216 The temporary demolition and construction works of the proposed development would appear in addition to the demolition and construction activities for the cumulative schemes at 29 Station Road, and Station Hill, as well as the reasonably foreseeable schemes at Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would occupy the same section of views as demolition and construction works for Station Hill, Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site. The proposed development in addition to the cumulative schemes and reasonably foreseeable schemes would constitute a very slight extension of the amount of view that demolition and construction works

occupy. This would cause a Small magnitude of impact upon the High sensitivity receptors and therefore a **Negligible Adverse** cumulative effect.

Cumulative Wireline Viewpoint 11: Views South-east from Christchurch Meadows

1.217 The temporary demolition and construction works of the proposed development would appear in addition to the demolition and construction activities for the cumulative schemes at 29 Station Road, and Station Hill, as well as the reasonably foreseeable schemes at Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would occupy the same section of views as demolition and construction works for Station Hill, Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site. The proposed development in addition to the cumulative schemes and reasonably foreseeable schemes would constitute a very slight extension of the amount of view that demolition and construction works occupy. This would cause a Medium magnitude of impact upon the High sensitivity receptors and therefore a temporary **Moderate Adverse** cumulative effect.

Cumulative Wireline Viewpoint 16: View South from Balmore Park

1.218 The temporary demolition and construction works of the proposed development may appear in views to the south from Balmore Park, where it would appear in the same section of views as the demolition and construction works for the cumulative schemes at Former BMW site, Station Hill and 29 Station Road, as well as the reasonably foreseeable scheme of Network Rail Thames Valley site office/Former Royal Mail site and Broad Street Mall, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would slightly extend the amount of view that demolition and construction works are seen in where they appear alongside the activities for the cumulative schemes and reasonably foreseeable schemes in views towards the urban area. This would cause a Small magnitude of impact upon the High sensitivity receptors and therefore a temporary **Minor Adverse** cumulative effect.

Cumulative Wireline Viewpoint 25: View North from Station Square

1.219 The temporary demolition and construction works of the proposed development would be seen in the backdrop against the skyline above the Main Building of Reading General Station (Grade II Listed) in addition to the demolition and construction activities for Network Rail Thames Valley site office/Former Royal Mail site, should they coincide. The demolition and construction stage of the proposed development would extend the amount of view demolition and construction activities are visible in behind the historic station building where it would cause a Medium magnitude of impact upon the Medium sensitivity receptors. This would result in a temporary **Moderate Adverse** cumulative effect.

Completed Development Cumulative Effects

Proposed Development in addition to Cumulative Schemes and Reasonably Foreseeable Cumulative Schemes

Townscape Effects

Application Site Character

1.220 The proposed development would cause direct changes to the application site in addition to the perceived changes caused by those cumulative schemes and reasonably foreseeable schemes on other sites. The proposed development in addition to any perceived changes caused by cumulative schemes and reasonably foreseeable schemes, would contribute to the increase in mass of development and would cause a Small magnitude of impact. The proposed development, in addition to the other cumulative schemes and reasonably foreseeable schemes would combine to provide the perception of increased urbanisation on the application site, as well as an improvement in the legibility of built form and wayfinding, causing a Large magnitude of impact. As such, the proposed development in addition to the cumulative schemes and reasonably foreseeable schemes would result in a **Minor Beneficial** cumulative effect on the Low sensitivity application site.

Reading Tall Building Strategy Townscape Character Area

CA22: Vastern Road

1.221 The proposed development with a height of 23 storeys would be located within the same urban townscape CA as the part 13 and part 23 storey scheme on the Former BMW Site, the up to 25 storey scheme on the Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the up to 11 storey scheme on the Former Scottish and Southern Energy Site. The proposed development in addition to these cumulative schemes and reasonably foreseeable schemes would significantly improve the quality of built form, and provide a strong local identity in the townscape that identifies Reading Station as a key area within the townscape, improving articulation and legibility of the townscape within the Low sensitivity Vastern Road CA. This would cause a Large cumulative magnitude of impact that would result in a **Moderate Beneficial** cumulative effect.

CA12: Caversham

1.222 Although none of the proposed development, cumulative schemes or reasonably foreseeable schemes would be located within the CA, the proposed development in addition to the cumulative schemes of the Former BMW Site in the adjacent Vastern Road CA, and the other cumulative schemes such as Station Hill and 29 Station Road in CA1: Station Hill, Station Hill and 52-55 Friar Street in CA3: Friar Street, Kenavon Drive in CA10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22 Vastern Road, and Broad Street Mall in CA15: Cheapside, would cause some perceived changes to the residential area of Caversham Road due to the increased building mass causing a Very Small magnitude of impact. The proposed development, in addition to the other cumulative schemes and reasonably foreseeable schemes would combine to provide the perception of increased urbanisation in adjacent CA's while maintaining the more domestic scale of development within CA12. The proposed development would combine with the other cumulative schemes and reasonable foreseeable schemes to increase the legibility of built form perceptible from CA12, as well as improving wayfinding and cause a Small magnitude of impact. As such, the proposed development in addition to the cumulative schemes and reasonably foreseeable schemes would result in a **Negligible Beneficial** cumulative effect upon the Medium sensitivity CA.

CA23: King's Meadow

1.223 Although none of the proposed development, cumulative schemes or reasonably foreseeable schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other cumulative schemes such as Station Hill and 29 Station Road in CA1: Station Hill, Station Hill and 52-55 Friar Street in CA3: Friar Street, Kenavon Drive in CA10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA13: Cattle Market, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA22: Vastern Road, and Broad Street Mall in CA15: Cheapside, would cause some perceived changes to the residential area of Caversham Road due to the increase in building mass causing a Very Small magnitude of impact. The proposed development, in addition to the other cumulative schemes and reasonably foreseeable schemes would combine to provide the perception of increased urbanisation in adjacent CA's while maintaining the green spaces of CA23. The proposed development would combine with the other cumulative schemes and reasonably foreseeable schemes to increase the legibility of built form perceptible from CA23, as well as improving wayfinding, causing a Small magnitude of impact. As such, the proposed development in addition to the cumulative schemes and reasonably foreseeable schemes would result in a **Negligible Beneficial** cumulative effect upon the High sensitivity CA.

CA1: Station Hill

1.224 The proposed development adjacent to the Station Hill CA, would cause perceived changes to the CA in addition to direct changes from the cumulative schemes within the Station Hill CA and those cumulative schemes in adjacent CA's such as Station Hill and 52-55 Friar Street in CA3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA13: Cattle Market, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA22: Vastern Road, and Broad Street Mall in CA15: Cheapside, where the additional building mass would cause a Very Small magnitude of impact. The permeability in the adjacent Vastern Road CA, resulting from the proposed development blocks would help to connect the Station Hill CA to the River Thames corridor and open spaces at Christchurch Meadows, through the application site, causing a Small magnitude of impact. The proposed development would result a **Negligible Beneficial** cumulative effect.

CA11: Napier Road

1.225 Although none of the proposed development, the cumulative schemes or the reasonably foreseeable schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other cumulative schemes such as Station Hill and 29 Station Road in CA1: Station Hill, Station Hill and 52-55 Friar Street in CA3: Friar Street, Kenavon Drive in CA10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA13: Cattle Market, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA22: Vastern Road, and Broad Street Mall in CA15: Cheapside would cause a Very Small magnitude of impact to the largely commercial area of Napier Road due to the addition of building mass. The proposed development, in addition to the other cumulative schemes and reasonably foreseeable schemes would combine to provide the perception of increased urbanisation in adjacent CAs, as well as an improvement in the legibility of built form and wayfinding perceptible from the Low sensitivity CA 11. As such, the proposed development in addition to the cumulative schemes and reasonably foreseeable schemes would cause a Small magnitude of impact, resulting in a **Negligible Beneficial** cumulative effect.

Visual Effects

Cumulative Wireline Viewpoint 07: View East from Swansea Road / Northfield Road

1.226 The proposed development in addition to the approved project of Station Hill and the reasonably foreseeable scheme of Network Rail Thames Valley site office/Former Royal Mail site, would extend the amount of view occupied by tall buildings. This would cause a Very Small magnitude of impact. The proposed development would combine with other cumulative schemes and reasonably foreseeable schemes the deliver variety in massing and heights as well as improvements to legibility of the public realm, marking the location of the railway station and the urban centre of Reading. This would cause a Small magnitude of impact upon the High sensitivity receptors. As such, the proposed development, in addition to the cumulative schemes, would result in a **Negligible Beneficial** cumulative effect.

Cumulative Wireline Viewpoint 09: View South-west from Christchurch Meadows

1.227 The proposed development would be seen in addition to the cumulative schemes of 29 Station Road, and Station Hill, as well as the reasonably foreseeable schemes of the Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site where it would increase the mass of built form visible and cause a Very Small magnitude of impact. Where the proposed development is visible in addition to the cumulative schemes and reasonably foreseeable schemes, as well as existing built form, it would provide visual interest in views to the south-west as well as legibility to the townscape, causing a Small magnitude of impact upon the Medium sensitivity receptors. The addition of the proposed development to views would result in a **Negligible Beneficial** cumulative effect.

Cumulative Wireline Viewpoint 11: Views South-east from Christchurch Meadows

1.228 The proposed development would be seen in addition to the cumulative schemes of 29 Station Road, and Station Hill, as well as the reasonably foreseeable schemes of the Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site where it would increase the mass of buildings in the view and cause a Very Small magnitude of impact. Where the proposed development is visible in addition to the cumulative schemes and reasonably foreseeable schemes, as well as existing built form, it would provide visual interest in views to the south-west, as well as increase legibility of the urban realm. The addition of the proposed development to views would cause a Small magnitude of impact upon the Medium sensitivity receptors that would result in a **Negligible Beneficial** cumulative effect.

Cumulative Wireline Viewpoint 16: View South from Balmore Park

1.229 The proposed development would appear in front of the cumulative schemes and reasonably foreseeable schemes of Station Hill, 29 Station Road, and Network Rail Thames Valley site office/Former Royal Mail site, as well as alongside the cumulative schemes of Former BMW site, Broad Street Mall and Former Scottish and Southern Electricity Site where it would increase the mass of built form visible and cause a Very Small magnitude of impact. The addition of the proposed development to the cumulative schemes and reasonably foreseeable schemes in views towards the urban centre of Reading would add to the variety in heights and visible in the centre of Reading where it would not only mark the urban centre in views but would also add to landmark buildings visible by virtue of its height and scale where it would cause a Small magnitude of impact upon the High sensitivity receptors. As such, the proposed development would result in a **Negligible Beneficial** cumulative effect.

Cumulative Wireline Viewpoint 25: View North from Station Square

1.230 The proposed development would be seen in addition to the reasonably foreseeable scheme of Network Rail Thames Valley site office/Former Royal Mail site, where it would occupy the same section of views but would extend the amount of view that tall buildings are visible against the skyline and reduce the prominence of the Main Building of Reading Station (Grade II Listed) causing a Medium magnitude of impact. However, the proposed development would, in addition to the Network Rail Thames Valley site office/Former Royal Mail site, introduce built form with variety in massing and heights that would increase the recognisable elements in views. This would result in a **Moderate Adverse** cumulative effect as it would alter the composition of the station building in close range views. This effect is considered to be significant.

Appendix 1.1: Planning Policy

Planning Policy

National Planning Policy

National Planning Policy Framework (NPPF) 2019

1.1 The National Planning Policy Framework (NPPF) which was first published in March 2012 has been updated and published in February 2019. The NPPF promotes a presumption in favour of sustainable development, defined as ***"meeting the needs of the present without** compromising the **ability of future generations to meet their own needs"***. Development proposals must also be in accordance with the relevant up-to-date Local Plan and policies set out in the NPPF, including those identifying restrictions with regard to designated areas, such as National Parks, Areas of Outstanding Natural Beauty (AONB) and Green Belt.

1.2 Paragraph 38 relates to decision making and states that:

- ***"Local planning authorities should approach decisions on** proposed development in a positive and creative way. They should use the full range of planning tools available, including brownfield registers and permission in principle, and work proactively with applicants to secure developments that will improve the economic, social and environmental conditions of the area. Decision-makers at every level should seek to approve **applications for sustainable development where possible".***

1.1 Section 12 of the NPPF sets out requirements for achieving well-designed places. Paragraph 124 outlines the importance of the design of the built environment and states that ***"good design is a key aspect of sustainable** development, creates better places in which to live and work and helps **make development acceptable to communities"***.

1.2 This approach is enshrined in Paragraph 127, which states:

"Planning policies and decisions should ensure that developments:

a) Will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;
b) Are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;
c) Are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);
d) Establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;
e) Optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development (including green and other public space) and support local facilities and transport networks; and
*f) Create places that are safe, inclusive and accessible and which promote health and well- being with a high standard of amenity for existing and future users and where crime and disorder, and the fear of crime, do not undermine the quality of life or **community cohesion and resilience".***

1.3 Paragraph 130 states:

- ***"Permission should be refused for development of poor design** that fails to take the opportunities available for improving the character and quality of an area and the way it functions, taking into account any local design standards or style guides in plans **or supplementary planning documents…Conversely, where the** design of a development accords with clear expectations in plan policies, design should not be used by the decision-maker as a **valid reason to object to development ...".***

1.4 Paragraph 131 states:

- ***"In determining applications, great weight should be given to** outstanding or innovative designs which promote high levels of sustainability, or help raise the standard of design more generally in an area, so long as they fit in with the overall form **and layout of their surroundings".***

1.5 Under Section 15 of the NPPF: Conserving and Enhancing the Natural Environment, Paragraph 170 states that planning policies and decisions should contribute to and enhance the natural and local environment by:

- ***"a) protecting and enhancing valued landscapes ...;***
- *b) recognising ... the wider benefits from natural capital and ecosystem services ...;*
- ***...".***

National Planning Practice Guidance 2014

1.6 The Planning Practice Guidance (PPG) was first published online in March 2014 and provides detailed guidance to support the NPPF. This will, where necessary, be updated in due course to reflect changes to the NPPF 2018. The key areas of guidance and themes of relevance to the Site relate to design. The key passages from the 'Design' PPG (see Paragraph: 001 Reference ID: 26-001-20140306) are outlined below.

- ***"Good quality design is an integral part of sustainable** development ...*
- *Achieving good design is identified as being about creating places, buildings, or spaces that work well for everyone, look good, last well, and will adapt to the needs of future generations.*
- *Good design responds in a practical and creative way to both the function and identity of a place. It puts land, water, drainage, energy, community, economic, infrastructure and other such resources to the best possible use – over the long as well as the **short term".***

1.7 Further objectives and achievements that good design can achieve are outlined, with Paragraph 002 noting that good design should, among other points:

"... address the need for different uses sympathetically".

1.8 Paragraph: 007 Reference ID: 26-007-20140306advises that ***"development should seek to*** *promote character in townscape and landscape by responding to and reinforcing locally distinctive patterns of development, local man-made and natural heritage and culture, while not preventing or discouraging appropriate innovation. The successful integration of all forms of new development with their surrounding context is an important design objective ... The opportunity for high quality hard and soft landscape design that helps to successfully integrate development into the wider environment should be carefully considered from the outset, to ensure it complements the architecture of the proposals* ***and improves the overall quality of townscape or landscape ..."***.

1.9 Paragraph 009 (Reference ID: 26-009-20140306) notes that:

- ***"A high quality landscape, including trees and s****emi-natural habitats where appropriate, makes an important contribution to* ***the quality of an area".***

1.10 The qualities of a well-designed place are identified by the PPG as including, among other points, a distinctive character (see Paragraph: 015 Reference ID: 26-015-20140306).

1.11 Further guidance on this is offered, in paragraph 020 Reference ID: 26-020-20140306:

"Distinctiveness is what often makes a place special and valued. It *relies on physical aspects such as:*

- *the local pattern of street blocks and plots;*
- *building forms;*
- *details and materials;*
- *style and vernacular;*
- *landform and gardens, parks, trees and plants; and*
- *wildlife habitats and micro-climates.*

Distinctiveness is not solely about the built environment ***–*** *it also* ***reflects an area's function, history,*** *culture and its potential need for* ***change".***

1.12 In addition, more detail on buildings and the spaces between them is noted in paragraphs 023-028.

1.13 In relation to Layout (paragraph 024 Reference ID: 26-024-20140306), PPG notes, among other points, that, layout should be considered in relation to:

- ***"... adjoining buildings, streets and spaces; the topography; the*** *general pattern of building heights in the area; and views, vistas and landmarks into and out of the development site.*
- *There may be an existing prevailing layout that development should respond to and potentially improve. Designs should ensure that new and existing buildings relate well to each other, that streets are connected, and spaces complement one another. This could involve following existing building lines, creating new links between existing streets or providing new public spaces* ***...".***

1.14 In relation to Scale (paragraph 026 Reference ID: 26-026-20140306), PPG notes, among other points, that:

- ***"... In general terms too much building mass compared with o****pen space may feel overly cramped and oppressive, with access and amenity spaces being asked to do more than they feasibly can. Too little and neither land as a resource or monetary investment will be put to best use.*
- *The size of individual buildings and their elements should be carefully considered, as their design will affect the: overshadowing and overlooking of others; local character; skylines; and vistas and views. The scale of building elements should be both attractive and functional when viewed and used from neighbouring streets, gardens and parks.*
- *The massing of development should contribute to creating distinctive skylines in cities, towns and villages, or to respecting existing skylines. Consideration needs to be given to roof space design within the wider context, with any adverse visual impact* ***of rooftop servicing minimised ...".***

Local Planning Policy

Reading Borough Council Reading Station Area Framework (RSAF 2010)

1.15 The Reading Station Area Framework (RSAF) forms part of RBC's LDF, with the status of supplementary planning document, and is designed to supplement Policy RC1 within the RCAAP. The document sets out six principles for the RSAF in guiding development within the Station Area, which should achieve "*A vital and enjoyable place, a place to work, a place to live, a well* ***connected and accessible place, a place to value and a highly sustainable place".*** Policies that underpin the RSAF are drawn directly from the Core Strategy and RCAAP LDF documents. The Site falls within the Station Area Boundary as defined in Figure 2.1 (p.12) of the RSAF.

1.16 The delivery of quality public realm within the Station Area is a key consideration of the RSAF, which sets out the following detailed aims for achieving quality public spaces:

- ***"'Stitching' together the*** *various development sites within the Area, both visually and physically;*
- *Unifying the area through a coordinated design approach that utilises the best contemporary modern materials and street furniture;*
- *Creating an environment that is busy, overlooked and safe* ***through its relationship with adjoining buildings ('passive surveillance');***
- *Contributing to the character and identity of the town centre, helping to instil a strong sense of place and underpinning investment;*
- *Creating more opportunities for sustainable forms of transport, particularly walking and cycling, by enhancing the connectivity* ***and legibility of the area"*** (p.24).

1.17 Ten public realm priorities are listed within the RSAF, eight are specific location references and two general themes, of which the Site forms a nodal point for Priority 2: Station Square North, Priority 3: Kennet-Thames Spine, Priority 5: Vastern Road, Pedestrian Grid and Landscaping and Public Art.

1.18 Priority 2: Station Square North states:

- *"**The two station entrances will lead out int**o high quality multi functional public spaces - **new 'town squares'** - one to the north and one to the south of the Station. Although there will be great competition for space outside the station entrances (buses, taxis, cars etc.), public space and pedestrian movement should **be prioritised"*** (p.25).

1.19 Priority 3: Kennet-Thames Spine states:

- ***"The spine will extend across the Thames with a new** footbridge(s) and new riverside parks, which can act as amenity space for new residents. The spine will include enhancements including wider pavements and greater pedestrian priority in Station Road. North of the railway, the spine will incorporate a **'green link' towards the river. Buildings will face onto the spine** rather than away from it, and, on all parts of the spine south of Vastern Road, the frontages will be enlivened with active uses including ret**ail and leisure"*** (p.26).

1.20 Priority 5: Vastern Road states:

- *"Potential changes to Vastern Road could reduce the dominance of speeding traffic and transform the character of the road from a by-pass at the edge of the town centre into a tree lined avenue as a central element of the town centre public realm, by planting **in the central reservation and creating planted verges"*** (p.27).

1.21 Landscaping is listed as a priority theme for the Station Area public realm stating:

- *"Although the development of the Station Area is unlikely to result in major new areas of green space, there will be a significant opportunity to provide new landscaping ... In particular, the Council wishes to see new tree planting in the **area. The Council's Tree Strategy (adopted 2010) states that t**he Council will seek to prioritise the protection, maintenance and planting of trees that enhance the appearance of central Reading, particularly its various public realm. There should be new tree planting along Vastern Road, for instance, including the central **reservation"*** (p.29).

1.22 The RSAF sets out guidance on development density, mass and height with the Site covered by individual development plots **N3 to N6**. In relation to density the document states that plot N3 should reflect a ***"Medium"*** density range, N4 and N5 should reflect a ***"Medium to High"*** density range and N6 should reflect a ***"High to Very High"*** density range (Figure 6.7, p.35).

1.23 In relation to massing the RSAF states:

- *"Development in the Station Area should be characterised by high density development with an intense, fine grained urban fabric framing flexible development plots capable of adaptation to many land uses, combinations of land uses (vertical and **horizontal) and many building types and forms"*** (p.34)

1.24 In terms of building heights, the RSAF uses landmark and benchmark heights, which are then applied to each individual development plot. Plot N3 is assigned a benchmark height of 6 storeys, Plot N4 7 storeys, Plot N5 8 storeys and Plot N6 a benchmark of at least 10 storeys (Figure 6.9, p.37).

1.25 The guidance does include for a degree of flexibility in benchmark heights, subject to specific criteria, as stated in paragraph 6.23:

- *"Benchmark heights may be modified upwards in order to realise certain urban design or other major planning benefits, or where applicants have demonstrated convincingly that the potential **impact of higher buildings on the surroundings can be mitigated"*** (p.36).

1.26 Paragraphs 6.28 and 6.29 make specific recommendations concerning building heights that relate to the Site and its immediate context:

- *"Much of the surrounding area consists of fairly low density, low rise residential areas. High-density development can also be achieved through lower-rise compact development forms and this will be particularly appropriate immediately adjoining low rise residential areas to the west of Caversham Road and the residential streets leading from Vastern Road northwards towards the Thames (e.g. Lynmouth Road);*
- *A transition zone (buffer zone) should be formed towards adjacent areas (particularly the historic core of the town and low-rise residential areas to the west and north) with heights stepping down so that they relate appropriately to surrounding development and residential areas. Development should respect the amenity, privacy and light requirements of these properties **..."*** (p.37).

1.27 Figure 6.10 (p.38) considers sensitive receptors within the Station Area and identifies properties along Lynmouth Road and De Montfort Road, which lie to the north of the Site and separated by Vastern Road, as within an area of ***"particular sensitivity to the effects of tall buildings".***

Reading City Centre Framework (RCCF, 2008)

1.28 The RCCF stands as a supporting document to the RCAAP and sets out spatial and design guidance for the area. As discussed in the RCAAP overview, the RCCF also identifies the site as falling within the MOA: Station/River. The RCCF highlights that the areas around Reading Station including the Site are; ***"Preferred locations for tall buildings subject to the detailed criteria of the Tall Buildings Strategy"*** (p.30). The design guidelines within the document share commonality with those discussed in the RCAAP and RSAF.

Reading Borough Housing and Economic Land Availability Assessment (HELAA, 2017)

1.29 The HELAA document identifies the Site as AB004: North of Station, which uses the RCAAP MOA sub-area RC1e as a basis for the assessment. The Site is considered as ***"potentially achievable"*** for a total of 634 units.

Reading Borough Local Plan (2019)

1.30 The draft Local Plan, once adopted, will represent the spatial planning strategy for Reading Borough Council up to 2036. The following policies and extracts from policies will be relevant to landscape and visual matters.

1.31 Policy CC3 (Adaptation to Climate Change) states:

> ***"All developments will demonstrate how they have been designed to*** *incorporate measures to adapt to climate change. The following measures shall be incorporated into development:*
>
> - *... Use of trees and other planting, where appropriate as part of a landscape scheme, to provide shading of amenity areas, buildings and streets and to help to connect habitat, designed with native plants that are carefully selected, managed and* ***adaptable to meet the predicted changed climatic conditions ..."*** (p.23).

1.32 Policy CC7 (Design and the Public Realm) states:

> ***"All development must be of high design quality that maintains and*** *enhances the character and appearance of the area of Reading in which it is located ... will be assessed to ensure that the development proposed makes a positive contribution to the following urban design objectives:*
>
> - *Character - a place with its own identity and sense of place;*
> - *Continuity and enclosure;*
> - *Quality of the public realm;*
> - *Ease of movement and permeability;*
> - *Legibility - clear image and easy to understand;*
> - *Adaptability – capable of adaptation over time;*
> - *Diversity – meets a wide range of needs.*
>
> *Developments will also be assessed to ensure that they:*
>
> - *Respond positively to their local context and create or reinforce local character and distinctiveness, including protecting and enhancing the historic environment of the Borough and providing value to the public realm;*
> - *Create safe and accessible environments where crime and disorder or fear of crime does not undermine quality of life or community cohesion;*
> - *Address the needs of all in society and are accessible, usable and easy to understand by them;*
> - *Are visually attractive as a result of good high quality built forms and spaces, the inclusion of public art and appropriate materials* ***and landscaping ..."*** (p.28).

1.33 Policy CC8 (Safeguarding Amenity) states:

> ***"Development will not cause a significant detriment****al impact to the living environment of existing or new residential properties, in terms of:*
>
> - *... Access to sunlight and daylight;*
> - ***Visual dominance and overbearing effects of a development ..."*** (p.30).

1.34 Policy EN7 (Local Green Space and Public Open Space) states:

> ***"The following Local Green Spaces (LGS) and Public Open Space*** *(POS), as shown on the Proposals Map, will be protected from development. Proposals that would result in the loss of any of these areas of open space, erode their quality through insensitive adjacent development or jeopardise their use or enjoyment by the public, will* ***not be permitted ..."*** (p.42).

1.35 Policy EN9 (Provision of Open Space) states:

> ***"All new development should make provision for appropriate open*** *space based on the needs of the development. This can be achieved through on or off-site provision, contributions toward provision or* ***improvement of existing leisure or recreational facilities ..."*** (p.45).

1.36 Policy EN10 (Access to Open Space) states:

> ***"In areas with relatively poor access to op****en space facilities (including as a result of severance lines), new development should make provision for, or contribute to, improvements to road and other crossings to improve access to green space and/or facilitate the creation or linking of safe off-roa****d routes to parks"*** (p.48).

1.37 Policy EN12 (Biodiversity and the Green Network) states:

> ***"... New development shall demonstrate how the location and type of*** *green space, landscaping and water features provided within a scheme have been arranged such that they maintain or link into the* ***existing Green Network and contribute to its consolidation ..."*** (p.51).

1.38 Policy EN14 (Trees, Hedges and Woodlands) states:

> ***"Individual trees, groups of trees, hedges and woodlands will be*** *protected from damage or removal where they are of importance, and* ***Reading's vegetation cover will be extended. The quality of waterside*** *vegetation will be maintained or enhanced;*
>
> *New development shall make provision for tree retention and planting within the application site, particularly on the street frontage, or off-site in appropriate situations, to improve the level of tree coverage within the Borough, to maintain and enhance the character and appearance of the area in which a site is located, to provide for biodiversity and to contribute to measures to reduce carbon and adapt to climate change. Measures must be in place to ensure that these* ***trees are adequately maintained"*** (p.55).

1.39 Policy H10 (Private and Communal Outdoor Space) states:

> ***"... The design of outdoor areas will respect the size and*** *character of other similar spaces in the vicinity, clearly identify whether they are private or communal spaces, ensure that they are appropriately related to main entrances, enhance safety and the perception of safety for future residents and the general public, and not be compromised by the relationship of other buildings which may be detrimental in* ***terms of overlooking, overbearing or overshadowing"*** (p.90).

1.40 Policy H14 (Suburban Renewal and Regeneration) states:

> ***"There is scope for some of Reading's suburban residential areas to*** *undergo renewal and regeneration that would achieve the following aims:*
>
> - *Improve the local built environment ...;*
>
> *Where development would fulfil the above aims, it would generally be supported, subject to other policies in this plan and provided that:*
>
> - *Any loss of undeveloped land would be outweighed by a qualitative improvement in open and green space and by the benefits of development to the community as a whole;*
> - *Buildings and features that make a positive contribution to the* ***area's character are retained ..."*** (p.96).

1.41 Policy CR2 (Design in Central Reading) states:

> ***"Applications for development within Central Reading should*** *demonstrate the following attributes:*
>
> *a) Development will build on and respect the existing grid layout structure of the central area, providing continuity and enclosure through appropriate relationships between buildings and spaces, and frontages that engage with the street at lower levels, and contributing towards enhanced ease of movement through and around the central area;*
> *b) Development will provide appropriate, well designed public spaces and other public realm, including squares, open spaces, streetscape, utilising high quality and well maintained hard and soft landscaped areas, and public art, that provide suitable functions and interest, sense of place and safe and convenient linkages to adjoining areas;*
> *c) Development should consider and, where possible, include ways of providing green infrastructure designed into the development, for instance through roof gardens, green walls and green roofs, to enhance the otherwise very urban environment;*
> *d) The architectural details and materials used in the central area should be high quality and respect the form and quality of the detailing and materials in areas local to the development site;*
> *e) Development and any associated public realm should contribute to the diversity of the central area, be capable of easy adaptation over time to meet changing circumstances, and be designed to enhance community safety;*
> *f) Development should be designed with consideration of adjacent development sites, and should not prevent or cause unreasonable burdens on the future development of those* ***sites"*** (p.129).

1.42 Policy CR3 (Public Realm in Central Reading) states:

> ***"Proposals for new developme****nt will need to make a positive contribution towards the quality of the public realm of the central area and will be assessed against the following criteria:*
>
> *ii) Imaginative uses of open space and the public realm, which contribute to the offer of the centre, will be encouraged, and new open spaces should be of a size and shape to be flexible enough to accommodate such uses. The provision of water features, trees (including street trees) and other planting, as well as hard landscaping, to create high-quality spaces, will be encouraged;*
> *iii) Development proposals adjacent to or in close proximity to waterways will retain and not impede existing continuous public access to and along the waterways, and will provide legible continuous public access to and along the waterways where this does not currently exist;*
> *iv) The design of developments adjacent to a waterway, including the refurbishment of existing buildings, will be required to enhance the appearance of the waterways and to provide active elevations facing the waterways. Development that turns its back on the waterways and results in blank or mundane elevations* ***facing the waterways will not be permitted ..."*** (p.54).

1.43 Policy CR10 (Tall Buildings) states:

> ***"In Reading, tall buildings are defined as 10 storeys of commercia****l floorspace or 12 storeys of residential (equating to 36 metres tall) or above. Tall buildings will meet all the requirements below;*
>
> *i) Within Reading Borough, tall buildings will only be appropriate* ***within the 'areas of potential for tall buildings' as defi****ned on the Proposals Map. These areas are as follows:*
>
> - *CR10a Station Area Cluster*
> - *CR10b Western Grouping*
> - ***CR10c Eastern Grouping"*** (p.49).

1.44 The Site falls within CR10a Station Area Cluster, which states:

> ***"A new cluster of tall buildings with the station at*** *its heart will signify the status of the station area as a major mixed-use destination and the main gateway to and most accessible part of Reading.*
>
> *Tall buildings in this area should:*
>
> - *Follow a pattern of the tallest buildings at the centre of the cluster, close to the station, and step down in height from that point towards the lower buildings at the fringes;*
> - *Contribute to the creation of a coherent, attractive and sustainable cluster of buildings with a high quality of public realm;*

- *Ensure that adequate space is provided between the buildings to avoid the creation of an overly dense townscape and to allow **buildings to be viewed as individual forms …"*** (p.140).

1.45 Policy CR10 also lists several requirements for tall building developments, which apply in addition to the area specific requirements:

- ***"Enhance Reading's skyline, through a distinctive profile and** careful design of the upper and middle sections of the building;*
- *Contribute to a human scale street environment, through paying careful attention to the lower section or base of the building, providing rich architectural detailing and reflecting their surroundings through the definition of any upper storey setback and reinforcing the articulation of the streetscape;*
- *Contribute to high-quality views from distance, views from middle-distance and local views;*
- *Take account of the context within which they sit, including the existing urban grain, streetscape and built form and local architectural style;*
- *Avoid bulky, over-dominant massing;*
- *Preserve and, where appropriate, enhance the setting of conservation areas and listed buildings;*
- *Use high quality materials and finishes;*
- *Create safe, pleasant and attractive spaces around them, and avoid detrimental impacts on the existing public realm ...;*
- *Ensure adequate levels of daylighting and sunlighting are able to reach buildings and spaces within the development;*
- *Avoid significant negative impacts on existing residential properties and the public realm in terms of outlook, privacy, daylight, sunlight, noise, light glare and night-**time lighting"*** (p.141).

Appendix 1.2: Baseline Conditions and Figures

Townscape Baseline

National Level Landscape Character

1.1 In terms of Landscape and Townscape Character, the Site lies in the eastern part of the National Character Area (NCA) 110: Chilterns, the key characteristics of which, of relevance to the Site, are:

- ***"The chalk plateau is incised by parallel branching valleys gently*** *shelving to the south-east into the London Basin. The large chalk aquifer is abstracted for water to supply London and its surrounds and also supports flows of springs, chalk streams and the River Thames ...*
- *The River Thames and its flood plain mark a distinctive area in the south. The river is a focus for settlement, abstraction and recreation ...*
- *Major transport routes, including motorways, radiate from adjacent Greater London, associated with significant 20th-century development and extensive urban fringe areas...*
- *Brick and flint are the dominant traditional building materials, with Totternhoe Stone (clunch) being less common, but still a* ***distinctive..."*** *(p. 7-8).*

1.2 There are four Statements of Environmental Opportunity for this NCA, of which SEO4 is of relevance, noting the need for creation of green infrastructure to reduce the impact of development, for example through:

- ***"Enhance local distinctiveness and create or enhance green*** *infrastructure within existing settlements and through new development, particularly in relation to the urban fringe ...;*
- *Adapt or remove existing development where to do so would significantly strengthen landscape character, enhance views and address barriers to natural processes and public access to the countryside ...;*
- *Addressing deficits in greenspace and access links, integrating the public transport and cycle network and creating new or improved multi-user routes and green spaces working across administrative boundaries as necessary ...;*
- *Maximising the appeal of existing and new green spaces and* ***sustainable transport routes close to people's homes and*** *workplaces, including in the urban fringe where it could also strengthen landscape character ...;*
- *Enhancing the rural and urban scene by promoting the use of traditional local building materials and vernacular styles and utilising appropriate infrastructu****re"*** *(p.27).*

County Level Landscape Character

1.3 Within the West Berkshire Landscape Character Assessment, the Site is located within land defined as 'Urban Area' for which no further detail is provided.

Local Level Townscape Character

1.4 Entec Ltd produced the Reading Tall Building Strategy (RTBS) in 2008 on behalf of Reading Borough Council in order to inform the development of a tall buildings policy and specific guidelines for individual sites, which form part of the Reading Central Area Action Plan. As part of the production of the RTBS, a townscape assessment was undertaken, and the Reading Central Area divided into townscape character areas. The RTBS was updated in March 2018 and the updates are documented below along with the original 2008 commentary.

1.5 As shown on **Figure 2: Townscape Character Plan**, the Site and its immediate setting fall within Character Area (CA) 22: Vastern Road. The north-western edge of the Site immediately abuts CA12 - Caversham Road whilst the north-eastern edge abuts CA 23 – King's Meadow. CA1 - Station Hill abuts the boundary of CA22 to the south, whilst CA2 - Reading Station East abuts the south-eastern boundary (both of these being locate beyond Reading Station and the Great Western Railway Line. The area immediately to the west of CA22 falls outside of the Reading Central Area.

1.6 It is noted on page 13 that ***"there are 8 character*** *areas which are judged to have a capacity for tall buildings. These areas are largely, but not wholly towards the edges of central Reading, adjacent to major transport routes such as the IDR and the railway line. Within these areas there is an absence of historic built form, and although the building style and heights across these areas is variable, there are characteristically occasional buildings of between 8 and 10 storeys. The buildings were largely constructed during the middle and later stages of the 20th century and have a medium sized or large block size. With* ***the exception of character area 19 'Mallard Row to 'Fobney Street' they all have a predominantly office or industrial land use"***. This includes CA 22 and CA 1 and 2 immediately to the south.

CA22 – Vastern Road

1.7 The RTBS Townscape Assessment sets out in table form the following descriptions for the character area against ten townscape criteria:

Consideration	Original Tall Buildings Strategy comment	2018 Update
Land Use	Warehouses and retail park	Major land uses remain the same, although the opening of the northern entrance to the station has brought a public transport interchange into the heart of the site.
Historical significance	Railway town and growth of manufacturing and commerce post 1840	No change.
Architectural style	The predominant material is coloured, metal cladding	No change.
Urban grain and townscape scale	The building blocks have a large floor space, although the buildings are not high rise and there is extensive car parking adjacent to the buildings. These features combine to create a medium scale townscape.	No change.

Townscape condition	The large, blank faces of the warehouses create an unexceptional area of townscape which does not respond well to the surrounding residential land use. Although the buildings are occupied and function well for their purpose, their design is unattractive and creates a weak and uninspiring area of townscape.	Although the new entrance to the station and adjacent square have improved the townscape condition of a small part of the site, the surrounding buildings remain unchanged.
Key views within the character area	There are no key views defined for the character area.	No change.
Key views into the character area	Buildings within the character area contribute to the skyline visible from Oxford Road when approaching Reading from the west. From the elevated position of Caversham Park, Balmore Park and Horse Close, built form within the character area contributes to the view of central Reading.	No change.
Landmark structures and existing tall buildings	The large, warehouse structures create a consistent, unexceptional townscape. There are no landmark structures. Although the warehouses create a roofline which is elevated above the surrounding residential buildings, there is no one structure which is notable as a tall building.	The new northern entrance to the station is a landmark, albeit not particularly high. It will become more prominent as development of surrounding sites allows views of it to open up. The new Christchurch Bridge is a landmark on the river, but is currently visually separated from the rest of the area.
Tall buildings planning applications	N/A	Outline planning permission (110024) was granted on the sorting office site for a major mixed use development including residential, office, hotel and retail. The plot adjacent to the station entrance would have been up to 16 commercial storeys or 21 hotel storeys, with heights decreasing to the west. This permission has now expired.
Townscape sensitivity to the inclusion of tall buildings	Low: The large block size which exists within the character area and the absence of any key views or visual focal point makes this an appropriate location for tall buildings. However, it is proposed that tall structures should not be developed along the north and western boundaries of the character area as these boundaries are shared with small scale residential areas. any proposed built form should respond in terms of height and scale to the residential area. The tallest structures should be located to the south of the character area, adjacent to the railway line. In this area the townscape features are larger scale, and adjacent to large scale features outside of the area e.g. existing station buildings, Thames Tower and Western Tower.	Townscape sensitivity remains low, albeit with the caveats expressed in 2008 continuing to apply.

CA12 – Caversham Road

1.8 The RTBS Townscape Assessment sets out in table form the following descriptions for the character area against ten townscape criteria:

Consideration	Original Tall Buildings Strategy comment	2018 Update
Land Use	Residential	No change.
Historical significance	Railway town and growth of manufacturing and commerce post 1840	No change.
Architectural style	Two storey, red brick, terraced housing	No change.
Urban grain and townscape scale	The low rise, terraced housing creates a small scale townscape.	No change.
Townscape condition	The buildings are in good condition. The consistent architectural style create a strong townscape character.	No change.
Key views within the character area	View from Caversham Bridge westwards	No change.
Key views into the character area	From the elevated position of Caversham Park, Balmore Park and Horse Close, built form within the character area contributes to the view of central Reading.	No change.
Landmark structures and existing tall buildings	There are no landmarks structures within the character area.	No change.
Tall buildings planning applications	N/A	No change.
Townscape sensitivity to the inclusion of tall buildings	High: There is a low capacity for the development of buildings of this scale due to the low rise, small scale residential character	Townscape sensitivity remains high.

	which predominates. Taller buildings would dilute the townscape pattern and would be uncharacteristic. The area is also inappropriate in terms of market demand and transport connections.	

CA23 – Kings Meadow

1.9 The RTBS Townscape Assessment sets out in table form the following descriptions for the character area against ten townscape criteria:

Consideration	Original Tall Buildings Strategy comment	2018 Update
Land Use	Sports ground and river meadows	No change.
Historical significance	N/A	Kings Meadow Baths, an unused listed Victorian facility at the time of the TBS, has been reopened as Thames Lido.
Architectural style	N/A	No change.
Urban grain and townscape scale	The large expanse of open meadows creates a large townscape scale.	No change.
Townscape condition	The meadows are a well maintained recreational resource and contribute positively to the townscape character.	No change.
Key views within the character area	The open views across the meadows to the wooded skyline created by bankside vegetation, has been identified as a key view.	No change.
Key views into the character area	From the elevated position of Caversham Park, Balmore Park and Horse Close, built form within the character area contributes to the view of central Reading.	No change.
Landmark structures and existing tall buildings	N/A	The Christchurch Bridge, opened in 2015, is a new prominent landmark on the Thames that links Caversham and central Reading. The 39m high bridge support is tall within a local context.
Tall buildings planning applications	N/A	No change.
Townscape sensitivity to the inclusion of tall buildings	High: The majority of the site is protected open space and therefore inappropriate as a location for tall buildings.	Townscape sensitivity remains high.

CA1 – Station Hill

1.10 The RTBS Townscape Assessment sets out in table form the following descriptions for the character area against ten townscape criteria:

Consideration	Original Tall Buildings Strategy comment	2018 Update
Land Use	A mixture of offices and retail land uses	These uses remain, although residential uses have also been introduced around Garrard Street.
Historical significance	Railway town and growth of manufacturing and commerce: post 1840. The Station building. Edward XVII statue and Great Western House (now Malmaison) are all listed.	No change
Architectural style	The architectural style is predominantly 1970s. Concrete is a widely used material. Ramps and staircases navigate the awkward spaces and level changes.	Much of the 1970s concrete architecture has now been demolished ahead of redevelopment, although the multi-storey car park remains and demolition has temporarily made it more prominent. The new station building is of a modern architectural style.
Urban grain and townscape scale	The large block size and occasionally tall buildings, the tallest being Thames Tower (11 storeys) and Western Tower (17 storeys) create a large townscape scale.	Thames Tower has been extended by four storeys to 15 storeys (2017). Western Tower has been demolished in advance of Station Hill redevelopment. A large townscape scale remains, including new station building and Station Square south.
Townscape condition	The buildings are occasionally derelict and all are either of a poor condition or an unexceptional design quality. The spaces between the buildings are awkward shapes and sizes and poorly maintained. The overall effect is of a poor quality townscape.	The area is in the process of improvement. The station itself has been much improved with the new station having been completed together with a new station square and transport interchange. Thames Tower has been re-clad and is in improved condition. Most of the poorest quality areas have been demolished, and await development.
Key views within the character area	N/A	No change.

Key views into the character area	Views of current buildings within the character area are possible from the A4, A327 and A33 when travelling into the city. From the elevated position of Caversham Park, Balmore Park and Horse Close, built form within the character area contributes to the view of central Reading.	No change.
Landmark structures and existing tall buildings	Thames Tower and Western Tower both form localised focal points to views.	Western Tower has been demolished. The new Station building, although not tall, forms a focal point and landmark within the area. Thames Tower's increased height makes it more of a focal point
Tall buildings planning applications	The 2007 application for the Station Hill site proposes residential units together with The proposed development at the Station Hill site would comprise no less that 577 and no more than 624 residential units together with office, retail, cultural and leisure land uses. The tallest building would range from 150-161 metres. There are two planning applications for tall buildings which have been approved.	There have been two subsequent iterations of the Station Hill scheme. Permission 090622 proposed up to 782 dwellings, 80,000 sq m offices plus retail and leisure. It included eight buildings, of which six qualify as tall buildings. The tallest building, B1, would have been 28 commercial storeys, and this would have been the tallest building in Reading. This was then superseded by a new permission, 130436, amended in 151426, which took in some adjacent buildings. This proposed up to 475 23 dwellings, 122,000 sqm of offices plus retail and leisure uses. This comprises seven buildings. Although six would potentially qualify as tall buildings, heights would be reduced from the previous scheme, with the tallest building, plot C, being 40m shorter than permitted in the previous scheme, and heights of other plots also reduced. However, plot C would still potentially be Reading's tallest building. The planning permission for 22 residential storeys on 29-35 Station Road (in place at the time of the TBS) has now expired.
Townscape sensitivity to the inclusion of tall buildings	Low: The large townscape scale, the absence of historic townscape features and the precedence for tall structures, all contribute to this area having a high capacity for the development of further tall	Townscape sensitivity remains low. Planning permissions have continued to establish this as the primary opportunity for tall buildings in Reading.
	buildings in terms of townscape character.	

CA2 – Station Area East

1.11 The RTBS Townscape Assessment sets out in table form the following descriptions for the character area against ten townscape criteria:

Consideration	Original Tall Buildings Strategy comment	2018 Update
Land Use	Offices.	No change.
Historical significance	Railway town and growth of manufacturing and commerce: post 1840. Adjacent to Forbury Gardens.	No change.
Architectural style	1970s - late 20th century office blocks.	Addition of four more modern office blocks – three at and adjacent to the former Energis site, and one at former Aldwych House on Blagrave Street.
Urban grain and townscape scale	The individual buildings within the character area e.g Apex Plaza and Queens House are large and blocky structures which create a sense of large scale townscape.	The new additions to the area have only served to reinforce this large scale townscape.
Townscape condition	The buildings within the character area are of an unexceptional design and quality.	The more recent office additions are of reasonably good quality, and have generally enhanced the overall condition of the area.
Key views within the character area	No key views have been defined for this area.	No change.
Key views into the character area	From the elevated position of Caversham Park, Balmore Park and Horse Close, built form within the character area contributes to the view of central Reading.	No change.
Landmark structures and existing tall buildings	Apex plaza is a local landmark due to its height and distinctive pink colour. The Energis/Metal box is a local landmark due to its prominence and distinctive shape.	The Energis/Metal Box/Queens House building has been demolished, and replaced by two 8-storey office buildings which were completed in 2017. Adjacent to this is 3 Forbury Place, an 11-storey office building which was completed in 2010.
Tall buildings planning applications	-	No change.
Townscape sensitivity to	Low: The high density of development within the character area, the characteristic large	Townscape sensitivity remains low.

the inclusion of tall buildings	block size and the absence of historic townscape features within the area ensures a low sensitivity to the development of further tall buildings. The absence of any key views also contributes to this being an appropriate location when judged against townscape character criteria.	

CA3 – Friar Street

1.12 The RTBS Townscape Assessment sets out in table form the following descriptions for the character area against ten townscape criteria:

Consideration	Original Tall Buildings Strategy	Tall Buildings Strategy comment 2018 update
Land Use	Friar Street is a shopping street	No significant change, although there is now some residential use of upper floors, and this would increase substantially as a result of new planning permissions.
Historical significance	Ecclesiastical Town; AD1121-1539 Post-Dissolution Reading: AD 1539-1840 Railway town and growth of manufacturing and commerce post 1840	No change.
Architectural style	The street has been redeveloped over many decades and as such the building frontage line has not been retained consistently and the architectural style is very varied. Some Victorian facades remain above the shop frontages but in many cases the architecture is undistinguished.	No change.
Urban grain and townscape scale	The tightly packed buildings and the relatively low skyline (generally 4-6 storeys) creates a medium scale townscape.	No significant change. Redevelopment has occurred along northern frontage on corner of Greyfriars Road, but this fits in with the assessed townscape scale. The Station Hill outline permission would mean buildings on the Friar Street frontage of approximately 6-8 storeys and increase further back, so this could lead to some taller elements.
Townscape condition	The buildings and public realm along the street is generally in good condition	No change.
Key views within the character area	Views along Friar Street eastwards towards the Market Place and St. Lawrence's church	Views to the west along Friar Street are now terminated by the tower at Chatham Place.
Key views into the character area	From the elevated position of Caversham Park, Balmore Park and Horse Close, built form within the character area contributes to the view of central Reading.	No change.
Landmark structures and existing tall buildings	The Ibis hotel is 14 storeys high Greyfriar's Church (at the western end of Friar Street)	No change.
Tall buildings planning applications		As above, the Station Hill planning permission covers part of the area, although the development within the area would not qualify as tall buildings. The resolution to grant permission at 52-55 Friar Street 162210 would include development of 10 residential storeys, although the highest elements would be set back from Friar Street and not prominent from street level.
Townscape sensitivity to the inclusion of tall buildings	Medium: There is a fairly consistent, low rise roof line which is occasionally punctuated with views of taller structures e.g. Ibis hotel. Where the tall structures are visible, they detract from the cohesive character of the shopping street and are overbearing features of an uncharacteristically large scale. Therefore further tall buildings would exacerbate this characteristic further.	Townscape sensitivity remains medium. There is likely to be an increase in height in parts of the area due to permissions, however efforts have been made to ensure that the Friar Street frontage itself is more in keeping with the existing roof line. Likewise, the appearance of the Chatham Place development from a view along Friar Street appears as a more distant element, and tall buildings in closer proximity would exacerbate effects on the area.

CA7 – Station Area West

1.13 The RTBS Townscape Assessment sets out in table form the following descriptions for the character area against ten townscape criteria:

Consideration	Original Tall Buildings Strategy comment	2018 Update
Land Use	Residential land use	No change.
Historical significance	Ecclesiastical Town; AD1121-1539. Post-Dissolution Reading: AD 1539-1840. Railway town and growth of manufacturing and commerce post 1840.	No change.
Architectural style	Victorian 2-3 storey terraced residential properties interspersed	The south side of Tudor Road has now been redeveloped for a 4/5 storey apartment block. However,

	with more recent small scale office/commercial development.	the remainder of the character area remains as described.
Urban grain and townscape scale	The low rise, terraced housing creates a fine grained, small scale townscape.	No change.
Townscape condition	Buildings on Tudor Road are largely derelict creating a degraded character. To the south of the character area the terraced housing is in good condition and creates an area of strong residential character as the backdrop to views of Greyfriar's Church.	The derelict buildings on Tudor Road have now been redeveloped into a modern apartment block. Otherwise, no change.
Key views within the character area	Views towards Greyfriar's church.	No change.
Key views into the character area	Views along west street to Greyfriar's Church which creates an attractive focal point. From the elevated position of Caversham Park, Balmore Park and Horse Close, built form within the character area contributes to the view of central Reading.	No change.
Landmark structures and existing tall buildings	Greyfriar's Church is located in this character area.	No change.
Tall buildings planning applications	-	No change.
Townscape sensitivity to the inclusion of tall buildings	High: The small scale, low rise and residential character of this area makes it inappropriate for the development of tall buildings.	Townscape sensitivity remains high.

CA13 – Cattle Market and Chatham Place

1.14 The RTBS Townscape Assessment sets out in table form the following descriptions for the character area against ten townscape criteria:

Consideration	Original Tall Buildings Strategy comment	2018 Update
Land Use	Mixed use.	No change.
Historical significance	Railway town and growth of manufacturing and commerce post 1840.	No change.
Architectural style	The Architectural style is variable including the large sheds and expansive car parking on the site	No change.
	of the Cattle Market and depot which is to the north of the character area and 3 storey residential blocks along Weldale Street.	
Urban grain and townscape scale	Buildings are of a variable height and block size but cumulatively create a medium scaled townscape.	No change. Recent development has reinforced the pattern of the higher buildings (4-6 storeys) on the Caversham Road frontage.
Townscape condition	The variety of building styles, block sizes and materials creates a weak townscape character.	No change.
Key views within the character area	No key views have been defined for this area.	No change. Buildings in Station Hill will be prominent from much of this area.
Key views into the character area	From the elevated position of Caversham Park, Balmore Park and Horse Close, built form within the character area contributes to the view of central Reading.	No change.
Landmark structures and existing tall buildings	There are no landmark structures within the character area.	No change.
Tall buildings planning applications	-	The Council has resolved to grant permission for 427 dwellings on the land south of Weldale Street subject to S106 agreement. The height varies across the site, but has a maximum of 12 residential storeys at the south eastern corner close to Chatham Place. The height of the tallest building in this scheme has been greatly reduced from the preapplication scheme, in order to comply with the Council's policy.
Townscape sensitivity to the inclusion of tall buildings	Medium: The existing large block sizes of built form at the cattle market site and the degraded townscape condition all contribute to a high capacity for the development of tall buildings. However, despite the suitability of this area, the height would be restricted by the surrounding small scale residential areas. Consideration should be given on a case by case basis to the appropriateness of tall building height in relation to these areas of strong residential character.	Townscape sensitivity remains medium. The issue has been explored in the recent planning application, which confirmed the south eastern corner as the greatest potential for height, albeit still within policy parameters.

Degree to which the Site reflects Published Townscape Assessment

1.15 This table sets out the assessment response of Barton Willmore LLP, following a site visit during April and May 2019, to the commentary provided in the Reading Tall Building Strategy Townscape Character Assessment (2008, updated 2018) regarding Character Area 22 (CA:22): Vastern Road in relation to the current condition of the Site:

Consideration	Original Tall Buildings Strategy comment	2018 Update	Barton Willmore LLP Response to the Townscape Character Assessment
Land Use	Warehouses and retail park	Major land uses remain the same, although the opening of the northern entrance to the station has brought a public transport interchange into the heart of the site.	The Site comprises retail units and car parking thus still accords with the published character assessment. However, there is no direct access to the Site from the new northern station entrance instead pedestrians are required to walk along Trooper Potts Way to join Vastern Road before accessing the Site from a small block paved pavement, which flanks the external façade of the retail units.
Historical significance	Railway town and growth of manufacturing and commerce post 1840	No change.	The Site is specifically referenced as part of the Great Western Railway Works, north of Reading Station, on historic OS Six Inch, 1888-1913 mapping. The Grade II listed Main Building of Reading Station lies to the south of the recent station construction and is not visible from the Site at present.
Architectural style	The predominant material is coloured, metal cladding	No change.	Buildings facades within the Site are utilitarian red brick fronting onto a large tarmac car parking area. The six storey station car parking building lies 20m to the south-east of the Site also exhibiting various utilitarian brick and concrete external finishes. Clearwater Court and Reading Bridge House also lie within CA22 and are of distinct architectural styles, which are not found elsewhere within the CA.
Urban grain and townscape scale	The building blocks have a large floor space, although the buildings are not high rise and there is extensive car parking adjacent to the buildings. These features combine to create a medium scale townscape.	No change.	The Site is in line with the assessment, however, within the wider CA22 the Clearwater Court and Reading Bridge House are larger in height than surrounding buildings increasing the sense of scale in the immediate area extending further south-east along Vastern Road. Vastern Road is a vehicle dominated corridor through the CA due to the double width, which acts to increase the grain and sense of scale of this area. Vastern Road acts as a physical and perceptual barrier between the north of the train station and the River Thames.
Townscape condition	The large, blank faces of the warehouses create an unexceptional area of townscape which does not respond well to the surrounding residential land use. Although the buildings are occupied and function well for their purpose, their design is unattractive and creates a weak and uninspiring area of townscape.	Although the new entrance to the station and adjacent square have improved the townscape condition of a small part of the site, the surrounding buildings remain unchanged.	The Site reflects the condition detailed in the assessment due to the low architectural merit of the existing buildings that provide a poor transition between the rail station and existing residential development beyond. The large facades of the units within the Site contribute to the weak townscape character.

Key views within the character area	There are no key views defined for the character area.	No change.	Reading Station Area Framework proposes the view north from the station as a new view to be created.
Key views into the character area	Buildings within the character area contribute to the skyline visible from Oxford Road when approaching Reading from the west. From the elevated position of Caversham Park, Balmore Park and Horse Close, built form within the character area contributes to the view of central Reading.	No change.	Buildings in CA:22 do not contribute to the skyline when seen from Oxford Road. The Blade and Thames Tower are the only identifiable buildings within the skyline.
Landmark structures and existing tall buildings	The large, warehouse structures create a consistent, unexceptional townscape. There are no landmark structures. Although the warehouses create a roofline which is elevated above the surrounding residential buildings, there is no one structure which is notable as a tall building.	The new northern entrance to the station is a landmark, albeit not particularly high. It will become more prominent as development of surrounding sites allows views of it to open up. The new Christchurch Bridge is a landmark on the river, but is currently visually separated from the rest of the area.	Reading Bridge House is within CA:22 and at a height of 36.50m is a tall building as per the RTBS, which also forms a prominent built element, which is identifiable in within the central Reading townscape. Clearwater Court is also a prominent building within CA:22 but not a tall building as defined in the RTBS.
Tall buildings planning applications	N/A	Outline planning permission (110024) was granted on the sorting office site for a major mixed use development including residential, office, hotel and retail. The plot adjacent to the station entrance would have been up to 16 commercial storeys or 21 hotel storeys, with heights decreasing to the west. This permission has now expired.	Outline planning application submitted for Former Royal Mail Sorting Office, 80 Caversham Road for a large scale mixed use development. Proposed building heights between 2 and 25 storeys.
Townscape sensitivity to the inclusion of tall buildings	Low: The large block size which exists within the character area and the absence of any key views or visual focal point makes this an appropriate location for tall buildings. However, it is proposed that tall structures should not be developed along the north and western boundaries of the character area as these boundaries are shared with small scale residential areas. any proposed built form should respond in terms of height and scale to the residential area. The tallest structures should be located to the south of the character area, adjacent to the railway line. In this area the townscape features are larger scale, and adjacent to large scale features outside of the area e.g. existing station buildings, Thames Tower and Western Tower.	Townscape sensitivity remains low, albeit with the caveats expressed in 2008 continuing to apply.	Site has a 'Low' sensitivity to the inclusion of tall buildings due to the proximity to the railway line and larger scale built form located to the south. The Site is separated from the smaller scale residential properties to the north by the double width Vastern Road.

Visual Baseline

Site Context Photographs

Site Context Photograph 01: View south from Vastern Road/Lynmouth Road

1.16 The viewpoint is located approximately 25m to the north of the Site on at the junction of Vastern Road and Lynmouth Road. The busy dual-carriageway Vastern Road extends across the foreground parallel to the viewer, with its associated infrastructure and traffic dominating the view. Beyond the road corridor the existing low-rise retail units on the Site are visible in the middle ground, with a series of canopy trees partially filtering views. The built forms on the Site generally restrict views beyond, although the Thames Tower (15 storeys) is visible rising above this in the background, drawing the eye to the south. To the east the 12 storey Reading Bridge House and the ongoing construction activities (including cranes) associated with the former BMW site development is visible, which also draws the eye to the east along Vastern Road.

1.17 The value of the view obtained from this location is considered to be low as it is not designated and has minimal or no cultural associations. As the receptors at this location will include people at their place of residence. (i.e. dwellings on Vastern Road), their susceptibility to the type of development proposed is considered to be high.

1.18 On the basis of the above the sensitivity of receptors at this location is considered to be Medium.

Site Context Photograph 02: View south-west from Vastern Road

1.19 The viewpoint position is located Vastern Road opposite Trooper Potts Way, approximately 30m to the north-east of the Site. The busy dual-carriageway Vastern Road extends across the foreground parallel to the viewer, with its associated infrastructure and traffic dominating the view. Beyond the road corridor the middle ground features several low to medium-rise built forms, including the low-rise retail units on the Site to the west and the 5-storey multi-storey car park to the east. The built forms across the middle ground generally restrict views beyond, although the Thames Tower (15 storeys) is clearly visible at the termination of the channelled views south along Trooper Potts Way, forming a visual focus to the view and drawing the eye towards Reading Station. To the east the 12-storey Reading Bridge House and the ongoing construction activities (including cranes) associated with the former BMW site development is visible, which also draws the eye to the east along Vastern Road.

1.20 The value of the view obtained from this location is considered to be low as it is not designated and has minimal or no cultural associations. As the receptors at this location will comprise people travelling along a busy towards Reading Station and people at their place of work (i.e. Sovereign House), their susceptibility to the type of development proposed is considered to be low.

1.21 On the basis of the above the sensitivity of receptors at this location is considered to be Low.

Site Context Photograph 03: View north from Station Square North

1.22 The viewpoint position is located at Station Square North, approximately 25m to the south of the Site. Station Square North forms the northern entrance forecourt to Reading Station and is visible extending across the foreground parallel to the viewer. This comprises recently introduced high-quality public realm interventions, including street furniture and tree planting. Beyond this, the rear of the existing low-rise built forms on the Site and on the adjacent Hermes site to the west are visible, with the metal-clad utilitarian retail and warehouse units presenting inactive unarticulated façades. These structures prevent views to the townscape beyond. To the north-east the 5-storey multi-storey car park is visible on Trooper Potts Way, beyond which glimpsed views of development fronting on to Vastern Way are available.

1.23 The view obtained is considered to be of medium value as it is noted as a new view (view 62) within the RSAF. The receptors at this location will comprise people arriving at Reading Station, whose attention will partially focussed on the surrounding townscape, meaning their susceptibility to the type of development proposed is considered to be medium.

1.24 On the basis of the above the sensitivity of receptors at this location is considered to be Medium.

Site Context Photograph 04: View south-east from Caversham Road

1.25 The viewpoint position is located on Caversham Road (A4155), approximately 100m to the north-west of the Site. Caversham Road extends perpendicularly from the viewer to the roundabout junction with Vastern Road in the middle ground. The Road and associated traffic dominate the view. Beyond the roundabout the built forms currently occupying the Site are visible, appearing as indistinct low-rise structures sitting in front of the Reading Station building. The background of the view features a number of tall buildings within central Reading, including Thames Tower, The Blade and One Reading Central, which add articulation to the skyline. Thames Tower in particular helps to draw the eye towards the station building.

1.26 The value of the view obtained from this location is considered to be medium as it is designated as a shorter distance view (view 39) within the RSAF. As the receptors at this location would comprise people travelling along a busy urban road, their susceptibility to the type of development proposed is considered to be low.

1.27 On the basis of the above the sensitivity of receptors at this location is considered to be Low.

Site Context Photograph 05: View south from the Thames Path / De Montfort Road

1.28 The viewpoint position is located on the Thames Path at its junction with De Montfort Road, approximately 190m to the north of the Site. The view towards the Site from this location is channelled along De Montfort Road by the predominantly two storey residential built forms on either side of the road (similar channelled views are also available along Lynmouth Road further to the east). The existing low-rise built forms on the Site are visible at the termination of the view in the middle ground, appearing as indistinct low-rise structures. Beyond this in the background a number of taller buildings are visible on the skyline, including development blocks on Tudor Road and the recently constructed 19 storey residential tower on Alfred Street/Chatham Street to the south-west.

1.29 The view obtained is considered to be of high value as it is designated as a shorter distance view (view 44) within the RSAF. As the receptors at this location will include people using the Thames Path or people at their place of residence, their susceptibility to the type of development proposed is considered to be high.

1.30 On the basis of the above the sensitivity of receptors at this location is considered to be High.

Site Context Photograph 06: View north-east from Caversham Road

1.31 The viewpoint position is located on Caversham Road, approximately 150m to the south-west of the Site. The busy Caversham Road extends across obliquely from the foreground of the view to the middle ground. Views towards the Site from this location are generally restricted by intervening built forms along Caversham Road, including Vastern House sorting office (on the Hermes site). Less restricted vies are available, however, to the east where the upper portions of the Reading Station building are visible in the middle ground and the top of the 12-storey Reading Bridge House is visible in the background.

1.32 The value of the view obtained from this location is considered to be low as it is not designated and has minimal or no cultural associations. As the receptors at this location will comprise people passing through the townscape along a busy, their susceptibility to the type of development proposed is considered to be low.

1.33 On the basis of the above the sensitivity of receptors at this location is considered to be Low.

Site Context Photograph 07: View east from Swansea Road / Northfield Road

1.34 The viewpoint position is located at the junction of Swansea Road and Northfield Road, approximately 150m to the east of the Site. The view towards the Site from this location is channelled along Northfield Road by the predominantly two storey residential built forms on either side of the road. The existing low-rise built forms located immediately adjacent to the south of the Site (i.e. on the Hermes site) are visible at the termination of the view in the middle ground. These metal-clad warehouse units appear as indistinct low-rise structures which curtail views towards the Site. Beyond this in the background the ongoing construction activities (including cranes) associated with the former BMW site development is visible, which tends to also draw the eye.

1.35 The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 38) within the RSAF. As the receptors at this location will include people at their place of residence, their susceptibility to the type of development proposed is considered to be high.

1.36 On the basis of the above the sensitivity of receptors at this location is considered to be High.

Site Context Photograph 08: View west from Reading Bridge

1.37 This viewpoint is located Reading Bridge, approximately 250m to the east of the Site. The slightly elevated position of the viewpoint offers uninterrupted oblique views west over and along the River Thames and south along George Street (B3345). Views are naturally focussed to the open expanse of the river to the west, with views channelled by the built forms and mature vegetation adjacent to the river on either side. The large-scale office blocks to the south of the river (including Clearwater Court and the adjacent office block on Norman Place) curtail views towards the Site from this location.

1.38 The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 46 and 47) within the RSAF. As the receptors at this location will include people travelling along George Street towards central Reading, their susceptibility to the type of development proposed is considered to be low.

1.39 On the basis of the above the sensitivity of receptors at this location is considered to be Medium.

Site Context Photograph 09: View south-west from Christchurch Meadows

1.40 The viewpoint position is located on a pedestrian/cycle route within Christchurch Meadows, approximately 380m to the north-east of the Site. The foreground comprises the green open space of Christchurch Meadows. This gives way to a band mature vegetation along the north bank of the River Thames, which extends across the middle ground of the view. This vegetation generally restricts views beyond, including towards the Site, albeit glimpsed views are available towards the Reading Station building. In addition, several tall buildings are visible on the skyline above the intervening vegetation, including Reading Bridge House within the middle ground to the south, and the recently constructed 19 storey residential tower on Alfred Street/Chatham Street within the background to the south-west. The ongoing construction activities (including cranes) associated with the former BMW site development are also visible on the skyline beyond Reading Bridge House to the south.

1.41 The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 43) within the RSAF. As the receptors at this location comprise visitors to the public open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to the type of development proposed is considered to be high.

1.42 On the basis of the above the sensitivity of receptors at this location is considered to be High.

Site Context Photograph 10: View north from Station Road

1.43 This viewpoint is located on Station Road, approximately 340m to the south of the Site. Station Road extends into the background of the view, perpendicular to the viewer. Built forms of varying heights (predominantly 3 to 4 storeys high) on either side of the road channel the view to the north where the Main Building of Reading Station (Grade II listed) terminates the view. The 15 storey Thames Tower lies to the immediate south-wet of the Station and is visually dominant from this location, occupying a noticeable portion of the visible sky. The station building curtails views further to the north, including towards the Site.

1.44 The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 58) within the RSAF and has cultural associations due to views of the listed station building. As the receptors at this location will comprise people who are passing through the townscape along a main route, their susceptibility to the type of development proposed is considered to be low.

1.45 On the basis of the above the sensitivity of receptors at this location is considered to be Medium.

Site Context Photograph 11: View south-east from Christchurch Meadows

1.46 This viewpoint is located on the towpath along the River Thames, adjacent to the War Memorial within Christchurch Meadows, approximately 425m to the north-west of the Site. The view is focussed along the river to the east, with views channelled by mature vegetation and built forms along each side of the river. The 3 to 4 storey residential blocks on the south side of the river (i.e. those on Waterman Place and Thames Avenue) within the middle ground largely restrict more far-reaching views south from this location, thus curtailing views towards the Site. Despite the intervening built forms across the middle ground, several tall buildings are discernible within the background, including 'Thames Tower' and 'The Blade' to the south-east.

1.47 The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 41) within the RSAF. As the receptors at this location comprise visitors to the public

open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to the type of development proposed is considered to be high.

1.48 On the basis of the above the sensitivity of receptors at this location is considered to be Medium.

Site Context Photograph 12: View north-east from Great Knollys Street

1.49 This viewpoint position is located on Great Knollys Street, approximately 460m to the south-west of the Site. The view is oriented east along Great Knollys Street, which extends from the foreground to the middle ground of the view. The road is lined on either side by 1 and 2-storey industrial and commercial sheds, which results in a channelling of the view. The intervening built form limits far-reaching visibility east and west and largely obscures views of the Site. However, several tall buildings punctuate the skyline above this, including the 15 storey 'Thames Tower' and two 6 storey residential blocks on Caversham Road/Abattoirs Road.

1.50 The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 29) within the RSAF. As the receptors at this location will comprise people travelling along a busy road and people at their place of work, their susceptibility to the type of development proposed is considered to be low.

1.51 On the basis of the above the sensitivity of receptors at this location is considered to be Low.

Site Context Photograph 13: View north-west from Forbury Gardens

1.52 This viewpoint position is located Within Forbury Gardens, approximately 470m to the south-east of the Site. The view is oriented to the north-west with the foreground comprised of an open area of amenity grass/lawn and footpaths. Mature vegetation within and surrounding the park and large-scale built forms surrounding the park to the west and south generally restricts wide ranging visibility out from within Forbury Gardens. The intervening vegetation and built form generally curtail views towards the Site.

1.53 The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 53) within the RSAF. As the receptors at this location comprise visitors to the gardens in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to the type of development proposed is considered to be high.

1.54 On the basis of the above the sensitivity of receptors at this location is considered to be High.

Site Context Photograph 14: View west from Kings Meadow

1.55 The viewpoint location in Kings Meadow, approximately 560m to the east of the Site. The foreground comprises green open space within Kings Meadows. This gives way to a dense band mature vegetation along the south bank of the River Thames and along Kings Meadow Road, which extends across the middle ground of views. This vegetation generally restricts far ranging views to the west and north, including towards the Site. Less restricted views are obtained to the south and south-west, where several tall buildings are visible on the skyline in the background of views, including the large-scale office blocks at Forbury Place on Forbury Road to the south, 'The Blade' to the south, and Reading Bridge House to the south-west. The ongoing construction activities (including cranes) associated with the former BMW site development are also visible on the skyline beyond Reading Bridge House to the south-west.

1.56 The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 49) within the RSAF. As the receptors at this location comprise visitors to the public open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to the type of development proposed is considered to be high.

1.57 On the basis of the above the sensitivity of receptors at this location is considered to be High.

Site Context Photograph 15: View south-east from the Thames Path / Thames Side Promenade

1.58 This viewpoint is located on the Thames Path/Thames Side Promenade, approximately 775m to the north-west of the Site. The view is open within the foreground, being focussed along the River Thames to the east and across the adjacent area of open space to the south. Mature vegetation across the middle ground – that lining the river to the north and east, and that within and surrounding the open space to the south - restricts more wide-ranging views from this location. Only partial glimpsed views are available through and above the intervening vegetation to some tall buildings located within central Reading in the background, such as the 15 storey Thames Tower to the south-east.

1.59 The view obtained is considered to be of medium value as it is designated as a longer distance view (view 1) within the RSAF. As the receptors at this location comprise users of the Thames Path/Thames Side Promenade and visitors to the public open space in the pursuit of outdoor recreation, their susceptibility to the type of development proposed is considered to be high.

1.60 On the basis of the above the sensitivity of receptors at this location is considered to be High.

Site Context Photograph 16: View south from Balmore Park

1.61 This viewpoint position is located within Balmore park approximately 1.2km to the north of the Site. The foreground comprises an expanse of open green space, which is enclosed by dense bands of mature vegetation surrounding the park in the middle ground to the south, east and west. Despite this, distant views are available to the south, owing to the elevated position of the viewpoint. In these views the centre of Reading is visible in the background, marked by several tall buildings punctuating the skyline. These include the 'The Blade' to the south-east; the 15 storey 'Thames Tower' to the south; City Tower to the south-west; and the 11 storey Fountain House on Oxford Road in the distance to the south-west. In addition the ongoing construction activities (including cranes) associated with the former BMW site development are also visible on the skyline beyond to the south-west.

1.62 The view obtained is considered to be of medium value as it is designated as a longer distance key view (view 14) within the RTBS (views from Balmore Park are also designated as a longer distance view (view 5) within the RSAF. As the receptors at this location visitors to Balmore Park in the pursuit of outdoor recreation, their susceptibility to the type of development proposed is considered to be high.

1.63 On the basis of the above the sensitivity of receptors at this location is considered to be High.

Site Context Photograph 17: View north from Mount Pleasant/Southampton Street

1.64 The viewpoint position is located at junction of Mount Pleasant and Southampton Street, approximately 1.6km to the south of the Site. The road junction dominates the view in the foreground view, although beyond these channelled views are available north along Mount Pleasant. Due to the slightly elevated position of the viewpoint, distant views are afforded across central Reading in the background. In these views the 15 storey Thames Tower forms a visual focus, punctuating the skyline. I addition the ongoing construction activities (including cranes) associated with the development at the junction of Crown Street and Silver Street, are also clearly visible on the skyline in the middle-ground.

1.65 The view obtained is considered to be of medium value as it is designated as a longer distance view (view 12) within the RSAF. As the receptors at this location will comprise people travelling along the busy Mount Pleasant and Southampton Street, their susceptibility to the type of development proposed is considered to be low.

1.66 On the basis of the above the sensitivity of receptors at this location is considered to be Low.

Site Context Photograph 18: View from south-west from Henley Road/Lower Henley Road

1.67 This viewpoint position is located at the junction of Henley Road and Lower Henley Road, approximately 1.7lm to the north-east of the Site. The road junction dominates the view in the foreground view with adjacent built forms channelling views west along Henley Road and south-west along Lower Henley Road. Due to the slightly elevated position of the viewpoint, distant views are afforded along Lower Henley Road across central Reading in the background to the south-west. In these views several tall buildings are visible, marking the centre of Reading. This includes the 15 storey Thames Tower, the 12-storey Reading Bridge House and the 13-storey hotel on Friar Street. In addition, the ongoing construction activities (including cranes) associated with the former BMW site development is visible adjacent to Reading Bridge House.

1.68 The view obtained is considered to be of medium value as it is designated as a longer distance view (view 10) within the RSAF. As the receptors at this location will comprise people travelling along the busy Henley Road and Lower Henley Road, their susceptibility to the type of development proposed is considered to be low.

1.69 On the basis of the above the sensitivity of receptors at this location is considered to be Low.

Site Context Photograph 19: View south-west from The Horse Close

1.70 This viewpoint position is located on The Horse Close, approximately 1.9km to the north of the Site. The Horse Close extends across the foreground of the view with the 2-storey residential dwellings to the south-east and west generally restricting wide-views in these directions. However, dwellings to the south and south-east are single storey which, along with the elevated viewpoint position, affords glimpsed distant views in these directions. Within these views several tall buildings are visible in the background, marking the location of central Reading. These include 'The Blade', the 15 storey Thames Tower and the and the 11 storey Fountain House on Oxford Road.

1.71 The view obtained is considered to be of medium value as it is designated as a longer distance view (view 7) within the RSAF. As the receptors at this location will include people at their place of residence, their susceptibility to the type of development proposed is considered to be high.

1.72 On the basis of the above the sensitivity of receptors at this location is considered to be High.

Site Context Photograph 20: View south-east from the Warren Footpath, Chazey Wood

1.73 This viewpoint is located on the Warren Footpath adjacent to Chazey Wood, approximately 2.7km to the north-west of the Site. The view from this location is across agricultural fields in the foreground, which slope to the south. The elevated topography affords distant views across the Thames Valley to the south and south-west, although views towards the Site are curtailed by intervening topography, built form and vegetation to the east and south-east.

1.74 The value of the view obtained from this location is considered to be high as it is located within the Chilterns AONB and is designated as a longer distance view (view 16) within the RSAF and as a key view (view 9) within the RTBS. As the receptors at this location will include people using the local PRoW network in the pursuit of outdoor recreation, their susceptibility to the type of development proposed is considered to be high.

1.75 On the basis of the above the sensitivity of receptors at this location is considered to be High.

Site Context Photograph 21: View north from the A33 near water treatment works

1.76 The viewpoint position is located on the A33, approximately 2.5km to the south of the Site. Views are available north along the A33, which is lined by dense mature hedgerow vegetation on either side. This vegetation restricts views to the east and west and channels views to the north. In views north a number of built forms are visible in the middle ground, albeit set within a well-vegetated context. Visible above and beyond this is the 15 storey Thames Tower, which punctuates the skyline and marks the location of central Reading.

1.77 The view obtained is considered to be of medium value as it is designated as a longer distance view (view 14) within the RSAF. As the receptors at this location will comprise people travelling along the busy A33 on approach to central Reading, their susceptibility to the type of development proposed is considered to be low.

1.78 On the basis of the above the sensitivity of receptors at this location is considered to be Low.

Site Context Photograph 22: View west from London Road, Shepherds Hill

1.79 This viewpoint is located on London Road, approximately 3.3km to the east of the Site. The foreground and middle ground of the view comprise the busy London Road and adjacent predominantly 2 storey residential dwellings. Whilst the adjacent built forms restrict views to the north and south, channelled views are available west along the wide London Road. Within these views west central Reading is visible in the distance, marked by the presence of several tall buildings punctuating the skyline. This includes the recently constructed 16 storey tower on Bembridge Place, 'The Blade' and the 15 storey Thames Tower. In addition the ongoing construction

activities (including cranes) associated with the former BMW site development is are visible above intervening built forms.

1.80 The view obtained is considered to be of medium value as it is designated as a longer distance view (view 11) within the RSAF. As the receptors at this location will comprise people travelling along the busy London Road on approach to central Reading, their susceptibility to the type of development proposed is considered to be low.

1.81 On the basis of the above the sensitivity of receptors at this location is considered to be Low.

Site Context Photograph 23: View south-west from Dunsden Way

1.82 This viewpoint is located on Dunsden Way in Dunsden Green, approximately 3.7km to the north-east of the Site. This is an open view across a number of large arable fields across the foreground. The suburban edge of Caversham is visible in the middle ground beyond which the centre of Reading is visible in the distance, marked by several tall buildings visible on the skyline. This includes 'The Blade', the upper portions of the 15 storey Thames Tower and the recently constructed 19 storey residential tower on Alfred Street/Chatham Street. In addition the ongoing construction activities (including cranes) associated with the former BMW site development is are visible.

1.83 On the basis of the above the sensitivity of receptors at this location is considered to be Medium.

Site Context Photograph 24: View north from Greyfriars Road / Garrard Street

1.84 This viewpoint is located at the junction of Greyfriars Road and Garrard Street, approximately 350m to the south of the Site. The large built form of largely commercial development that occupies the foreground of views, limits the extent of visibility to views channelled along Greyfriars Road and Gerrard Street. Views towards the site are largely curtailed by existing built form such as the Xafinity House that occupies much of the foreground, and Phoenix House that forms the extent of views north. Existing built forms visible range from 2 storeys to the 14 storey hotel development seen in views along Gerrard Street.

1.85 The view obtained is considered to be of medium value as it is close to the location of view 31, which is designated as a shorter distance view within the RSAF. As receptors at this location will comprise transient receptors moving along the urban road that is lined by commercial development, visual receptors at this location are considered to have a low susceptibility to the type of change proposed.

1.86 On the basis of the above the sensitivity of receptors at this location is considered to be Medium.

Site Context Photograph 25: View north from Station Square

1.87 This viewpoint is located at the Station Hill, approximately 230m to the south of the Site. The foreground of views available from this area are dominated by the high quality public realm, although a large number of metal bollards divide the open space and provide an element of clutter that is enhanced by the large and incongruous digital advertising board that significantly detracts from the visual appreciation of the designed relationship between the new Reading Station building and the Main Building of Reading General Station (Grade II Listed).

1.88 The existing station buildings form the extent of views and curtail views to the north from Station Square with the architectural quality of the 15 storey Thames Tower having a strong influence over views gained from the area. The view obtained is considered to be of medium value as although it is not designated within the RSAF, it has cultural associations due to views of the listed station building. As the receptors at this location will comprise people who are passing through the townscape along a main route, their susceptibility to the type of development proposed is considered to be low.

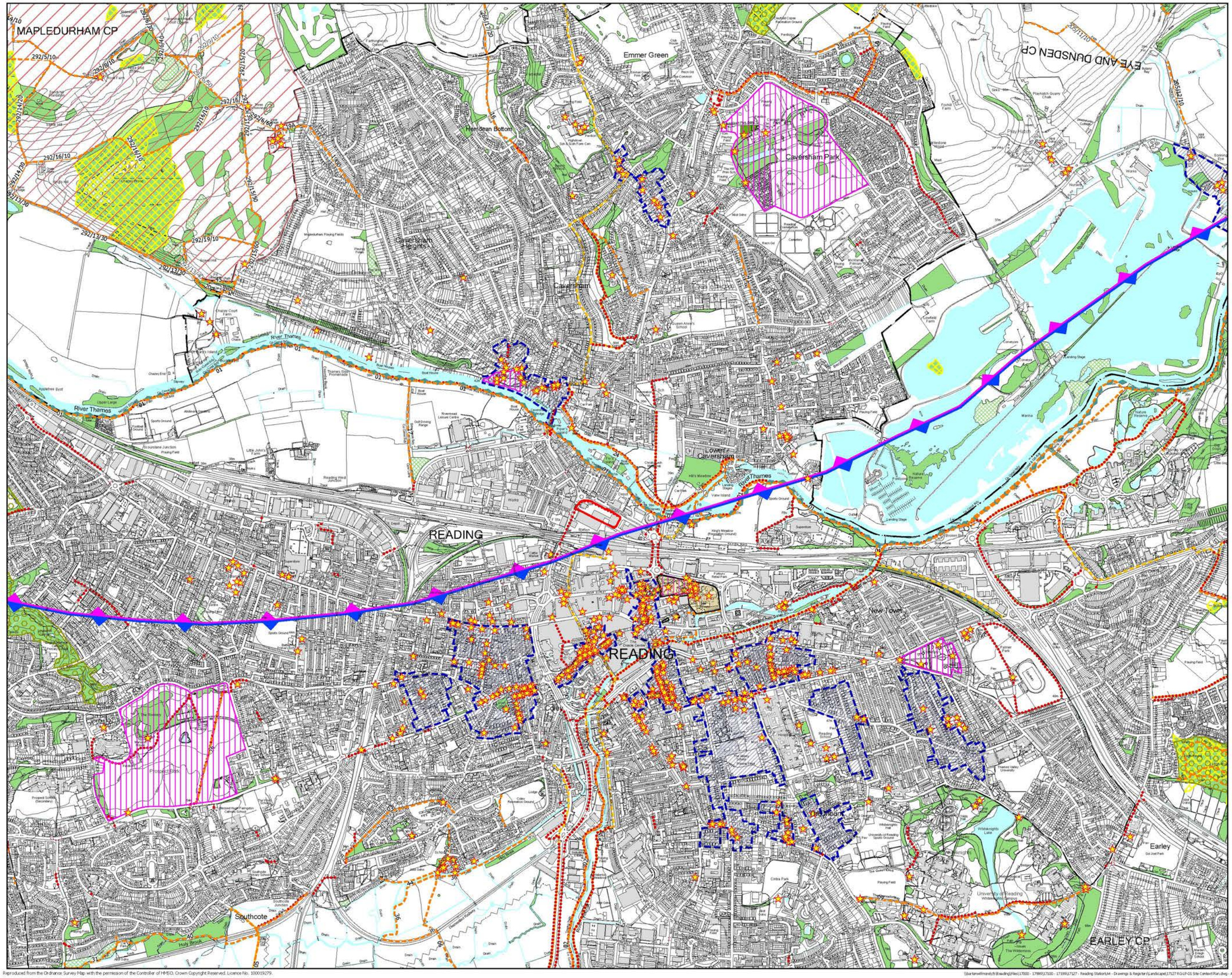
1.89 On the basis of the above the sensitivity of receptors at this location is considered to be Medium.

Site Context Photograph 26: View north from Blagrave Street

1.90 This viewpoint is located on Blagrave Street, approximately 270m to the south of the Site. Views to the north are channelled along the street by buildings that line it such as 2 Blagrave Street to the east and Forbury Works (which is located within Market Place Conservation Area) to the west. The large building of Apex Plaza occupies a large section of views to the north, with the modern but not recent extension to the Main Building of Reading General Station (Grade II Listed), occupying the rest of views beyond Blagrave Street. The built form of the station building and Apex Plaza curtail views further north, including towards the Site. The public realm and Reading Abbey Quarter signage combine with the street trees to create an attractive street scene that draws views towards the station.

1.91 The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 54) within the RSAF and has cultural associations due to views of buildings within the Market Place Conservation Area. As the receptors at this location will comprise people who are passing through the townscape along a main route, their susceptibility to the type of development proposed is considered to be low.

1.92 On the basis of the above the sensitivity of receptors at this location is considered to be Medium.



The scaling of this drawing cannot be assured

Revision	Date	Drn	Ckd
-	-	-	-

N

Legend

- Site Boundary
- Ancient Woodland #
- Existing Woodlands, Copses and Tree Belts ^
- Existing Scrub ^
- Existing Water Courses and Features ^
- Contours/Spot Heights (Metres AOD) ^
- Public Rights of Way *
- National Trails / Long Distance Walks #
- Sustrans Cycle Route +
- Cycle Route ++
- Listed Buildings ~
- Conservation Area ##
- Registered Parks and Gardens ~
- Scheduled Monument ~
- Area of Outstanding Natural Beauty #
- Local Nature Reserve #

Sources:
^ OS Mapping
Natural England GIS Data Set
~ Historic England National Monument Record GIS Data Set
* Oxfordshire County Council, Reading Borough Council, West Berkshire Council and Wokingham Borough Council PROW GIS Data
+ Sustrans National Cycle Network GIS Data
++ Department of Transport Cycle Network Model
Reading Borough Council and South Oxford Council Local Plan Proposals Map, Adopted Interactive Map
** Reading Borough Council, Reading Tall Building Strategy, January 2008
~~ Reading Borough Council, Reading Station Area Framework, Adopted December 2010

Data collated for constraints and analysis mapping is based on publicly available sources at the time of preparation inserted using the British National Grid and may itself not be accurate. Barton Willmore shall not be liable for the accuracy of data derived from external sources.

TVIA FIGURE 1

Project:
Reading Station Park

Drawing Title:
Site Context Plan

Date	Scale	Drawn by	Check by
08.01.2020	1:10,000 @A1 1:20,000 @A3	ML/LH	RG
Project No	Drawing No		Revision
17127	RG-LP-01		-

0 100 200 300 400 500m

BARTON WILLMORE

Planning • Master Planning & Urban Design • Architecture • Landscape Planning & Design • Environmental Planning • Graphic Communication • Public Engagement • Development Economics

bartonwillmore.co.uk

Offices: at Birmingham Bristol Cambridge Cardiff Ebbsfleet Edinburgh Glasgow Leeds London Manchester Newcastle Reading Southampton

Reproduced from the Ordnance Survey Map with the permission of the Controller of HMSO. Crown Copyright Reserved. Licence No. 100019279.

The scaling of this drawing cannot be assured

Revision	Date	Drn	Ckd
-	-	-	-

LEGEND

- Site Boundary
- Existing Woodlands, Copses and Tree Belts ^
- Existing Water Courses and Water Features ^

Central Reading Policies **

- Boundary of Identified Centre (Policy RL1) (Reading Central, Policies CR1-16)
- Major Opportunity Areas (Policy CR11-13)
- Sites Identified for Development or Change (Policy CR11-14)
- Tall Building Clusters (Policy CR10)
- Office Core (Policy CR1)
- Central Core (Policy CR1)
- Major Landscape Features (Policy EN13)
- Local Green Space and Public Open Space (Policy EN7)

Reading Station Area Framework ~~

- Station Area Framework Boundary

Sources:
^ OS Mapping
** Reading Borough Council, Adopted Local Plan, 2019
~~ Reading Borough Council, Reading Station Area Framework, Adopted December 2010

TVIA FIGURE 4

Project:
Reading Station Park

Drawing Title:
Central Reading Designations

Date	Scale	Drawn by	Check by
08.01.2020	1:5,000 @A1 1:10,000 @A3	LH	RG
Project No	Drawing No		Revision
17127	RG-LP-05		-

BARTON WILLMORE
Planning • Master Planning & Urban Design • Architecture • Landscape Planning & Design • Environmental Planning • Graphic Communication • Public Engagement • Development Economics
bartonwillmore.co.uk
Offices at Birmingham Bristol Cambridge Cardiff Ebbsfleet Edinburgh Glasgow Leeds London Manchester Newcastle Reading Southampton

Reproduced from the Ordnance Survey Map with the permission of the Controller of HMSO. Crown Copyright Reserved. Licence No. 100019279.

The scaling of this drawing cannot be assured

Revision	Date	Drn	Ckd
-	-	-	-

N

Legend

- Site Boundary
- Existing Woodlands, Copses and Tree Belts ^
- Existing Scrub ^
- Existing Water Courses and Features ^
- Contours/Spot Heights (Metres AOD) ^
- Public Rights of Way *
- National Trails / Long Distance Walks #
- Sustrans Cycle Route +
- Cycle Route ++
- Location of Photographic Viewpoints (Site Context Photographs: 1-26)

Sources:
^ OS Mapping
Natural England GIS Data Set
~ Historic England National Monument Record GIS Data Set
* Oxfordshire County Council, Reading Borough Council, West Berkshire Council and Wokingham Borough Council PROW GIS Data
+ Sustrans National Cycle Network GIS Data
++ Department of Transport Cycle Network Model

Data collated for constraints and analysis mapping is based on publicly available sources at the time of preparation inserted using the British National Grid and may itself not be accurate. Barton Willmore shall not be liable for the accuracy of data derived from external sources.

TVIA FIGURE 5

Project:
Reading Station Park

Drawing Title:
Visual Appraisal Plan

Date	Scale	Drawn by	Check by
08.01.2020	1:10,000 @A1 1:20,000 @A3	ML/LH	RG
Project No	Drawing No		Revision
17127	RG-LP-08		-

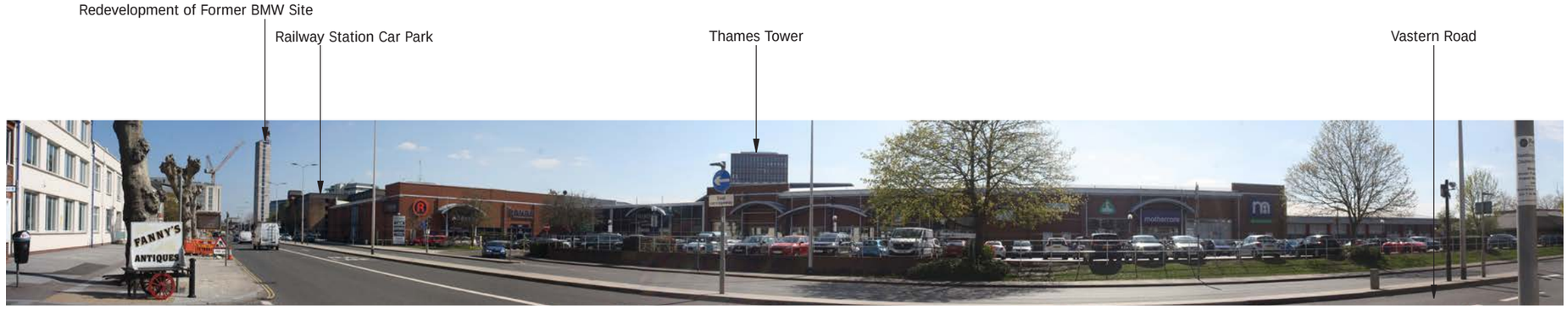
BARTON WILLMORE

Planning • Master Planning & Urban Design • Architecture • Landscape Planning & Design • Environmental Planning • Graphic Communication • Public Engagement • Development Economics

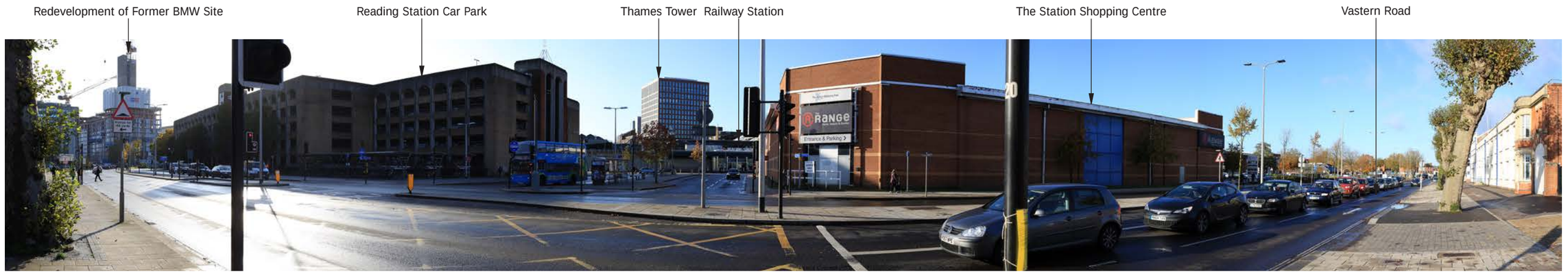
bartonwillmore.co.uk

Offices at Birmingham Bristol Cambridge Cardiff Ebbsfleet Edinburgh Glasgow Leeds London Manchester Newcastle Reading Southampton

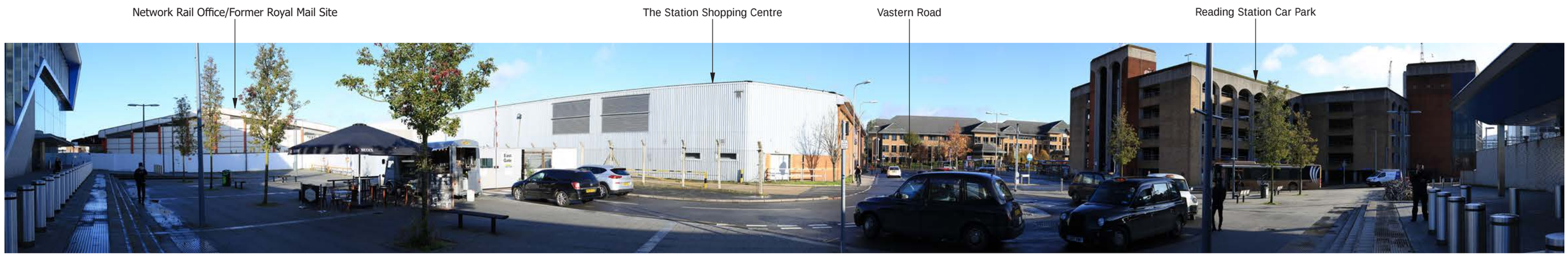
Reproduced from the Ordnance Survey Map with the permission of the Controller of HMSO. Crown Copyright Reserved. Licence No. 100019279.



SITE CONTEXT PHOTOGRAPH 1



SITE CONTEXT PHOTOGRAPH 2



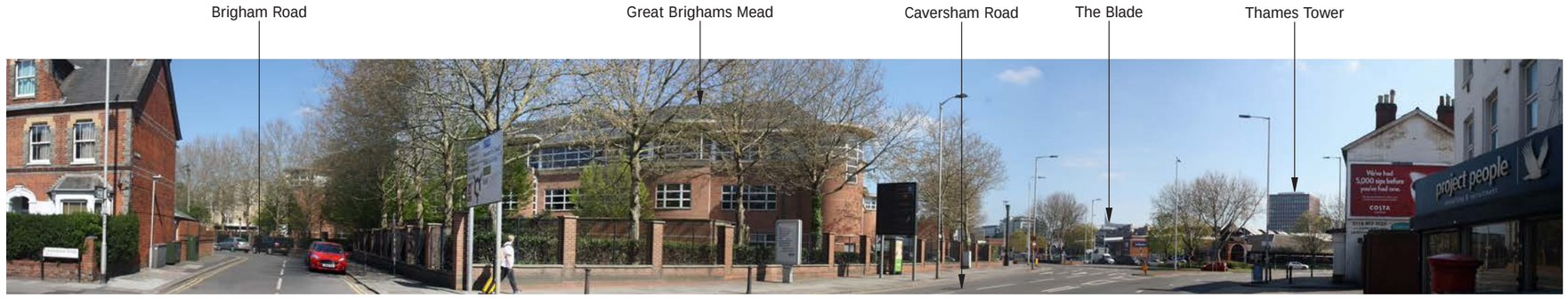
SITE CONTEXT PHOTOGRAPH 3

READING STATION PARK

SITE CONTEXT PHOTOGRAPHS: 1 - 3

DATE TAKEN: APR/NOV 2019
PROJECT NUMBER: 17127

BARTON WILLMORE



SITE CONTEXT PHOTOGRAPH 4



SITE CONTEXT PHOTOGRAPH 5



SITE CONTEXT PHOTOGRAPH 6

READING STATION PARK

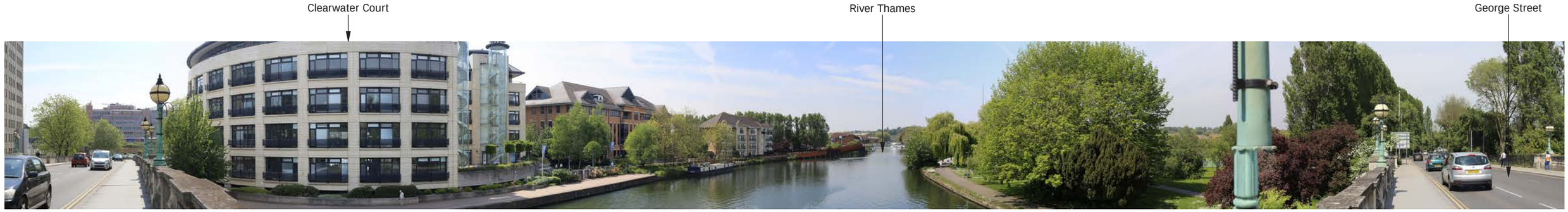
SITE CONTEXT
PHOTOGRAPHS: 4 - 6

DATE TAKEN: APR/NOV 2019
PROJECT NUMBER: 17127

BARTON WILLMORE



SITE CONTEXT PHOTOGRAPH 7



SITE CONTEXT PHOTOGRAPH 8



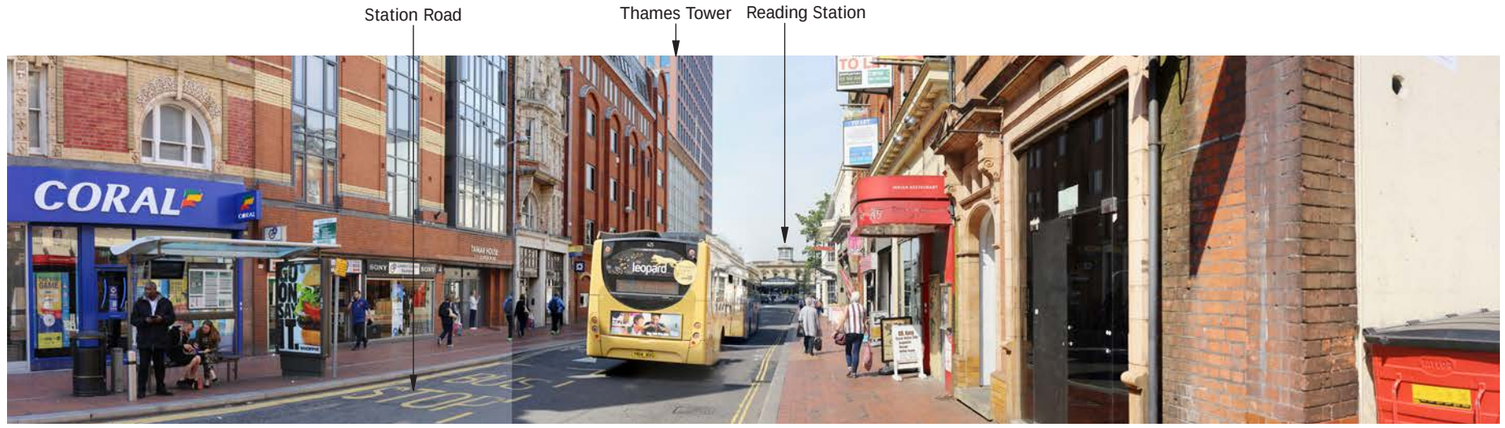
SITE CONTEXT PHOTOGRAPH 9

READING STATION PARK

SITE CONTEXT PHOTOGRAPHS: 7 - 9

DATE TAKEN: APR/MAY 2019
PROJECT NUMBER: 17127

BARTON WILLMORE



SITE CONTEXT PHOTOGRAPH 10



SITE CONTEXT PHOTOGRAPH 11



SITE CONTEXT PHOTOGRAPH 12

READING STATION PARK

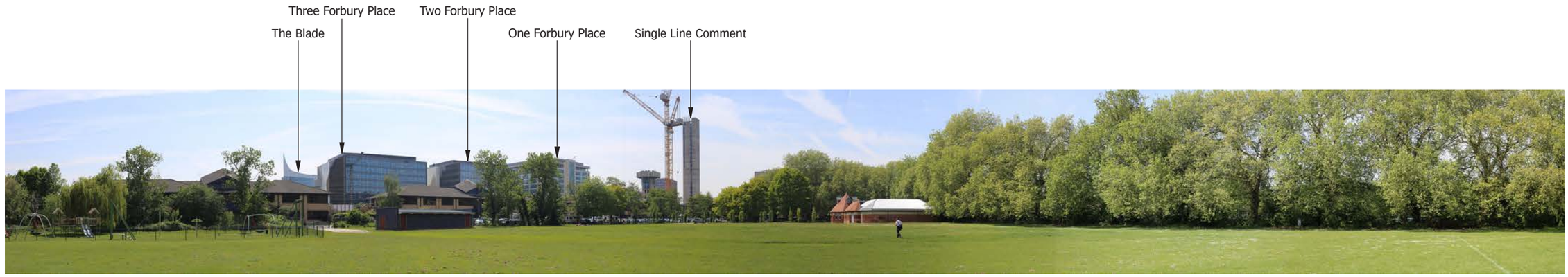
SITE CONTEXT PHOTOGRAPHS: 10 - 12

DATE TAKEN: MAY 2019
PROJECT NUMBER: 17127

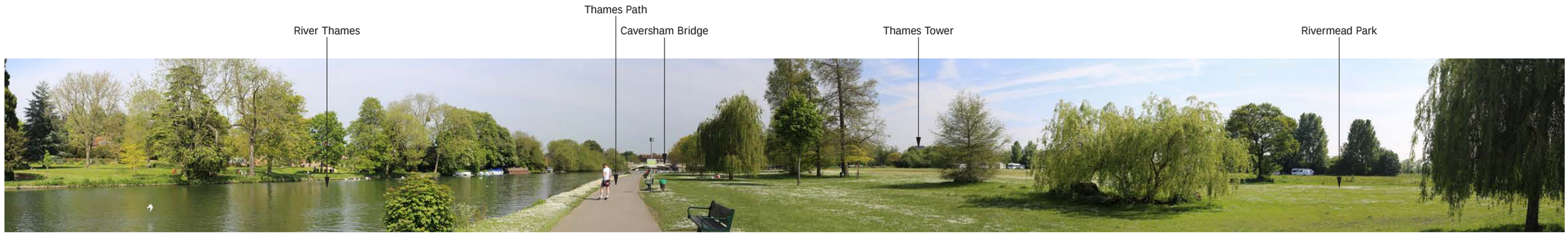
BARTON WILLMORE



SITE CONTEXT PHOTOGRAPH 13



SITE CONTEXT PHOTOGRAPH 14



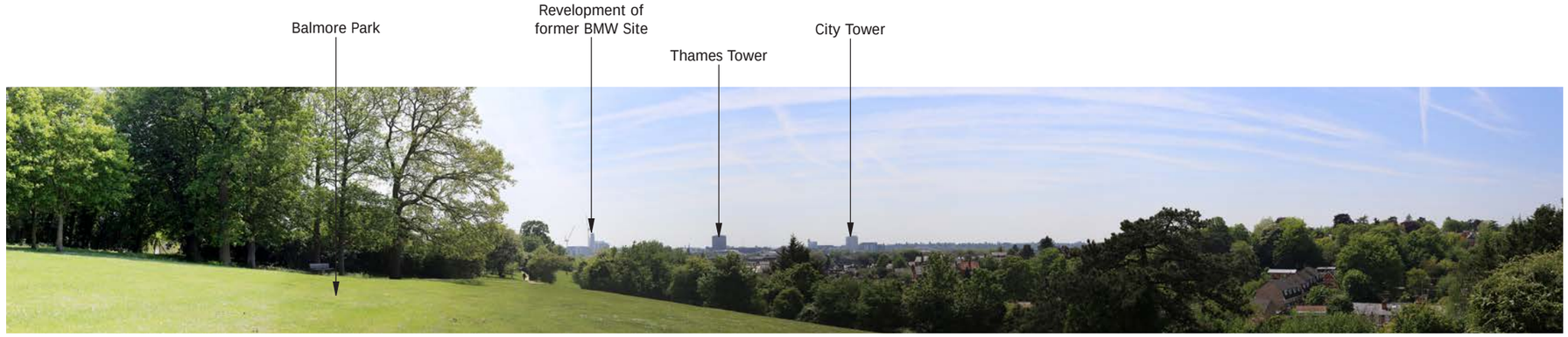
SITE CONTEXT PHOTOGRAPH 15

READING STATION PARK

SITE CONTEXT PHOTOGRAPHS: 13 - 15

DATE TAKEN: MAY 2019
PROJECT NUMBER: 17127

BARTON WILLMORE



SITE CONTEXT PHOTOGRAPH 16



SITE CONTEXT PHOTOGRAPH 17



SITE CONTEXT PHOTOGRAPH 18

READING STATION PARK

SITE CONTEXT PHOTOGRAPHS: 16 - 18

DATE TAKEN: MAY 2019
PROJECT NUMBER: 17127

BARTON WILLMORE



SITE CONTEXT PHOTOGRAPH 19



SITE CONTEXT PHOTOGRAPH 20



SITE CONTEXT PHOTOGRAPH 21

READING STATION PARK

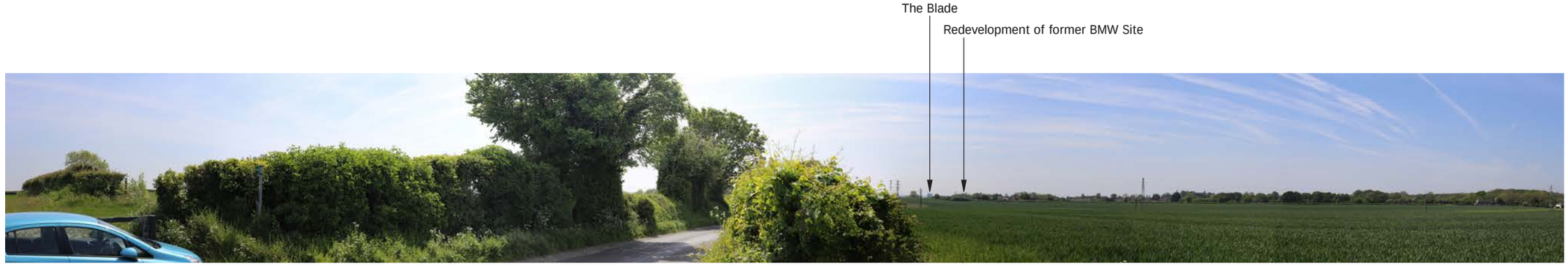
SITE CONTEXT PHOTOGRAPHS: 19 - 21

DATE TAKEN: MAY 2019
PROJECT NUMBER: 17127

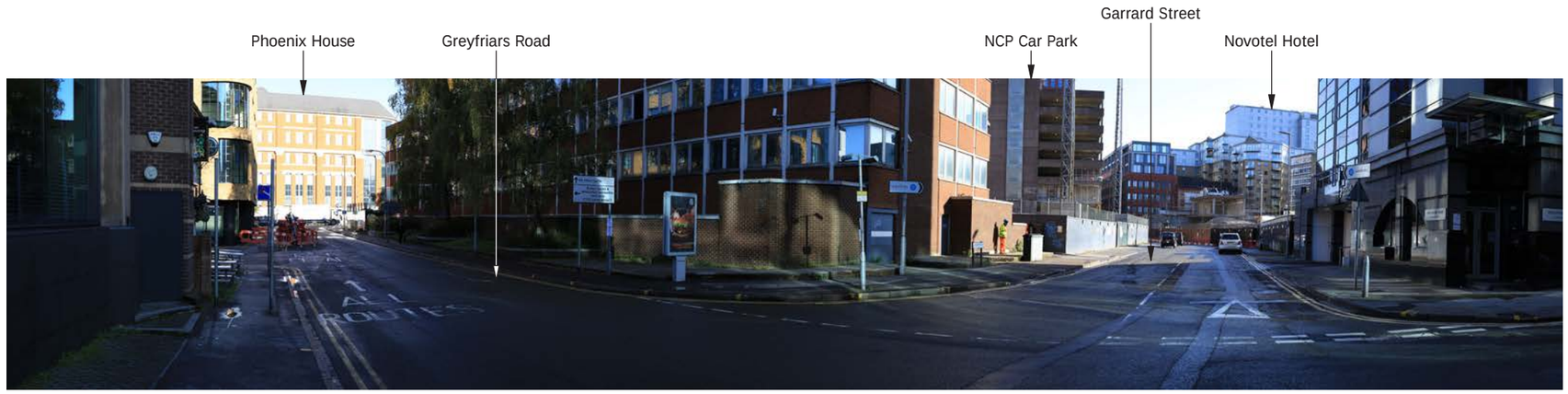
BARTON WILLMORE



SITE CONTEXT PHOTOGRAPH 22



SITE CONTEXT PHOTOGRAPH 23



SITE CONTEXT PHOTOGRAPH 24

READING STATION PARK

SITE CONTEXT PHOTOGRAPHS: 22 - 24

DATE TAKEN: MAY/NOV 2019
PROJECT NUMBER: 17127

BARTON WILLMORE



SITE CONTEXT PHOTOGRAPH 25



SITE CONTEXT PHOTOGRAPH 26

READING STATION PARK

SITE CONTEXT
PHOTOGRAPHS: 25 - 26

DATE TAKEN: NOV 2019
PROJECT NUMBER: 17127

BARTON WILLMORE

Appendix 1.3: Townscape Effects Table

Townscape Receptor		Townscape Effects				
Area	Sensitivity	Demolition and Construction Stage		Operational Stage – Year 1 (Parameter Plans)		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
National Landscape Character Area						
Natural England's NCA Profile 110: Chilterns	The application site and surrounding townscape form a localised part of this extensive NCA. The NCA as a whole comprises a combination of countryside mixed with urban development and major transport routes. The application site and adjoining landscape are considered to be urban in character. The surrounding built elements are not particularly distinctive or characteristic of the wider NCA. On the basis of the above the NCA is considered to be of low value. Due to the urban context of this part of the NCA, its susceptibility to the type of development proposed is considered to be low. The combination of the low value and low susceptibility results in a Low sensitivity.	Very Small	Negligible Adverse	Very Small	Negligible Adverse	The temporary demolition and construction stage of the proposed development would introduce plant and machinery, material stockpiles and welfare facilities into a localised part of the NCA. However, the very localised nature of the demolition and construction activities in relation to the wider extent of the NCA would not be perceived over a wide area and would represent a direct alteration to only a very small proportion of the NCA as a whole. The key characteristics of the NCA would remain unaffected. This would cause a Very Small magnitude of impact and result in a Negligible Adverse effect. At Year 1, the proposed development would not influence a wide area of the NCA. The proposed development would contribute positively to the built in the centre of Reading although there would be an increase in massing locally. However, these changes are of such a small geographic extent in relation to the scale of this NCA, and within an urban area, that overall the proposed development would cause a Very Small magnitude of impact and result in a Negligible Adverse effect.
Reading Tall Building Strategy Townscape Character Area						

Townscape Receptor		Townscape Effects				
Area	Sensitivity	Demolition and Construction Stage		Operational Stage – Year 1 (Parameter Plans)		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
CA 22: Vastern Road	The CA contains several warehouses and a retail parks, with built forms comprising low-rise, large-scale blocks of utilitarian massing and appearance (e.g. unarticulated facades and metal cladding), set within extensive areas of surface car parking, which are of a commonplace type in the wider area. This results in a consistent yet unexceptional townscape, albeit there are some examples of recently constructed taller development of higher-quality architecture in places (e.g. Clearwater Court). Development on the fringes of the CA to the north and west comprises smaller scale two to three-storey residential and commercial properties while development on the former BMW site is currently under construction for 13 and 23 storey buildings. The sense of tranquillity is diminished by the busy Vastern Road and Caversham Road (A329), which traverse the CA; the Great Western Mainline and Reading Railway Station, which defines the southern edge of the CA. The recently completed northern entrance to the station provides good quality public realm interventions within the CA, which adds an element of townscape quality and enhances the visual amenity experience and sense of place. The CA contains no recreational resources and carries no statutory heritage designations. Based on the above, the value of the CA is considered to be low. The CA comprises an area of existing large-scale built form and road infrastructure within a built-up urban context where tall buildings are currently under constructions and existing tall buildings located within the adjacent townscape. Therefore, the susceptibility of the CA to the type of development proposed is considered to be Low. Furthermore, the RTBS notes that the large block size and lack of any key views or visual focal pints, make the CA an appropriate location for tall buildings; and the RCAAP identifies the application site as falling within 'area of potential for tall buildings' (i.e. RC13a Station Area Cluster). The combination of the low value and low susceptibility results in a Low sensitivity.	Large	Moderate Adverse	Large	Moderate Beneficial	The demolition and construction activities would be located within the north of this CA, occupying a large proportion of its area. The temporary introduction of plant and machinery, demolition and construction traffic and demolition and construction activities would result in direct changes to the CA where they would be perceived as detracting from the character of the CA for the duration of the demolition and construction works. This would result in a Moderate Adverse effect. At Year 1, the introduced built form would fundamentally alter the fabric of a large part of this CA, helping to establish a strong local identity in the townscape. The overall form, layout, mass and scale of the introduced built form would provide application site wide improvements to the quality of built form. Whilst the proposed development would increase the mass of building in the CA, it would create a landmark building on the roundabout with enhanced legibility. The proposed development would also provide improvements to the legibility of the public realm that would relate well to the key townscape features of the northern station entrance, creating a coherent townscape element that positively contributes to the local area. The block arrangement of the proposed development would allow a connection from the subway that passes under the railway station through the application site and would contribute to the aspirations set out within Reading BC planning documents to connect the river corridor to the centre of Reading south of the railway line. The legibility of the northern entrance to the station would be much clearer with improved sightlines leading towards the station and the River Thames. The increased building mass along with improvements to legibility and built form through creation of a landmark building by virtue of its scale would constitute a Large magnitude of impact to the CA. This would result in a Moderate Beneficial effect.

Townscape Receptor		Townscape Effects				
Area	Sensitivity	Demolition and Construction Stage		Operational Stage – Year 1 (Parameter Plans)		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
CA 12: Caversham Road	The CA forms a residential area comprised predominantly of Victorian and Edwardian two-storey red brick terraces and semi-detached properties. Whilst this small-scale townscape features some more recently constructed larger residential blocks of up to four storeys in height adjacent to the river, the townscape retains a sense of cohesion with some scenic quality, although some properties exhibit slight wear. The limited garden space and enclosure ratio of the narrow streets produces a tight urban grain and results in a sense of enclosure and a resulting degree of tranquillity away from the busy Caversham Road and Vastern Road. One notable exception to the small-scale residential built form is the large office block (Great Brighams Mead), which is located centrally at the junction of Caversham Road and Vastern Road. The CA contains no statutory heritage designations, although the Thames Path extends along its northern boundary, following the southern bank of the river. Based on the above, the value of the CA is considered to be Medium. This is a small-scale townscape with built forms of a consistent height, massing and form, resulting in a coherent character, albeit with larger scale built form in its wider setting to the east and south. Whilst the CA has little scope to directly accommodate the type of development proposed (as noted within the RTBS), there is some scope to accommodate it within its setting. Accordingly the townscape is of Medium susceptibility. The combination of the Medium value and Medium susceptibility results in a Medium sensitivity.	Small	Minor Adverse	Small	Negligible Beneficial	Although the demolition and construction activities associated with the proposed development would not cause any direct changes to the CA, the temporarily introduced tall plant and machinery (including cranes) in the adjacent CA would detract from the townscape characteristics of the Caversham Road CA, particularly where street orientation allows channelled views towards the application site. The temporary demolition and construction activities would be perceived as intrusive features, which would partially alter the setting of this CA and would be at odds with its over-riding Victorian and Edwardian residential character for the duration of the demolition and construction stage. However, from much of the CA the demolition and construction works would not be perceptible due to the high enclosure ratio. As such, the temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact and result in a Minor Adverse effect. At Year 1, the proposed development would be imperceptible from much of the CA due to the existing enclosure provided by the tight urban grain. However, where the taller built forms of the proposed development are perceived, they would contrast with the prevailing 2 to 3 storey Victorian and Edwardian residential development in the CA. The configuration of the proposed development would allow physical and visual permeability between the blocks, thus helping to reduce their perceived mass, helping the proposed development to relate to the street pattern of this adjacent CA. In addition, the progression in height from the predominantly 2 to 3-storey built forms that characterise this CA and the taller forms of the Development would be moderated by a stepping up in height, which would help to reduce any sense of physical over-dominance. Where perceived within the setting of the CA, the proposed development would introduce a positive contribution to the skyline that would help to enhance legibility and wayfinding for the northern entrance to the railway station through the connection of the landmark Christchurch Bridge to the north and the northern station entrance to the south that would indirectly cause a Small magnitude of impact upon the CA, although the increased building mass would cause a Very Small magnitude of impact. Considering both the positive and negative aspects above, on balance the proposed development would cause a Negligible Beneficial effect.

Townscape Receptor		Townscape Effects				
Area	Sensitivity	Demolition and Construction Stage		Operational Stage – Year 1 (Parameter Plans)		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
CA 23: King's Meadow	This CA comprises a series of open green spaces and playing fields located along the River Thames, including river meadows and sports pitches, which offer numerous recreational opportunities. The various open spaces are generally in good condition and contain a wealth of mature trees, which contribute to a well-vegetated character and, along with the adjacent river, enhance the scenic quality and sense of place of the CA. The green open spaces also offer a sense of tranquillity within and otherwise built-up urban context. Whilst it contains no statutory heritage designations, the vast majority of the CA is identified as a 'Major Landscape Feature' and an 'Important Areas of Open Space' (Policy LE14 and RC14) within the RCAAP (2008). Based on the above, the value of the CA is considered to be High. This is an area of undeveloped green spaces which is locally protected open space, albeit within a built-up urban context containing some large-scale developments. On balance the susceptibility of the CA to the type of development proposed in its setting is considered to be Medium. The combination of the High value and Medium susceptibility results in a High sensitivity.	Small	Minor Adverse	Small	Minor Beneficial	Although the demolition and construction activities associated with the proposed development would not cause any direct changes to the CA, the temporarily introduced tall plant and machinery (including cranes) in the adjacent CA would detract from the large expanse of open meadows. The temporary demolition and construction activities would be perceived as intrusive features, which would slightly alter the setting of this CA and would be at odds with the recreational resource of the open meadows. Although immediately adjacent to the Vastern Road CA, the King's Meadow CA is afforded some level of separation from the application site. However, the temporary demolition and construction stage of the proposed development would be imperceptible from large areas of the CA. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Minor Adverse effect upon the setting of this CA where the demolition and construction activities are perceptible above the bankside vegetation of the River Thames. At Year 1, the proposed development would cause some slight changes to the setting of the CA where it is perceptible above the bankside vegetation of the River Thames. The proposed taller forms would contrast with the open meadows of the CA but would be perceived alongside other tall buildings that identify the centre of Reading which would adversely affect the sense of place. This would cause a Very Small magnitude of impact. However, the configuration of the proposed development would allow physical and visual permeability between the blocks, thus helping to reduce their perceived massing. Where the proposed taller built forms are perceived in the setting of this CA, they would introduce a positive contribution to the skyline that would help to enhance wayfinding by sign-posting the location of the centre of Reading as well as connecting the landmark Christchurch Bridge within the CA and the northern station entrance to the south which would cause a Small magnitude of impact. Considering both the positive and negative aspects above, on balance the proposed development would cause a Minor Beneficial effect.
CA 1: Station Hill	This CA includes Reading Station and the area of office, retail and residential land uses immediately adjacent to south. This is an emerging townscape following the demolition of a number of structures and the introduction of new high-quality architecture, including the new station building, set within high-quality public realm interventions such as Station Square. The height and massing of built forms ranges from between 3 and 15 storeys, with 'Thames Tower' (15 storeys) forming a visual focus that sign-posts the location of the station and provides a degree of legibility within the surrounding townscape. The Station building, the Edward XVII statue and Great Western House (now Malmaison) are all listed (all Grade II). Station Square provides a large public open space, with large numbers of people passing to and from the station giving rise to a sense of vibrancy. Overall the value of the CA is considered to be Medium. The CA comprises an area of existing large scale built development and rail infrastructure, including tall buildings, within a built-up urban context. Therefore, the susceptibility of the CA to the type of development proposed in its setting is considered to be Low. Furthermore, the RCAAP identifies the application site as falling within 'area of potential for tall buildings' (i.e. RC13a Station Area Cluster). The combination of the Medium value and the Low susceptibility results in a Low sensitivity.	Small	Minor Adverse	Small	Negligible Beneficial	Given the enclosed nature of this CA, demolition and construction activities associated with the Development would not be readily perceptible from the vast majority of the CA. Whilst the uppermost parts of taller demolition and construction plant and machinery such as cranes, would be perceptible from the Great Western main line immediately to the north of the application site, these would be perceived in context with existing rail infrastructure which are a defining characteristic of this CA. In light of the above there would be no alteration to any of the key characteristics of the CA and the demolition and construction activities would cause a Small magnitude of impact that would result in a Minor Adverse effect. At Year 1, the proposed development would give rise to some slight changes to the setting of the CA where it is perceptible above the large structure of the station building. The taller elements of the temporary demolition and construction stage would be perceived alongside other tall buildings that identify the centre of Reading such as the Thames Tower within the CA. The permeability resulting from the configuration of the proposed development blocks would help to reduce their perceived massing as well as connecting the Station Hill CA through the application site to the River Thames and Thames Path, Christchurch Bridge and Christchurch Meadow recreational area. The perception of building mass in the adjacent CA would cause a Very Small magnitude of effect with the increased legibility of townscape causing a Small magnitude of effect. On balance, the proposed development would result in a Negligible Beneficial effect upon the setting of this CA.

Townscape Receptor		Townscape Effects				
Area	Sensitivity	Demolition and Construction Stage		Operational Stage – Year 1 (Parameter Plans)		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
CA 2: Reading Station East	The CA comprise an area of large-scale office blocks, dating from the 1970s through to the early 20th century. Built forms are of an unremarkable design and quality, although the more recent additions have introduced a higher-quality architecture that has enhanced the overall condition of the area. The individual buildings within the character area (e.g. Apex Plaza) are large and blocky structures extending up to 12 storeys in height ('One Reading Central'), which create a sense of a large-scale townscape. Apex Plaza in particular is a local landmark due to its height and distinctive pink colour. Perceptual qualities are influenced by the busy Vastern Road and Forbury Road (A329), which traverse the CA and diminish the sense of tranquillity. The CA contains only one Grade II listed building – the Walter Parsons Corn Stores – but contains no recreational resources. Overall the value of the CA is considered to be Low. The CA comprises an area of existing large-scale built form and road infrastructure within a built-up urban context. Therefore, the susceptibility of the CA to the type of development proposed in its setting is considered to be Low. Furthermore, the RTBS notes that the CA has a low sensitivity to the development of further tall buildings. The combination of the Low value and Low susceptibility results in a Low sensitivity.	Small	Negligible Adverse	Small	Negligible Beneficial	While the temporary demolition and construction stage of the proposed development would not occur within this CA, the tall plant and machinery (including cranes) would be perceived in its setting from some limited areas in the CA. In these areas, the demolition and construction activities would be perceived alongside the existing built form of largely unremarkable architectural quality where they would not alter the key characteristics of the CA. The temporary demolition and construction activities would cause a Small adverse magnitude of impact which would result in a Negligible Adverse effect. At Year 1, the proposed development would give rise to some slight changes to the setting of the CA where it is perceptible amongst the existing built form and railway infrastructure. The proposed taller forms would introduce a positive contribution to the skyline that would help to enhance wayfinding in the townscape and where perceived, would introduce locally distinctive architectural improvements with variety in massing and heights, into the setting of this CA which would cause a Small magnitude of impact. The proposed development would cause a Negligible Beneficial effect on the setting of this CA.
CA 7: Reading Station West	This CA has a predominantly residential land use, albeit interspersed with occasional small-scale commercial office blocks. Built forms comprise a mix of two to three-storey Victorian terraces with later infill development of three to five storey blocks, which largely respect the scale and grain of the earlier structures resulting in sense of consistency. Housing is generally in good condition and the low rise, terraced housing creates a fine grained, small-scale townscape with a strong residential character. The CA contains only one Grade I listed building, Greyfriars Church, but contains no recreational resources. Overall the value of the CA is considered to be Medium. This is a small-scale townscape with built forms of a consistent height, massing and form, resulting in a coherent character, albeit with larger scale built form in its wider setting to the east. Whilst the CA has little scope to directly accommodate the type of development proposed (as noted within the RTBS), there is some scope to accommodate it within its setting. Accordingly the townscape is of Medium susceptibility. The combination of the Medium value and Medium susceptibility results in a Medium sensitivity.	Very Small	Negligible Adverse	Very Small	Negligible Beneficial	Although the temporary demolition and construction activities for the proposed development would not occur within this CA, the tall plant and machinery (including cranes) would be perceived from very small parts of its setting. However, from much of the CA the demolition and construction works would not be perceptible due to the high enclosure ratio. The temporary demolition and construction works would cause a Very Small magnitude of impact which would result in a Negligible Adverse effect. At Year 1, the proposed development would be largely imperceptible from the CA due to the high enclosure ratio of much of the Reading Station West CA. Where the proposed development is perceptible in the setting of this CA, it would introduce a positive contribution to the skyline due to the delivery of a landmark building by virtue of its scale and height. The proposed development would cause a Very Small magnitude of impact that would result in a Negligible Beneficial effect on the setting of this CA.

Townscape Receptor		Townscape Effects				
Area	Sensitivity	Demolition and Construction Stage		Operational Stage – Year 1 (Parameter Plans)		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
CA 13: Cattle Market and Chatham Place	This CA comprises an area of commercial and industrial development, centred on the application site of the former cattle market, with the exception of a small area of residential development on Weldale Street and occasional residential blocks. The majority of the built forms date from the mid-20th century onwards, albeit with some older buildings along Caversham Road to the east; are predominantly low-rise one and two storeys, although with some taller forms on the Caversham Road frontage; and are of a low architectural quality, comprising red brick and metal-clad sheds and warehousing, although some of the more recent developments and the older developments provide a higher-quality architecture. The townscape is overall in a relatively poor condition and there is a proliferation of security fencing that diminishes the scenic quality of the CA. The area is defined to the north by the Great Western Mainline and by the busy Caversham Road (A329) to the east, and frequent heavy goods traffic is associated with the predominant land-use, which diminishes the sense of tranquillity. The CA contains two Grade II buildings on the Caversham Road frontage but contains no recreational resources. Overall the value of the CA is considered to be Very Low. The CA is typified by the presence of industrial and commercial development set within a built-up urban context. Due to the diminished visual amenity experience, and the presence of larger scale built form within its setting to the south and east, the susceptibility to the type of development proposed within the setting of the CA is considered to be Low. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity.	Very Small	Negligible Adverse	Very Small	Negligible Beneficial	The temporary demolition and construction activities for the proposed development would not occur within this CA but some of the taller plant and machinery (including cranes) would be perceived from very small parts of it. However, from much of the CA the demolition and construction works would not be perceptible due to the high enclosure ratio and large elements occupying intervening land. The temporary demolition and construction works would cause a Very Small magnitude of impact that would result in a Negligible Adverse effect on the setting of this CA. At Year 1, the proposed development would be largely imperceptible from the CA due to the levels of enclosure in some parts of it and the existing development in the vicinity of Station Hill and Reading Station West. Where the proposed development is perceptible in the setting of this CA, it would introduce a positive contribution to the skyline due to its landmark nature by virtue of its scale and height. The proposed development would cause a Very Small magnitude of impact that would result in a Negligible Beneficial effect on the setting of this CA.
CA 3: Friar Street	This CA is centred along the retail street of Friar Street where the form of the CA is comprised of commercial and residential properties with hotel development fronting onto the road. Although the buildings and public realm are generally in good condition, the mixture of built forms appear relatively dated and exhibit a low architectural merit with a level of discordance that detracts from the quality of the Victorian facades that remain in some buildings. The townscape has a medium scale that is created by the largely four to six storey development that is interspersed with taller elements such as the 14 storey Ibis hotel. The low architectural quality of many buildings along Friar Street is bookended by views towards the landmarks of Greyfriars Church and St Lawrence Church to the east and west of the CA. Overall the value of the CA is considered to be Very Low. The susceptibility of the CA to the type of development proposed within its setting is considered to be Low. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity.	Very Small	Negligible Adverse	Very Small	Negligible Beneficial	The temporary demolition and construction activities for the proposed development would not occur within this CA but some of the taller plant and machinery (including cranes) would be perceived from very small parts of it. The demolition and construction works would not be perceptible from the majority of the CA due to the high enclosure ratio and existing built form. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse effect on the setting of this CA where demolition and construction activities are perceptible. At Year 1, the proposed development would be largely imperceptible from the CA due to the levels of enclosure in some parts of it and the existing development in the vicinity of Station Hill. Where the proposed development is perceptible in the setting of this CA, it would introduce a positive contribution to the skyline due to an increase in the perception of landmark building by virtue of its scale. The proposed development would cause a Very Small magnitude of impact that would result in a Negligible Beneficial effect on the setting of this CA.

Townscape Receptor		Townscape Effects				
Area	Sensitivity	Demolition and Construction Stage		Operational Stage – Year 1 (Parameter Plans)		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
CA 4: Station Road	This CA is centred along the retail street of Friar Street where the form of the CA is largely comprised of commercial properties with some historic building frontages that hide the more modern retail buildings. Key elements of the CA include the consistent architectural quality of buildings along the pedestrianised Queen Victoria Street. The townscape has a medium scale that is created by the largely three storey development that has a high density. Overall the value of the CA is considered to be Low as although it is in close proximity to the Market Place and London Road Conservation Area, it is not subject to any landscape or townscape designations. The susceptibility of the CA to the type of development proposed within its setting is considered to be Low due to the physical separation from the application site. The combination of the Medium value and the Low susceptibility results in a Low sensitivity.	Very Small	Negligible Adverse	Very Small	Negligible Beneficial	Temporary demolition and construction activities for the proposed development would not occur within this CA but some of the taller plant and machinery (including cranes) would be perceived from very small parts of it although would not detract from the consistent architectural quality of Queen Victoria Street. The temporary demolition and construction works would cause a Very Small magnitude of impact that would result in a Negligible Adverse effect on the setting of this CA where demolition and construction activities are perceptible. At Year 1, the proposed development would be largely imperceptible from the CA due to the levels of enclosure in some parts of it and the existing development in the vicinity of Station Hill. Where the proposed development is perceptible in the setting of this CA, it would introduce a positive contribution to the skyline due to an increase the perceptible landmark buildings by virtue of its scale. The proposed development would cause a Very Small magnitude of impact that would result in a Negligible Beneficial effect on the setting of this CA.
CA 11: Napier Road	This CA is focused along the railway line to the east of Reading Station and includes the existing residential, commercial and retail development largely set within woodland vegetation that lies between the railway line and the River Thames. Although the built form is up to 10 storeys tall, the individual block sizes are relatively small and are separated by parking and landscaped areas to create a medium scale townscape. Development on the former BMW site is currently under construction immediately adjacent to the CA and will increase building heights on the edge of Napier Road to 13 and 23 storeys. The Low architectural quality of the development within the CA means that it is considered to have an overall value of Very Low. The CA is considered to have a Low susceptibility to the type of change proposed within its setting due to the weak townscape character. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity.	Very Small	Negligible Adverse	Very Small	Negligible Beneficial	While the temporary demolition and construction stage of the proposed development would not occur within this CA, the tall plant and machinery (including cranes) would be perceived in its setting from some areas in the CA alongside the existing unremarkable built form adjacent to the railway line. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse effect on the setting of this CA where demolition and construction activities are perceptible. At Year 1, the proposed development would give rise to some slight changes to the setting of the CA where it is perceptible amongst the existing built form and railway infrastructure. The taller forms of the proposed development would introduce a positive contribution to the skyline that would help to enhance wayfinding in the townscape and where perceived, would introduce a locally distinctive built form with variety in massing and heights, into the setting of this CA where the under construction development on the former BMW site immediately adjacent to it has a strong influence. The proposed development would cause a Very Small magnitude of impact that would result in a Negligible Beneficial effect on the setting of this CA.
Application Site Character						

Townscape Receptor		Townscape Effects				
Area	Sensitivity	Demolition and Construction Stage		Operational Stage – Year 1 (Parameter Plans)		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Application Site	The existing built forms on the application site comprise a series of low-rise retail units, constructed predominantly in red brick with corrugated metal cladding. The rear and side facades of the retail units generally lack articulation or fenestration, resulting in a blank inactive façade. The front facing aspects of the buildings in contrast feature doors, windows, canopies, recesses and signage, resulting in a more active and articulated façade. Overall the existing built forms are large-scale blocks of utilitarian massing and appearance which, along with the extensive surface car parking. Based on the above, the application site is considered to have a Very Low value. The northern and western boundaries of the application site are bounded by Vastern Road and Caversham Road respectively. These are busy roads with high volumes of traffic that result in diminished levels of tranquillity within the application site. The application site is contained to the south and east by large-scale built forms: the former Royal Mail sorting office and the recently completed Reading Railway Station building to the south, as well as a multi-storey car park to the east. Whilst the application site is contiguous with the former Royal Mail building, it is separated from the Reading Railway Station building by the northern entrance forecourt; and from the multi-storey car park by Trooper Potts Way. The susceptibility of the application site to the type of development proposed within its setting is considered to be Low. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity.	Large	Moderate Adverse	Large	Moderate Beneficial	Demolition and construction operations on the application site would cause direct changes to its character through the removal of an existing retail facility and replacement with plant and machinery. The construction traffic and plant movements would constitute discordant elements on the application site. There would be no access to the application site which would be surrounded by hoarding with the construction works being a higher elevation than the existing elements on the application site. The temporary demolition and construction works would cause a Large adverse change to the character of the application site due to the replacement of the entire application site with construction operations. As such, the temporary construction activities would result in a Moderate Adverse effect upon the Low sensitivity application site. The overall form, layout, mass and scale of the introduced built form would provide application site wide improvements to the quality of built form. Whilst the proposed development would increase the mass of building on the application site, it would create a positive built frontage to Vastern Road and the roundabout as well as forming a transition in townscape from the domestic scale of buildings north of the application site, to the town centre beyond the railway line to the south of the application site. The proposed development would also provide improvements to the legibility of the public realm that would relate well to the key townscape features of the northern station entrance, creating a coherent townscape element that positively contributes to the local area. The block arrangement of the proposed development would allow a much clearer legibility of public realm with respect to the northern entrance to the station where improved sightlines would strengthen the relationship between the application site and key townscape elements. The increased building mass along with improvements to legibility and built form through creation of a landmark building by virtue of its scale would constitute a Large magnitude of impact to the application site. This would result in a Moderate Beneficial effect.

Appendix 1.4: Visual Effects Table

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
01	View south from Vastern Road/ Lynmouth Road	The viewpoint is located approximately 25m to the north of the Site on at the junction of Vastern Road and Lynmouth Road. The busy dual-carriageway Vastern Road extends across the foreground parallel to the viewer, with its associated infrastructure and traffic dominating the view. Beyond the road corridor the existing low-rise retail units on the Site are visible in the middle ground, with a series of canopy trees partially filtering views. The built forms on the Site generally restrict views beyond, although the Thames Tower (15 storeys) is visible rising above this in the background, drawing the eye to the south. To the east the 12 storey Reading Bridge House and the ongoing construction activities (including cranes) associated with the former BMW site development is visible, which also draws the eye to the east along Vastern Road. The value of the view obtained from this location is considered to be low as it is not designated and has minimal or no cultural associations. As the receptors at this location will include people at their place of residence. (i.e. dwellings on Vastern Road), their susceptibility to the type of development proposed is considered to be high. On the basis of the above the sensitivity of receptors at this location is considered to be Medium.	Fixed and Transient	Open	Full	Most	Medium	Moderate Adverse	Medium	Negligible Beneficial	During the temporary demolition and construction stage of the proposed development, the ground level activities would be partially screened from view due to hoarding around the Site which would partially limit the amount of clutter visible. The taller activities, however, would be visible against the skyline with tall plant and machinery such as cranes being seen at close proximity. Views of the proposed development under demolition and construction would slightly erode the visual amenity experience at this location, leading to a limited deterioration to the existing view that would cause a Medium magnitude of impact and result in a Moderate Adverse effect. At Year 1, the large mass of the proposed development would occupy views to the south where it would replace views of car parking and the cluttered brick facades of existing retail units. The proposed development would form a large mass that would shorten views to the south and screen existing buildings south of the railway line such as Thames Tower. The proposed development would form a new skyline element that would alter the composition of views gained at Vastern Road whilst introducing locally distinctive built form with variety in massing and heights, that would enhance views of built form and compliment other new tall built form it is seen alongside, such as the currently under construction development at the former BMW site. The new built form would be seen alongside the improved legibility of the public realm which would further enhance the visual amenity experience. The proposed built forms would also contribute to creating a visual interest and a strong sense of place that would serve to visually locate the urban area around the station. This would cause a Medium magnitude of impact. Considering the scale of the proposed built forms and the proximity of the visual receptors, the proposed development would occupy a large amount of the visual envelope, albeit with new built form. This would cause a Small magnitude of impact. Taking into account both the positive and negative aspects above, on balance the proposed development would result in a Negligible Beneficial effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
02	View south-west from Vastern Road	The viewpoint position is located Vastern Road opposite Trooper Potts Way, approximately 30m to the north-east of the Site. The busy dual-carriageway Vastern Road extends across the foreground parallel to the viewer, with its associated infrastructure and traffic dominating the view. Beyond the road corridor the middle ground features several low to medium-rise built forms, including the low-rise retail units on the Site to the west and the 5-storey multi-storey car park to the east. The built forms across the middle ground generally restrict views beyond, although the Thames Tower (15 storeys) is clearly visible at the termination of the channelled views south along Trooper Potts Way, forming a visual focus to the view and drawing the eye towards Reading Station. To the east the 12-storey Reading Bridge House and the ongoing construction activities (including cranes) associated with the former BMW site development is visible, which also draws the eye to the east along Vastern Road. The value of the view obtained from this location is considered to be low as it is not designated and has minimal or no cultural associations. As the receptors at this location will comprise people travelling along a busy towards Reading Station and people at their place of work (i.e. Sovereign House), their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Low.	Fixed and Transient	Open	Full	Most	Medium	Minor Adverse	Medium	Negligible Beneficial	During the temporary demolition and construction stage of the proposed development, the ground level activities would be partially screened from view due to hoarding around the Site which would partially limit the amount of clutter visible. The taller activities however, would be visible against the skyline with tall plant and machinery such as cranes being seen at close proximity. Views of the mass and height of the proposed development under demolition and construction would slightly erode the visual amenity experience at this location where it would cause a Medium magnitude of impact, resulting in a Minor Adverse effect. At Year 1, the proposed development would introduce a large mass of built form into views gained from the vicinity of Vastern Road. The height and mass of the proposed development would form a new skyline element that would alter the composition of views gained in the vicinity whilst introducing locally distinctive built form with variety in massing and heights that would enhance views of built form. The arrangement of the proposed development would allow views between the built form that create a visual connection to the railway station northern entrance and underpass that connects to the centre of reading. The improved arrangement of built form would be seen alongside the improved legibility of the public realm which would further enhance the visual amenity experience. The proposed built forms would also contribute to creating a visual interest and a strong sense of place that would serve to visually locate the area around the station and causing a Medium magnitude of impact. Considering the scale of the proposed built forms and the proximity of the visual receptors, proposed development would occupy a large amount of the visual envelope which would cause a Small magnitude of impact. However, taking into account both the positive and negative aspects above, the proposed development would result in a Negligible Beneficial effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
03	View north from Station Square North	The viewpoint position is located at Station Square North, approximately 25m to the south of the Site. Station Square North forms the northern entrance forecourt to Reading Station and is visible extending across the foreground parallel to the viewer. This comprises recently introduced high-quality public realm interventions, including street furniture and tree planting. Beyond this, the rear of the existing low-rise built forms on the Site and on the adjacent Hermes site to the west are visible, with the metal-clad utilitarian retail and warehouse units presenting inactive unarticulated façades. These structures prevent views to the townscape beyond. To the north-east the 5-storey multi-storey car park is visible on Trooper Potts Way, beyond which glimpsed views of development fronting on to Vastern Way are available. The view obtained is considered to be of medium value as it is noted as a new view (view 62) within the RSAF. The receptors at this location will comprise people arriving at Reading Station, whose attention will partially focussed on the surrounding townscape, meaning their susceptibility to the type of development proposed is considered to be medium. On the basis of the above the sensitivity of receptors at this location is considered to be Medium.	Fixed	Open	Full	Most	Medium	Moderate Adverse	Medium	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would largely occupy the foreground of views available from the northern station entrance. Although hoarding would screen views of some ground level clutter, the tall plant and machinery would be visible at close proximity. Demolition and construction works for the proposed development would replace views of the poor quality built form that exhibits little architectural merit but would occupy a greater area of the skyline in views due to the elevated nature of the demolition and construction activities. The temporary demolition and construction stage of the proposed development would cause a Medium magnitude of impact that would result in a Moderate Adverse effect. At Year 1, the proposed development would introduce a large mass of built form into the close range views gained from the vicinity of the northern station entrance. The height and mass of the proposed development would occupy the foreground of views although the arrangement of the built form would channel views between the buildings towards the former SSE site and the River Thames to the north. The height and mass of the proposed development would form a new skyline element that would alter the composition of views gained in the vicinity whilst introducing locally distinctive built form with variety in massing and heights that would enhance views of built form. The improved arrangement of built form would be seen alongside improvements to the legibility of the public realm which would further enhance the visual amenity experience. The proposed built forms would also contribute to creating a visual interest and a strong sense of place that would serve to visually locate the area around the station. This would cause a Medium magnitude of impact while the large mass of development would cause a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
04	View south-east from Caversham Road	The viewpoint position is located on Caversham Road (A4155), approximately 100m to the north-west of the Site. Caversham Road extends perpendicularly from the viewer to the roundabout junction with Vastern Road in the middle ground. The Road and associated traffic dominate the view. Beyond the roundabout the built forms currently occupying the Site are visible, appearing as indistinct low-rise structures sitting in front of the Reading Station building. The background of the view features a number of tall buildings within central Reading, including Thames Tower, The Blade and One Reading Central, which add articulation to the skyline. Thames Tower in particular helps to draw the eye towards the station building. The value of the view obtained from this location is considered to be medium as it is designated as a shorter distance view (view 39) within the RSAF. As the receptors at this location would comprise people travelling along a busy urban road, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Low.	Fixed and Transient	Filtered/ restricted	Partial	Most	Large	Moderate Adverse	Medium	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would appear in views towards the south-east gained by visual receptors along Caversham Road. The taller elements of plant, machinery and the demolition and construction works would be seen in views channelled along the road where they would interrupt views of recognisable townscape elements including The Blade and Thames Tower. Views of ground level activities would be largely screened by hoarding around the Site and foreground elements. Where views of the temporary demolition and construction activities are available, they would be seen in the context of traffic and infrastructure associated with the A4155 Caversham Road and the highway clutter of signs and street lights as well as existing buildings and vegetation. The temporary demolition and construction stage of the proposed development would cause a Large magnitude of impact that would result in a Moderate Adverse effect. At Year 1, the proposed development would introduce a large mass of built form into views towards the roundabout where it would form a landmark building and mark the transition from the two storey residential TCA of Caversham Road, to the redevelopment area in the Vastern Road TCA surrounding Reading Station. Existing development along Caversham Road would channel views towards the proposed development where the height and mass of the built form would screen views towards existing buildings south of the railway line such as Thames Tower and The Blade. The built form of the proposed development would form a new skyline element that would alter the composition of views gained in the vicinity whilst introducing locally distinctive built form with variety in massing and heights, that would enhance views of built form and reduce the amount of clutter in views along Caversham Road. The new built form would be seen alongside improved legibility of public realm a which would further enhance visual amenity and cause a Medium magnitude of impact. The large mass of built form would cause a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
05	View south from the Thames Path/De Montfort Road	The viewpoint position is located on the Thames Path at its junction with De Montfort Road, approximately 190m to the north of the Site. The view towards the Site from this location is channelled along De Montfort Road by the predominantly two storey residential built forms on either side of the road (similar channelled views are also available along Lynmouth Road further to the east). The existing low-rise built forms on the Site are visible at the termination of the view in the middle ground, appearing as indistinct low-rise structures. Beyond this in the background a number of taller buildings are visible on the skyline, including development blocks on Tudor Road and the recently constructed 19 storey residential tower on Alfred Street/Chatham Street to the south-west. The view obtained is considered to be of high value as it is designated as a shorter distance view (view 44) within the RSAF. As the receptors at this location will include people using the Thames Path or people at their place of residence, their susceptibility to the type of development proposed is considered to be high. On the basis of the above the sensitivity of receptors at this location is considered to be High.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Medium	Moderate Adverse	Medium	Minor Beneficial	During the temporary demolition and construction stage of the proposed development, the demolition and construction activities would be partially visible above the terraced housing that lines De Montfort Road. The taller elements of plant, machinery and the demolition and construction works would be seen in views channelled along the narrow road by the largely two storey development lining the road. The demolition and construction activities would interrupt views towards top floors the City Tower, that can be seen above the existing Siemens building immediately to the south of the Site and development to the south of the railway line. Additionally, the demolition and construction works would add to the visual clutter of streetlights, signs, telegraph wires, aerials, satellite dishes and low quality surfacing that detract from the visual amenity along the residential road. The temporary demolition and construction stage of the proposed development would cause a Medium magnitude of impact that would result in a Moderate Adverse effect. At Year 1, the proposed development would introduce a large mass of built form into views along the residential road. The mass of built form would occupy a large area of views that are channelled along the narrow residential road towards the Site, although the gap in buildings on the Site would partially align with De Montfort Road, allowing views through the development. The built form of the proposed development would form a new skyline element that would alter the composition of views gained in the vicinity although the new skyline elements would comprise locally distinctive built form, with variety in massing and heights. The landmark buildings by virtue of scale and height would be seen alongside improved legibility of public realm which would further enhance visual amenity. This would cause a Medium magnitude of impact, whilst the introduced mass of built form would cause a Small magnitude of impact. Considering both the positive and negative aspects above, the proposed development would result in a Negligible Beneficial effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
06	View north-east from Caversham Road	The viewpoint position is located on Caversham Road, approximately 150m to the south-west of the Site. The busy Caversham Road extends across obliquely from the foreground of the view to the middle ground. Views towards the Site from this location are generally restricted by intervening built forms along Caversham Road, including Vastern House sorting office (on the Hermes site). Less restricted vies are available, however, to the east where the upper portions of the Reading Station building are visible in the middle ground and the top of the 12-storey Reading Bridge House is visible in the background. The value of the view obtained from this location is considered to be low as it is not designated and has minimal or no cultural associations. As the receptors at this location will comprise people passing through the townscape along a busy, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Low.	Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would be seen in views to the north-east alongside the existing built form and infrastructure of the railway line. Buildings in the foreground would partially screen some of the ground level demolition and construction activities but the more elevated plant, machinery demolition and construction works would be seen against the skyline in views that are largely characterised by low quality architecture and clutter provided by the railway infrastructure. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Minor Adverse effect. At Year 1, the large mass of the proposed development would appear above the existing built form in views to the north-east. The proposed development would form a new skyline element that would alter the composition of views whilst introducing locally distinctive built form with variety in massing and heights, that would enhance views of built form, complimenting other new tall built form it is seen alongside, such as the currently under construction development at the former BMW site. The proposed built forms would also contribute to creating a visual interest and a strong sense of place that would serve to visually signify the urban regeneration of the area around the station and would cause a Small magnitude of impact. Considering the scale of the proposed built forms and the proximity of the visual receptors, the proposed development would cause a Very Small magnitude of impact to views. This would result in a Negligible Beneficial effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
07	View east from Swansea Road/Northfield Road	The viewpoint position is located at the junction of Swansea Road and Northfield Road, approximately 150m to the east of the Site. The view towards the Site from this location is channelled along Northfield Road by the predominantly two storey residential built forms on either side of the road. The existing low-rise built forms located immediately adjacent to the south of the Site (i.e. on the Hermes site) are visible at the termination of the view in the middle ground. These metal-clad warehouse units appear as indistinct low-rise structures which curtail views towards the Site. Beyond this in the background the ongoing construction activities (including cranes) associated with the former BMW site development is visible, which tends to also draw the eye. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 38) within the RSAF. As the receptors at this location will include people at their place of residence, their susceptibility to the type of development proposed is considered to be high. On the basis of the above the sensitivity of receptors at this location is considered to be High.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Negligible Beneficial	During the temporary demolition and construction stage of the proposed development, the demolition and construction activities would be partially visible above the terraced housing that lines the road. The taller elements of plant, machinery and the demolition and construction works would be seen in the context of the existing built form along Northfield Road and existing Siemens building immediately adjacent to the southern boundary of the Site. Demolition and construction activities would interrupt views towards the currently under construction development on the former BMW site which is partially visible above the existing Siemens building in views channelled along the narrow road by the two and three storey development lining the road. Additionally, the demolition and construction works would add to the visual clutter of streetlights, signs, telegraph wires, aerials, satellite dishes and low quality public realm that detract from the visual amenity along the road. The temporary stage of the proposed development would cause a Small magnitude of impact that would result in a Minor Adverse effect. At Year 1, the proposed development would introduce a large mass of built form into views along the road where largely 2 and 3 storey development channel views along the route of the road which would cause a Small magnitude of effect. The proposed built form would also contribute to increasing visual interest and visually signify the urban regeneration of the area around the station. The built form of the proposed development would form a new skyline element and landmark building by virtue of its height that would alter the composition of views gained in the vicinity although it would comprise locally distinctive built form with variety in massing and heights which would cause a Small magnitude of impact. The large scale of the proposed development would be noticeable in views cause a Very Small magnitude of impact. As a result, the proposed development would result in a Negligible Beneficial effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
08	View west from Reading Bridge	This viewpoint is located Reading Bridge, approximately 250m to the east of the Site. The slightly elevated position of the viewpoint offers uninterrupted oblique views west over and along the River Thames and south along George Street (B3345). Views are naturally focussed to the open expanse of the river to the west, with views channelled by the built forms and mature vegetation adjacent to the river on either side. The large-scale office blocks to the south of the river (including Clearwater Court and the adjacent office block on Norman Place) curtail views towards the Site from this location. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 46 and 47) within the RSAF. As the receptors at this location will include people travelling along George Street towards central Reading, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Medium.	Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Negligible Beneficial	During the temporary demolition and construction stage of the proposed development, the taller elements of the demolition and construction activities would be partially visible above the existing development at Clearwater Court and Norman Place. The higher demolition and construction activities would be seen against the skyline above the rooflines of the existing built form where they would be seen as receptors pass over the bridge. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact and result in a Minor Adverse effect. At year 1, the proposed development would be partially visible above the large built forms of the office blocks that line the southern bank of the River Thames. The additional built form would appear against the skyline to the west where, by virtue of its scale it would form a landmark in views and cause a Small magnitude of effect as it would be recognisable. The proposed development would not alter the context of views that are drawn along the river corridor and would extend the urban views along the river corridor, causing a Very Small magnitude of effect. As such, the proposed development would result in a Negligible Beneficial effect upon views available in this vicinity.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
09	View south-west from Christchurch Meadows	The viewpoint position is located on a pedestrian/cycle route within Christchurch Meadows, approximately 380m to the north-east of the Site. The foreground comprises the green open space of Christchurch Meadows. This gives way to a band mature vegetation along the north bank of the River Thames, which extends across the middle ground of the view. This vegetation generally restricts views beyond, including towards the Site, albeit glimpsed views are available towards the Reading Station building. In addition, several tall buildings are visible on the skyline above the intervening vegetation, including Reading Bridge House within the middle ground to the south, and the recently constructed 19 storey residential tower on Alfred Street/Chatham Street within the background to the south-west. The ongoing construction activities (including cranes) associated with the former BMW site development are also visible on the skyline beyond Reading Bridge House to the south. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 43) within the RSAF. As the receptors at this location comprise visitors to the public open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to the type of development proposed is considered to be high. On the basis of the above the sensitivity of receptors at this location is considered to be High.	Transient	Filtered/ restricted	Partial	Partial	Medium	Minor Adverse	Medium	Minor Beneficial	During the temporary demolition and construction stage of the proposed development, the demolition and construction activities would be partially visible above the existing development that forms the relatively horizontal skyline along the River Thames. The taller demolition and construction activities would be visible alongside the local landmark of Christchurch Bridge. The temporary demolition and construction works would interrupt views of the upper floors of the City Tower which is partially visible above the existing development south of the railway line but would be partially screened by the mature vegetation within the Christchurch Meadows. The temporary demolition and construction stage of the proposed development would cause a Medium magnitude of impact that would result in a Minor Adverse effect. At Year 1, the proposed development would introduce a large mass of built form into views to the south-west from Christchurch Meadows where it would appear in the same views as Christchurch Bridge and screen existing townscape elements such as City Tower and Reading Station from view which would cause a Very Small magnitude of impact. The large mass of built form would increase the vertical interest in views towards the centre of Reading where the proposed development would be seen alongside the existing townscape elements such as Thames Tower. The vertical elements of the proposed built form would contribute to increasing visual interest and visually locate land to the north of Reading Station. The proposed development would alter the composition of views gained in the vicinity of Christchurch Meadow but would introduce locally distinctive built form with variety in massing and heights that would complement other tall buildings that it is seen alongside, causing a Medium magnitude of impact. As such, the proposed development would result in a Minor Beneficial effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
10	View north from Station Road	This viewpoint is located on Station Road, approximately 340m to the south of the Site. Station Road extends into the background of the view, perpendicular to the viewer. Built forms of varying heights (predominantly 3 to 4 storeys high) on either side of the road channel the view to the north where the Main Building of Reading Station (Grade II listed) terminates the view. The 15 storey Thames Tower lies to the immediate south-wet of the Station and is visually dominant from this location, occupying a noticeable portion of the visible sky. The station building curtails views further to the north, including towards the Site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 58) within the RSAF and has cultural associations due to views of the listed station building. As the receptors at this location will comprise people who are passing through the townscape along a main route, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Medium.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Negligible Adverse	During the temporary demolition and construction stage of the proposed development, the demolition and construction activities would be partially visible in views channelled along Station Road where they would be seen above the station building. The taller demolition and construction activities would appear against the skyline between the existing built form that lines Station Road. The temporary demolition and construction stage of the proposed development would introduce an additional level of clutter into views to the north along the road which is afforded a relatively high level of enclosure. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact, resulting in a Minor Adverse effect. At Year 1, the proposed development would appear as a large mass at the extent of views north along Station Road where it would form a backdrop to the listed station building. The proposed development would increase the level of visual enclosure in views to the north where it would enhance the sense of development in the vicinity of the station building. The vertical elements of the proposed built form would contribute to increasing visual interest and add to the combination of architectural forms visible at the northern end of Station Road causing a Small magnitude of impact. The proposed development would alter the composition of views north along Station Road, reducing the prominence of the Main Building of Reading Station (Grade II Listed) but would introduce locally distinctive built form with variety in massing and heights, causing a Very Small magnitude of impact. As such, the proposed development would result in a Negligible Adverse effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
11	View south-east from Christchurch Meadows	This viewpoint is located on the towpath along the River Thames, adjacent to the War Memorial within Christchurch Meadows, approximately 425m to the north-west of the Site. The view is focussed along the river to the east, with views channelled by mature vegetation and built forms along each side of the river. The 3 to 4 storey residential blocks on the south side of the river (i.e. those on Waterman Place and Thames Avenue) within the middle ground largely restrict more far-reaching views south from this location, thus curtailing views towards the Site. Despite the intervening built forms across the middle ground, several tall buildings are discernible within the background, including 'Thames Tower' and 'The Blade' to the south-east. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 41) within the RSAF. As the receptors at this location comprise visitors to the public open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to the type of development proposed is considered to be high. On the basis of the above the sensitivity of receptors at this location is considered to be Medium.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Negligible Beneficial	During the temporary demolition and construction stage of the proposed development, the demolition and construction activities would be partially visible above the existing development that forms the relatively horizontal skyline formed by development along the southern bank of the River Thames. While the ground level demolition and construction operations would be screened from view by development on intervening land, the more elevated operations would be visible above the rooflines of riverside development. The temporary demolition and construction stage of the proposed development would interrupt views of the upper floors of Thames Tower as well as alter the context of views across the river. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Minor adverse effect. At Year 1, the proposed development would introduce a large mass of built form into views along the River Thames corridor where they appear above the riverside development, increasing the vertical elements in the relatively consistent horizontal townscape. Where the proposed development forms a mass above the existing built form on the riverside it would reinforce the increasing visual interest in the vicinity of Reading Station, although it would screen views of the Thames Tower, causing a Very Small magnitude of impact. The proposed development would alter the composition of views gained in the vicinity but would introduce locally distinctive built form with variety in massing and heights that would complement other tall buildings that it is seen alongside such as the currently under construction development on the former BMW site and would cause a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
12	View north-east from Great Knollys Street	This viewpoint position is located on Great Knollys Street, approximately 460m to the south-west of the Site. The view is oriented east along Great Knollys Street, which extends from the foreground to the middle ground of the view. The road is lined on either side by 1 and 2-storey industrial and commercial sheds, which results in a channelling of the view. The intervening built form limits far-reaching visibility east and west and largely obscures views of the Site. However, several tall buildings punctuate the skyline above this, including the 15 storey 'Thames Tower' and two 6 storey residential blocks on Caversham Road/Abattoirs Road. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 29) within the RSAF. As the receptors at this location will comprise people travelling along a busy road and people at their place of work, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Low.	Fixed and Transient	Filtered/ restricted	Partial	Limited	Very Small	Negligible Adverse	Very Small	Negligible Beneficial	During the temporary demolition and construction stage of the proposed development, the demolition and construction activities would be partially visible above the foreground elements of commercial and industrial units. The demolition and construction operations would be seen amongst the clutter of the light industrial units, fencing, outdoor storage areas, car parking and low quality public realm, which would screen ground level works. The more elevated activities would interrupt views of the currently under construction development on the former BMW site, which is partially visible. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact, resulting in a Negligible Adverse effect. At Year 1, the proposed development would introduce a new built form into views that are characterised by the high levels of clutter. The proposed development would increase the number of tall buildings visible for receptors looking north-east where it would appear in the same section of views as Thames Tower and the currently under construction development on the former BMW site, where it would help to consolidate the sense of high density development in the vicinity of Reading Station where it would cause a Very Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial effect.
13	View north-west from Forbury Gardens	This viewpoint position is located Within Forbury Gardens, approximately 470m to the south-east of the Site. The view is oriented to the north-west with the foreground comprised of an open area of amenity grass/lawn and footpaths. Mature vegetation within and surrounding the park and large-scale built forms surrounding the park to the west and south generally restricts wide ranging visibility out from within Forbury Gardens. The intervening vegetation and built form generally curtail views towards the Site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 53) within the RSAF. As the receptors at this location comprise visitors to the gardens in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to the type of development proposed is considered to be high. On the basis of the above the sensitivity of receptors at this location is considered to be High.	Transient	Filtered/ restricted	Glimpse	Limited	Very Small	Minor Adverse	Very Small	Neutral	The temporary demolition and construction stage of the proposed development would be almost entirely screened from view for visual receptors in Forbury Gardens by the mature vegetation that lines the park and the large blocks of built form to the south of the railway line that occupies intervening land. The most elevated demolition and construction activities and cranes may be partially visible above the roofline of Apex Plaza to the north-west of the park but would not detract from the visual amenity of the park itself or views towards the Market Place Conservation Area to the west. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact, resulting in a Minor Adverse effect. At Year 1, the proposed development would be almost entirely screened from view for visual receptors in the park by vegetation around the edge of Forbury Gardens and the existing built form on intervening ground such as Apex Plaza to the north-west of the park. Where glimpses of the proposed development are available above the trees and buildings on intervening ground, it would not alter the context of any views to the north west, or towards the Market Place conservation Area to the west where it would cause a Very Small magnitude of impact. The proposed development would be seen as a landmark building by virtue of its height where it is visible above existing built form, causing a Very Small magnitude of impact. The focus of views would remain within the park itself and the proposed development would be largely screened from view. As such, the proposed development would result in a Neutral effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
14	View west from Kings Meadow	The viewpoint location in Kings Meadow, approximately 560m to the east of the Site. The foreground comprises green open space within Kings Meadows. This gives way to a dense band mature vegetation along the south bank of the River Thames and along Kings Meadow Road, which extends across the middle ground of views. This vegetation generally restricts far ranging views to the west and north, including towards the Site. Less restricted views are obtained to the south and south-west, where several tall buildings are visible on the skyline in the background of views, including the large-scale office blocks at Forbury Place on Forbury Road to the south, 'The Blade' to the south, and Reading Bridge House to the south-west. The ongoing construction activities (including cranes) associated with the former BMW site development are also visible on the skyline beyond Reading Bridge House to the south-west. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 49) within the RSAF. As the receptors at this location comprise visitors to the public open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to the type of development proposed is considered to be high. On the basis of the above the sensitivity of receptors at this location is considered to be High.	Transient	Filtered/ restricted	Glimpse	Limited	Very Small	Minor Adverse	Very Small	Neutral	The temporary demolition and construction stage of the proposed development would be almost entirely screened from view for visual receptors at Kings Meadow by the mature vegetation that lines its western edge and the existing built form of Reading Bridge House. The top of the most elevated demolition and construction activities and cranes may be partially visible above the existing vegetation and buildings in views to the west although would not detract from the visual amenity experienced in the open views available at Kings Meadow. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact, resulting in a Minor Adverse effect. At Year 1, the proposed development would be almost entirely screened from view for visual receptors at Kings Meadow by the mature vegetation along the western edge and the large built form of Reading Bridge House. Where glimpses of the proposed development are available above the trees and buildings on intervening ground, it would be seen alongside the currently under construction tall building at the former BMW site and the existing development at Forbury Place where it would form a landmark building by virtue of its height and cause a Very Small magnitude of impact. Glimpses of the very top part of the proposed development in this setting would not alter the context of any views with the focus of views remaining within Kings Meadow but would increase the urbanisation of views glimpses to the centre of Reading, causing a Very Small magnitude of impact. As such, the proposed development would result in a Neutral effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
15	View south-east from the Thames Path/ Thames Side Promenade	This viewpoint is located on the Thames Path/Thames Side Promenade, approximately 775m to the north-west of the Site. The view is open within the foreground, being focussed along the River Thames to the east and across the adjacent area of open space to the south. Mature vegetation across the middle ground – that lining the river to the north and east, and that within and surrounding the open space to the south - restricts more wide-ranging views from this location. Only partial glimpsed views are available through and above the intervening vegetation to some tall buildings located within central Reading in the background, such as the 15 storey Thames Tower to the south-east. The view obtained is considered to be of medium value as it is designated as a longer distance view (view 1) within the RSAF. As the receptors at this location comprise users of the Thames Path/Thames Side Promenade and visitors to the public open space in the pursuit of outdoor recreation, their susceptibility to the type of development proposed is considered to be high. On the basis of the above the sensitivity of receptors at this location is considered to be High.	Transient	Filtered/ restricted	Glimpse	Limited	Very Small	Minor Adverse	Very Small	Neutral	During the temporary demolition and construction stage of the proposed development, views gained by visual receptors in the vicinity of the Thames Path would remain largely unchanged due to the high levels of visual screening provided by existing vegetation on intervening ground. Where glimpsed views towards the demolition and construction activities are available through the vegetation as transient receptors move along the route, the cranes and plant would be partially visible in gaps between the foreground elements but would not detract from the visual amenity experienced along the Thames Path with views remaining focused upon the River Thames corridor where they are drawn along the river towards Caversham Bridge. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact, resulting in a Minor Adverse effect. At Year 1, the proposed development would be partially visible in glimpsed views to the south-east from the Thames Path, where it would be seen amongst the vegetation that occupies intervening ground. Where glimpsed views are available, the proposed development would contribute to the sense of urban regeneration at Reading Station and would help with wayfinding as it would form a landmark building by virtue of its size, causing a Very Small magnitude of impact. Although the proposed development would introduce a new element in the skyline where it is seen, it would not alter the context of views in which the river corridor would remain the focus with glimpsed views towards the locally distinctive built form with variety in massing and heights of the proposed development seen amongst vegetation on Rivermead Park, causing a Very Small magnitude of impact. As such, the proposed development would result in a Neutral effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
16	View south from Balmore Park	This viewpoint position is located within Balmore park approximately 1.2km to the north of the Site. The foreground comprises an expanse of open green space, which is enclosed by dense bands of mature vegetation surrounding the park in the middle ground to the south, east and west. Despite this, distant views are available to the south, owing to the elevated position of the viewpoint. In these views the centre of Reading is visible in the background, marked by several tall buildings punctuating the skyline. These include the 'The Blade' to the south-east; the 15 storey 'Thames Tower' to the south; City Tower to the south-west; and the 11 storey Fountain House on Oxford Road in the distance to the south-west. In addition the ongoing construction activities (including cranes) associated with the former BMW site development are also visible on the skyline beyond to the south-west. The view obtained is considered to be of medium value as it is designated as a longer distance key view (view 14) within the RTBS (views from Balmore Park are also designated as a longer distance view (view 5) within the RSAF. As the receptors at this location visitors to Balmore Park in the pursuit of outdoor recreation, their susceptibility to the type of development proposed is considered to be high. On the basis of the above the sensitivity of receptors at this location is considered to be High.	Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would introduce tall plant and cranes across a wide section of views to the south from Balmore Park. The temporary demolition and construction activities would be seen amongst the longer distance views where the existing tall buildings in Reading offer vertical elements in the wide vista available to the south. The demolition and construction works would interrupt views of the Thames Tower and Reading Station as well as the spire on the Church of St Giles-in-Reading. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact, resulting in a Minor Adverse effect. At Year 1, the proposed development would introduce a large mass of built form into views to the south where it would help to consolidate the sense of urban regeneration in the vicinity of the station as well as form a landmark building in views by virtue of its scale and height. The proposed development would screen views of the Reading Station and the tall building of the Thames Tower but would introduce additional locally distinctive built form with variety in massing and heights that would be seen alongside other tall buildings such as the currently under construction development on the former BMW site and the City Tower that punctuate the skyline either side of the Site where it would cause a Small magnitude of impact. The increased mass of built form visible from the park would cause a Very Small magnitude of impact to views. As such, the proposed development would result in a Negligible Beneficial effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
17	View north from Mount Pleasant/ Southampton Street	The viewpoint position is located at junction of Mount Pleasant and Southampton Street, approximately 1.6km to the south of the Site. The road junction dominates the view in the foreground view, although beyond these channelled views are available north along Mount Pleasant. Due to the slightly elevated position of the viewpoint, distant views are afforded across central Reading in the background. In these views the 15 storey Thames Tower forms a visual focus, punctuating the skyline. I addition the ongoing construction activities (including cranes) associated with the development at the junction of Crown Street and Silver Street, are also clearly visible on the skyline in the middle-ground. The view obtained is considered to be of medium value as it is designated as a longer distance view (view 12) within the RSAF. As the receptors at this location will comprise people travelling along the busy Mount Pleasant and Southampton Street, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Low.	Transient and Fixed	Filtered/ restricted	Glimpse	Partial	Small	Negligible Adverse	Small	Negligible Beneficial	During the temporary demolition and construction stage of the proposed development, the demolition and construction activities would be partially visible on the horizon in views to the north where they would break the skyline to the east of Thames Tower. The taller elements of plant, machinery and the demolition and construction works would be seen in the context of the existing clutter in views that is provided by street furniture and low quality public realm that detracts from the visual amenity along the road. Whilst the temporary demolition and construction activities would be visible, they would not alter the context views towards Reading town centre from the vicinity of Mount Pleasant and Southampton Street. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Negligible Adverse effect. At Year 1, the proposed development would introduce a mass of built form into views adjacent to the existing tall buildings of Thames Tower and the IBIS Hotel, extending the height of development further east. The proposed development would represent a consolidation of tall buildings in the vicinity of Reading Station that would increase visual interest in longer views that are heavily cluttered by foreground elements through the introduction of additional locally distinctive built form with variety in massing and heights. This would cause a Small magnitude of impact. The built form of the proposed development would form a new skyline element that would increase the built form visible but would not alter the composition of views gained in the vicinity, causing a Very Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
18	View from south-west from Henley Road/Lower Henley Road	This viewpoint position is located at the junction of Henley Road and Lower Henley Road, approximately 1.7lm to the north-east of the Site. The road junction dominates the view in the foreground view with adjacent built forms channelling views west along Henley Road and south-west along Lower Henley Road. Due to the slightly elevated position of the viewpoint, distant views are afforded along Lower Henley Road across central Reading in the background to the south-west. In these views several tall buildings are visible, marking the centre of Reading. This includes the 15 storey Thames Tower, the 12-storey Reading Bridge House and the 13-storey hotel on Friar Street. In addition, the ongoing construction activities (including cranes) associated with the former BMW site development is visible adjacent to Reading Bridge House. The view obtained is considered to be of medium value as it is designated as a longer distance view (view 10) within the RSAF. As the receptors at this location will comprise people travelling along the busy Henley Road and Lower Henley Road, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Low.	Transient and Fixed	Filtered/ restricted	Glimpse	Limited	Very Small	Negligible Adverse	Very Small	Neutral	During the temporary demolition and construction stage of the proposed development, the demolition and construction activities would be partially visible in the longer range views that are framed by foreground vegetation and development. The taller elements of plant, machinery and the demolition and construction works would be seen alongside the Thames Tower and the currently under construction development on the former BMW site, where they would be seen in the context of the existing clutter in views that is provided by high levels of street furniture and low quality public realm that detracts from the visual amenity along the road. The temporary demolition and construction activities would be visible amongst the foreground vegetation, built form and highway clutter, but would not alter the context of views towards the centre of Reading. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact which result in a Negligible Adverse effect. At Year 1, the additional mass of the proposed development would be partially visible alongside other tall buildings in the vicinity of Reading Station, where it would represent a consolidation of tall buildings identifying the centre of the town that would increase visual interest in longer views that are heavily cluttered by foreground elements, causing a Very Small magnitude of impact. The built form of the proposed development would form a new skyline element that would not alter the composition of views gained in the vicinity and would cause a Very Small magnitude of impact. As such, the proposed development would result in a Neutral effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
19	View south-west from The Horse Close	This viewpoint position is located on The Horse Close, approximately 1.9km to the North of the Site. The Horse Close extends across the foreground of the view with the 2-storey residential dwellings to the south-east and west generally restricting wide-views in these directions. However, dwellings to the south and south-east are single storey which, along with the elevated viewpoint position, affords glimpsed distant views in these directions. Within these views several tall buildings are visible in the background, marking the location of central Reading. These include 'The Blade', the 15 storey Thames Tower and the and the 11 storey Fountain House on Oxford Road. The view obtained is considered to be of medium value as it is designated as a longer distance view (view 7) within the RSAF. As the receptors at this location will include people at their place of residence, their susceptibility to the type of development proposed is considered to be high. On the basis of the above the sensitivity of receptors at this location is considered to be High.	Transient and Fixed	Filtered/ restricted	Glimpse	Limited	Very Small	Minor Adverse	Very Small	Neutral	The temporary demolition and construction stage of the proposed development would be almost entirely screened from view for visual receptors in the vicinity of The Horse Close by the mature vegetation and existing development that occupies the foreground. The top of the most elevated demolition and construction activities and cranes may be partially visible above the existing vegetation and buildings although would not detract from the visual amenity experienced in this area. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact, which would result in a Minor Adverse effect. At Year 1, the proposed development would be almost entirely screened from view for visual receptors at The Horse Close by the foreground vegetation and development. Where the proposed development is visible to the south-west, it would be seen alongside the tops of other tall buildings where it would represent a consolidation of built form in views towards the centre of Reading, causing a Very Small magnitude of impact. Glimpses of a very small part of the proposed development in this setting would not alter the context of any views with the focus of views remaining within Kings Meadow but the building would represent a landmark building by virtue of its height and scale which would cause a Very Small magnitude of impact. As such, the proposed development would result in a Neutral effect.
20	View south-east from the Warren Footpath, Chazey Wood	This viewpoint is located on the Warren Footpath adjacent to Chazey Wood, approximately 2.7km to the north-west of the Site. The view from this location is across agricultural fields in the foreground, which slope to the south. The elevated topography affords distant views across the Thames Valley to the south and south-west, although views towards the Site are curtailed by intervening topography, built form and vegetation to the east and south-east. The value of the view obtained from this location is considered to be high as it is located within the Chilterns AONB and is designated as a longer distance view (view 16) within the RSAF and as a key view (view 9) within the RTBS. As the receptors at this location will include people using the local PRoW network in the pursuit of outdoor recreation, their susceptibility to the type of development proposed is considered to be high. On the basis of the above the sensitivity of receptors at this location is considered to be High.	Transient	Filtered/ restricted	Glimpse	Limited	Very Small	Negligible Adverse	Very Small	Neutral	The temporary demolition and construction stage of the proposed development would be almost entirely screened from view for visual receptors in the vicinity of The Warren Footpath by the topography and vegetation in the foreground. The top of the most elevated demolition and construction activities and cranes may be partially visible above the existing vegetation and landform, where they would be seen within the context of long distance views towards the centre of Reading. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact, resulting in a Negligible Adverse effect. At Year 1, the proposed development would be almost entirely screened from view for visual receptors on the footpath due to the topography and vegetation that occupies the foreground of views. Should the very top of the proposed development be visible above the vegetation and topography to the south-east, it would be seen in the context of long distance views towards the centre of Reading where it would form a landmark building by virtue of its height and scale and would cause a Very Small magnitude of impact. Glimpses of a very small part of the proposed development in this setting would not alter the context of any views with the focus of views remaining the undulating agricultural fields of the foreground and longer views into the settled Thames Valley below where it would cause a Very Small magnitude of impact. As such, the proposed development would result in a Neutral effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
21	View north from the A33 near water treatment works	The viewpoint position is located on the A33, approximately 2.5km to the south of the Site. Views are available north along the A33, which is lined by dense mature hedgerow vegetation on either side. This vegetation restricts views to the east and west and channels views to the north. In views north a number of built forms are visible in the middle ground, albeit set within a well-vegetated context. Visible above and beyond this is the 15 storey Thames Tower, which punctuates the skyline and marks the location of central Reading. The view obtained is considered to be of medium value as it is designated as a longer distance view (view 14) within the RSAF. As the receptors at this location will comprise people travelling along the busy A33 on approach to central Reading, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Low.	Transient	Filtered/ restricted	Glimpse	Limited	Very Small	Negligible Adverse	Very Small	Neutral	The temporary demolition and construction stage of the proposed development would be almost entirely screened from view for visual receptors on the A33 due to the high level of vegetation lining the route and occupying the foreground of views. The top of the most elevated demolition and construction activities and cranes may be partially visible above the existing vegetation and buildings although would not detract from the visual amenity experienced in this area due to the high levels of visual clutter provided by the highway infrastructure. Where views of the temporary demolition and construction stage of the proposed development are available above the roadside vegetation, they would not alter the context of views along the busy road. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse effect. At Year 1, the proposed development would be almost entirely screened from view for visual receptors travelling on the A33. Where the proposed development is visible above the vegetation and existing development to the north, it would be seen alongside the tops of other tall buildings where it would represent a consolidation of built form in views towards the centre of Reading, causing a Very Small magnitude of impact. Glimpses of the top of the proposed development in this context would not alter the focus of views where it would be seen amongst the existing visual clutter of the highway infrastructure where it would cause a Very Small magnitude of impact. As such, the proposed development would result in a Neutral effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
22	View west from London Road, Shepherds Hill	This viewpoint is located on London Road, approximately 3.3km to the east of the Site. The foreground and middle ground of the view comprise the busy London Road and adjacent predominantly 2 storey residential dwellings. Whilst the adjacent built forms restrict views to the north and south, channelled views are available west along the wide London Road. Within these views west central Reading is visible in the distance, marked by the presence of several tall buildings punctuating the skyline. This includes the recently constructed 16 storey tower on Bembridge Place, 'The Blade' and the 15 storey Thames Tower. In addition the ongoing construction activities (including cranes) associated with the former BMW site development are visible above intervening built forms. The view obtained is considered to be of medium value as it is designated as a longer distance view (view 11) within the RSAF. As the receptors at this location will comprise people travelling along the busy London Road on approach to central Reading, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Low.	Transient and Fixed	Filtered/ restricted	Glimpse	Limited	Very Small	Negligible Adverse	Very Small	Neutral	The temporary demolition and construction stage of the proposed development would be almost entirely screened from view for visual receptors in the vicinity of London Road due to the existing built form and vegetation in the foreground as well as the topography of the intervening land. The top of the most elevated demolition and construction activities and cranes may be partially visible amongst the street lights and highway infrastructure in the foreground as well as pylons in the middle distance that add to the level of clutter in views to the west. As such, where they are visible, the demolition and construction activities would not detract from the visual amenity experienced in this area and would not alter the context of views gained in the vicinity of London Road. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact and result in a Negligible Adverse effect. At Year 1, the proposed development would be almost entirely screened from view for visual receptors in the vicinity of London Road. Where the proposed development is visible above the foreground elements of vegetation and existing development, it would be seen alongside existing clutter and the tops of other tall buildings where it would represent a consolidation of built form in views towards the centre of Reading, causing a Very Small magnitude of impact. Glimpses of the top of the proposed development in this context would not alter the focus of views where the additional built form would be seen amongst the existing visual clutter of highway infrastructure and pylons where it would cause a Very Small magnitude of impact. As such, the proposed development would result in a Neutral effect.

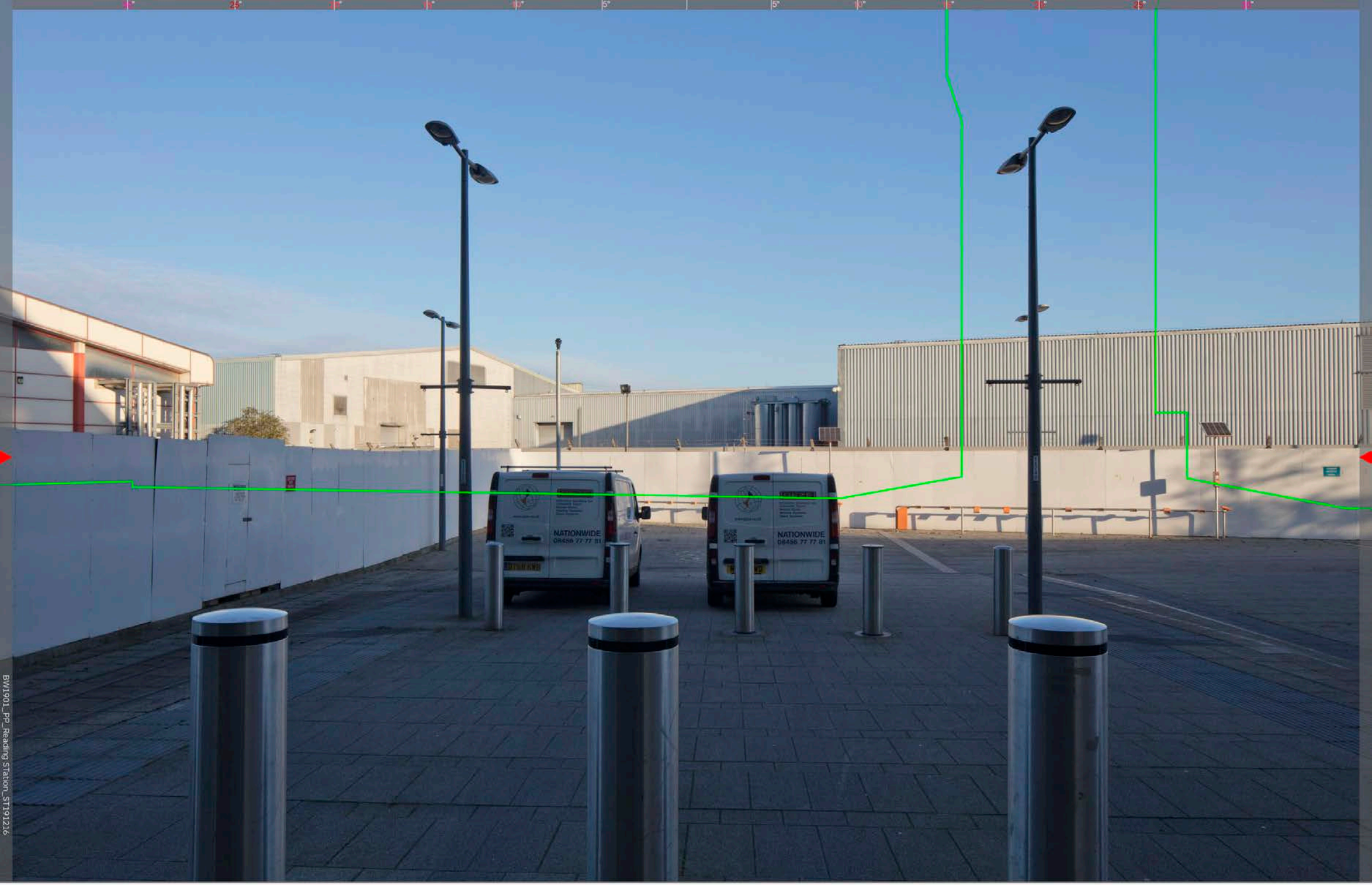
Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
23	View south-west from Dunsden Way	This viewpoint is located on Dunsden Way in Dunsden Green, approximately 3.7km to the north-east of the Site. This is an open view across a number of large arable fields across the foreground. The suburban edge of Caversham is visible in the middle ground beyond which the centre of Reading is visible in the distance, marked by several tall buildings visible on the skyline. This includes 'The Blade', the upper portions of the 15 storey Thames Tower and the recently constructed 19 storey residential tower on Alfred Street/Chatham Street. In addition the ongoing construction activities (including cranes) associated with the former BMW site development are visible. The value of the view obtained from this location is considered to be low as it is not designated and has minimal or no cultural associations. As the receptors at this location will comprise transient receptors on the country lane that is lined on both sides by hedgerow vegetation, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Medium.	Transient and Fixed	Filtered/ restricted	Glimpse	Limited	Very Small	Negligible Adverse	Very Small	Neutral	The temporary demolition and construction stage of the proposed development would be almost entirely screened from view for visual receptors in the vicinity of Dunsden Way by the foreground vegetation that lines the road as well as the variations in topography on the intervening land. Where visible, the temporary demolition and construction activities for the proposed development would be seen alongside the pylons that occupy the middle distance in glimpsed views towards the developed centre of Reading, with mature vegetation on the ridgeline at Milestone Wood providing a high level of visual screening for development in the centre of Reading that is enhanced by hedgerow vegetation on both sides of Dunsden Way which limits views into the surrounding landscape. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact and result in a Negligible Adverse effect. At Year 1, the proposed development would be almost entirely screened from view visual receptors in the vicinity of Dunsden Way. The topography of intervening land and the mature vegetation on the ridgeline at Milestone Wood, would almost entirely screen the proposed development from view but glimpses of the tall building would represent a landmark by virtue of its scale and size, causing a Very Small magnitude of impact. Where it is seen within the context of views towards the developed centre of Reading, the proposed development would be seen alongside pylons that occupy the middle ground of views and form point features in the skyline, causing a Very Small magnitude of impact. Where glimpsed views of the top of the proposed development are available over the large areas of agricultural land in the foreground, it would not alter the focus of the views which would remain the foreground and longer views into the settled Thames Valley in the south-west. As such, the proposed development would result in a Neutral effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
24	View north from Greyfriars Road/ Garrard Street	This viewpoint is located at the junction of Greyfriars Road and Garrard Street, approximately 350m to the south of the Site. The large built form of largely commercial development that occupies the foreground of views, limits the extent of visibility to views channelled along Greyfriars Road and Gerrard Street. Views towards the site are largely curtailed by existing built form such as the Xafinity House that occupies much of the foreground, and Phoenix House that forms the extent of views north. Existing built forms visible range from 2 storeys to the 14 storey hotel development seen in views along Gerrard Street. The view obtained is considered to be of medium value as it is close to the location of view 31, which is designated as a shorter distance view within the RSAF. As receptors at this location will comprise transient receptors moving along the urban road that is lined by commercial development, visual receptors at this location are considered to have a low susceptibility to the type of impact proposed. On the basis of the above the sensitivity of receptors at this location is considered to be Medium.	Transient	Filtered/ restricted	Glimpse	Limited	None	Neutral	None	Neutral	The temporary demolition and construction stage of the proposed development would be almost entirely screened from view for visual receptors in the vicinity of Greyfriars Road and Gerrard Street. The majority of the demolition and construction activities would be screened from view by the exiting built form in the foreground. The most elevated demolition and construction activities and cranes may be partially visible above the roofline of Phoenix House to the north but would not detract from the visual amenity of the urban road. Where visible, they would be seen in the context of a view along an urban road in the centre of Reading where existing signs, street furniture and low quality public realm provide an element of clutter to views. The temporary demolition and construction stage of the proposed development would cause a magnitude of impact of None, resulting in a Neutral effect. At Year 1, the proposed development would be almost entirely screened from view for visual receptors in the vicinity of Greyfriars Road and Gerrard Street by the existing built form of Xafinity House and Phoenix House. Some partial views of the very top of the proposed development may be available above the existing built form for visual receptors in the vicinity, but where these glimpses of the new building are available, it would not alter the context of any views where the focus would remain channelled along the urban roads where buildings typical of an urban area form the extent. The existing screening means that the proposed development would cause a magnitude of impact of None, resulting in a Neutral effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
25	View north from Station Square	This viewpoint is located at the Station Hill, approximately 230m to the south of the Site. The foreground of views available from this area are dominated by the high quality public realm, although a large number of metal bollards divide the open space and provide an element of clutter that is enhanced by the large and incongruous digital advertising board that significantly detracts from the visual appreciation of the designed relationship between the new Reading Station building and the Main Building of Reading General Station (Grade II Listed). The existing station buildings form the extent of views and curtail views to the north from Station Square with the architectural quality of the 15 storey Thames Tower having a strong influence over views gained from the area. The view obtained is considered to be of medium value as although it is not designated within the RSAF, it has cultural associations due to views of the listed station building. As the receptors at this location will comprise people who are passing through the townscape along a main route, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Medium.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Minor Adverse	During the temporary demolition and construction stage of the proposed development, the demolition and construction activities would be partially visible above the Main Building of Reading General Station (Grade II Listed). The taller elements of the demolition and construction activities and plant such as cranes would be partially seen against the skyline above both the new station building and the historic station building. The temporary demolition and construction works would appear alongside the large advertising screen where they would introduce an additional element of clutter into views over Station Square towards the former station building. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Minor Adverse effect. At Year 1, the proposed development would appear as an additional element in views of the Main Building of Reading General Station (Grade II Listed), where it would alter the backdrop and setting of the building and clock tower. The proposed development would introduce built form into the backdrop of the historic station building that would create a new skyline element which would contribute to increasing visual interest and add to the juxtaposition between the combination of architectural forms visible from Station Square, causing a Small magnitude of impact. The focus of views gained by visual receptors at Station Square would remain the historic station building seen within the context of an urban area with more modern development complimenting the more historic building where the proposed development would cause a Very Small magnitude of impact. As such, the proposed development would result in a Negligible Adverse effect.

Visual Receptor				Visual Effects							
Ref	Name	Sensitivity	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and Construction Stage		Operational Stage – Year 1 Parameter Plans		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
26	View north from Blagrave Street	This viewpoint is located on Blagrave Street, approximately 270m to the south of the Site. Views to the north are channelled along the street by buildings that line it such as 2 Blagrave Street to the east and Forbury Works (which is located within Market Place Conservation Area) to the west. The large building of Apex Plaza occupies a large section of views to the north, with the modern but not recent extension to the Main Building of Reading General Station (Grade II Listed), occupying the rest of views beyond Blagrave Street. The built form of the station building and Apex Plaza curtail views further north, including towards the Site. The public realm and Reading Abbey Quarter signage combine with the street trees to create an attractive street scene that draws views towards the station. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 54) within the RSAF and has cultural associations due to views of buildings within the Market Place Conservation Area. As the receptors at this location will comprise people who are passing through the townscape along a main route, their susceptibility to the type of development proposed is considered to be low. On the basis of the above the sensitivity of receptors at this location is considered to be Medium.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Very Small	Neutral	The temporary demolition and construction stage of the proposed development would be largely screened from view for visual receptors on Blagrave Street by the existing built form at the northern end of the street. The large mass of Apex Plaza and the modern but not recent extension to the station building would screen views of the majority of demolition and construction activities, although the cranes and highest works would be partially visible alongside the Apex Plaza. Where visible, the temporary demolition and construction works would not alter context of views along the urban street. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Minor Adverse effect. At Year 1, the proposed development would be largely screened from view for visual receptors using Blagrave Street by the large mass of built form at Apex Plaza and part of the station building that occupy views north along the street. Where glimpses of the proposed development are available above the trees and buildings at the northern end of the road, it would not alter the context or focus of views along the urban street in the centre of reading where built form is a common aspect in views and the landmark building by virtue of its height and scale would cause a Very Small magnitude of impact. Furthermore, the proposed development would not detract from views of buildings such as Forbury Works which form part of the Market Place Conservation Area where it would cause a Very Small magnitude of impact. As such, the proposed development would result in a Neutral effect.

[i] Type of receptor: Fixed, Transient
[ii] Nature of the view of the Development: Open, Filtered/restricted, None
[iii] Degree of visual intrusion of the Development (extent of the view occupied by the Development): Full, Partial, Glimpse, None
[iv] Proportion of the Development visible: Full, Most, Partial, Limited, None



BW1901_PP_Reading Station_ST191216



© AVR LONDON

Preliminary Alignment

1.6 m above ground

15:09 02 December 2019

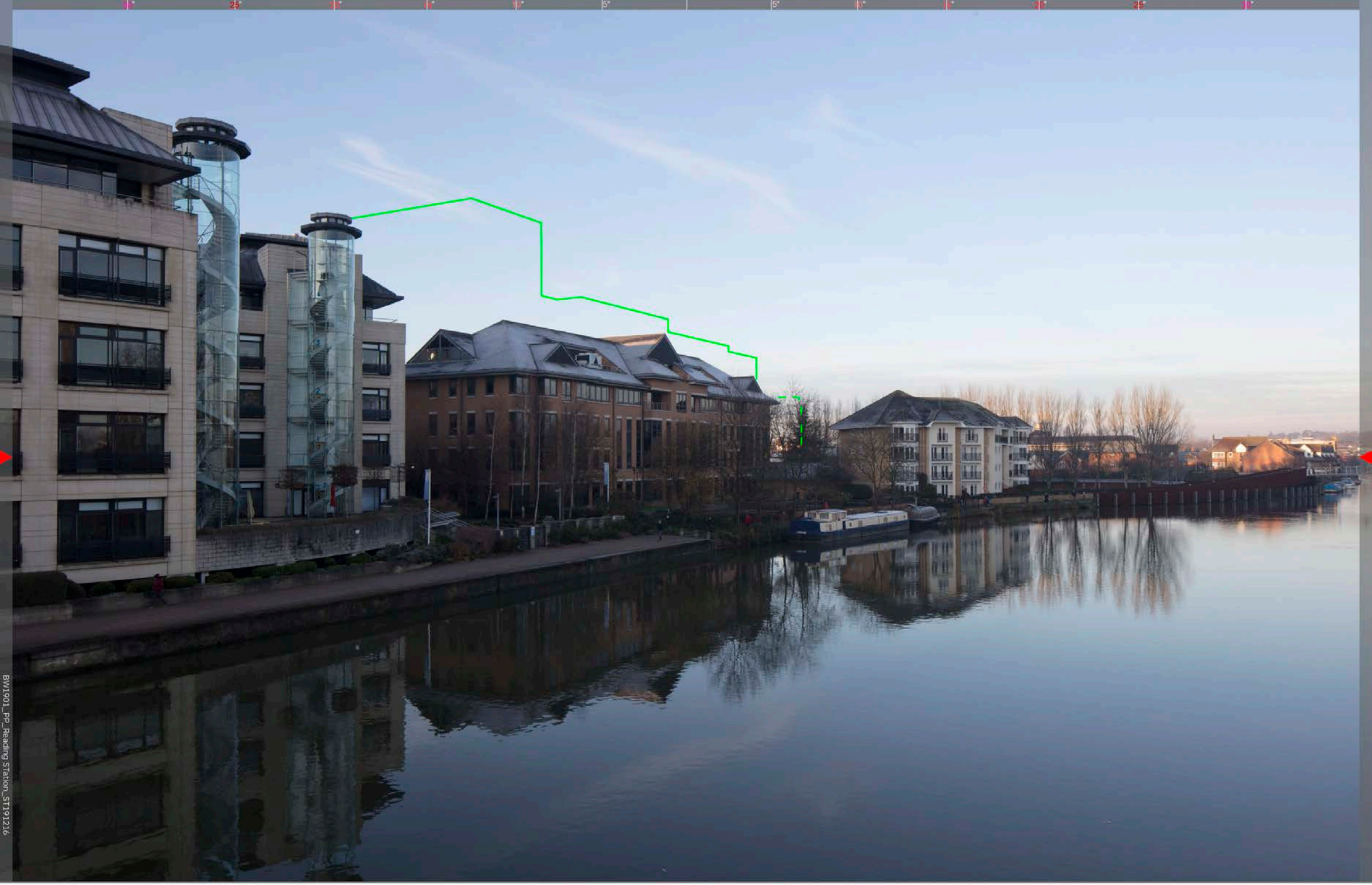
BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading Station_ST191216



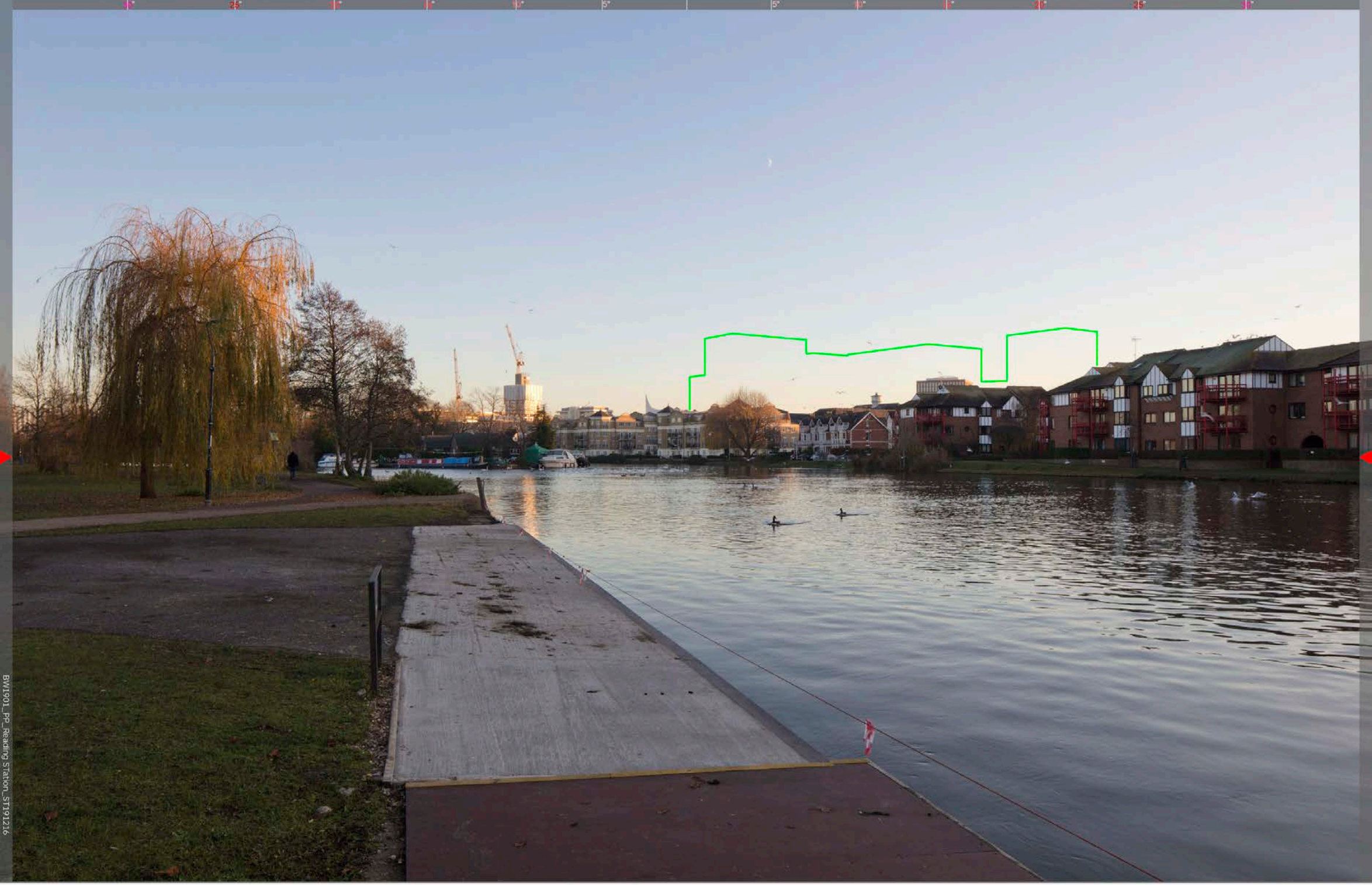
BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading Station_ST191216



© AVR LONDON

Preliminary Alignment

1.6 m above ground

15:54 02 December 2019

BW1901_PP_Reading STation_ST191216



BW1901_PP_Reading STation_ST191216



BW1901_pp_Reading Station_ST191216



© AVR LONDON

Preliminary Alignment

1.6 m above ground

10:24 02 December 2019

BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading Station_ST191216

Volume 3: Technical Appendices
Table of Contents

Technical Appendix 1.1: **IEMA Quality Mark Checklist**
Technical Appendix 1.2: **Regulation 18(5)(b) Statement**
Technical Appendix 2.1: **EIA Scoping Report**
Technical Appendix 2.2: **Ground Conditions Preliminary Risk Assessment**
Technical Appendix 2.3: **Ecological Impact Assessment**
Technical Appendix 2.4: **Flood Risk Assessment**
Technical Appendix 2.5: **Historic Environment Assessment**
Technical Appendix 2.6: **Summary Planning Policies**
Technical Appendix 7.1: **Environmental Health Officer Consultation**
Technical Appendix 7.2: **Air Quality Appendix**
Technical Appendix 8.1: **Legislation and Guidance**
Technical Appendix 8.2: **Baseline Survey**
Technical Appendix 8.3: **Construction Plant**
Technical Appendix 8.4: **Site Suitability**
Technical Appendix 8.5: **Daytime Ambient Noise Levels**
Technical Appendix 9.1: **Wind Microclimate Results**
Technical Appendix 10.1: **Drawings**
Technical Appendix 10.2: **Acoustic Site Suitability**
Technical Appendix 10.2: **Daylight and Sunlight Results**
Technical Appendix 10.3: **Overshadowing Assessment**
Technical Appendix 10.4: **Solar Glare Results**

Technical Appendix 1.1: IEMA Quality Mark Checklist

Table 1.1: IEMA Quality Mark Check	
EIA Commitment and ES Review Criteria	
EIA Commitment 1: Regulatory Compliance[1]	
a) Does the ES, in the light of the project being assessed, identify, describe and assess effects on:	√
- Human Beings	√
- Fauna & Flora	√
- Soil	√
- Water	√
- Air	√
- Climate	√
- Landscape	√
- Cultural Heritage	√
- Material Assets	√
b) Does the ES attempt to set out the interaction between the factors set out under criteria 1.a)?	√
c) Does the ES contain a clear section, or sections, providing a description of the project comprising information on the site, design and size of the project?	√
d) Does the ES contain a section, or sections, that describe the likely significant effects of the proposed project on the environment?	√
e) Does the ES contain a clear section, or sections, that provide a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects?	√
f) Does the ES contain a clear section, or sections, that provides the data required to identify and assess the main effects which the project is likely to have on the environment?	√
g) Does the ES contain a section, or sections, that outline the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects?	√
h) Has a Non-Technical Summary been produced containing an outline of the information mentioned in 1c) to 1h)?	√
EIA Commitment 4: EIA Context	
A) Scoping	
i) Has the ES clearly stated what effects will be addressed and how this decision was reached?	√
ii) Are the main environmental concerns and their locations, where relevant, clearly identified with an explanation of the risks posed from the project? Including relevant environmental issues beyond the boundary of the proposal?	√
iii) Does the ES identify the environmental issues that will not be assessed and explain why they are not being considered further?	√

[1] A number of the criteria under this Commitment cover similar issues to criteria set out in the other three Commitments, below. Where this occurs IEMA recognise that there will inevitably be some overlap between the criteria. However, the assessment of the criteria under this Commitment is focussed on the presence or absence of the issue, whereas the assessment of similar criteria, within the other three Commitments, will focus on the quality of the consideration of the issue in question.

Table 1.1: IEMA Quality Mark Check	
EIA Commitment and ES Review Criteria	
iv) Is the sub-topic scope undertaken in relation to each of the topics included in the EIA appropriate and focussed	√
B) Alternatives, including iterative design	
i) Does the ES set out the main alternatives that were considered at different points during the development of the proposal?	√
ii) Are the main reasons for the selection of the proposal over distinct alternatives and design iterations easily identifiable?	√
iii) Does the ES clearly indicate how the EIA process, environmental issues and consultee responses influenced the iterative design process that led to the proposed project?	√
EIA Commitment 5: EIA Content	
A) Baseline	
i) Does the ES describe the current condition of those aspects of the environment that are likely to be significantly affected by the development?	√
ii) Is the sensitivity / importance of the baseline environment clearly evaluated?	√
iii) Are limitations in the baseline information identified and clearly set out?	√
B) Assessment	
i) Are the methods for establishing the magnitude of impacts on the receiving environment clearly defined?	√
ii) Does the ES set out a generic methodology for the assessment and evaluation of significance OR clearly explain and justify a specific method for each environmental issue?	√
iii) Does the assessment of significance consider the impact's deviation from the established baseline condition? (e.g. the sensitivity of the environment, the extent to which the impact is reversible, etc.).	√
iv) Does the ES identify the significance of impacts that would be anticipated to remain following the successful implementation of any mitigation set out in the ES?	√
vii) Does the ES give appropriate prominence to both positive and negative effects relative to their significance?	√
C) Environmental Management	
i) Does the ES describe the measures proposed to be implemented to avoid, reduce, and if possible, remedy significant adverse impacts of the proposed development?	√
ii) Is an indication of the effectiveness of the stated mitigation measures provided?	√
iii) Are details provided related to any management plans that the ES indicates should be implemented to deliver the mitigation measures and/or monitor the environmental impact of the project?	√
iv) Does the ES identify the general groups who will be responsible for the follow-up programme?	√

Table 1.1: IEMA Quality Mark Check	
EIA Commitment and ES Review Criteria	
EIA Commitment 6: EIA Communication	
A) Consultation	
i) Does the description of any consultation include details of those who were contacted, including statutory and non-statutory consultees, and the public?	√
ii) Does the main text of the ES provide a summary of the main issues raised by consultees?	√
iii) Does the ES set out if any of the issues raised by consultees will not be dealt with in the ES?	√
If so is clear justification set out as to why the issue has been scoped out?	√
B) ES Quality	
i) Does the ES provide appropriate illustrations through the use of maps and/or diagrams? In particular this should cover:	
- the location of the site, site layout and boundary,	√
- operational appearance,	√
- main environmental receptors and	√
- impacts displayed in a visual format where appropriate.	√
ii) Is the area of proposed land clearly described and indicated on an appropriate map or diagram?	√
iii) Are the anticipated timescales of construction, operation and (where appropriate) decommissioning of the proposal clearly set out in the main text?	√
iv) Is the information in the ES presented in a manner in which a non-specialist would be able to logically identify information they were seeking?	√
v) Are technical terms kept to a minimum, with a glossary provided?	√
C) Non-Technical Summary (NTS)	
i) Does the NTS provide sufficient information for the non-specialist reader to understand the main environmental impacts of the proposal without reference to the main ES?	√
ii) Are maps and diagrams included in the NTS that, at a minimum, illustrate the location of the application site, the footprint of the proposed development, and the location of relevant key features?	√
iii) Is it clear that the NTS was made available as a separate, stand-alone document to facilitate a wider readership?	√



Technical Appendix 1.2: Regulation 18(5)(b)

Regulation 18(5)(b) Statement

Regulation 18(5)(a) of the EIA Regulations requires a developer to ensure than an environmental statement is prepared by competent experts and Regulation 18(5)(b) provides that the environmental statement must be accompanied by a statement from the developer outlining the relevant expertise or qualifications of such experts. This statement has therefore been prepared and included within this ES pursuant to these regulatory requirements and the table below sets out the competent experts appointed by the Applicant to prepare this ES and their respective expertise and qualifications.

Company	Contribution to ES	EIA Team Member	Qualifications	Relevant Memberships	Relevant Experience and Accreditation
RAMBOLL	Project Coordination and Management	Michael Elliott	B.Sc. (Hons) Environmental Geography (University College London)	Practitioner Member IEMA	Ramboll (previously Environ and Ramboll Environ) was a founding member of the Institute of Environmental Management and Assessment (IEMA). Ramboll has been an EIA Practitioner since 1989 and has been IEMA Quality Mark Registered since 2011. EIA experience includes urban regeneration, masterplan schemes, urban extensions, industrial and infrastructure projects. • Michael Elliott has over 18 years' experience, specialising in Environmental Impact Assessment (EIA), Scoping Assessments, Stakeholder Engagement, Sustainable Development and Planning and Development studies. He leads on substantial, complex development projects and has considerable experience in the property, regeneration, power, transport, and waste sectors. • Michelle Wheeler has 12 years' of environmental consultancy experience in the UK. • Michelle specialises in EIA project management, direction and review, as well as landscape/townscape and visual assessment. She has been involved in over 50 projects in the UK including urban regeneration and masterplan schemes. • Ben Weldin has over 7 years of experience working on large infrastructure projects and urban regeneration schemes. • Madeleine Truman has two years' experience supporting the project management team on urban regeneration projects.
		Michelle Wheeler	BLArch (Hons) *Cum Laude* (Pretoria, South Africa)	Institute of Environmental Management and Assessment (Associate)	
		Ben Weldin	BSc (Hons) – Biological Sciences Msc (Hons) – Environmental Protection and Management	Chartered Environmentalist - IEMA	
		Madeleine Truman	BSc (Hons) Environmental Science (University of York)	Associate Member IEMA	
	Air Quality	Lesley Vining	BSc (Hons) Environmental Science	Institute of Air Quality Management (MIAQM) Institute of Environmental Management and Assessment (IEMA) Institute of Environmental Scientists	• Lesley Vining has over 20 years' of environmental consultancy experience. As one of Ramboll Environ's principal air quality scientist within the UK she manages a team of air quality practitioners. • Lesley is extensively involved in carrying out ambient air quality assessments, either as standalone studies or as part of environmental statements and permit applications. • Ana has over 8 years' experience as an environmental professional with a strong technical background in the field of air quality and knowledge in natural resources management. • Ana has produced several air quality assessments, including EIA and non-EIA, for a wide variety of large residential, mixed-use, commercial and industrial development across the UK.
		Ana Gomes	MSc in Environmental Engineering (Technical University of Madrid, Spain) MSc in Environmental Sciences and Technology (University of Porto, Portugal) BSc (Hons) in Environmental Sciences and Technology (University of Porto, Portugal)	Associate Member of the Institution of Environmental Sciences Associate Member of the Institute of Air Quality Management.	
	Noise and Vibration	Simon Taylor	BSc(Hons) Audiotechnology and Computer Science	Institute of Acoustics (MIOA)	• Joseph has over 14 years' of noise and vibration consultancy experience. As one of Ramboll's principal noise consultants within the UK he manages a team of noise consultants in the London office and is extensively involved in carrying out noise

		Joseph Mendis	BSc (Hons) Aerospace Engineering	Institute of Acoustics (MIOA)	assessments throughout the UK, either as standalone studies or as part of environmental statements. • Simon has over 13 years of experience as an acoustic consultant providing noise and vibration advice across all key sectors including residential, infrastructure, commercial, healthcare and education. Simon is experienced with all relevant acoustic assessments including EIA and non-EIA assessments. During Simon's 5 years working on Crossrail, he was responsible for successfully gaining permission for tunnelling works through central London repeatedly via Section 61 process, without any objection from Local authorities. • Camilla has over 5 years of noise and vibration experience, working on environmental statements for a variety of schemes, as well as providing acoustic advice throughout the lifecycle of a project (RIBA Stages 1-6).
		Camilla Fletcher	MSc Acoustic Engineering (University of Southampton) MA Music (University of Cambridge)	CEng IOA	
	Ecology	Laura Sanderson	MSc Wildlife Management and Conservation (Reading, UK) BSc Zoology (Reading, UK)	CEnv Licensed to survey for bats, barn owls and great crested newts in England, Wales and Scotland.	• Laura Sanderson has worked as an ecological consultant for over 10 years. She has worked as ecologist on many EIA and non-EIA developments; including urban regeneration schemes, urban extensions, industrial developments, large on-shore wind and solar farms and highways and pipeline projects; and • Laura is highly experienced in all parts of project ecology work, from extended Phase 1 habitat surveys, detailed further surveys, EcIA production, Ecological Clerk of Works during construction and post-construction planning support.
		Chris Savage	BSc (Hons) Ecology and MSc Ecological Assessment	Full member of Chartered Institute OF Ecology and Environmental Management (CIEEM) Licensed to survey for bats and great crested newt in England. Licenced in Tree Climbing and Aerial Rescue.	• Chris Savage has over seven years' experience working as an ecological consultant. • Background is in protected species surveys, with bats as a specialism, and habitat assessment. In recent years has focused on urban ecology and in particular large urban regeneration schemes. • Experience on EIA and non-EIA projects UK-wide and competent in all areas of ecology work including Phase 1 habitat assessment, protected species survey, European Protected Species Mitigation licensing, EcIA, and post-construction planning assistance included BREEAM, CfSH, Habitat Management Plans etc.
	Geo-Environmental/ Contamination	Matthew Pannett	BSc (Hons) Geochemistry MSc Hydrogeology and groundwater chemistry	Fellow of the Geological Society	• Matthew has more than 20 years of experience in environmental consultancy. He advises clients on environmental risks and liabilities associated with property transactions and redevelopment, day-to-day operations and regulatory compliance. • Matthew has managed numerous environmental assessments of land portfolios for a range of corporate, financial, investment and property clients; advised on a number of Part IIA contaminated land sites and undertaken remediation projects at a wide variety of industrial and manufacturing facilities. • Matthew's technical responsibilities include the management and direction of Ramboll's contaminated land team, and specialist hydrogeological and geological studies. • Lucy has four years of experience working with contaminated land, two years of which were for a drilling contractor overseeing project management and two of which are in environmental consultancy. • Lucy has supported large ground investigation projects and environmental assessments of land portfolios as well as project managing smaller due diligence projects. • Lucy has experience on site supervising ground investigation, remedial works and environmental watching briefs at a wide range of industrial and commercial sites.
		Lucy Baker	BSc (Hons) Environmental Geoscience	Fellow of the Geological Society	
BARTON WILLMORE	Socio-Economics	Debbie Mayes	BA (Hons) Geography (University of Kent) MA Town Planning (University of Westminster)	Member of the Institute of Economic Development (IED)	• Debbie has over 18-years of professional experience in the field of socio-economic research in both the public and private sector specialising in demographic forecasting and social impact assessment. • Natalie has over 8-years of professional experience in the field of socio-economic research, specialising in economic impact assessment.
		Natalie Lillis	BSc Land Management (University of Reading) MSc Urban Planning and Development (University of Reading)	Member of the Royal Town Planning Institute (RTPI)	

	Townscape, Heritage and Visual Assessment	Matthew Chard	Master's Urban Design (University of Greenwich) PG Dip Landscape Architecture (University of Greenwich)	Chartered Member of the Landscape Institute (CMLI)	• Barton Willmore is a registered practice of the UK Landscape Institute (membership number 897) and an Institute of Environmental Management and Assessment (IEMA) EIS Quality Mark Registrant; and • This ES Volume has been prepared and overseen by chartered landscape architects, who between them have over 40 years' experience specialising in the assessment of landscape/townscape and visual effects.
		Rob Griffiths	MA (Hons) Landscape Planning and Management (University of Manchester)	Chartered Member of the Landscape Institute (CMLI) Practitioner Member of the Institute of Environmental Management and Assessment (PIEMA)	
CHP Surveyors Ltd	Daylight, Sunlight, Overshadowing, Solar Glare and Light Pollution	James Crowley	BSc in Building Surveying (University of Greenwich)	Member of Royal Institution of Chartered Surveyors (RICS)	• James has over 30 years of professional experience advising on the implications that schemes may have on the daylight and sunlight enjoyed by neighbouring properties as well as the level of daylight and sunlight proposed accommodation will enjoy. • Projects have been undertaken throughout the UK for both the public and private sector.
Xi Engineering Consultants	Wind	Donald Black	MEng (Hons) Mechanical Engineering (The University of Edinburgh)	CEng – MIMechE Member of the Institute for Leadership and Management (MInstLM)	• Xi Engineering Consultants have an established reputation providing support and services relating to various areas of environmental assessment including, wind microclimate, vibration, airborne and underwater acoustics. • Donald has 16 years of engineering experience providing advice and support and reviews for planning applications and environmental impact assessments • Donald is a Chartered Mechanical Engineer with the Institution of Mechanical Engineers (CEng MIMechE) and is also a member of the Institute for Leadership and Management (MInstLM) • Donald is a member of Renewable UKs Small and Medium Wind Technical Steering Group, the Nuclear Decommissioning Authority, SME Technical Steering Group, and is a member of both the IEC and BSi committees defining new wind turbine through life and lifetime extension standards.
MOLA	Historic Environment Assessment	Christina Holloway	BA (Hons); Diploma in Field Archaeology		• MOLA is one of the largest archaeological and built heritage practices in Britain, providing independent heritage advice and services for 43 years; • Registered Organisation with CIfA (Chartered Institute for Archaeologists); • Independent Research Organisation recognised by AHRC; • Member of FAME (Federation of Archaeological Managers & Employers); • MOLA's specialist pre-planning team is involved in over 200 projects each year, assisting clients with planning applications on sites including complex urban developments, large rural schemes and infrastructure projects, producing Historic Environment Assessments, Risk Assessments and Environmental Statements; • Ashley Blair has 10 years' experience as a professional archaeologist and has specialised in archaeological assessments and EIAs for the last two years. • Rupert Featherby has over 25 years' experience as a professional archaeologist, and has specialised in archaeological assessments and EIAs for 11 years. and • Christina Holloway has 18 years' professional archaeology experience and has specialised in archaeological assessments and EIAs for 11 years.
		Ashley Blair	BA (Hons); MA		

	Built Heritage Assessment	Sam Abelman	BA (Hons); MSc	Full Member - Institute of Historic Building Conservation	• Sam Abelman has 15 years' experience as a professional built heritage consultant and has specialised in heritage assessments and EIAs for the 5 years. He is a full IHBC member (Institute of Historic Building Conservation).
simpson | tws	Flood Risk Assessment	Mark Cradduck	BSc (Hons)	Member of the Institute of Civil Engineers (MICE)	• Mark is an Associate at Simpson Associates and a senior member of the Civil Engineering Department, which provides a comprehensive design service for highways, drainage and service infrastructure on a wide variety of projects. • Mark has over 10 years` experience in the construction industry and has been involved in ensuring projects run smoothly and designs are completed within budget and on time. • Mark has experience undertaking Technical Assessments for a mixed range of projects, he has knowledge of a range of computer software for developing detailed designs and experience in undertaking complex calculations and resolving design and development problems. • Mark has experience in successfully completing Flood Risk Assessments for residential & commercial schemes where the site lies in Flood Zones 1, 2, 3a & 3b, together with identifying the necessary mitigation measures and proposed surface water management strategies in compliance with current legislations. • Jack is an engineer at Simpson Associates and a member of the Civil Engineering Department. • Jack has over 3 years` experience utilising a range of computer software programmes to assist with the development of designs and resolution of technical issues through the preparation and analysis of complex ground models, flood analysis, calculations etc. • Jack has experience in successfully completing Flood Risk Assessments for residential & commercial schemes where the site lies in Flood Zones 1, 2, 3a & 3b, together with identifying the necessary mitigation measures and proposed surface water management strategies in compliance with current legislations.
		Jack Hadley	BEng (Hons)	Member of the Institute of Civil Engineers (MICE)	

Technical Appendix 2.1: EIA Scoping Report

Intended for
Aviva Investors Ltd.

Date
December 2019

Project Number
1700003910

READING STATION SHOPPING PARK
EIA SCOPING OPINION REQUEST REPORT

RAMBOLL

Project No.	**1700003910**
Issue No.	**6**
Date	**04/12/2019**
Made by	**Madeleine Truman**
Checked by	**Ben Weldin**
Approved by	**Michelle Wheeler**

Made by:

Checked/Approved by:

This report has been prepared by Ramboll UK Limited with all reasonable skill, care and diligence, and taking account of the Services and the Terms agreed between Ramboll UK Limited and the Client. This report is confidential to the Client, and Ramboll UK Limited accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by Ramboll UK Limited beforehand. Any such party relies upon the report at their own risk.
Ramboll UK Limited disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the Services.

Version Control Log

Revision	Date	Made by	Checked by	Approved by	Description
1	25/06/201	MT	BW	MW	Draft issue for Planning Review
2	05/07/2019	MT	BW	MW	Second issue for Client Review
3	15/07/2019	MT	BW	MW	Third issue for Client Review
4	18/07/2019	MT	BW	MW	Draft Issue to RBC
5	22/11/2019	MT	BW	MW	Responses to Client Review
6	04/12/2019	MT	BW	MW	Final Issue to RBC

CONTENTS

1. INTRODUCTION 1
1.1 Background 1
1.2 Purpose of EIA Scoping Report 2
1.3 Consultation Strategy 2
2. PLANNING CONTEXT 4
2.1 Planning History 4
2.2 Application Documents 4
2.3 Planning Policy 5
3. APPLICATION SITE 8
3.1 Application Site Location 8
3.2 Site Description 8
3.3 Surrounding Environment and Environmental Considerations 9
3.4 Potential Sensitive Receptors 11
4. PROPOSED DEVELOPMENT 12
5. EIA Process and Approach 14
5.1 Need for Environmental Impact Assessment 14
5.2 Content of Environmental Statement 14
5.3 Format of Environmental Statement 15
5.4 Basis of Environmental Impact Assessment 16
5.5 Baseline Conditions 17
5.6 Alternatives 18
5.7 Assessment Methodology 18
6. PROPOSED SCOPE OF ENVIRONMENTAL STATEMENT 26
7. POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS AND LIKELY EFFECTS – SCOPED IN 27
7.1 Socio-Economics 27
7.2 Air Quality 30
7.3 Wind Microclimate 33
7.4 Daylight, Sunlight, Overshadowing and Solar Glare 35
7.5 Townscape and Visual 38
7.6 Built Heritage 41
8. POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS AND LIKELY EFFECTS – SCOPED DOWN 45
8.1 Noise and Vibration 45
9. POTENTIAL NON-SIGNIFICANT ENVIRONMENTAL IMPACTS AND LIKELY EFFECTS – SCOPED OUT 48
9.1 Archaeology 48
9.2 Transport and Accessibility 50
9.3 Ground Conditions 53
9.4 Water Resources and Flood Risk 55
9.5 Ecology 56
9.6 Telecommunication Interference 57
9.7 Climate Change 61
9.8 Major Accidents and Disasters 62
9.9 Health 63
9.10 Waste 64
10. SUMMARY 66

EIA Scoping Opinion Request Report
Reading Station Shopping Park

LIST OF TABLES

Table 1.1: Consultees 3
Table 3.1: Potential Sensitive Receptors 11
Table 5.1: Description of Cumulative Schemes 22
Table 6.1: Proposed Scope of ES 26
Table 7.1: Socio-Economic Study Area 28
Table 9.1: Telecommunication and Broadcast Services Appraisal 58

LIST OF FIGURES

Figure 1.1: Application Site Location 1
Figure 3.1: Application Site Redline Boundary 9
Figure 3.2: Selection of Environmental Considerations 10
Figure 4.1:Building Plots Parameter Plan Including Separation Distances 13

1. INTRODUCTION

1.1 Background

Ramboll UK Ltd. ('Ramboll') has been commissioned by Aviva Investors Ltd (hereinafter referred to as the 'Applicant') to prepare an Environmental Impact Assessment (EIA) Scoping Opinion Request Report (hereafter referred to as the 'EIA Scoping Report') for the proposed development of the Reading Shopping Park site (hereafter referred to as the 'application site').

As shown in Figure 1.1, the application site is located in the Reading city centre, to the north of Reading Railway Station and to the south of Vastern Road (A329), within the administrative boundary of the Reading Borough Council (RBC).

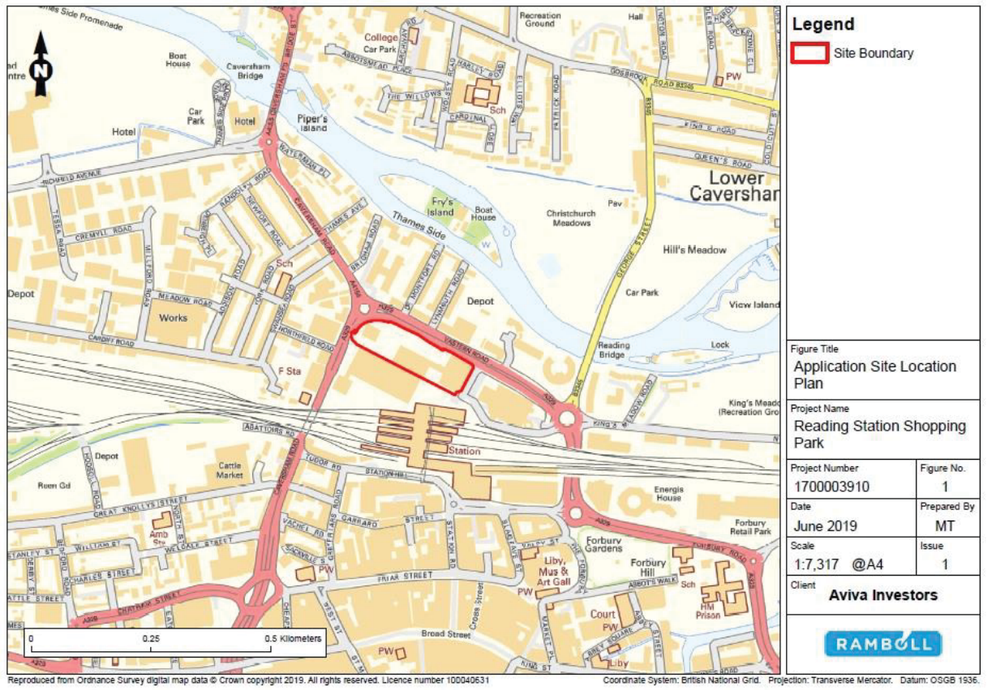


Figure 1.1: Application Site Location

The Applicant intends to submit an application for outline planning permission for the demolition of the existing buildings and the construction of a mixed-use development comprising residential and commercial uses together with associated parking, access arrangements, and landscaping (hereafter referred to as the 'proposed development').

Further explanation of the application site and the proposed development is given in Sections 3 and 4 of this EIA Scoping Report.

It should be noted that the development proposals are still evolving and will be subject to extensive pre-application consultations, but any further revisions are not anticipated to exceed the parameters described in this EIA Scoping Report.

Due to the scale and nature of the proposed development, outlined in Section 4 of this EIA Scoping Report, it is considered that the proposals fall within Schedule 2 (10(b)) of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (hereinafter referred to as the 'EIA Regulations') and that an EIA is required.

The findings of the EIA will be reported in an Environmental Statement (ES), which will accompany the application for outline planning permission for the proposed development. The EIA process is described in Section 5 of this EIA Scoping Report.

1.2 Purpose of EIA Scoping Report

Regulation 15 of the EIA Regulations allows for the Applicant to ask the local planning authority to state in writing their opinion as to the scope of the EIA. This report constitutes a formal request for an EIA Scoping Opinion from the RBC.

The purpose of this EIA Scoping Report is to agree with the RBC the proposed scope of the EIA and the approach to be adopted for the technical assessments to be scoped within the EIA, as well as to facilitate wider consultation with statutory consultees and key stakeholders who may have an interest in the likely significant environmental effects of the proposed development.

This report:

- outlines the planning context in Section 2;
- describes the key characteristics and the surrounding context of the application site in Section 3, providing a plan sufficient to identify the land;
- briefly describes the emerging proposed development for the application site including its anticipated technical capacity in Section 4;
- summarises the key considerations of the EIA process in Section 5 and the approach that will be adopted for the EIA of the proposed development;
- summarises the technical topics considered in scoping the EIA in Section 6;
- identifies the likely significant environmental effects anticipated for the proposed development at this stage in Section 7 and Section 8;
- explains in Section 7 and Section 8, the proposed scope and assessment methodologies that will be adopted to predict the magnitude of potential impacts and the scale of likely effects, and to assess the significance of the residual effects within the EIA; and
- outlines the environmental topic areas in Section 9 that are considered unlikely to result in significant environmental effects and are therefore proposed to be scoped out of the EIA.

This EIA Scoping Report has been developed in accordance to the provisions of Regulation 15 of the EIA Regulations, as well as best practice methods.

During the EIA Scoping process, it is anticipated that the RBC will provide an agreed framework within which the EIA will be undertaken. When adopting a formal EIA Scoping Opinion, the RBC will take into account the views of statutory consultees and other interested parties.

1.3 Consultation Strategy

The process of consultation is a key requirement of EIA and the views of statutory consultees and stakeholders serve to help identify specific issues, as well as highlighting the existence of any information in their possession, or of which they have knowledge, which may be of assistance in progressing the EIA. The key consultees that should be provided the opportunity to contribute to the formal EIA Scoping process include, but are not limited to, those set out in Table 1.1.

Table 1.1: Consultees	
Statutory Consultees	**Non-Statutory Consultees**
Reading Borough Council (RBC)	Thames Water Utilities Limited (TWUL)
Environment Agency (EA)	Neighbourhood/residents associations
Natural England (NE)	Thames Valley Police
Network Rail (NR)	
Highways England	

Each technical assessment chapter of the ES will include a summary of the relevant consultations undertaken as part of the EIA.

As part of the design and EIA process, measures will be developed and discussed with relevant consultees (i.e. NE, EA) and stakeholders to avoid, reduce, mitigate likely adverse effects, or provide enhancements to likely beneficial effects, as appropriate.

2. PLANNING CONTEXT

2.1 Planning History

This section summarises the key planning history of most relevance to the application site and provides background to the existing and consented land uses at the application site. Relevant applications are summarised as follows:

- 87/TP/1105: Development to provide three retail warehouses, one restaurant, together with car parking, internal site roads, service area and landscaping on land at junction of Caversham Road and Vastern Road, Reading. Application permitted with conditions on 18/03/1988.
- 070767: Minor external alterations to shopfront, erection of canopy to front of building, minor external alterations to south-east elevation and siting of secure compound in rear service yard. Application permitted 30/10/2007.
- 071279: Change of use of 2322 m^2 of ground floor from retail (A1) to leisure (D2) or retail (A1). Application permitted 11/04/2008.

The application site has been in retail use since the 1980s and is occupied by two warehouse type buildings (Use Class A1) sub divided into four retail units on the southern and eastern boundaries, as well as a third building occupied by a restaurant unit (Use Class A3) in the north-western corner. The buildings are located within extensive surface level car parking.

2.2 Application Documents

The scope of the application for outline planning permission is due to be agreed with RBC; however, at this stage it is anticipated that the following documents will be required to accompany the application:

- Covering Letter and Application form;
- Community Infrastructure Levy (CIL) Additional Information form;
- RBC Local Floor Space Information form;
- Site Location Plan;
- Existing Buildings and Demolition Drawings;
- Development Parameters (including text and plans);
- Design and Access Statement (including Illustrative Scheme)
- Landscape Statement (including Open Space Assessment and Sustainable Drainage Strategy (SUDS));
- Planning Statement (including Housing Statement and Planning Obligations);
- Transport Assessment (including Travel Plan, Parking Provision);
- Affordable Housing Statement;
- Energy Statement;
- Sustainability Statement;
- Environmental Statement (including the Townscape and Visual, Built Heritage, Flood Risk Assessment, Air Quality Assessment, Archaeology Assessment, Ecology Assessment, Daylight, Sunlight and Overshadowing Assessment, Ground Conditions Assessment, Noise Assessment, Wind Microclimate Assessment, Arboriculture Impact Assessment);
- Site Waste Management Plan;
- Sustainable Design and Construction Statement;
- Statement of Community Consultation;

- Economic Assessment;
- Foul Sewage and Utilities Assessment; and
- Internal Daylight and Sunlight Assessment.

2.3 Planning Policy

The design development of the proposed development will be guided by policy and guidance discussed in this section. It is important to note that although policy and guidance will inform the scope of technical assessments within the EIA, the proposed development's compliance to and performance against these policy directives and guidance (together with associated planning standards/targets) will be appraised within the Planning Statement and Design and Access Statement for the application, and not within the EIA.

Accordingly, the ES will not include an exhaustive discussion of the policies that have informed the scope of the technical topics. Instead, a list of legislation and policies that have been considered in preparing the EIA as a whole, would be appended to ES Chapter 2: EIA Process and Methodology.

2.3.1 National Legislation and Policy

National Planning Policy Framework, 2019

The 2019 National Planning Policy Framework (NPPF)[1] was published and became immediately effective on 19 February 2019, superseding the 2012 NPPF. It sets out the Government's planning policies for England. It provides within a single document the greater part of national planning policy advice and articulates the Government's vision for delivering sustainable development. The NPPF is a material planning consideration.

Planning Practice Guidance

The Planning Practice Guidance (PPG)[2] is an online resource which became effective in March 2014 and is continually updated. The PPG aims to make planning guidance more accessible, and to ensure that the guidance is kept up-to-date.

2.3.2 Regional and Local Policy

The ES will have regard to the following local planning documents:

- Reading Borough Local Development Framework Core Strategy (2015);
- Reading Station Area Framework (2010);
- Reading Central Area Action Plan (2009);
- Reading City Centre Framework (2009);
- Sites and Detailed Policies Document (2015); and
- Draft Reading Borough Local Plan (2017).

Reading Borough Local Development Framework Core Strategy, 2015

The Reading Borough Local Development Framework Core Strategy[3] (adopted in January 2008 and altered in January 2015) states that the application site is located in an area designated as a 'Major Development Area in the Centre'. The adopted Core Strategy indicates that up until 2026, there would be a greater concentration of housing and employment in the centre of Reading, near the station.

[1] Secretary of State for Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework.
[2] https://www.gov.uk/government/collections/planning-practice-guidance
[3] Reading Borough Council, 2015. Reading Borough Local Development Framework. Core Strategy.

Submission Draft Reading Borough Local Plan, 2018

RBC is in the process of producing a new Local Plan, which will contain planning policies to guide development up to 2036. The Submission Draft Reading Borough Local Plan and Proposals Map[4] were submitted to the Secretary of State for Communities and Local Government in March 2018. The application site is located in the Draft Reading Borough Local Plan under Policy 'CR11e: North Station'. The policy states the following:

"There will be retail and leisure development on the ground floor activating the streets and spaces including the new northern station square, with other uses including residential and offices on upper floors. Public car parking will be provided. A high quality route incorporating a green link should be provided through to the Thames. Development should take account of mitigation required as a result of a Flood Risk Assessment."

2.3.3 Policy Designations

Reading Central Area Action Plan, 2009

The application site is located within the boundary of the Reading Central Area Action Plan[5] (RCAAP) which was adopted in 2009. The application site is located in the sub-area Station/River Major Opportunity Area. Policy RC1e states the following:

"There will be retail and leisure development on the ground floor with other uses including residential and offices on upper floors."

The RCAAP states that no one area in the centre is seen as being inappropriate for housing development.

Reading Station Area Framework, 2010

RBC produced the Reading Station Area Framework[6] in order to provide a comprehensive approach to the area's future redevelopment. The framework sets out broad development principles to guide the planned redevelopment of the area, individual sites, the public realm and new transport infrastructure taking into account of existing and emerging policy. The framework should be considered to be a bridge between the provisions of the Core Strategy and the RCAAP, and the more specific requirements of individual site briefs for key sites in the area. The framework has the status of a Supplementary Planning Document, supplementing policy RC1 of the RCAAP, and as such is a material consideration in the determination of planning applications for development in the area.

Strategic Housing Market Assessment, 2016

The Strategic Housing Market Assessment[7] identifies that 699 new dwellings per year is required in Reading up to 2036. A significant proportion of the development to be provided in Reading, as identified within the Local Plan, will be within the central area, including 7,600 homes, 71,000 m^2 of offices and up to 27,000 m^2 of retail and related uses.

Supplementary Planning Documents

The following RBC Supplementary Planning Documents (SPDs) are of relevance:

[4] Reading Borough Council, 2018. Submission Draft Reading Borough Local Plan.
[5] Reading Borough Council, 2009. Reading Central Area Action Plan.
[6] Reading Borough Council, 2010. Reading Station Area Framework.
[7] GL Hearn Limited, 2016. Berkshire (including South Bucks) Strategic Housing Market Assessment.

- Community Infrastructure Levy Charging Schedule, 2015[8]: This document provides information on the charge imposed on new developments to support the provision of infrastructure;
- Statement of Community Involvement, 2014[9]: This document sets out the consultation process for matters relating to planning; and
- Affordable Housing Supplementary Planning Document, 2013: This document provides developers with guidance on the policy and explains developer requirements to contribution to affordable housing.

[8] Reading Borough Council, 2015. Community Infrastructure Levy Charging Schedule.
[9]

3. APPLICATION SITE

3.1 Application Site Location

The application site is located in Reading city centre as shown in Figure 1.1.

The application site's immediate boundaries are defined by the following:

- Vastern Road (A329) to the north, beyond which are residential units and a Scottish and Southern Energy office unit;
- Trooper Potts Way to the east, beyond which is Reading Railway Station car park;
- Network Rail Thames Valley Area site office to the south, beyond which is Reading Railway Station railway lines; and
- Caversham Road to the west, beyond which are a range of commercial, residential and industrial units.

The wider context of the application site is characterised by urban development with a fragmented mixture of commercial, industrial and residential uses.

Reading Railway Station is located 50 m to the south and the River Thames is located 150 m north-west of the application site. The Oxkem Controls of Major Accidents Hazards (COMAH) Establishment is located approximately 1.65 km east of the application site. The application site does not lie within the consultation zones of the COMAH Establishment.

Reading is undergoing significant redevelopment in the area surrounding Reading Railway Station. Of particular relevance to the proposed development, given its close proximity, is the Reading Metropolitan development proposal by Hermes on the current Network Rail Thames Valley Area site office (former Royal Mail site) on Caversham Road, directly adjacent to the application site along its southern boundary. The current Hermes proposals indicate that the tallest building would extend up to 25 storeys in height. It is understood that the planning application for this scheme has been submitted to RBC and is currently being determined.

3.2 Site Description

The application site boundary is presented in Figure 3.1.

The application site covers an area of approximately 1.80 hectares (ha) and lies at an elevation of between approximately 37,8 m and 38,8 m Above Ordnance Datum (m AOD).

The application site comprises three pavilion style buildings and surfaced car parking. The buildings are occupied by commercial units (including an Aldi, The Range, Mothercare and Majestic Wine) and a separate building in restaurant use (TGI Fridays. The units are low rise, approximately 2-3 storeys high. There is currently provision for 280 surface car parking spaces.

The application site access point is off Caversham Road and egress is from Vastern Road (A329). The site is serviced from Trooper Pots Way.

Landscaping forms the southern edge of Vastern Road and eastern edge of Caversham Road. This includes a number of canopy trees, in addition to grass and shrub planting.

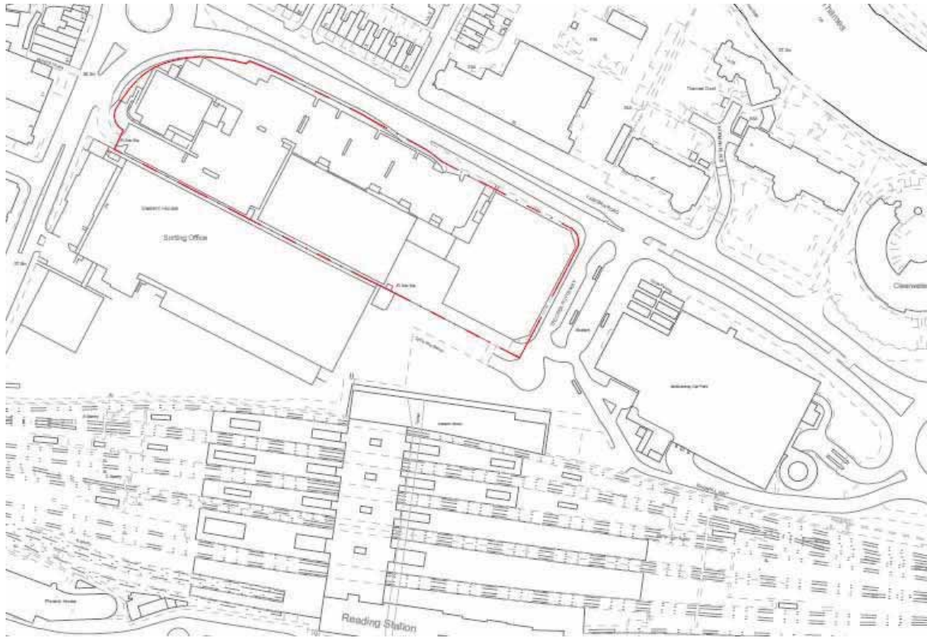


Figure 3.1: Application Site Redline Boundary

3.3 Surrounding Environment and Environmental Considerations

A description of the environmental considerations is presented in each of the technical sections in Sections 7 - 9. A selection of the key considerations is presented spatially in Figure 3.2.

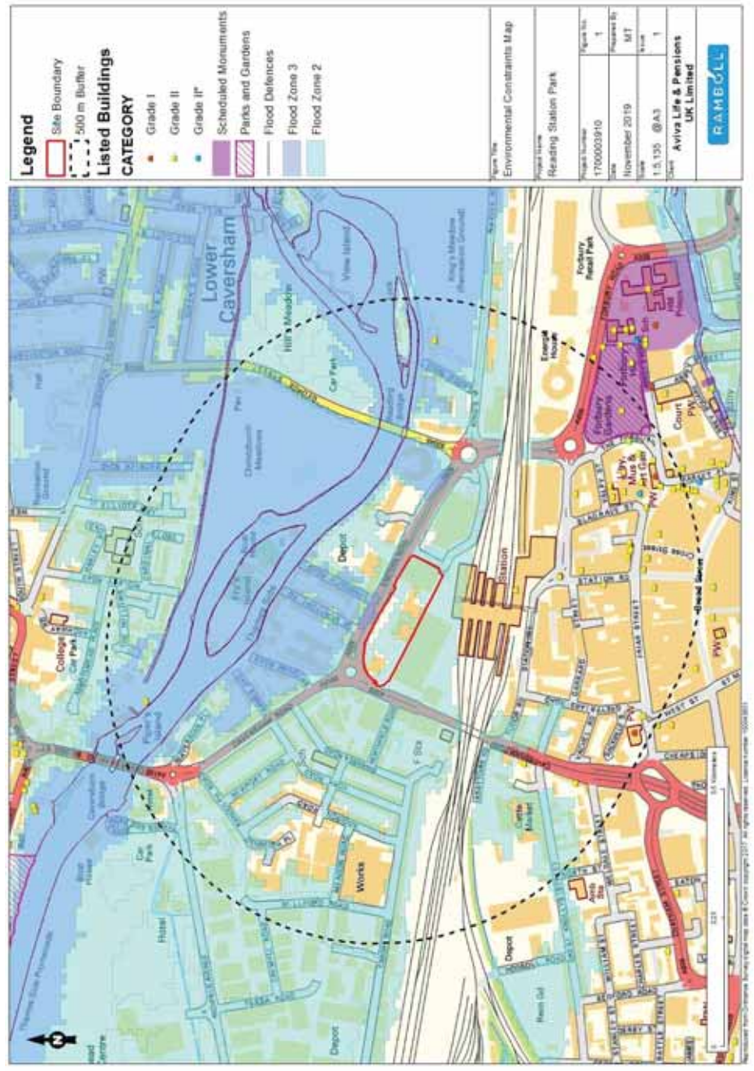


Figure 3.2: Selection of Environmental Considerations

3.4 Potential Sensitive Receptors

A number of receptors have been identified that would potentially be sensitive to effects resulting from the proposed development, as set out in Table 3.1. Further detail is provided as appropriate in Sections 7 - 9.

Table 3.1: Potential Sensitive Receptors

Environmental Consideration	Sensitive Receptors within Study Area
Severance, Fear and Intimidation, Delay, Amenity	• Existing pedestrians and users of the application site and within the surrounding area who would be present during the demolition and construction works and once the proposed development is completed.
Residential Amenity and Health	• Existing residential properties, including those to the north and west • Future residential properties on-site, as well as those within identified cumulative schemes
Non-residential Amenity, Employment	• Existing commercial and retail uses on-site and within the study area
Community Facilities Amenity and Capacity	• Existing primary and secondary schools • Existing healthcare facilities – GPs, dentists and hospitals • Existing community facilities, including leisure centres and local community centres • Existing open space and amenity space
Townscape Character, Views and Heritage Setting	• Existing townscape character areas (including Reading Tall Building Strategy Character Area 22: Vastern Road) • Heritage assets including listed buildings, registered parks and gardens, listed buildings and structures
Transportation Facilities and Capacity	• Reading Railway Station (overland rail) • Reading North Bus Station (bus) • Road network (drivers) • Pedestrian and cycling paths and routes (pedestrians, cyclists)
Controlled Waters Quality and Flood Risk	• River Thames • Ground water • Underlying geology and hydrology (including the Principal Aquifer)
Ecology	• Habitats, including trees and vegetation within and adjacent to the application site • Protected species • River Thames and associated habitat and species
Air Quality and Climate	• On and off-site residential receptors • Demolition and construction workers • Local air quality (Air Quality Management Area (AQMA))
Contamination	• Demolition and construction workers • Underlying geology and hydrogeology – primarily Principal Aquifer • River Thames
Resource consumption and demand	• Foul and potable water

4. PROPOSED DEVELOPMENT

The development proposals, which are currently being refined through the on-going pre-application design and consultation processes, are expected to deliver the comprehensive redevelopment of the application site.

The proposed development is anticipated to comprise of the following:

- Demolition of the existing buildings;
- Construction of a single level basement to allow for any necessary below ground surface water attenuation;
- Construction of approximately four new buildings, up to approximately 112.9 mAOD, indicatively up to 23 storeys;
- Delivery of a total maximum floorspace of up to 115,000 m^2 gross external area (GEA), which could include:
  - up to a maximum of approximately 1,000 new residential units within a maximum floorspace of up to 100,000 m^2 GEA, provided within a range of apartment buildings of varying scale and a mix of unit sizes, including a proportion of affordable homes;
  - up to a maximum floorspace of approximately 7,000 m^2 GEA flexible retail, leisure and community uses (Use Class A1-A5, D1-D2), with a minimum of 2,000 m^2 Use Class A1-A5, D1-D2 to be provided;
  - up to a maximum floorspace of approximately 115,000 m^2 GEA office use (Use Class B1a);
  - up to a maximum floorspace of approximately 8,000 m^2 GEA hotel use (Use Class C1);
- Delivery of residential car parking provision (including disabled parking provision) in accordance with Approved Document M of the Building Regulations 2010 Part M4 Category 3. The remainder of uses would be designed in accordance with Part M4 Category 2.
- Delivery of cycle storage in line with current policy requirements;
- Delivery of a mix of public and private open space, including children's playspace equivalent to a minimum of approximately 10 % of the application site area.

New pedestrian and cycle routes would be provided within the proposed development creating permeability through the application site. In addition, vehicular access would be provided.

Although the design proposals are still evolving, is it anticipated that any revisions to the proposals described above would be likely to fall within the parameters presented within this EIA Scoping Report.

The draft 'minimum separation distances' parameter plan is presented in Figure 4.1.



Figure 4.1:Building Plots Parameter Plan Including Separation Distances

5. EIA PROCESS AND APPROACH

5.1 Need for Environmental Impact Assessment

EIA is a formal process by which the effects of certain types of development projects on the environment are identified, assessed and reported upon and mitigation identified in order for the effects to be taken into account by the relevant competent authority when considering whether to grant planning permission.

As noted at Section 1, the proposed development falls within Schedule 2 (10(b)) of the EIA Regulations and an EIA is required.

The EIA Regulations set out in general terms the content of an ES and allow an Applicant to obtain a formal EIA Scoping Opinion from the relevant planning authority regarding the issues to be considered within the EIA for a specific development proposal; what information should be contained in the ES; and what effects are likely to be more significant than others. EIA best practice encourages applicants to consult other organisations likely to have an interest in a development proposal.

5.2 Content of Environmental Statement

The specified information to be included in the ES of the proposed development will comply with Regulations 18(3) - 18(5) and Schedule 4 of the EIA Regulations. In summary the ES will present the following:

- A description of the application site, its location and surrounding context and associated environmental sensitivities – baseline conditions;
- A description of the proposed development containing information on the:
  - physical characteristics and land use requirements of the proposed development during the demolition and construction works and the completed development;
  - main characteristics of the operational stage of the proposed development including energy demand, nature and quantity of the materials and natural resources used (water, land, soil and biodiversity);
  - expected residues and emissions (water, air, soil, sub-soil pollution, noise, vibration, light, heat, waste) resulting from the construction and operation of the proposed development;
- A description of the reasonable alternatives studied by the Applicant, as relevant to the proposed development, and the reasons for the selection of the chosen option, including a comparison of the environmental effects;
- A description of the relevant aspects of the baseline and an outline of the likely evolution thereof without the implementation of the proposed development (see ‘Do-Nothing scenario’ in Section 5.4 and 5.5) as far as natural changes from the baseline can be assessed;
- A description of the factors of the environment likely to be significantly affected by the proposed development, including:
  - population;
  - human health;
  - biodiversity (fauna and flora);
  - land (land take);
  - soil;
  - water (quantity and quality);
  - air;
  - climate (greenhouse gas emissions, adaptation to climate change);
  - population vulnerability to major accidents and disasters;

  - material assets, including the architectural, archaeological and landscape assets;
  - the interaction between the above factors;
- A description of the likely significant effects of the proposed development on the environment, which should indicate the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, beneficial and adverse effects of the proposed development resulting from the:
  - construction and existence of the development, including demolition works;
  - use of natural resources, in particular land, soil, water, biodiversity and the sustainability of resources where possible;
  - emission of pollutants such as noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;
  - risk to human health, cultural heritage or the environment (due to accidents or disasters);
  - accumulation of effects with other existing and/or approved projects, taking into account existing environmental problems or the use of natural resources;
  - impacts on climate (nature and magnitude of greenhouse gas emissions) and the vulnerability of the proposed development to climate change;
  - technologies and substances used;
- A description of the forecasting methods used to assess the effects on the environment including details of difficulties encountered and the main uncertainties;
- A description of mitigation measures to avoid, prevent, reduce or where possible, offset any significant adverse effects on the environment and, where appropriate, any proposed monitoring arrangements for both the demolition and construction stage and the completed development stage;
- A non-technical summary of the information provided above;
- A reference list detailing sources used for the descriptions and assessments included in the ES; and
- A statement outlining the relevant experience and or qualifications of the experts who have prepared the ES.

5.3 Format of Environmental Statement

The ES will comprise the following suite of documents:

- Non-Technical Summary
  - Individual volumes of the ES will be summarised within a Non-Technical Summary (NTS), which will outline the key findings of the EIA, presented in non-technical language to assist the reader;
- Volume 1: Main Environmental Statement Report comprising:
  - Five introductory chapters (Introduction; EIA Process and Methodology; Alternatives and Design Evolution; Proposed Development Description; and Demolition and Construction Environmental Management);
  - Technical assessment chapters which will report on the EIA of the proposed development as described in the introductory chapters, as well as in documents that will accompany the application, as explained in Section 3;
  - Two concluding chapters (Intra Cumulative Effects and Residual Effects);
- Volume 2:
  - Townscape and Visual Impact Assessment accompanied by Accurate Visual Representations (AVRs);
  - Built Heritage Assessment;

- Volume 3: Technical Appendices including amongst others;
  - Preliminary Ecological Appraisal (PEA); Arboriculture Impact Assessment (AIA); Historic Environment Assessment (HEA); Preliminary Risk Assessment (PRA); and Flood Risk Assessment (FRA).

5.4 Basis of Environmental Impact Assessment

The EIA will be undertaken based on the proposed development as described in the introductory chapters of the ES (as described in Section 5.3 of this report).

It is anticipated that the outline planning application for the proposed development will seek to reserve all matters associated with land use; scale and massing; internal layout; appearance, and landscaping. Access is anticipated to be fixed.

At this stage it is anticipated that the reserved matters would be defined by means of the following:

- Development Parameters (including plans and statements);
- Maximum area schedule; and
- Indicative residential unit and tenure mix.

At this stage it is anticipated that the parameters identified and assessed through the EIA will likely consider the following:

- Development Footprint;
- Site Access and Site Egress;
- Minimum Separation Distances;
- Maximum Heights (m AOD) for Residential and Non-Residential uses; and
- Basement Footprint.

The parameter plans will be accompanied by a parameter statements and supported by a Design & Access Statement and design code, which will present design principles for the proposed development and landscape proposals, indicative material palette, as well as development commitments. Due to the indicative nature of the material palette, the EIA will place no reliance on this information.

The above would define the maximum quantum of individual use classes (and minimum in the case of 2000 m^2 GEA of Use Classes A1-A5, D1-D2) and provide a controlling set of design principles within which the reserved matters will be brought forward.

To ensure that the EIA is proportionate, it will assess the worst-case development for each technical discipline scoped within the EIA.

At this stage, it is anticipated that the following supporting documents will be considered during the preparation of the EIA for the proposed development, although it is noted that the scope of the planning submission documents is still to be agreed with the RBC:

- Design and Access Statement, including an outline lighting strategy and outline waste strategy which will describe the key principles to be adopted within the proposed development;
- Foul Sewage and Utilities Assessment which will summarise the foul sewage and utility connections required and the predicted consumption of water and energy;
- Energy Statement which will include, amongst others, a high-level assessment of the proposed development's energy demand and a high-level assessment of the energy efficiency and renewable technologies that could be adopted in the proposed development;
- Sustainability Statement which will describe the options available to embed sustainability into the proposed development at reserved matters stage;

- Transport Assessment (TA); and
- Outline Waste Management Plan which will describe the demolition and construction waste management measures and controls that would be adopted for the proposed development; and
- Stand-alone environmental reports, which will be appended to the ES (see Sections 9 and 10).

Where information is not available due to the outline nature of the proposed development, the EIA will make reasonable assumptions which will be clearly set out and based on professional judgement and experience of developments of a similar nature and scale.

5.5 Baseline Conditions

Consideration will be given, as appropriate (and subject to programmed implementation), within the EIA to the following existing and future site conditions:

- As identified during site surveys and desk-based data collection (Existing Baseline);
- In the event that the proposed development does not proceed (the 'Do Nothing' scenario);
- At the time the proposed development is completed and becomes operational (Future Baseline); and
- In combination with other existing and/or approved development in the cumulative study area of the application site (Cumulative Future Baseline as discussed in Section 5.7.4)).

5.5.1 Baseline – Existing and Future (Opening Year)

The EIA will predict the likely change in environmental conditions as a result of the proposed development. The assessment of the scale and nature of a likely change will be undertaken against a reference condition, known as the 'existing baseline'. In most cases, the existing baseline represents the environmental condition of the application site and the surrounding area at the time of the assessment, although it may also include a projected environmental condition at a defined point in the future, the 'future baseline'.

The existing baseline for the EIA will be taken as the existing application site and its immediate surrounds, with the exception of transport and accessibility; air quality; and noise and vibration where a future baseline, namely the year of the proposed development's completion, will be considered.

Various baseline surveys (Extended Phase 1 Habitat Survey, PRA, Noise Survey) will be undertaken to characterise the existing baseline conditions at the application site.

Additional assessments and surveys undertaken during the course of the EIA process will utilise information already available, as well as new information provided in response to this EIA Scoping Report. Collectively the information will establish an existing baseline against which changes introduced by the proposed development will be assessed.

The future baseline will be predicted by means of third party data, modelling and application of future growth factors as appropriate for air quality, noise and transport.

5.5.2 Do Nothing

The 2017 EIA Regulations stipulate that the ES should consider the likely evolution of the existing application site conditions in the absence of the proposed development (i.e. the 'Do Nothing Scenario'). The evolution of application site conditions will be qualitatively reviewed within ES Chapter 3: Alternatives and Design Evolution presented within ES Volume 1.

5.6 Alternatives

The EIA Regulations require that the ES provides an outline of the reasonable alternatives to the proposed development considered by the Applicant and the reasons for the selection of the preferred option. The alternatives considered in the course of the design process, such as site location, land uses, layouts and design evolution, will be presented. The environmental factors that informed each of the options would be presented as relevant.

5.7 Assessment Methodology

5.7.1 Approach

The EIA will be undertaken in line with best practice guidance, which includes the following publications:

- England and Wales: Online National Planning Practice Guidance[10];
- Department for Transport: Design Manual for Roads and Bridges Volume 11: Environmental Assessment[11], 2008;
- Department of the Environment, Transport and the Regions (DETR) Mitigation Measures in Environmental Statements, 1997;
- Institute of Environmental Assessment: Guidelines for Environmental Assessment of Road Traffic[12], 1994;
- Institute of Environmental Management and Assessment: Guidelines for Environmental Impact Assessment[13], 2004;
- Institute of Environmental Management and Assessment: The State of Environmental Impact Assessment Practice in the UK, 2011;
- Department for Communities and Local Government (DCLG): Amended Circular on Environmental Impact Assessment (consultation paper)[14], 2006;
- DCLG: Environmental Impact Assessment: A guide to good practice and procedures (consultation paper)[15], 2006;
- Department of the Environment (DOE) Good Practice Guide - Preparation of Environmental Statements for Planning Projects that Require Environmental Assessment, 1995;
- European Commission: Environmental Impact Assessment – Guidance on Scoping, 2001
- DCLG: Guidance for Environmental Impact Assessment. On-line Resource[16], 2014;
- Office of the Deputy Prime Minister: Environmental Impact Assessment: A Guide to Procedures, 2000;
- Institute of Environmental Management and Assessment: Shaping Quality Development, 2015[17]; and
- Institute of Environmental Management and Assessment: Special Report into the State Environmental Impact Assessment Practice in the UK[18], 2011.

10 http://planningguidance.planningportal.gov.uk/blog/guidance/environmental-impact-assessment
11 Department for Transport, 2008. Design Manual for Roads and Bridges Volume 11: Environmental Assessment.
12 Institute for Environmental Assessment (IEMA), 1994. Guidelines for Environmental Assessment of Road Traffic [Now the Institute of Environmental Management and Assessment.
13 Institute of Environmental Management and Assessment (IEMA), 2004, Guidelines for Environmental Impact Assessment. IEMA.
14 Department for Communities and Local Government, 2006. Amended Circular on Environmental Impact Assessment: A consultation paper. DCLG.
15 Department for Communities and Local Government, 2006. Environmental Impact Assessment: A guide to good practice and procedures – a consultation paper. DCLG.
16 Department for Communities and Local Government, 2014. Guidance for Environmental Impact Assessment. DCLG.
17 Institute of Environmental Management and Assessment, November 2015. Shaping Quality Development.
18 Institute of Environmental Management and Assessment, 2011. The State of Environmental Impact Assessment Practice in the UK.

The EIA will employ a range of tools and approaches aimed at predicting the likely scale and nature of environmental effects. Some technical assessments will rely on mathematical models which provide a numerical estimate of the size of an environmental change or impact, such as the levels of noise or air pollutants likely to arise from net additional traffic, or from heating plant emissions. Other technical assessments will rely on map-based techniques to plot the extent of land use change or habitat loss or use illustrative methods to communicate how the proposed development might appear from a particular viewpoint.

The predictions in the EIA will indicate the scale and nature of the proposed development's likely effects, to enable informed planning decisions about the likely environmental outcomes of the proposed development; however, these predictions may be subject to a degree of uncertainty. As such, the tools employed, and the assumptions made in each case will be developed accordingly and set out clearly.

As a general rule, the EIA will assess the potential environmental impacts and effects that are likely to arise as a consequence of the proposed development. Any embedded mitigation developed through the proposed development's evolution will be considered within this assessment, and a level of significance will be applied to the likely effects.

Any additional mitigation measures and/or enhancement measures that would need to be incorporated to reduce or off-set likely effects, will then be discussed and the assessment would be undertaken again as necessary to incorporate the identified measures. The outcome of likely residual effects following the incorporation of additional mitigation and/or enhancement measures would then be presented and consideration will be given as to whether any proposed monitoring arrangements would be appropriate.

It is anticipated that the demolition and construction programme of the proposed development would be sequenced over an approximate 3.5 - 4 year period. The EIA will assess and report on the completed development as a whole and not the phased development. This is because no significant delay (i.e. of more than 12 months) is anticipated between the development phases. In addition, a phased assessment is not proposed to be undertaken for the following reasons:

- A robust phasing strategy will be prepared by the Applicant based on detailed consideration of receptors within the immediate surroundings of the application site, as well as newly introduced receptors (e.g. residents of completed residential units); and
- The impacts and effects that are likely to arise during the demolition and construction stage would not materially differ on a phase-by-phase basis and therefore robust assessments would be presented in each technical chapter.

5.7.2 Demolition and Construction Stage Effects

As mentioned in Section 5.3, ES Volume 1 will contain an introductory chapter (Chapter 5: Demolition and Construction Environmental Management) which will describe the proposed development's anticipated development programme and the key activities that are expected to be undertaken during demolition and construction works. The information will form the basis for the assessment of the proposed development's demolition and construction effects.

The chapter will not assess the significance of likely effects during the demolition and construction works, as this will be addressed within subsequent individual technical assessment chapters of the ES, where relevant.

Understanding of demolition and construction works (methods, techniques, equipment and phasing) is rarely available at the outline planning application stage. Where this is the case, 'realistic' scenarios will be adopted, with assumptions clearly identified in the relevant technical chapters of the ES. This will be based on demolition and construction methodologies for the application site which can be used as a benchmark that would not be exceeded. Outputs will be

identified that can be the subject of controls. It should be noted that in using this approach, actual construction methods may be more benign.

The chapter will also outline the measures that would be adopted/incorporated as part of the development proposals to avoid, reduce and mitigate typical environmental impacts and effects during the demolition and construction stage. As such the chapter will provide a framework Construction Environmental Management Plan (CEMP) for the proposed development, which will define policies, a management framework and procedures for the implementation of specific measures and controls. The framework CEMP will be a key form of embedded mitigation for the proposed development and would form the basis for a CEMP to be secured by means of a suitably worded planning condition to be imposed by the RBC.

5.7.3 Completed Development Stage Effects

As mentioned in Section 5.3, ES Volume 1 will contain an introductory Chapter 4: Proposed Development Description which will describe the proposed development's physical characteristics, proposed access arrangements, landscaping strategy, proposed utilities and plant, estimated emissions and arisings, operational provisions and controls, as well as technical capacity, by reference to the defined parameters, commitments and design code. The description will include mitigation measures that have been embedded within the development proposals. The information will form the basis for the assessment of the proposed development's completed development (and operational) effects.

5.7.4 Cumulative Effects

The EIA Regulations require that, in assessing the effects of a particular development proposal, consideration is also given to the cumulative effects which might arise from the proposal in conjunction with other existing and/or approved development proposals in the vicinity. The following two types of Cumulative Effects will be considered within ES Volume 1 and 2:

- Intra-Project effects of different types of impact from the proposed development on particular receptors at or surrounding the application site. Potential impact interactions include the combined effects of noise, dust and visual impacts during demolition and construction of the proposed development on a particular sensitive receptor; and
- Inter-Project effects which are combined effects generated from the proposed development with other existing and/or approved developments. These other developments may generate their own individually insignificant effects but when considered together could amount to a significant cumulative effect, for example, combined townscape and visual impacts from two or more (existing and/or approved) developments.

Intra-Project Cumulative Effects

Impact interactions from the proposed development itself on particular receptors at or surrounding the application site will be considered during the demolition and construction works, and also once the proposed development is completed. It is possible; however, that depending on the predicted individual 'completed developments' impacts, only the demolition and construction work effects will be considered as often they generate the greatest likelihood of interactions occurring and hence significant effects.

Dependent on the relevant sensitive receptors, the assessment will focus either on key individual receptors or on groups considered to be most sensitive to potential interacting effects. The criteria for identifying those receptors which are considered to be potentially sensitive will include existing land uses, proximity to the demolition and construction works and the application site, and likely duration of exposure to impacts. It should be noted that only minor to major residual effects will be considered within this assessment.

With regard the potential for cumulative effects to occur, it is anticipated that standard mitigation measures as detailed in a site-specific CEMP (such as dust suppression measures, use of quiet plant, restrictions on working hours) can be applied to prevent temporary unacceptable effects from the interaction of effects occurring on-site.

Cumulative effects will be assessed using professional judgment. Due to the 'cross-boundary' and 'overlapping' nature of intra-project cumulative effect across various environmental topics, and the assessment approach adopted, the results of intra-project cumulative effects will be holistically presented within a discrete assessment chapter and not within each of the technical assessment chapters. This will avoid unnecessary duplication and repetition and presents a proportionate approach.

Inter-Project Cumulative Effects

To ensure that Inter-Project (in-combination) cumulative effects are assessed as comprehensively and realistically as possible, the EIA would consider other 'approved projects'. These approved projects are:

- Development proposals for which planning permission has been granted (e.g. resolution to grant issued or signed legal agreement); AND
- located within 1 km of the redline boundary of the application site; AND
- 10,000 m^2 GEA in floor area or would give rise to >150 residential units or relevant large-scale infrastructure projects.

For those cumulative schemes which have had subsequent amendments (minor and non-material), the latest known iteration will be assessed with the EIA. For those cumulative schemes were reserved matters applications have been submitted pursuant to an outline consent, the outline consent will be considered as this represent the worst case.

The schemes which fall within the spatial and quantum parameters defined above, and which are likely to give rise to significant cumulative effects in combination with the proposed development, will be quantitatively assessed on a topic by topic basis, subject to the availability of scheme information in the public domain. Where information is not available, a qualitative assessment will be undertaken.

The results of the inter-project cumulative effects will be presented in each of the technical assessment chapters of the ES.

At this stage, four cumulative schemes have been identified that comply with the above selection criteria, as presented in Table 5.1, and will be assessed quantitatively in the ES.

In addition to the approved projects, a further four schemes have been identified which are not yet 'approved', but are likely to be approved in the near future and are therefore classified as 'reasonably foreseeable' and due to their scale and proximity to the proposed development, warrant inclusion within the EIA for consideration of potential in combination cumulative effects. The first of these, scheme five, is the former Royal Mail site scheme (80 Caversham Road) which lies adjacent to the southern boundary of the application site. Given its close proximity, this scheme will also be considered quantitatively in the ES. Schemes six-eight will be assessed qualitatively.

Table 5.1: Description of Cumulative Schemes

No	Address	App. Ref.	Description of Cumulative Scheme	Assessment Approach
Approved Projects (including Resolution to Approve)				
1	Former BMW Site – Thames Quarter	190809	Erection of a part 13-storey, part 23 storey building comprising 335 apartments in a mix of studio, one-bedroom, two-bedroom and three-bedroom units, residents' lounges, tech-hub, dining room, and cinema room, various rooftop outdoor amenity spaces, concierge/reception with coffee meeting area, gym, residents' storage facilities, post room, ancillary back-of-house facilities, 335 secure cycle parking spaces, car parking spaces, landscaping, and associated works.	Quantitative
2	Station Hill	151426 and 151427 (as varied by 190441 and 190442 which relate to non-compliance with conditions)	Outline application with all matters reserved for mixed use redevelopment of Plot E of the Station Hill site and neighbouring Telecom House site (48 to 51 Friar Street and 4 to 20 Garrard Street) to comprise the demolition of existing buildings and erection of new buildings/ structures to provide residential units, a range of town centre uses including retail and related uses (Use Class A1 - A5), associated infrastructure, public realm works and ancillary development.	Quantitative
		190465	Application for the approval of reserved matters (access, scale, appearance, layout and landscaping) for Plot E within the development site known as Station Hill submitted pursuant to Outline Planning Permission ref. 190442 and submission of details for approval pursuant to conditions attached to that permission. The proposals comprise the construction of a 12 storey building (plus basement storey) containing 370 'Build to Rent' residential units (Use Class C3), 1,151 m^2 (GEA) of flexible retail floorspace (Use Classes A1, A2, A3, A4, A5), cycle storage, car parking, servicing, plant areas, landscaping, new public realm and other associated works (amended description).	
		190466	Application for approval of reserved matters (access, scale, appearance, layout and landscaping) for Plot F within the development site known as Station Hill submitted pursuant to Outline Planning Permission ref. 190441, and submission of details for approval pursuant to Conditions attached to that permission. The proposals comprise construction of a 12 storey (plus basement storey) building containing 168 Build to Rent residential units (Use Class C3), 390 m^2 (GEA) of flexible retail floorspace (Use Classes A1, A2, A3, A4, A5, D2), 656 m^2 (GEA) of leisure floorspace (Use Class D1 or D2), cycle storage, car parking, servicing, plant areas, landscaping, new public realm and other associated works (amended description).	

Table 5.1: Description of Cumulative Schemes

No	Address	App. Ref.	Description of Cumulative Scheme	Assessment Approach
3	Kenavon Drive	170509	Demolition of the two existing retail (Homebase and former Toys R Us) structures and the erection of new buildings ranging between 2 and 11 storeys in height, providing 765 (18 x studio, 302x1, 409x2 and 36x3- bed) residential units (Class C3), 5 commercial units (1x flexible Class A1-A4, B1 or D1-D2, 1x flexible D1 or D2, 1x flexible Class A1- A5, 1x flexible Class A3 or A4, 1x flexible A1-A5 or D1-D2 uses), various works to the public realm, including a new riverside square, landscaping, accesses, parking and associated works.	Quantitative
4	Land between Weldale Street and Chatham Street, Reading	170326	Demolition of all existing buildings (including 3 retail units) and structures, and erection of new buildings ranging between lower ground and 4 storeys to lower ground and 11 storeys in height, providing 427 (233x1, 182x2 & 12x3-bed) residential units (Class C3) and 1 flexible ground floor retail shop (Class A1) or restaurant and cafe (Class A3) unit, together with new public realm, landscaping, accesses, parking and associated works (amended description).	Quantitative
5	29 Station Road Reading, RG1 1LG	181930	Demolition of the existing vacant 6-storey retail and office building and erection of a replacement basement and part 4, part 22 (with rooftop plant above) storey building to provide flexible retail (Class A1, A2, A3, A4 or A5) use at part ground floor level, a 135- bedroom hotel (Class C1) at 1st to 16th floors and offices (Class B1a) at 17th to 21st floors, associated servicing from Garrard Street and other associated works(amended description).	Qualitative
6	52 to 55 Friar Street and 12 Greyfriars Road, Reading RG1 1DX	162210	Demolition of existing building and structures (Class A1) and erectionof three new buildings ranging between 6 - 12 (and basement) storeys in height to provide 135 (1xstudio, 54x1, 73x2 & 7x3-bed) residential units (Class C3), a flexible Class A1-A5 use at ground floor level fronting onto Friar St, a flexible Class A1-5, B1(a) or D2 (gym only) use at ground floor level fronting onto Greyfriars Rd, with associatedaccess, parking, servicing, landscaping and engineering works.	Quantitative
Reasonably Foreseeable Schemes				
7	Network Rail Thames Valley Area site office/ Former Royal Mail site	182252 Validated (allocation CR11e)	Outline application considering access, landscaping, layout and scale involving the demolition of all existing buildings and structures (Classes B1a and B2) and erection of new buildings ranging between basement and 2 – 25 storeys in height, providing 658 (79 x studio, 227x1, 335x2 & 17x3-bed) residential units, office accommodation (Class B1a), flexible ground floor Class A1-3 uses, a community	Quantitative

Table 5.1: Description of Cumulative Schemes

No	Address	App. Ref.	Description of Cumulative Scheme	Assessment Approach
			centre(Class D1), health centre uses (Class D1) and various works including car parking, servicing, public and private open space, landscaping, highways, pedestrian and vehicular access and associated works.	
8	Former Scottish and Southern Energy site	Awaiting application (allocation CR11e)	Demolition of a number of structures on the site and the erection of a new residential scheme (up to 210 units), with a max height of 11 storeys (up to 36 m above ground level) including a new north south pedestrian link, connecting Christchurch Bridge to Vastern Road towards the station as well as drainage infrastructure and landscaping.	Qualitative
9	Broad Street Mall Broad Street Reading, RG1 7QG	182137 (allocation CR12c)	Construction of three residential buildings (Use Class C3) ranging in height from 5 to 22 storeys (Site E to provide 52 units, Site B to provide 139 Units and Site A to provide 172 units) above Broad Street Mall and provision of a podium level amenity area; construction of an 18 storey building on South Court comprising ground and first floor retail (Use Class A1/A2/A3) and residential over upper floors (Use Class C3, Site C to provide 99 units); change of use and extension of Quadrant House to form a 3 storey residential building (Use Class C3, Site D to provide 31 units); and creation of three ground floor retail units (Use Class A1/A2/A3) fronting Dusseldorf Way and Queens Walk.	Qualitative

The number of schemes to be considered for each technical assessment presented in ES Volume 1 or 2 will vary, depending on the likelihood for significant in-combination environmental effects to arise. Where a cumulative scheme has been excluded, this will be clearly stated within each technical chapter with justification for the exclusion.

It is requested that the RBC review Table 5.1 and confirm whether the list of cumulative schemes is acceptable.

Following receipt of feedback from the RBC and before submission of the application for the proposed development, if any relevant additional cumulative schemes have been consented during this period, they will be assessed qualitatively within the ES.

5.7.5 Significance

In assessing the significance of likely and residual effects, regard will be had to the:

- sensitivity, value or susceptibility of the environmental receptor to the change or impact, based on a scale of high, medium or low;
- magnitude of the potential impact, based on a scale of high, medium, small and unknown;
- likelihood of the effect occurring, based on a scale of certain, likely or unlikely;
- duration of the effect, based on a scale of long, medium and short term (temporary);
- geographical extent of the effects at local, borough, regional, national and international levels; and
- reversibility of the effect, being either reversible or irreversible.

Unless indicated otherwise within a technical assessment the duration of the effect would be defined as follows:

- Short term: up to 5 years;
- Medium term: 5-10 years; and
- Long term: 10 years +.

In order to provide a consistent approach to the presentation of the scale and nature of residual effects, the following terminology will be used throughout the ES:

- **Nature / Type of Effects**
  - **Adverse**: detrimental or negative effect to an environmental resource or receptor;
  - **Neutral**: an effect that on balance, is neither beneficial nor adverse to an environmental resource or receptor; and
  - **Beneficial**: advantageous or positive effect to an environmental resource or receptor.
- **Scale of Effects**
  - **Negligible**: effects which are beneath levels of perception;
  - **Minor**: slight, very short or highly localised effects;
  - **Moderate**: limited effects (by magnitude, duration, reversibility, value and sensitivity of receptor) which may be considered significant; and
  - **Major**: considerable effect (by magnitude, duration, reversibility, value and sensitivity of receptor, which may be more than of a local significance or lead to a breach of a recognised environmental threshold, policy, legislation or standard).

Based on the above, residual effects of moderate and major scale may be considered significant, but would be dependent on the relevant technical assessment, as well as the existence of published assessment guidance. Where published assessment guidance is not definitive in respect of categorising/determining significant environmental effects, professional judgement will be applied, taking into account the duration, extent and context of the effect, to determine significant effects. Significant effects would be considered material to the planning decision making process.

Where there are any deviations to the terminology set out above (e.g. due to published industry guidance or professional judgement), this will be clearly identified and explained within the relevant ES chapter.

6. PROPOSED SCOPE OF ENVIRONMENTAL STATEMENT

This section considers the potential environmental impacts and likely effects that are at this stage anticipated to arise in connection with the proposed development and therefore the technical topics proposed for inclusion within the ES.

Initial appraisals for each technical topic have been undertaken to determine the existing baseline conditions and as a result, the potential for each technical topic to exhibit significant environmental effects.

Table 6.1 presents the technical topics considered in scoping the EIA.

Table 6.1: Proposed Scope of ES

Scoped In Topics	Scoped Down Topics	Scoped Out Topics
Socio-Economics	Noise and Vibration	Archaeology
Air Quality	Daylight, Sunlight, Overshadowing and Solar Glare	Transport and Accessibility
Wind Microclimate		Ecology
Built Heritage		Water Resources and Flood Risk
Townscape and Visual		Ground Conditions
		Arboriculture
		Climate Change
		Health
		Major Accidents and Disasters
		Waste
		Telecommunication Interference

The methodology and scope of the ‘scoped in’ and ‘scoped down’ topics is addressed in Sections 7 and 8 respectively. Section 9 addresses the ‘scoped out’ topics that are unlikely to generate significant effects.

7. POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS AND LIKELY EFFECTS – SCOPED IN

This section summarises the potential significant environmental impacts and likely effects that are at this stage anticipated to arise in connection with all stages of the proposed development and will therefore be addressed in the EIA. It sets out the approach to be adopted in each instance, the scope of technical assessments to be undertaken and the assessment methods proposed.

7.1 Socio-Economics

A Socio-Economic assessment will be presented in ES Volume 1. The assessment will consider the potential socio-economic impacts of the proposed development; particularly the impact on employment, housing, population and community facilities. The assessment will be undertaken in the context of the existing site conditions, existing and future socio-economic baseline conditions in the study area and the relevant policy framework.

The proposed development will create a range of employment opportunities both through the demolition and construction stage, and once the proposed development is completed and operational. The proposed new homes and non-residential floorspace will bring new residents and on-site employees to this area of Reading, introducing additional socio-economic effects such as increases in economic output and demand for community infrastructure (e.g. healthcare and schools).

7.1.1 Site Information and Baseline Conditions

The application site is located within the boundary of the Reading Central Area Action Plan (RCAAP) which was adopted in 2009. The application site is located in the sub-area Station/River Major Opportunity Area. Policy RC1e states that the area to the north of the station would provide retail and leisure development on ground floor with other uses including residential on upper floors. The RCAAP states that no one area in the centre is seen as being inappropriate for housing development.

A desktop study will be undertaken, which will include a review of available information to determine the existing baseline conditions at site, local and borough level. This will focus on demographic, economic and employment data; the location and capacity of community facilities (including education, healthcare and leisure/open space); and crime statistics. Consideration will be given to employment generated by existing on-site uses.

The existing baseline will be established using a combination of data sources including nationally published statistics from the Office for National Statistics (ONS)[19], Ministry of Housing, Communities and Local Government (MHCLG)[20], Department for Education (DfE)[21], National Health Service (NHS)[22], Home Office[23] and RBC[24] where relevant. This includes the Business Register and Employment Survey[25], Annual Population Survey[26] and Census 2011[27], Sub National

[19] Office for National Statistics (ONS), various data sets and years
[20] Ministry of Housing, Communities and Local Government, 2015. Indices of Deprivation
[21] DfE, January 2019 School Census, School Capacity Forecasts 2017/2018
[22] NHS, GP workforce Statistics March 2019 and location data of GP practices and branches and dental surgeries, May 2019
[23] Home Office, Police.UK Crime Statistics, various years
[24] RBC, Reading Childcare Sufficiency 2017; Reading Annual Monitoring Report 2017-2018; Reading Open Spaces Strategy (March 2007); and Reading Open Spaces Strategy Update Note 2018 (January 2018)
[25] Business Register and Employment Survey, various years
[26] Annual Population Survey, various years
[27] ONS, 2011. Census

Population Projections (SNPP)[28], Sub National Household Projections (SNHP)[29] and Mid-Year Population Estimates (MYPE)[30].

Relevant policy and supplementary planning guidance produced by the RBC will be consulted.

7.1.2 Potential Impacts and Likely Effects

- The assessment will consider the effects of the proposed development within the context of the policy framework and existing/future baseline conditions. A review of the existing on-site operations and associated employment will be undertaken.

The assessment will consider the following potential impacts and likely effects:

- Development works and the resulting loss of existing employment and economic activity;Development works and the resulting generation of direct and indirect employment and economic output, measured in Gross Value Added (GVA);
- Generation of direct and indirect and induced employment and GVA resulting from the delivery of non-residential floorspace, taking account of existing on-site economic activity and displacement;
- Delivery of new housing including affordable housing;
- Introduction of a new residential population accommodated by the residential units and the resulting demand for local community services and infrastructure on:
  - Primary healthcare (GP provision);
  - Early years, primary and secondary education;
- Impacts on existing levels of deprivation in the local study area; and
- Impacts on crime and safety.

7.1.3 Approach and Methodology

There are no published assessment guidance and technical significance criteria to assess socio-economic effects. Accordingly, the assessment will be undertaken based on professional experience and judgement, having regard to the existing baseline position.

Consultation

No specific consultation over and above this scoping exercise is considered necessary.

Study Area

The assessment will be considered at the site level, the local area level (Abbey Ward), borough level (RBC area) and national level (England), or where applicable within a certain distance of the application site boundary, as summarised in Table 7.1.

Table 7.1: Socio-Economic Study Area

Assessment	Study Area (distance from site boundary)
Development works employment and economic output	Local area and RBC
Loss of on-site economic activity and jobs during development works	Local area and RBC
Completed development employment and economic output	Local area and RBC
Housing delivery	Local area and RBC

[28] ONS, 2016-based SNPP
[29] ONS, 2016-based SNHP
[30] ONS, 2018 MYPE

Table 7.1: Socio-Economic Study Area	
Assessment	**Study Area (distance from site boundary)**
Early years education	1.0 km application site boundary
Primary education	2.6 km from application site boundary
Secondary education	5.6 km from application site boundary
Primary healthcare (GP and dental practices)	1.0 km from application site boundary
Secondary healthcare (i.e. hospitals)	Local area and RBC
Community and recreational facilities	Local area and RBC
Open space	Various based on RBC Open Spaces Strategy (March 2007) and Update Note 2018 (January 2018)
Play space	Various based on RBC Open Spaces Strategy (March 2007) and Update Note 2018 (January 2018)
Deprivation	Local area and RBC
Crime and safety	Local area and RBC

Demolition and Construction

- Direct construction employment effects will be calculated using the estimated construction value alongside the Construction Industry Training Board (CITB), Labour Forecasting Tool (LFT)[31].
- Indirect and induced employment will be calculated using multipliers from the Homes and Communities Agency (HCA) Additionality Guide (2014) [32]. Other additionality factors such as displacement rates from the Additionality Guide will be applied to reach a final net result.
- GVA will be calculated by applying the latest Oxford Economics GVA per worker (2016-2019) figures.

Completed Development

- Completed development direct operational employment will be calculated by using land use specific employment densities from HCA Employment Density Guidelines (2015)[33], which will be applied to the non-residential floorspace schedule.
- Completed development indirect and induced employment will be calculated by applying multipliers from the HCA Additionality Guide, with other additionality factors such as displacement applied to reach an overall net employment result.
- GVA will be calculated by applying the latest Oxford Economics GVA per worker (2016-2019) figures.
- Delivery of housing will be evaluated by using the quantum of proposed residential units compared to the existing housing stock in RBC and alongside identified housing targets.
- Assessment of local expenditure will be evaluated by multiplying the quantum of proposed residential units by household expenditure data published by Experian[34].

[31] https://www.citb.co.uk/about-citb/construction-industry-research-reports/consultancy/labour-forecasting-tool/revolutionise-industry/
[32] Homes and Communities Agency, 2014. Additionality Guide, 4th ed. HCA.
[33] Homes and Communities Agency, 2015. Employment Density Guidelines. HCA.
[34] Experian Retail Planner Data, 2017

- Residential population yields will be calculated by multiplying the number of residential units by the average household size in the anticipated completion year of the proposed development as projected by the ONS 2016-based SNHP.
- Primary and secondary school children yields will be calculated through application of pupil product ratios (to be advised by RBC) to the residential accommodation schedule, in order to derive expected demand for school places from the new population of the proposed development. This information will be compared to the current capacity in primary and secondary schools derived from DfE Annual School Census and school capacity data (presented within the baseline assessment) to establish whether the expected demand from the new population can be accommodated within the existing provision. Assessment of effects on early years education will be assessed qualitatively in the context of baseline conditions informed by the RBC Childcare Sufficiency Assessment 2017.
- In terms of local community services impacts, residential population yields (described above) will be compared to the current capacity at GP surgeries and dental surgeries derived from NHS GP workforce statistics (presented within the baseline assessment) to establish whether the expected demand from the new population can be accommodated within the existing provision.
- Available open space and recreational facilities within the study area will be determined by desk top review of local planning documents. This information will be considered against open space standards set out in RBC's Open Space Strategy (March 2007) and Open Space Strategy Update Note 2018 (January 2018) and the proposed development's demand for recreational facilities will be assessed using the Sports England Calculator[35]. Play space requirements will be based on those derived by the Landscape Architects.
- The potential impact on deprivation resulting from the proposed development will be assessed qualitatively considering the new employment opportunities and residential units, local socio-economic characteristics.
- The impact of the proposed development on crime will be assed qualitatively based on the extent to which increased population and modern housing design techniques are expected to impact upon crime, or the fear of crime.

The evaluation of proposed development's effects will be based on an assessment of the magnitude of the impact and the sensitivity of the identified receptor. The scale of effects will be identified on a matrix basis.

Mitigation measures integral to the development proposals (i.e. inherent mitigation) will be considered, whilst any additional mitigation measures will be recommended, where necessary, to reduce potential adverse effects.

Consideration will be given to inter-project cumulative effects, subject to availability of cumulative scheme information in the public domain.

7.2 Air Quality

An Air Quality technical assessment will be presented in ES Volume 1. The assessment will consider the implications of current and future ambient air quality at the application site for the proposed residential and commercial use, as well as the implications of emissions from the proposed development on local air quality. Consideration will be given to the potential for emissions from existing road and rail sources to impact air quality on the application site. Potential new sources of air pollution arising from the proposed development during the demolition and construction stage, and once completed (i.e. traffic flows and heating plant), will be considered.

[35] https://www.activeplacespower.com/

7.2.1 Site Information and Baseline Conditions

The application site is located within the Reading Air Quality Management Area (AQMA) which covers the town centre and areas along the major arterial roads leading into Reading. The AQMA was declared for exceedances of the annual mean NO_2 objective. The main source of air pollutants impacting the application site will be from the arterial roads and roundabouts to the north, east and west and from the rail line.

Air quality monitoring conducted by RBC indicates the potential of roadside exceedances of the annual mean NO_2 objective close to the application site, particularly close to Caversham Road. Slightly lower concentrations have been recorded on Vastern Street, just meeting the air quality objective.

7.2.2 Potential Impacts / Effects

The assessment will consider the effects of the proposed development within the context of the policy framework and baseline conditions. The assessment will consider the following potential impacts and associated likely effects:

- Development works, the resulting dust impacts and the associated effects on human health, amenity and ecological receptors;
- Development works, the resulting demolition and construction traffic and the associated traffic emission effects on human health receptors;
- Impacts from existing road emissions in the vicinity of the application site and the associated effects on human health receptors introduced by the proposed development;
- Completed development traffic emissions from the operation of the proposed development, taking into account the removal of the traffic generated by the existing uses, and the associated effects on human health receptors both on- and off-site; and
- Heating plant emissions from the operation of the proposed development and the associated effects on human health receptors both on- and off-site.

It is considered that the proposed development would not give rise to any odour impacts and associated effects and will therefore not be assessed as part of the ES Chapter.

7.2.3 Approach and Methodology

The suite of air quality assessments will be undertaken in accordance with the most recent Environmental Protection UK and Institute of Air Quality Management (IAQM)[36] air quality planning guidance.

Consultation

Consultation would be undertaken with the Air Quality Officer at the RBC to agree the scope of the assessment.

Study Area

The study area will include the application site and the main road network identified within the Transport Assessment as likely to be impacted by the proposed development. The study area will encompass representative off-site receptors identified as at risk of impacts from the proposed development and will consider identified neighbouring cumulative schemes and commercial activities adjacent to the application site.

[36] EPUK & IAQM. May 2015. Land-Use Planning & Development Control: Planning for Air Quality. Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes.

Demolition and Construction

A qualitative assessment of the potential impact on local air quality from demolition and construction activities will be undertaken in accordance with the Institute of Air Quality Management (IAQM) document 'Guidance on the Assessment of Dust from Demolition and Construction'[37] to assess the magnitude and significance of these impacts during the demolition and construction stage.

The risk of dust arising in sufficient quantities to cause annoyance and/or health impacts will be determined using four risk categories: negligible, low, medium and high risk. A development is allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large; and
- The sensitivity of the area to dust impacts, which is defined as low, medium or high sensitivity. These risk categories are defined in detail within the latest guidance issued by the Mayor of London.

These two factors will be combined to determine the risk of dust impacts. The risk category assigned to the proposed development can be different for each of the four potential activities (demolition, earthworks, construction and trackout).

Potential impacts from exhaust emissions from demolition and construction vehicles using the wider road network will be assessed following the methodology set out for operational vehicles given below for the completed proposed development.

Completed Development

Potential impacts from existing road traffic and rail emissions will be assessed to determine the suitability of the application site for residential development and the need for additional mitigation to protect future residents from poor air quality. A qualitative review of existing off-site emissions from industrial sites in proximity to the proposed development will be carried out to ensure that potential impacts are included within the future baseline data included within the assessment. The need to explicitly model off-site point sources of emissions is not anticipated and is proposed not to be undertaken.

To assess potential on- and off-site impacts from road traffic emissions, the assessment will utilise the latest version of the ADMS-Roads modelling software and consider the current and future baseline air quality in the area, as well as the potential effects of the change in traffic levels as a result of the completed proposed development.

Overall, the assessment will include the air quality impacts under the following three scenarios:

- Existing Baseline;
- Future Baseline (existing baseline + future growth derived from tempro factors + cumulative schemes); and
- Future Baseline + proposed development.

Modelled concentrations in the current baseline year will be compared against local monitoring data in order to verify the model output.

Where emissions of oxides of nitrogen from heating plant associated with the on-site energy centre exceed 5 mg/s, potential impacts would be modelled using the ADMS model to predict concentrations with the proposed development fully operational.

The impact of traffic and heating plant emissions would be combined to assess potential impacts at both on and off-site receptors. Changes in air quality impacts at existing receptors as a result

[37] Guidance on the assessment of dust from demolition and construction, IAQM, February 2014.

of the proposed heating plant and changes to traffic flows will be assigned impact descriptors based on the most recent Environmental Protection UK and the Institute of Air Quality Management (IAQM) air quality planning guidance.

Consideration will be given to inter-project cumulative effects, subject to availability of cumulative scheme information in the public domain.

7.3 Wind Microclimate

A wind microclimate technical assessment will be presented in ES Volume 1. The assessment will consider the potential wind impacts of the proposed development; particularly with regard to the suitability of the proposed development for the intended pedestrian and occupier use, as well as unsafe wind conditions as designated by the Lawson Comfort Criteria[38].

7.3.1 Site Information and Baseline Conditions

The application site is located in Reading, where there are prevailing south westerly winds. There is also a secondary peak of north easterly winds which occurs around springtime.

The existing built form across the application site comprises low to medium sized commercial properties. This built form also characterises the immediate surrounding area, along with some two-three storey residential properties located to the north and west of the application site. Due to the relatively open nature of the site, as well as the River Thames located 150 to the north-east, it is anticipated that the application site is afforded limited protection from both prevailing wind directions.

7.3.2 Potential Impacts / Effects

Given the envisaged size and geometry of the proposed development, it is important to avoid undesirable wind speeds being generated at ground level and at any other level where pedestrian activity is proposed. The wind microclimate assessment will quantify the potential changes to the local wind environment (both on-site and within the immediately surrounding area) in terms of sensitive pedestrian areas such as entrances, thoroughfares, podium and roof terraces, public realm, private and communal open space and quantify these in relation to their ‘usability’ for a range of pedestrian activities defined by the well-known and established Lawson Comfort Criteria.

The assessment will consider the effects of the proposed development within the context of the policy framework and baseline conditions.

The assessment will consider the following potential impacts and associated likely effects:

- Change in wind conditions as a result of the introduction of new built form and the associated effects on pedestrian comfort and safety with the completed proposed development and within the immediate surrounding study area.

7.3.3 Approach and Methodology

The assessment will be undertaken by reference to the Lawson Comfort Criteria.

Consultation

No specific consultation over and above this scoping exercise is considered necessary.

Study Area

The study area will consist of surrounding built environment and landscape features within a 300 m radius of the application site boundary.

38 Lawson TV, 2001. Building Aerodynamics. London. Imperial College Press.

Demolition and Construction

As the proposed development is constructed, the wind conditions on-site will alter on a regular basis. Additionally, the worst-case scenario in terms of wind conditions is assumed to be when the proposed development is completed. Therefore, the demolition and construction stage will not be assessed quantitatively, with wind conditions commented on using professional judgement.

Completed Development

A wind microclimate Computational Fluid Dynamics (CFD) assessment of the proposed development will be undertaken. The CFD assessment will compare values to the Lawson Comfort and Safety Criteria.

The assessment will consider the following three scenarios:

- Existing baseline;
- Existing baseline + proposed development; and
- Existing baseline + proposed development + cumulative schemes.

Cumulative schemes within a 300 m radius of the application site boundary will be considered. Cumulative schemes outside of this radius would not be expected to have significant impact due to their distance from the proposed development.

The CFD assessment will use a Lattice Boltzmann Method (LBS) which is a trusted solver for wind microclimate assessments. CFD modelling will be conducted in the absence of any soft or hard landscaping, in order to provide a conservative result.

The results of this analysis will be benchmarked against the well-established Lawson Comfort Criteria to determine the suitability of the different pedestrian use areas both within and surrounding the application site for sitting, standing, entering a building, strolling or walking, with an additional criteria for areas likely to be unsafe for pedestrians. The suitability of the conditions both within the proposed development and surrounding the application site will be presented and discussed within the ES. Should mitigation measures be required to ensure that wind conditions are suitable for their intended use, the areas requiring mitigation will be identified and mitigation measures will be proposed; either through additional modelling or through professional judgement, depending on the significance of the mitigation required. The potential for strong winds to occur will also be quantified.

Through the determination of the suitability for use of the pedestrian areas surrounding the application site, a direct comparison can then be made with the baseline/existing off-site conditions where applicable, and the effect to these surrounding areas assessed, with the significance of effects identified.

It should be noted that the focus of the assessment will be a comparison of the measured conditions to the desired use of the proposed development. Due to the outline nature of the application, the proposed development will be governed by parameters, and therefore no detailed information on the likely locations of sitting areas, public realm and open space will be available. Accordingly, the assessment will report the modelled wind speeds at identified receptor locations on-site and the associated use. An interpretation would be made of the likely future use and recommendations made on required mitigation measures at the reserved matter stage, should this be required.

The results of these assessments will be presented within the ES Chapter.

The focus of ground level locations such as thoroughfares and entrances will be for the windiest season, as these locations are expected to be usable at all times throughout the year.

Consideration will be given to inter-project cumulative effects, subject to availability of cumulative scheme information in the public domain.

7.4 Daylight, Sunlight, Overshadowing and Solar Glare

A daylight, sunlight, overshadowing and solar glare technical assessment will be undertaken and presented in ES Volume 1. The assessment will consider the potential daylight, sunlight and overshadowing impacts of the proposed development; particularly to the existing neighbouring residential buildings and emerging developments. In addition, the potential for solar glare to affect users of the surrounding road network, will be considered.

Internal daylight to the new residential units and sunlight within the new open space (2 hour sun on ground test) of the proposed development will be assessed separately and the results presented in a stand-alone report accompanying the planning application. Accordingly, these assessments will not form part of the scope of the EIA and have not been considered further within this EIA Scoping Report.

7.4.1 Site Information and Baseline Conditions

The application site is occupied by four low-rise pavilion style commercial units and one building, extending to approximately 2-3 storeys high.

The wider context of the application site is characterised by low rise urban development with a mixture of commercial, industrial and residential uses.

Daylight and Sunlight

The assessment will consider the likely significant effects of the proposed development on daylight, sunlight and overshadowing to existing residential properties with an expectation of daylight and sunlight amenity, together with overshadowing to existing open space and public amenity areas.

The following receptors have been identified as sensitive in relation to daylight and sunlight and will therefore be considered within the assessment:

- 15-53 Vastern Road;
- 87-89 Caversham Road;
- 91 Caversham Road; and
- 93-97 Caversham Road.

Overshadowing

There do not appear to be any existing areas of amenity to the north of the application site that would be sensitive to overshadowing. The ES Chapter will consider the quality of direct sunlight the proposed development amenity space will receive.

Solar Glare

The BRE states that *"glare or solar dazzle can occur when sunlight is reflected from a façade or area of metal cladding"*. This is a consideration in relation to road users and train drivers whereby instances of reflection can obscure the view of traffic/rail signals and thus have the potential to cause an accident.

At the outline stage, the details of the façade treatment will not be developed. However, it is likely that a solar glare assessment will be required in respect of the junction of Caversham Road and Vastern Road. Due to the distance of the Reading Railway Station from the application site (50 m) and intervening development, significant effects on the rail signalling system are considered unlikely and will therefore not be assessed.

Reasonable assumptions will be made in respect of the likely façade treatment, based on the design code and in consultation with the architects.

7.4.2 Potential Impacts / Effects

The assessment will consider the effects of the proposed development within the context of the policy framework and baseline conditions.

The assessment will consider the following potential impacts and associated likely effects:

- Daylight, sunlight and overshadowing to existing neighbouring residential developments; and
- Daylight, sunlight and overshadowing to cumulative residential schemes.

It is considered that there will be no further impacts and associated effects arising from the proposed development that require assessment as part of the ES Chapter.

7.4.3 Approach and Methodology

The assessment will be undertaken in accordance with the guidance and recommendations given in the following documents, as well as the application of professional judgement:

- The Building Research Establishment (BRE) Report 'Site Layout Planning for Daylight and Sunlight - A Guide to Good Practice' (BRE 209)[39];
- Chartered Institution of Building Services Engineers (CIBSE) Lighting Guide (2014)[40];
- British Standard BS8206:2 (2008)[41];
- Solar Dazzle Reflected from Sloping Glazed Facades (1987)[42]; and
- CIE Collection on Glare (2002) [43].

Consultations

No additional consultation over and above this EIA scoping exercise is considered necessary to inform the assessment.

Study Area

Daylight, Sunlight and Overshadowing

Existing sensitive receptors, buildings under construction and cumulative schemes with planning permission within 150 m of the application site boundary will be assessed.

Demolition and Construction

The level of effect on daylight and sunlight availability to existing neighbouring residential properties would vary throughout the demolition and construction stage and would steadily increase in magnitude as the superstructure is built. Any temporary accommodation or construction equipment such as cranes would only have a temporary effect on the daylight and sunlight levels to the surrounding properties.

Those effects that would be perceptible as the superstructure and cladding progress would be similar to those of the completed development. A qualitative assessment will be undertaken using professional judgement, with the worst-case scenario represented by the completed development.

Completed Development

Daylight and Sunlight to Surrounding Receptors

The likely significant effects of the completed development will be discussed within the ES Chapter.

---

39 Building Research Establishment, 2011. Site Layout Planning for Daylight and Sunlight: A Guide to Good Practice (BRE209)
40 Chartered Institution of Building Services Engineers, 2014. LG10/14 Lighting Guide 10: Daylighting – A Guide for Designers – LG10
41 British Standards Institute, 2008. BS 8206-2: 2008 Lighting for Buildings. Code of Practice for Daylighting. BSI.
42 British Standards Institute, 1987. BRE Information Paper Solar Dazzle Reflected from Sloping Glazed Facades by P. J Littlefair (April 1987)
43 Commission Internationale de L'Eclairage, 2002. CIE Collection on Glare 146:2002. Austria. CIE

The BRE Report focuses on the daylight and sunlight amenity within residential properties and those properties where natural light is considered desirable (i.e. hospitals and schools). In line with the BRE Report, the assessment will undertake daylight and sunlight analysis of the nearest existing and emerging residential properties to the application site identified by a site inspection and a desktop study. In addition, survey information will be used to identify residential properties most likely to experience effects from the proposed development.

Information on the receptors will be gathered using details available on the RBC's planning database, estate agent's property particulars and site inspections. Where analysis is to be undertaken of buildings under construction or emerging developments, information available on RBC's planning portal will be used to determine the position of windows. If information is available to determine the layout of the rooms, the interior layouts will also be applied to the analysis model and additional daylight testing will be undertaken. Where information on existing receptors are not available, reasonable room layout assumptions will be made and presented in the assessment.

The studies to be undertaken will use a three-dimensional computer model of the application site and the surrounding buildings in the study area for the following scenarios:

- Existing baseline (representing the current site conditions);
- Existing baseline + proposed development; and
- Existing baseline + proposed development + cumulative schemes.

A separate scenario will be assessed following the above three scenarios, namely Existing Baseline + Reading Station Area Framework (RSAF) massing. As the RSAF is a material consideration, this scenario will consider the available daylight, with the implementation of the massing set out in the RSAF and the associated results compared with the analysis for the scheme.

The effect of the proposed development on the daylight and sunlight amenity received by the neighbouring buildings will be analysed using bespoke software.

The assessment will be carried out in accordance with the guidance given in the BRE Report. The assessment will include an analysis at all windows serving residential accommodation where they overlook the proposed development. Additionally, where information is available, daylight analysis within the rooms served by the windows will be undertaken.

In analysing the resultant daylight and sunlight assessment data, consideration will be given to the criteria set out in the BRE Report guidelines. However, since the BRE Report guidelines do not specifically relate to metropolitan locations, a degree of flexibility will be applied to the application site, as it is located in an urban area.

Residential properties will be considered a high sensitivity receptor. Receptor sensitivity will take into account the likely daylight and sunlight requirements for the property room use, using the BRE Report as a guide. For example, the main living space in a dwelling will be considered as a receptor of high sensitivity whereas a bedroom, which are considered as 'less important' in terms of daylight and sunlight requirements, will be a low sensitivity receptor.

Numerical criteria will be presented for the magnitude of impact. A matrix approach taking into account the receptor sensitivity and magnitude of impact will be adopted to establish the scale of effect.

Professional judgment will be applied to establish the significance of the effect. In this regard the interpretation of the scale will consider the actual quantum of light lost or gained rather than the percentage change. The percentage value may well be misleading, particularly where the baseline values are already low. For example, where the baseline values are low, a small change in the quantum of light could represent a high percentage change in the overall figure. This would imply

that there would be a significant change in daylight. However, in reality, the difference would be imperceptible.

Solar Glare

Solar glare is a highly localised and temporary effect dependent on the direction the viewer is "looking", the position of the sun relative to the viewer and the reflecting surface and localised weather conditions. The effect of solar glare, the reflected image of the sun on the façade of the proposed development would be analysed at specific locations determined on the basis that they are most likely to have the potential to be affected by any glare generated by the proposed development.

To aid the full solar glare calculations, assumed material specifications and façade treatment will be applied to the three-dimensional computer model of the proposed development and an appropriate average material specification applied to the neighbouring buildings. MBS software will be used to generate fish eye images with a 180 degree field of view. This exercise allows the total luminance of a view to be sampled when the images are transferred into the Radiance software. Glare calculations, using the Radiance software, will then undertaken.

Where testing and review indicates it is required, the CIE Glare Index will be used to identify glares sources across the full 180 degree field of view of the fish eye images and apply a ratio to the significance of the glare instance.

Consideration will be given to inter-project cumulative effects, subject to availability of cumulative scheme information in the public domain.

7.5 Townscape and Visual

The townscape and visual impact assessment (TVIA) will be presented in ES Volume 2. The assessment will consider the potential impacts of the proposed development on townscape character and views, particularly the:

- baseline of the townscape features, character and views;
- change to the application site's features and characteristics arising from the proposed development;
- change to townscape character areas within the study area;
- effects on features and townscape character arising from these changes;
- changes arising from the proposed development to views of the application site, including locally important or designated views;
- effects of the proposed development on both fixed and transient visual receptors, in particular pedestrians and surrounding residential receptors;
- combined effects in conjunction with cumulative schemes.

7.5.1 Site Information and Baseline Conditions

The application site is currently of a utilitarian character, comprising retail warehouse buildings; hard standing serving as frontage car parking and a service yard to the rear of the retail units; a restaurant, with associated hard landscape; and soft landscape forming the southern edge of Vastern Road and eastern edge of Caversham Road. This includes soft landscape including a number of canopy trees, in addition to grass and shrub planting.

The application site and its immediate setting fall within Reading Tall Building Strategy (RTBS) (2018) Character Area (CA) 22: Vastern Road. The northern edge of the application site immediately abuts CA12 - Caversham Road. CA1 - Station Hill abuts the boundary of CA22 to the south and CA23 - King's Meadow abuts the northern and eastern boundaries of CA22.

The description of CA22 notes the predominance of warehousing and retail park use, including blocks of large footprint, albeit not high rise; and extensive car parking, combining to create a medium-scale townscape of unexceptional quality which does not respond well to adjacent residential land use.

There are no established key views within the CA but views towards it are obtained from elevated land to the north and Oxford Road to the west. The Reading Station Area Framework (RSAF, 2010) sets out the location for two new views to be created within the CA from the Station Square North and Christchurch Bridge. Representative designated views towards the Site within the study area comprise the following as identified separately in the RTBS, Reading Central Area Action Plan (RCAAP, 2009) and RSAF:

- Kings Meadow (RCAAP and RSAF);
- Reading Bridge (RTBS, RCAAP and RSAF);
- Christchurch Meadows (RSAF);
- War Memorial, Christchurch Meadows (RSAF);
- Lynmouth Road (RSAF);Junction of Prospect Street and Peppard Road (RSAF);
- Balmore Park (RTBS, RCAAP and RSAF);
- Caversham Court Gardens (RTBS and RSAF);
- Junction of Mount Pleasant and Southampton Street (RTBS and RSAF);
- Station Road (RSAF);
- A33 near water treatment works (RTBS and RSAF);
- The Horse Close (RTBS and RSAF);
- A4 at Shepherd's Hill, Earley (RSAF);
- Junction of Wokingham Road and Green Road (RTBS, RCAAP and RSAF);
- Blagrave Street (RSAF);
- Henley Road junction with Lower Henley Road (RSAF);
- Caversham Road (RSAF);
- Northfield Road (RSAF);
- Caversham Bridge (RTBS and RSAF); and
- Oxford Road (RCAAP).

The CA is considered to be suitable for tall buildings, albeit not along the roadsides and the tallest structures should be adjacent to the railway line. The RSAF includes a number of corridor views towards the application site from the west and north and a view to be created from the station subway south of the application site.

7.5.2 Potential Impacts / Effects

The assessment will consider the effects of the proposed development within the context of the policy framework and baseline conditions.

The assessment will consider the following potential impacts and associated likely effects during the construction of the proposed development:

- Development works and associated visibility of machinery, cranes and other equipment used in construction works; and the hoarding and site lighting which will be visible at street level.

The assessment will consider the following potential impacts and associated likely effects of the completed proposed development:

- Visibility of the proposed development in local views (including RBC designated views), effects on the quality of local views and on viewers;

- Impacts on the townscape character and quality of the application site; and
- Impacts on the townscape character and quality of the townscape character areas within the study area.

7.5.3 Approach and Methodology

The suite of townscape and visual assessments will be undertaken by reference to the guidance listed below and application of professional judgement.

Consultation

The set of views for assessment and study area will be agreed in consultation with RBC and other relevant consultees as identified by RBC.

Study Area

The study area for the visual assessment will be agreed with RBC, but is likely to extend up to approximately 3.5 km from the application site boundary, including for a number of designated viewpoints from elevated locations. Beyond this distance it is considered that there would not be potential for the significance of effects on views.

The study area for townscape character will be approximately 1 km from the application site, within which area it is judged that the height and scale of the proposed development could result in significant effects on townscape character due to the visibility of the proposed tall elements within that area.

The viewpoints will be determined through analysis of topography, streetscape and urban grain of the area surrounding the application site, the existing townscape character in the surrounding area, and through tests of the emerging design in selected views which indicated the extent and nature of visibility. Due to the urban nature and location of the application site, no Zone of Theoretical Visibility (ZTV) modelling will be undertaken.

Demolition and Construction

The assessment of demolition and construction works will be based on the typical impacts and effects associated with a development of the proposed nature and scale taken in conjunction with the particular application site and its sensitivities. The visual character and effects of the process would alter at different times of day and throughout the different phases of demolition and construction work, and so it is not possible to accurately represent the process in the verified views. Additionally, none of the effects resulting from the process, apart from those associated with the completed proposed development, would continue beyond the construction process, and so it is considered appropriate for the TVIA to consider the effects of the completed proposed development in greater detail than those of demolition and construction, because those effects will be permanent and long-term. Accordingly, a qualitative assessment will be undertaken for the demolition and construction works based on professional judgement and experience.

Completed Development

The TVIA will be undertaken by reference to the following key guidance documents and relevant local, regional and national policy:

- Guidelines for Landscape and Visual Impact Assessment (2013)[44];
- Townscape Character Assessment Technical Information Note (2018)[45]
- NPPF (2019); and
- Planning Practice Guidance (PPG).

[44] IEMA and The Landscape Institute, 2013. Guidelines for Landscape and Visual Impact Assessment. Third Edition.
[45] Landscape Institute, 2018, LI Technical Information Note 05/2017, Revised April 2018

The baseline assessment of the TVIA will include an account of:

- The contemporary character of the townscape on and around the application site;
- The existing characteristics of the pre-selected set of views;
- The sensitivity of the townscape, with regard to its value and susceptibility to the proposed type of change; and
- The sensitivity of views, with regard to their value and susceptibility to the proposed type of change, and with regard to the type and numbers of likely viewers (as described in the Guidelines on Landscape and Visual Impact Assessment, GLVIA 3rd Edition.

The study areas are described above. For the visual assessment, not every view of the proposed development within the study area will be assessed. A range of representative views would be selected to reflect the likely extent of the visibility of the proposed development. All of the viewpoints considered will be from public places and locations frequented by pedestrians rather than solely vehicles. Within this study area, two types of viewing locations will be selected for assessment:

- Representative townscape locations from particular points of the compass from which the proposed development will be visible, and from which the effect on other points nearby can be deduced; This will include locations where there is extensive open space between the viewer and the proposed development, such as from across rivers, parkland and along streets directed towards the application site, which will give visual prominence to the taller elements of the proposed development; and
- Views and locations of particular sensitivity, including designated views.

Verified views will be prepared for the assessment views. These will include representations of the proposed development in outline (wireline). The view scenarios for assessment will be as follows:

- Existing baseline;
- Existing baseline + proposed development; and
- Existing baseline + proposed development + cumulative schemes.

A full set of views will be proposed to RBC for agreement in due course.

The assessment will consider the magnitude of change in relation to the sensitivity of each receptor. Judgements of sensitivity and magnitude will be made on a word scale. A matrix will be set out in the methodology will set out how these are combined to determine the scale and nature of the effect, and ultimately to make a judgement on the significance of the effect. It should be noted that the qualitative and subjective nature of the subject area of the TVIA means that the results cannot be easily quantified, and so reference must always be made to the rationale for the combination of these judgements which will be explained in the narrative of the assessment.

The significance of effect also includes a qualitative judgement. The terms used in this judgement will be 'beneficial, neutral and adverse'. A 'beneficial' effect is where the quality of the environment (townscape character or view) is enhanced. An 'adverse' effect is where the quality of the environment is diminished or harmed. A 'neutral' effect is where the quality of the environment is preserved or sustained or where there is an equal balance of benefit and harm.

7.6 Built Heritage

A heritage impact assessment will be presented in ES Volume 2. The assessment will consider the potential for the proposed development to affect those elements of setting that contribute to the heritage significance of identified and relevant heritage assets, within the study area.

The TVIA will be considered and will be cross-referenced as appropriate.

7.6.1 Site Information and Baseline Conditions

Review of the baseline situation has identified that there are no statutory listed built heritage assets within the application site.

The following listed buildings are located within the identified study area:

- Main Building of Reading General Station, Grade II listed, National Heritage List reference 1321892;
- Regent Place Grade II listed National Heritage List reference 1113434;
- Statue of King Edward VII Grade II listed National Heritage List reference 1113589;
- Walter Parsons Corn Stores Grade II listed National Heritage List reference 1248738;
- Great Western House Grade II listed National Heritage List reference 1113591; and
- Kings Meadow Swimming Pool Grade II listed National Heritage List reference 1391153.

7.6.2 The following conservation areas are located within the identified study area:

- The Market Place/London Street Conservation Area which extends to 280 m from the approximate site centre.

7.6.3 The following registered parks and gardens and landscapes are located within the identified study area:

- The Forbury Garden Registered Grade II National Heritage List reference 1000586 which is 430 m from the approximate site centre.

7.6.4 The following locally listed buildings are located within the identified study area:

- The Entrance building, Part of Scottish and Southern Energy (SSE), 55 Vastern Road, Reading, RG1 8BU is 125 m from the approximate site centre.

7.6.5 Potential Impacts and Likely Effects

The proposed construction of new built forms would have the potential to indirectly affect the particular significance of the built heritage assets within the study area, as a result of change to their setting and also shared local and or longer distance views to and from these built heritage assets.

7.6.6 Approach and Methodology

There is currently no prescribed or preferred method of preparing an EIA built heritage assessment. There are a number of potential methodologies in guideline documents (rather than policy or prescribed guidance), which have been accepted in a number of contexts. The methodology proposed will be informed by established national policy, guidance and advice documents to frame the assessment process. Crucially, it will acknowledge how the understanding and appreciation of the heritage values of the asset and its constituent elements can be affected both directly and indirectly through change to setting, and not only physically and visually but also as part of a broader experience.

Guidance on the assessment of built heritage effects is largely provided within the NPPF, PPG and supported by other national guidance and advice, including those provided by Historic England. The assessment will therefore be undertaken with reference to the relevant statutory duties of the Planning (Listed Buildings & Conservation Areas) Act 1990, the NPPF, the PPG, the Development Plan, relevant best practice/guidance and material considerations.

The built heritage assessment will provide an assessment of the likely significant effects of the proposed development on the settings of individual above ground designated built heritage assets

within the study area and the contribution of the effect on the setting of a heritage asset will make to the significance of that asset.

Townscape and visual and built heritage assessments are separate, although linked, procedures. The townscape and visual baseline analysis contribute to the scope of the built heritage assessment and built heritage assets contribute to the character and appearance of the townscape character and representative views. The townscape and visual assessment in turn contributes to the understanding of likely significant effects on the settings of built heritage assets. Accordingly, the assessment will be informed by the verified views prepared for the TVIA.

The heritage assessment will include consideration of the effects of the proposed development in relation to the criteria and terms set out in the NPPF and PPG. In accordance with that policy and guidance, where adverse effects are found, they would be judged to be either of 'less than substantial harm' or 'substantial harm' to the significance of the affected heritage asset. The relevant tests of the NPPF would then be triggered by this judgement.

Consultation

No additional consultation over and above this EIA scoping exercise is considered necessary to inform the assessment.

Study Area

The study area would extent up to 500 m from the redline boundary of the application site and will be based on views testing undertaken as part of the TVIA to establish the likely zone of visual influence and range within which significant effects of development of this scale would be experienced within the existing townscape context.

Demolition and Construction

The methodology utilised for assessing the construction effects will be consistent with that utilised for the completed development stage effects.

Construction works are a necessary first step in the redevelopment of the application site and one that is associated with urban environments, where there is an awareness of development taking place. Construction impacts are not considered to be significant, in EIA terms, as they are indirect, temporary in nature and short-medium term in duration.

Completed Development

The methodology that will be followed can be summarised as follows:

- Identify the relevant built heritage baseline situation / conditions within the built heritage study area though a desktop survey and site visit;
- Refine the built heritage assets and built heritage study area (i.e. identify those resources that would not be affected by the proposed development, and so be excluded further from the EIA process);
- Undertake detailed consideration of the identified heritage assets and apply judgement in respect of the importance and sensitivity of the assets based on defined significance criteria. The Heritage Statement will provide the necessary proportionate assessments of significance of the identified built heritage assets, and any contribution of setting to that significance, in line with the requirements of paragraph 128 of the NPPF. This baseline will inform the professional judgement and conclusions reached in the ES with regard to heritage effects;
- Consider the effect of the proposed development on each of the identified heritage assets and form a judgement as to the duration, extent and scale of the effect. This will include assessment of effects at both the construction, and operational stages of the proposed development. In doing so, consideration will be given to the mitigation measures that have been taken on board in the design and construction or operational lifetime of the proposed

development. The significance of any residual effects, i.e. those that might remain after mitigation would then be considered. Appropriate cross-referencing will be made between the HEA and TVIA.

- Consider cumulative effects and a form a further judgement on the effect on the built heritage assets in conjunction with those other schemes agreed.

Identification of built heritage assets to establish the baseline situation will include review of existing national and local historic environment records and other resources, and also Historic England's best practice guidance and advice.

Following the identification of each built heritage asset, a judgement will be made of the heritage importance of the asset based upon an assessment of its particular significance. This will be proportionate to both the importance of the asset and the nature and extent of the development proposals, taking into account the relative location and role of the application site in their setting and significance. In addition, and as a further layer of analysis, the relative sensitivity of each of the heritage assets to further change will be defined. This will provide an NPPF-compliant assessment of effects which will inform the assessments carried out for EIA purposes.

A number of tables contained within Historic England's guidance document Seeing the History in the View: A Method for Assessing Heritage Significance within Views[46] will be used as a helpful starting point to determine relevant criteria for the assessment of the importance and sensitivity of the heritage assets, and magnitude of impact of the proposed development on each, and then to measure the overall scale and significance of heritage effects.

The assessment will also utilise more recent advice published by Historic England alongside, including Historic Environment Good Practice Advice in Planning Note 2: Managing Significance in Decision Taking in the Historic Environment[47] and Good Practice Advice in Planning Note 3: The Setting of Heritage Assets[48]. These guidelines assist in understanding and appreciating and then articulating how change can affect heritage significance and setting. Together this will provide an appropriate framework and approach, as informed by professional judgement, to utilise for determining the significance of the residual effects of the proposed development.

Consideration will be given to inter-project cumulative effects, subject to availability of cumulative scheme information in the public domain.

[46] English Heritage, 2012. Seeing the History in the View. A Method for Assessing Heritage Significance within Views.
[47] Historic England, 2015. Managing Significance in Decision-Taking in the Historic Environment
[48] Historic England, 2017. Good Practice Advice in Planning Note 3: The Setting of Heritage Assets

8. POTENTIAL SIGNIFICANT ENVIRONMENTAL IMPACTS AND LIKELY EFFECTS – SCOPED DOWN

This section summarises the potential significant environmental impacts and likely effects that are at this stage anticipated to arise in connection with particular stages of the proposed development or aspects of the application site and will therefore be addressed in the EIA within 'scoped down' chapters. It sets out the approach to be adopted in each instance, the scope of technical assessments to be undertaken and the assessment methods proposed.

8.1 Noise and Vibration

A Noise technical assessment will be presented in ES Volume 1. The assessment will assess the effects of ambient noise on the proposed development, with traffic and trains considered the dominant sources. The assessment will also consider the potential noise impacts from the proposed development; particularly construction noise and vibration, road traffic noise, and any external plant noise on existing sensitive receptors.

It is considered that the proposed development would not give rise to the following impacts and associated effects and will therefore not be assessed as part of the ES Chapter:

- Vibration impacts from existing identified vibration sources, such as passing trains, and the effects on future residents of the proposed development. Due to the distance between the proposed development and the railway lines, it is considered that at this distance no effects will arise on future residents.
- Vibration impacts from the proposed development during operation on existing receptors. Due to the nature of the proposed development no activities that generate high levels of vibration are proposed.

8.1.1 Site Information and Baseline Conditions

The application site is located in an existing commercial area, with commercial and residential properties surrounding the application site. Reading Railway Station is located approximately 50 m to the south of the application site.

A baseline noise survey will be undertaken to quantify the existing noise climate. It is considered likely that the existing dominant noise sources comprise road traffic noise from the A329 and noise from passing trains. A written description of the noise climate will be undertaken.

The proposed development has the potential to give to vibration during the course of demolition and construction works.

The proposed development has the potential to contribute to the existing ambient noise climate during the course of demolition and construction works and during its operation. With regard to the latter, the operation of associated plant and the operation of any potential commercial, retail and community uses would have the potential to generate noise.

8.1.2 Potential Impacts / Effects

The assessment will consider the potential noise and vibration impacts and associated likely effects of the proposed development within the context of the policy framework and baseline conditions.

The assessment will consider the following potential impacts and associated likely effects:

- Development works, the resulting demolition and construction plant noise and vibration impacts and the associated effects on buildings and on existing and future residents and building occupants within the study area;
- Development works, the resulting demolition and construction traffic and the associated noise effects on existing and future residents within the study area;
- Ambient noise effects from surrounding noise sources (e.g. future traffic flows of surrounding road links, taking into account the removal of the traffic generated by the existing uses, as well as other existing noise sources) on future residents of the proposed development;
- Noise effects on future residents of the proposed development from the operation of non-residential components of the proposed development (e.g. industrial, community, commercial and retail).
- Noise effects on existing local residents as a result of traffic generated by the proposed development, taking into account the removal of the traffic generated by the existing uses; and
- Building services plant noise effects associated with the operation of the proposed development upon existing noise sensitive receptors.

8.1.3 Approach and Methodology

The suite of noise and vibration assessments will be undertaken in accordance with relevant British Standards as set out below, as well as the Calculation of Road Traffic Noise (CRTN)[49] method and World Health Organisation (WHO) Guidance for Community Noise (1999)[50].

Consultation

Consultation with the RBC will be undertaken to agree the proposed assessment methodology for the ES Chapter and to confirm the methodology for the baseline noise survey.

Study Area

The study area incorporates:

- The application site;
- Existing nearest Noise Sensitive Receptors (NSR's) to the application site boundaries, including:
  - Residential premises to the north of the application site (opposite side of Vastern Road);
  - Great Brighams Mead (opposite side of Vastern Road);
  - SSE Contracting Limited (opposite side of Vastern Road);
  - Residential units above the commercial uses to the west of the application site (opposite side of Caversham Road);
  - Network rail offices / sorting offices to the south of the application site; and
- The main road network identified within the TA as being impacted by the proposed development and the existing NSR's situated along these roadways.

The car park to the east of the application site is not considered to be noise-sensitive. More distance receptors will only be assessed if significant impacts are predicted to the closest noise-sensitive receptors.

49 The Department for Transport, 1988. Calculation of Road Traffic Noise.
50 World Health Organization, 1999. Guidelines for Community Noise, Stockholm University & Karolinska Institute.

Baseline Noise Survey

The baseline noise survey will comprise attended day and night-time noise monitoring and attended short-term noise measurements to quantify the existing noise climate. Unattended measurements cannot be undertaken due to security reasons.

Demolition and Construction

The assessment of demolition and construction noise and vibration on surrounding sensitive receptors will be considered in accordance with the following standards, guidance and methodologies:

- BS5228-1:2009 for demolition and construction plant noise and construction traffic noise[51];
- BS7385 for vibration in buildings[52]; and
- BS6472-1 for vibration effects on humans[53].

Completed Development

The assessment of noise on and from the proposed development will be undertaken in accordance with the following standards, guidance and methodologies:

- CRTN for the impact of operational road traffic noise and change in road traffic noise as a result of the proposed development;
- BS8233:2014[54] and WHO 'Guidance for Community Noise':1999 for noise break-in, external amenity space (balconies and communal open space) noise; and
- BS4142: 2014 for industrial and commercial noise[55].

The assessment will consider the following three scenarios:

- Existing baseline;
- Future baseline (existing baseline + future growth derived from tempro factors + cumulative schemes); and
- Future baseline + proposed development.

Where the identified impacts indicate a notable change in noise and vibration levels compared to the baseline an assessment, appropriate additional mitigation measures will be recommended.

In order to determine the significance of likely effects, the magnitude of the impact and sensitivity of the NSR will be considered together. On that basis, the scale of identified effects will be determined.

Consideration will be given to inter-project cumulative effects, subject to availability of cumulative scheme information in the public domain.

51 British Standards Institution, 2009. BS 5228-1 Code of practice for noise and vibration control on construction and open sites, BSI.
52 British Standards Institution, 1993. BS 7385 Evaluation and measurement for vibration in buildings, BSI.
53 British Standards Institution, 2008. BS 6472-1 Guide to evaluation of human exposure to vibration in buildings, BSI.
54 British Standards Institution, 2014. BS 8233:2014 Guidance on sound insulation and noise reduction for buildings, BSI.
55 British Standards Institution, 2014. BS 4142: 2014 Methods for rating and assessing industrial and commercial sound, BSI.

9. POTENTIAL NON-SIGNIFICANT ENVIRONMENTAL IMPACTS AND LIKELY EFFECTS – SCOPED OUT

During the EIA scoping process, consideration has been given to ensuring that the EIA is proportionate and therefore only focuses on the likely significant effects of the proposed development. Accordingly, the scoping process has identified a number of potential environmental issues that are unlikely to generate significant effects on the environment and therefore, are proposed to be scoped out of the ES. These issues are discussed in this section.

9.1 Archaeology

An archaeology technical assessment will be presented in as a technical appendix in ES Volume 3. The assessment will consider the potential demolition and construction stage impacts of the proposed development; particularly the proposed basement construction.

9.1.1 Site Information and Baseline Conditions

There are no statutorily designated assets on the application site and the application site is not located within a Conservation Area (CA). The closest CA is Market Place/London Street Conservation Area located approximately 390 m south-east of the application site. The closest listing building is the Grade II listed main building of Reading general station (Listing entry 1321892), approximately 230 m to the south of the application site. There are 25 Grade II listed buildings within 550 m of the application site, the Grade II* town council chamber and offices with clock tower (Listing Entry 1113400) and the Grade I Listed Greyfriars Church (Listing Entry 1321952).

The application site is not within an area of archaeological potential as designated by RBC.

The British Geological Survey (BGS) data indicates that the application site is located within the Thames River on an 'island' of brickearth. Data from borehole logs held by the BGS online data library from developments in the 1980s would that the brickearth has been removed as in all logs within the application site found alluvium directly beneath under-dated made ground. However, evidence from archaeological investigations on the south side of the Thames would indicate that the presence of an earlier River Thames channel.

There have been no archaeological investigations within the application site but 29 have been carried out within the study area. Of these there are four which are within 50 to 150 m of the application site; two are to the north on the northern side of Vastern Road (the A329), one on the eastern side of Vastern Road/Forbury Road (the A329) and one the south side of the railway lines and west of Reading Railway Station. All these investigations recorded approximately 2m of made ground directly over alluvium. Further, none of the investigations recorded buried heritage assets earlier than the late post medieval, i.e. 1800s and onwards. Archaeological data from within the study area indicates that settlement throughout all periods was focused south of the station, on the outcrop of Taplow Gravels between the Thames to the north of the application area and the River Kennet 870 m to the south. Being located within the River Thames channel, the application would have been prone to flooding and therefore unsuitable for permanent settlement. Prehistoric artefacts to north of the application site suggest that the application site may have been used seasonally or possibly for the ritual deposition of artefacts. Throughout the medieval period, it is likely to have been used for pasture. Thus, there is a low potential for the presence of remains dating from the later prehistoric (Neolithic onwards) to the late 19th century. There is moderate potential for palaeoenvironmental remains of low significance given to presence of alluvium and there is an uncertain potential for early prehistoric remains but these would be buried towards the bottom of the alluvial sequence and at the interface between the alluvium and natural Thames gravels and unlikely to be affected by the proposed development.

Given that no remains of high significance have been identified, a generally low potential for the presence for remains of all other periods, other than from the late 19th century onwards, it is recommended that the Archaeology be scoped out.

9.1.2 Potential Impacts / Effects

The assessment will consider the effects of the proposed development within the context of the policy framework and baseline conditions. The assessment will consider the following potential impacts and associated likely effects:

- Development works, in particular the proposed basement excavation and construction, as well as any remediation works (if required) which could remove below ground heritage/archaeological assets with its footprint to its maximum depth;
- Development works in particular piled foundations which would have impacts similar to that of the basement construction. Piles would only have an impact if inserted prior to basement construction, and pile caps and ground beams, depending on the depth of the basement, may have no further impact; and
- Development works, in particular landscaping and any associated works, servicing etc., which could remove any later, e.g. late medieval and post medieval remains at the top of the alluvial sequence.

It is considered that due to the nature of the proposed development, it would not give rise to the following impacts and associated effects and will therefore not be assessed:

- Operational /completed development stage effects.

This is because once the proposed development has been completed, no further ground disturbance would occur and consequently there would be no additional impacts or resulting environmental effects upon buried heritage assets.

9.1.3 Approach and Methodology

The suite of assessments will conform entirely to requirements of the NPPF, and to standards specified by the Chartered Institute for Archaeologists[56] (CIfA) and Historic England[57] and the RBC.

Consultation

Consultation was undertaken with Berkshire Historic Environment Records (BHER) office to confirm the study area. Consultation with Berkshire Archaeological Advisor will be undertaken during the writing of the HEA regarding the mitigation. No specific consultation during scoping exercise is considered necessary.

Study Area

In order to set the application site into its full archaeological and historical context, a 550 m-radius study area around the application site boundary will be considered. Information on the known historic environment features within that study area will be collected from the primary repositories of such information.

56 Chartered Institute for Archaeologists, December 2014. Standards and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment, Reading.
57 English Heritage, 2008. Conservation principles, policies and guidance. Swindon.
Historic England, 2015. The Setting of Heritage Assets – Historic Environment Good Practice Advice in Planning: 3. Historic England in collaboration with the Historic Environment Forum, second edition.
Historic England, 2015. Managing Significance in Decision-Taking in the Historic Environment – Historic Environment Good Practice Advice in Planning: 2. Historic England in collaboration with the Historic Environment Forum, second edition.

Demolition and Construction

A desk-based Historic Environment Assessment (HEA) will be produced in support of the EIA, to be included as a Technical Appendix in ES Volume 3.

The HEA will put the proposed development into its full archaeological and historical context and provide an assessment of the significance of known and potential buried heritage assets within and beyond the application site, which may be affected by the proposed development. They will include assessments of factors which will have compromised the survival of buried heritage remains.

Physical effects upon buried heritage assets would all be permanent, whether or not the proposed development works are temporary in nature (e.g. ground excavation for temporary services, lighting and hoardings).

The archaeological specialist will liaise closely with other topic specialists (e.g. ground conditions) to ensure that there is no overlap in the assessment of effects, along with the design team. Where possible there will be an attempt to mitigate, by design, any impacts on particularly sensitive assets, although these are not considered to be present.

The fully illustrated assessment will put the application site into its archaeological and historical context and include a detailed baseline compiled through a broad range of standard data sources, including the Berkshire Historic Environment Record (BHER), Historic England's National Heritage List (NHL), and local authority data sources along with published works and cartographic sources specific to the area, and geotechnical and geoarchaeological data. The assessment will also consider any earlier desk-based assessments and archaeological investigations in or around the application site. The MOLA in-house Geographical Information System (GIS) will be consulted which holds information on statutory designations' GIS data, projected Roman roads, georeferenced published historic maps and Defence of Britain survey data.

The HEA will use these sources to assess the likely presence and significance of any heritage assets which may be affected by development. This would include known assets and the potential for previously unrecorded remains, the likely depth of remains and a review of factors which may have compromised asset survival.

An appropriate mitigation strategy will be set out in the EIA with the aim of reducing or offsetting any adverse effect (i.e. resulting in no significant residual effects). Measures to mitigate effects would normally consist of design adjustments, to allow significant resources to be protected and retained (preservation *in situ*) or, where this is not justified or feasible, investigation and recording before and during development, with dissemination at an appropriate level (preservation by record).

Consideration will be given to inter-project cumulative effects, subject to availability of cumulative scheme information in the public domain.

9.2 Transport and Accessibility

A Transport and Accessibility technical assessment is proposed to be scoped-out of the ES. Due to the anticipated significant reduction in traffic movements following redevelopment, it is considered that the proposed development would not give rise to significant environmental effects in relation to Transport and Accessibility. The proposed development would have significantly fewer parking spaces than the existing retail park and hence the anticipated reduction in traffic movement. A Transport Assessment will be produced and submitted alongside the planning application which will provide a full analysis of the existing and proposed site trip generation and associated impacts.

This assessment approach was confirmed with the RBC Transport Development Control Manager. Confirmation of the approach was received by email on 26 November 2019.

9.2.1 Site Information and Baseline Conditions

The application site is located within an established mixed-use area, comprising both commercial and residential land uses. The site benefits from good transport infrastructure in close proximity which facilitates travel by non-car modes such as walking, cycling and public transport.

Vehicular access to the site is currently achieved from Caversham Road to the west with egress being off Vastern Road to the north. It is proposed to retain similar vehicular access/egress arrangements for the proposed development.

There are good walking linkages in the local area, with extensive footway provision along Caversham Road, Vastern Road and Trooper Potts Way. Controlled pedestrian crossing facilities are provided across Caversham Road just south of Northfield Road, Vastern Road just east of its roundabout junction with Caversham Road and also to the west of the Vastern Road / George Street / Napier Road, as well as on Trooper Potts Way at its junction with Vastern Road adjacent the northeast corner of the application site.

A pedestrian route from the application site to the town centre can be easily achieved via the northern entrance to Reading Railway Station (accessed via Trooper Potts Way), where it is possible to walk through the station building and exit onto Station Hill at the northern end of the town centre. The application site's very close proximity to the town centre means that there is potential for trips to be made on foot, noting that there are numerous leisure, retail and employment uses within the town centre.

In terms of cycling infrastructure, a shared use foot/cycle way extends southwards from the Vastern Road / Caversham Road roundabout along Caversham Road along the application site's western boundary. A shared foot/cycle way is also provided along Vastern Road along part of the site's northern frontage, although cyclists are directed to re-join the carriageway where it connects with the Retail Park egress road. All of the signalised crossings on Vastern Road between the Caversham Road roundabout and Napier Road/Bagnall Way roundabout are Toucan crossings and therefore suitable for use by cyclists.

There are six bus stops accessible within 400 m of the application site on Trooper Potts Way to the east of the application site and on Caversham Road to the west and north-west. There are approximately 12 different bus services available from these stops combined. The application site is therefore considered to be ideally situated to facilitate a highly sustainable development with low parking provision and low levels of vehicle trips.

The application site is also situated approximately 50 m north of Reading Railway Station, which can be accessed by pedestrians via Caversham Road and Trooper Potts Way. The station is served by frequent rail services to/from London Paddington and Oxford which will be further enhanced when Crossrail services commence. Up to four Crossrail services an hour in each direction will serve Reading Railway Station, allowing passengers to travel through central London without having to change trains.

9.2.2 Potential Impacts and Likely Effects

Demolition and Construction

This stage will generate movements by HGVs. Based on experience of similar scale schemes, HGV trips would not have a significant effect on delay, amenity, severance, safety etc. A Construction Logistics Plan / Construction Traffic Management Plan will form part of the planning application and will set out ways of mitigating the impacts of construction traffic.

Completed Development

The proposed development would deliver an improved public realm with new pedestrian and cycle routes through the application site. Additionally, the application site is anticipated to generate

significantly fewer vehicle trips than the current retail park resulting in beneficial effects on highway safety, severance, amenity, fear & intimidation, and delay. A Travel Plan will be submitted setting out measures to further reduce the impact of the development on the surrounding transport networks, including measures to reduce the need for people to travel.

Car Parking Provision

The proposed development would have significantly reduced levels of parking compared to the existing retail park, resulting in fewer traffic movements being generated. A Car Parking Management Plan will form part of the TA and will set out the ways in which the onsite car parking will be managed.

Trip Generation

- Private car

  The number of private car trips generated would be significantly reduced as a result of the development.
- Public transport

  The proposed development would lead to an increase in public transport trips, to be assessed in detail within the TA.
- Cycling

  The proposed development would lead to an increase in cycle trips, to be assessed in detail within the TA. However, the significant reduction in car trips would be beneficial for cyclists.
- Pedestrian

  The proposed development would lead to an increase in pedestrian trips, to be assessed in detail within the TA. However, the significant reduction in cars trips would be beneficial for pedestrians, particularly in relation to highway safety, amenity, severance and fear & intimidation.
- Servicing

  Servicing trips would be generated by the proposed development, but these would be accommodated within the site. The number of servicing trips generated would be relatively low and would have minimal impact on the highway network.

9.2.3 Approach and Methodology

Given the nature of the proposed development and standard mitigation measures that would be committed to by the Applicant, significant transport and accessibility effects are unlikely to arise. The significant reduction in vehicle trips to the application site following redevelopment would have a beneficial effect on the surrounding highway network, and would be beneficial for all road users, particularly pedestrians and cyclists but also public transport users through improved/more reliable bus journey times as a result of reduced congestion and queuing on the highway network.

The highways and transport implications of the proposed development would be comprehensively considered within the Transport Assessment which will be submitted with the planning application.

There will be additional documents prepared which will address other specific highways and transport related issues such as a Construction Logistics Plan, Construction Travel Management Plan, Delivery and Servicing Plan, Parking Management Plan and Travel Plan. The primary function of these documents will be to minimise the proposed developments associated highways and environmental impact.

9.3 Ground Conditions

A Ground Conditions technical assessment is proposed to be scoped-out of the ES. It is considered that the proposed development would not give rise to significant environmental effects in relation to Ground Conditions.

9.3.1 Site Information and Baseline Conditions

The potential for ground contamination at the application site has been assessed from a site visit undertaken on the 16 April 2019 and review of historical maps. Local authority records and information from environmental databases have also been obtained.

Site History

The application site was historically occupied by part of the Great Western Railway Works including a coal depot by the late 1890s with multiple railway sidings. The railway sidings were no longer present by the late 1980s, with buildings present on-site in the current configuration. Two electricity substations are present in the south and west of the application site.

Potential contaminants could include oils and fuels, asbestos fibres, metals and chemicals, and there is the likelihood of Made Ground/fill being present at the application site from the construction of the current and past developments.

Geology

The application site is located in an area of moderate sensitivity with regard to groundwater resources. The application site is underlain by Unproductive Strata, which is further underlain by a Principal Aquifer. There are 10 groundwater abstractions recorded within 2 km, none of which are for public potable water supply. The abstractions are considered likely to be from the Chalk Principal Aquifer, which is separated from the Made Ground by the low permeability Langley Silt Member. The clay and silt deposits can be expected to provide some protection to downward migration of contamination (if present) within groundwater. The application site is not located within a groundwater Source Protection Zone.

Hydrology

The application site is located in an area of moderate sensitivity with regard to surface water resources given that the River Thames is located 150 m north-east. There are three surface water abstractions within 2 km of the application site; however, none of the abstractions are for sensitive uses such as for public potable water supply.

The majority of the application site (approximately 95 %) is located in Flood Zone 2 (Medium Probability). Small areas (<5 %) in the west and centre of the site are located in Flood Zone 1 (Low Probability), and small portion (< 5%) of the north-eastern site boundary is located in Flood Zone 3 (High Probability).

Hydrogeology

The application site is underlain by Unproductive Strata, which is further underlain by a Principal Aquifer.

9.3.2 Potential Impacts and Likely Effects

The preliminary contamination risk assessment undertaken for the application site identified a number of potential pollutant linkages at both the construction and completed development stages of the proposed development. In consideration of this, and in the absence of mitigation, the following potential pollutant linkages could present a potentially unacceptable risk (as defined in Model Procedures for the Management of Contaminated Land, CLR 11):

- Future site users and construction workers may come in to direct contact with potentially contaminated shallow soils (including Made Ground) and NAPL impacted shallow groundwater. This could include dermal, ingestion and inhalation pathways;
- Chemical attack from the direct contact of potentially contaminated soils with proposed structures on site, including potable water supply pipes and building materials;
- Migration of ground gas and contaminant vapours into new buildings and structures;
- Adjacent site users may come into contact with potentially contaminated dust from construction works; and
- Potentially contaminated groundwater may migrate and impact both the shallow and deep aquifers and River Thames.

9.3.3 Approach and Methodology

Due to the nature of the proposed development, there would be no direct pollutant linkage in respect of the newly introduced residential receptors. This is because the proposed development will either cap or encapsulate the ground preventing future site users being exposed to potential contaminants. Vapour migration pathways, if necessary, would be managed through appropriate industry standard barriers or controls.

In advance of development works commencing on-site, the following standard regulatory and environmental mitigation measures and protection controls will be developed and implemented for the proposed development to avoid significant risks to construction workers and controlled waters:

- A Ground Contamination Risk Assessment will be prepared to inform the emerging proposals and will be presented as a technical appendix to the ES. The assessment will identify the risks associated with soil and groundwater contamination and the risk management strategy to allow the proposed development to proceed in a manner that avoids and minimises risks to human health and controlled waters;
- Further investigation and testing will be undertaken post-planning to further quantify the extent of soil and groundwater contamination and the characteristic ground gas and vapour situation for the application site. Any material which potentially contains asbestos will be managed in line with best practice guidance and current regulatory requirements;
- A Remediation Strategy will be prepared and agreed in consultation with RBC; and
- A Foundation Works and Piling Risk Assessment will be undertaken to determine risk management procedures during piling to avoid the creation of pollution pathways during substructure works before the removal of material during excavation of the basement area.

As is standard practice the above measures will be secured by means of appropriately worded planning conditions.

During the construction stage, standard best practice protocols and procedures will be adopted to ensure appropriate on-site storage of materials and to avoid the risk of accidental spills and contamination. These measures would be set out within the CEMP to be secured by means of an appropriately worded planning condition.

On the basis of the above, it is considered that the proposed development is unlikely to give rise to significant adverse environmental effects in relation to ground conditions. Accordingly, a ground conditions technical assessment chapter is proposed to be scoped out of the EIA. For completeness, the Ground Contamination Risk Assessment will be included within ES Volume 3: Technical Appendices of the ES.

9.4 Water Resources and Flood Risk

A Water Resources and Flood Risk technical assessment is proposed to be scoped-out of the ES. It is considered that the proposed development would not give rise to significant environmental effects in relation to Water Resources and Flood Risk.

9.4.1 Site Information and Baseline Conditions

There are no surface water features on the application site.

The majority of the application site is occupied by hardstanding with small areas of landscaping around the perimeter. The application site benefits from an existing drainage system although detailed drainage surveys have not yet been carried out.

The River Thames is located 150 m north-west of the application site.

The majority of the application site (approximately 95%) is located in Flood Zone 2 (Medium Probability). Small areas (<5%) in the west and centre of the site are located in Flood Zone 1 (Low Probability), and small portion (<5%) of the north-eastern site boundary is located in Flood Zone 3 (High Probability).

The EA is working with partners to design a potential scheme to reduce flooding from the River Thames in north Reading and Lower Caversham[58]. The latest design proposes a mixture of flood walls and embankments, as well as temporary flood barriers around Christchurch Meadows. The scheme is currently in consultation period, seeking views from local stakeholders on the current designs. The EA is aiming to submit planning permission in summer 2020, with the possibility for the scheme to be completed by summer 2021.

Therefore, actual flood risks at the application site would be significantly lower than those typically associated with areas of Flood Zones 2 and 3.

9.4.2 Potential Impacts and Likely Effects

During the demolition and construction works there would be a risk of accidental spills and contamination of surface water run-off. The proposed development would present an opportunity to reduce surface water run-off as part of the redevelopment works and reduce the risk of flooding.

The intensification of land uses would result in an increase in potable water demand and foul water discharge.

9.4.3 Approach and Methodology

There are no surface water features on the application site. The application site is not located in a Source Protection Zone.

In respect of controlled waters, the application site benefits from an existing drainage system which collects surface water runoff and foul sewage before discharging to the public sewerage system. There are no known direct connections from the application site to surface water features.

In advance of development works commencing on-site, potential contamination on-site will be addressed by means of standard mitigation measures, including the development of an appropriate Remediation Strategy and the removal of sources of contamination as appropriate. As such, the proposed development would not pose any risks to controlled waters.

During the construction stage, the proposed development will adopt standard best practice measures to ensure appropriate surface water management, storage of any liquids and sediment

[58] https://consult.environment-agency.gov.uk/thames/reading-and-caversham-flood-alleviation-scheme-inf/

management. These measures will be set out within the CEMP to be secured by means of an appropriately worded planning condition.

The proposed development will incorporate SuDS which will reduce the risk of flooding downstream and reduce the risk of pollution. No basements are proposed as part of the development and there are no proposals for any discharge to ground.

In respect of water consumption, the proposed development would adopt standard water saving devices and features as part of its design.

Based on the above, no significant adverse environmental effects are likely to arise in relation to Water Resources and Flood Risk. A formal Water Resources Assessment is therefore proposed to be scoped out of the EIA, but the proposed development's FRA (including an outline drainage strategy) will be presented as a technical appendix in the ES.

The FRA will be produced in accordance with the NPPF and PPG: Flood Risk and Coastal Change. In particular, the FRA would assess whether the proposed development is likely to be affected by current or future flooding and will consider the potential for flood risks to arise as a result of the introduction of the proposed development, either on or off-site.

The FRA will include a SuDS feasibility assessment which will, taking into account the underlying ground conditions, propose a SuDs strategy for the application site. Approach and Methodology

9.5 Ecology

An Ecology assessment is proposed to be scoped-out of the ES. It is considered that the proposed development would not give rise to significant environmental effects in relation to Ecology of sufficient significance to warrant an EIA chapter; however, a separate Ecological Impact Assessment (EcIA) report will be prepared in accordance with CIEEM guidelines[59].

9.5.1 Site Information and Baseline Conditions

An ecological survey of the application site was undertaken on 02 April 2019 by a Ramboll Ecologist. The purpose of the survey was to identify any preliminary ecological constraints and opportunities at the application site.

The survey confirmed that the on-site habitats comprise buildings, hardstanding, amenity grassland, introduced shrub, scattered trees, and slate chippings.

The application site contains two separate units of buildings, with shops including The Range, Aldi, Mothercare and TGI Fridays with associated hard standing (paths and car parking). There are areas of amenity grassland and introduced shrub around the buildings. Scattered trees are present across the application site. There is a small area of bare ground to the east of the application site, with a small area of slate chippings to the south-west of the application site.

The buildings, hardstanding, and slate chippings are of negligible ecological importance. Amenity grassland, introduced shrub, and scattered trees are of importance at Site level only.

The application site does not hold any statutory designations for wildlife and no statutory designated sites are present within 1 km. The following three non-statutory designated sites have been identified within 1 km of the application site:

- Cow Lane Depot;
- Warren Woodlands Complex; and
- Coal, Kennetmouth, and Kings Meadow East.

[59] CIEEM, 2018. Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal. Chartered Institute for Ecology and Environmental Management, Winchester.

The application site is unlikely to support significant populations of rare or protected invertebrates due to it comprising largely hardstanding and buildings.

It is also considered of Negligible suitability to support great crested newt and other amphibians, otter, reptiles, badger and hedgehog.

The application site is considered to be of Site level importance for use by common species of nesting and foraging bird.

The trees and buildings on the application site are considered to have Negligible potential to support roosting bats. The application site contains minimal habitat suitable to support foraging bats and is unlikely to function as a commuting corridor.

Overall the application site is of limited ecological value, and the value that exists is related to common species of nesting and foraging birds.

9.5.2 Potential Impacts and Likely Effects

During the demolition and construction works, all of the existing habitats on-site would be removed. However, the proposed development would offer the opportunity to deliver biodiversity enhancements through the landscaping proposals and other measures.

9.5.3 Approach and Methodology

A stand-alone EcIA report will be provided as an appendix to the ES. The EcIA will describe the baseline conditions on the application site and define the ecological importance of the features that could be affected by the redevelopment. The effects of the redevelopment (in construction and operation) would be assessed and mitigation proposed for any significant effects noted. The report would propose enhancement measures to promote biodiversity in the redeveloped scheme.

Biodiversity mitigation and enhancement measures would be incorporated within the parameters of the proposed development. These would include demolition of buildings and removal of trees and vegetation at an appropriate time of year to avoid impacts on nesting birds (or ecological supervision/watching brief if this is not possible), erection of bird boxes, provision of landscape planting.

Opportunities for ecological enhancement within the application site would also be provided, for instance, the potential to install bat boxes within the proposed development would be investigated. The provision of lighting would be carefully designed to avoid light spill onto areas of suitable bat foraging and commuting habitat.

On this basis, and taking into account the relatively low ecological value of the application site, significant ecological effects are unlikely to arise from the proposed development.

9.6 Telecommunication Interference

A Telecommunication Interference technical assessment is proposed to be scoped-out of the ES. It is considered that the proposed development would not give rise to significant environmental effects in relation to Telecommunication Interference. However, an assessment of possible interference to broadcast television reception will be undertaken. In addition, an assessment of interference to other telecommunications technologies (in particular, fixed microwave and point to point radio links) will be conducted. These assessments will include site visits (to determine the locations of any sensitive receptors around the application site) and baseline reception surveys to understand the pre-construction reception conditions.

9.6.1 Site Information and Baseline Conditions

The application site currently comprises four pavilion style commercial units (including an Aldi, The Range, Mothercare and Majestic Wine) and a separate building in restaurant use. It is likely

that there are a number of antenna systems in use around the application site for both signal transmit and receive purposes. These could be used for various technologies; however, it is likely that most will be used for standard television reception. Any baseline surveys to assess telecommunications coverage in and around the site will detail what any antenna is used for, especially in areas that may be subject to theoretical signal shadowing effects from the use of tower cranes and the proposed development itself.

9.6.2 Potential Impacts and Likely Effects

New, tall buildings and structures have the potential to impact on radio, television and other broadcast services as a result of shadowing and reflection effects caused. Table 9.1 provides an appraisal of the services that could potentially be affected by the proposed development.

Table 9.1: Telecommunication and Broadcast Services Appraisal

Service	Key Outcomes
Analogue Terrestrial Television	Due to the completed Digital Television Switchover, it is now not possible for the proposed development to impact analogue terrestrial television reception, as analogue television transmissions have been switched off South-East England region.
Digital Terrestrial Television (DTT)	DTT is more commonly known as 'Freeview'. The area is served by DTT services from the Crystal Palace transmitter (NGR TQ 33940 71220) to the east of the application site, and the Hannington transmitter (SU 52740 56807) to the west of the application site. In relation to Crystal Palace, the signal shadows from the proposed development would be created to the west, and for the Hannington transmitter, signal shadows would be created to the east. Although the application site and surrounding area is relatively undeveloped in comparison to the proposed development, industrial and commercial use is dominant to the north-east (in what will be the signal shadow) and it is therefore anticipated that the proposed development would not significantly affect reception in the locality. However, by understanding the baseline reception conditions (from a pre-construction signal survey) and by undertaking a reception impact assessment, an accurate understanding of possible impacts and effects can be ascertained and this standalone technical report would support the application. Should television reception be affected post development, the Applicant would investigate the complaints, and if deemed authentic and attributable to the proposed development, mitigation measures in the form of antenna betterment, antenna repositioning or via the provision of a cabled TV services would be provided.
Digital Satellite Television	Digital satellite television services are provided by geo-stationary earth orbiting satellites positioned above the equator. For the optimum

Table 9.1: Telecommunication and Broadcast Services Appraisal

Service	Key Outcomes
	reception of all satellite services, all receiving dishes must be positioned on the highest part of the rooftop as possible to ensure views to the sky's south-east horizon are free from other local skyline building clutter. Should there be any roof mounted satellite signal receiver dishes on the adjacent locations where line-of-sight views to the serving satellites may be obscured by the proposed development, relocating dishes to areas on the roof top where views to those satellites remain clear, would ensure the good reception of satellite television signals.
Cable Television	A number of 'TV over cable' operators exist in Reading. TV services are provided to a property via cables and decoded using a set top box or an integrated television set. Virgin Media, Sky and BT all provide such services. The availability of cable TV depends on provider's cable infrastructure. As cabled TV services operate via wired broadband, fibre and ADSL, interference effects cannot occur due to the nature of content delivery (through a cable, underground) and there is no possibility of effects from the proposed development on these services.
VHF (FM) Radio	The reception of VHF (FM) broadcast radio services are unlikely to be affected by the proposed development due to the nature of the radio broadcast network, the methods used for the encoding and decoding of signals and the likely current good coverage provided by the local VHF (FM) radio transmitters.
DAB Radio	The reception of DAB radio would not be affected by the proposed development as coverage is currently excellent throughout the Reading area and the network is designed to operate well in densely cluttered urban environments.
Mobile Phone Communications	The area will be served well by 2G, 3G and 4G mobile phone networks. The proposed development would not have any impact upon the operation of mobile telephones. The cellular nature of a mobile telephone network enables each handset to 'pick' the best cell site to ensure the correct operation of the handset. At this location, mobile telephone coverage would be optimal and robust due to the nature of the commercial requirements in buildings within the wider area.
Fixed Microwave Links and other point-to-point Radio Communications Channels	Radio and microwave links can be adversely affected by obstructions on and near to their transmission path such as construction cranes, buildings and trees. In general, the directional nature of radio links means that interference can

Table 9.1: Telecommunication and Broadcast Services Appraisal

Service	Key Outcomes
	be avoided by defining clearance zones beyond which any degradation will be insignificant, or by moving the link to avoid the obstruction. Should any existing links be impacted upon because of the proposed development, standard mitigation options would be likely to comprise the: • use of other radio scanner sites; • use of a radio relay site; • construction of a new base station site; • use of private circuits or satellite services; and • redefining of the exclusion zones by the use of aerial engineering. The identification of the appropriate measures would be determined by a detailed review of the existing radio communications infrastructure at each base station, confirmation of the data for the services operated by the link's owner from the identified radio sites; and review of the theoretical analysis of the proposed development layout on the existing radio communication systems, to identify the exclusion zone for any affected radio infrastructure. It is noted that such standard mitigation measures can be readily implemented to ensure the continuing operation of links such that the proposed development is not considered likely to generate any significant residual effects on these services.
New Telecommunication Services within the proposed development	All new telecommunications services into the proposed development would consider the expected growth in internet traffic and would provide bandwidth for heavy simultaneous use. The 'e-infrastructure' would be designed well and easily upgradeable for a modern building. Any signal distribution systems would be designed to be future proof and the nature of such networks would ensure that no unwanted or uncontrolled electromagnetic emissions would occur. Any radio transmitters used within the proposed development (for example, Wi-Fi or maintenance needs) would be CE Certified, meaning that the products have undergone stringent radio emission testing for use within the UK.

9.6.3 Approach and Methodology

As set out in Table 9.1, potential effects on telecommunication services may be limited to fixed DTT (Freeview) reception and fixed microwave links and other point-to-point radio channels only (should such links be present near the application site); however, these can be readily mitigated by means of standard measures as listed in Table 9.1.

Due to the presence of existing microwave links around the application site and the potential for television interference, the following reports will be produced as technical appendices to the ES:

- Pre-Construction Television Reception Impact Assessment; and
- Telecommunications / Microwave Fixed Link Impact Assessment.

9.7 Climate Change

A Climate Change technical assessment is proposed to be scoped-out of the ES. It is considered that the proposed development would not give rise to significant levels of greenhouse gas (GHG) emissions that would contribute to climate change.

9.7.1 Site Information and Baseline Conditions

The UK Climate Projections (UKCP09)[60] have produced predictions of climatic changes for the UK, including more intensive summers, milder winters, sea level rise, and more frequent storms and heavy rainfall. Given the location of the application site 150 m from the River Thames, it would be at risk from increased flooding as a result of climate change.

The EA is working with partners to design a potential scheme to reduce flooding from the River Thames in north Reading and Lower Caversham[61]. The latest design proposes a mixture of flood walls and embankments, as well as temporary flood barriers around Christchurch Meadows. The scheme is currently in consultation period, seeking views from local stakeholders on the current designs. The EA is aiming to submit planning permission in summer 2020, with the possibility for the scheme to be completed by summer 2021.

Given the existing commercial uses on the application site and in the surrounding area, the proposed development is unlikely to result in increased GHG emissions from the application site over and above existing conditions.

9.7.2 Potential Impacts and Likely Effects

Vulnerability to Climate Change

Increased flood risk associated with climate change will be addressed in the FRA, as well as best-practice mitigation measures that have been embedded as part of the proposed development.

Other climatic predictions, such as increased temperatures, and their likely environmental effects, such as overheating within residential units, will be addressed as part of the reserved matters stage.

Greenhouse Gas Emissions

The potential for the proposed development to affect the climate would largely be determined by the demolition and construction works of the proposed development, as well as the way the new buildings and residential units are used during operation; however, development and planning can play an important role within the wider determinants of climate mitigation including sustainable design initiatives.

The primary greenhouse gas (GHG) from urban development projects is carbon dioxide (CO_2), set out as CO_2 equivalent (CO_{2e}) to take account of all GHGs collectively, to prevent an understatement of global warming impact.

The Applicant will seek to achieve a number of sustainable design initiatives in line with policy requirements.

The proposed development's outline energy and sustainability strategy will therefore aim to:

60 Department for Environment, Food and Rural Affairs, 2009. Adapting to Climate Change – UK Climate Projections 2009.
61 https://consult.environment-agency.gov.uk/thames/reading-and-caversham-flood-alleviation-scheme-inf/

- minimise overheating within the residential units through appropriate design measures;
- minimise overall energy demand and consumption through practicable energy efficient design;
- minimise carbon dioxide emissions arising from the operation of the proposed development as far as practicably possible through the use of efficient plant, fittings and fixtures; and
- reduce carbon dioxide emissions arising from the operation of the proposed development as a result of on-site low carbon technology.

The Applicant will also seek to ensure that the proposed development's design is resilient in respect of climate change (for example in respect of flood risk) and that construction materials are selected following the Building Research Establishment (BRE) 'Green Guide to Specification' to:

- minimise embodied energy content (the energy used in manufacture);
- use recyclable materials where they have high embodied energy; and
- maximise the recycled content of the material, ease of maintenance, appropriate sourcing of materials and totally excluding deleterious and hazardous materials.

The proposed development will also seek to reduce the need to travel by private car as there will be a reduction in the number of car parking spaces than the existing use. Furthermore, the application site is within good proximity to sustainable transport options, such as Reading Rail Station. The proposed development will provide secure cycle parking and other initiatives to improve accessibility and links with the nearby amenities.

Furthermore, the Applicant will commit to best practice measures during the demolition and construction stage to minimise potential climate impacts. These measures will be set out within the CEMP, to be secured by means of a suitably worded planning condition.

9.7.3 Approach and Methodology

In addition to the Air Quality ES Chapter and the FRA, which will form a technical appendix to the ES, the following stand-alone assessments will consider the proposed development's indirect or secondary impacts on climate:

- Energy Statement; and
- Sustainability Statement (including BREEAM Pre-Assessment).

Based on the above, no significant adverse environmental effects are likely to arise in relation to Climate. Accordingly, a discrete Climate technical assessment is proposed to be scoped out of the EIA.

9.8 Major Accidents and Disasters

A Major Accidents and Disasters technical assessment is proposed to be scoped-out of the ES. It is considered that the proposed development would not give rise to significant environmental effects in relation to Major Accidents and Disasters. In particular, the proposed development would not be subject to significant risks from major accidents involving the Oxkem site as this is located approximately 1.65 km west of the application site.

9.8.1 Site Information and Baseline Conditions

The application site is not located within a geographical region that has historically been subject to natural disasters although it does lie in an area which is vulnerable to flooding. However, embedded mitigation measures will include amongst others, ensuring finished floor levels are set above the Climate Change predicted flood level, ensuring a safe means of escape for vulnerable users and preparing an emergency flood evacuation plan for the proposed development.

As discussed previously, the Oxkem COMAH Establishment is located approximately 1.65 km east of the application site. As such, it is considered unlikely that this would pose risks to the proposed development. The application site does not lie within the consultation zones of the COMAH Establishment, and therefore, there is no need to consult with the Health and Safety Executive (HSE) regarding the proposed development.

9.8.2 Approach and Methodology

There is no recognised guidance on the assessment of major accidents and disasters. The 2017 EIA Regulations state that "*a description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned*" should be provided within the ES.

It is considered that the majority of major natural disasters, such as epidemics, earthquakes, volcanic eruptions and droughts are not of relevance to the application site or proposed development; however, vulnerability to flood risk and storm events are considered to be relevant.

Flood risk will be considered within the FRA, where best-practice mitigation measures will be outlined. Strong winds associated with storm events will be factored into the design of the proposed development in respect of structural integrity and appropriateness of landscaping features. It is considered that no further assessment in respect of natural disasters is necessary.

In respect of major accidents:

- Utility failure (such as electricity, gas, water supply or sewerage) will be avoided through appropriate design and sufficient consultation with utility providers, ensuring that necessary repairs can be undertaken, and continuation of supply ensured;
- Urban fires will be mitigated through appropriate design in accordance with Building Regulations and relevant safety guidance, in addition to the established 999 emergency response procedures in place in Reading; and
- Terrorist incident risk is not considered to be heightened or noteworthy due to the application site's location and intended uses of the proposed development.

Based on the above, no significant adverse environmental effects are likely to arise in relation to Major Accidents and Disasters. Accordingly, a discrete Major Accidents and Disasters technical assessment is proposed to be scoped out of the EIA.

9.9 Health

A Health technical assessment is proposed to be scoped-out of the ES. It is considered that the proposed development would not give rise to significant environmental effects in relation to Health.

9.9.1 Site Information and Baseline Conditions

The application site is occupied by several tenants for a combination of commercial and retail uses. The on-site uses offer no beneficial in-direct and directs effects on the local population with regard to human health with the current baseline conditions.

9.9.2 Considerations

The potential effects of a new development on the health of new and existing residents and workers would be largely determined by the way the proposed development's buildings and spaces are used, as well as lifestyle factors which cannot be accurately quantified or controlled at the planning stage. These wider factors sit outside of the scope of planning and EIA.

Development and planning can play an important role within the wider determinants of health and well-being, including provision of good quality work space, employment, access to health services, access to open space and access to healthy forms of transport. This role between planning and development, and health and wellbeing is limited to the location, design and nature of uses proposed and the methods in which they are constructed. The scope of this assessment needs to be applied proportionately to the type of development being considered.

Residential, commercial, office, leisure, community, retail and industrial uses are located within the surrounding area. The proposed development itself could also comprise residential, commercial, leisure, retail, and community spaces.

Mitigation measures will be incorporated into the design of the proposed development to maximise health and wellbeing such as the provisioning of well-designed residential units and pedestrian areas; the provision of on-site employment opportunities, on-site recreation opportunities, on-site open space; as well as access to schools and healthcare facilities.

9.9.3 Approach and Methodology

A number of assessments within the EIA will consider the proposed development's indirect or secondary impacts which can have an effect on health:

- Ground Conditions Risk Assessment (technical appendix);
- Socio-economic Assessment;
- Air Quality Assessment;
- Noise Assessment;
- Transport and Accessibility Assessment;
- Daylight, Sunlight and Overshadowing Assessment; and
- Wind Microclimate Assessment.

Based on the above, no significant adverse environmental effects are likely to arise in relation to Health. Accordingly, a discrete health and wellbeing technical assessment is proposed to be scoped out of the EIA.

9.10 Waste

9.10.1 Site Information and Baseline Conditions

There are currently waste streams directly arising from the operations associated with application site. On-site uses are commercial and therefore the associated waste streams include commercial waste (comprising some industrial waste). With the introduction of the proposed development, the type and quantum of waste streams would change. Existing waste production is likely to be less than what which would be produced from the proposed development.

9.10.2 Potential Impacts and Likely Effects

During demolition and construction works, the greatest potential for waste arisings would be from the demolition of existing buildings. Suitable mitigation measures will be employed in order to maximise on-site re-use and recycling and thereby reduce landfill waste from the demolition and construction works. In addition, the volume of waste produced from demolition and construction works in the surrounding area will not exceed the RBC landfill allowance and thus the cumulative effect from the development arising from demolition and construction waste will not be significant. Given the good, direct road network across the Reading Railway Station area, residential receptors in the surrounding area are unlikely to be significantly affected by vehicle movements bringing materials to the application site and taking waste away.

Although the operational waste is anticipated to increase when compared to the existing on-site waste generation, the new on-site floorspace would be provided with appropriate waste facilities to promote sustainable waste practices and recycling.

9.10.3 Approach and Methodology

Waste management during demolition and construction would be undertaken in accordance with a Construction Site Waste Management Plan (SWMP) to ensure suitable management of construction waste, minimisation of waste arising and maximisation of waste re-use and recycling.

The Applicant's contractors would be encouraged to maximise opportunities for waste recycling and re-use both on and off-site where practically possible. In the event that residual matters require off-site disposal, the Applicant's contractors would ensure the appropriate categorisation of waste in accordance with current regulatory requirements.

The Demolition and Construction Environmental Management chapter of the ES will outline likely waste quantities arising from demolition and construction works and present the Applicant's commitments to waste minimisation and management during these works.

The Proposed Development Description ES chapter will summarise the operational waste management measures which would be included within the proposed development. Sufficient information relevant to the waste management practices during all phases of the proposed development will be provided to fulfil requirements in line with the key UK waste related legislation and overarching EU Directives.

Based on the proposed development's land uses and waste streams, plus the proactive commitment to waste reduction, it is considered that waste generation would not be a significant issue in itself, requiring assessment within the EIA. Taking into account best practice mitigation measures, it is not anticipated that there would be any environmental effects from the future waste generation streams by the proposed land uses, save for the environmental effects of the collection of waste and secondary effects of emissions and traffic noise associated with waste vehicles. The movements of waste vehicles will be factored into the proposed development's trip generation figures and assessed in the Air Quality and Noise and Vibration chapters of the ES as well as in the standalone Transport Assessment.

Based on the above, no significant adverse environmental effects are likely to arise in relation to Waste. Accordingly, a discrete waste technical assessment is proposed to be scoped out of the EIA.

10. SUMMARY

The ES will address the requirements of Schedule 4 of the EIA Regulations. The preliminary structure and content of the ES is as follows:

- Non-Technical Summary;
- Volume 1: Main Environmental Statement:
  1. Introduction;
  2. EIA Process and Methodology;
  3. Alternatives and Design Evolution;
  4. Proposed Development Description;
  5. Demolition and Construction Environmental Management;
  6. Socio-Economics;
  7. Archaeology;
  8. Air Quality;
  9. Noise and Vibration;
  10. Daylight, Sunlight, Overshadowing and Solar Glare;
  11. Wind Microclimate;
  12. Intra Cumulative Effects;
  13. Summary of Residual Effects and Mitigation;

  Glossary of Terms and Abbreviations;
- Volume 2: Townscape, Visual and Heritage Impact Assessment including a Heritage Statement; and
- Volume 3: Technical Appendices.

Following review of the emerging proposed development it is not deemed necessary to undertake a full EIA and produce ES chapters for water resources and flood risk; ground conditions; ecology; waste; health and well-being; climate change; major accidents and disasters; and telecommunication interference; however, ES Volume 3 will include the following ES technical appendices to inform the planning application:

- Historic Environment Assessment;
- Flood Risk Assessment;
- Contamination Risk Assessment; and

Technical Appendix 2.2: Preliminary Risk Assessment

Intended for
Aviva Life & Pensions UK Limited

Date
February 2020

Project Number
1700003910

READING STATION PARK
GROUND CONDITIONS PRELIMINARY RISK ASSESSMENT

RAMBOLL

READING STATION PARK
GROUND CONDITIONS PRELIMINARY RISK ASSESSMENT

Project No.	**1700003910**
Issue No.	**2**
Date	**10/02/2020**
Made by	**Lucy Baker & Olivia Naylor**
Checked by	**Matthew Pannett**
Approved by	**Michael Elliott**

Made by: L. Baker O. Naylor

Checked/Approved by: Matthew Pannett Michael Elliott

This report has been prepared by Ramboll UK Limited with all reasonable skill, care and diligence, and taking account of the Services and the Terms agreed between Ramboll UK Limited and the Client. This report is confidential to the Client, and Ramboll UK Limited accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by Ramboll UK Limited beforehand. Any such party relies upon the report at their own risk.
Ramboll UK Limited disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the Services.

Version Control Log

Revision	Date	Made by	Checked by	Approved by	Description
1	11/12/2019	LB	MP	ME	First Issue to Client
2	10/02/2020	LB, ON	MP	ME	Second Issue to Client

Ramboll
240 Blackfriars Road
London
SE1 8NW
United Kingdom
T +44 20 7808 1420
www.ramboll.co.uk

CONTENTS

EXECUTIVE SUMMARY		**I**
1.	**INTRODUCTION**	**1**
1.1	Background	1
1.2	Objectives	1
1.3	Scope and Limitation	1
1.4	General Limitations and Reliance	1
2.	**SITE INSPECTION**	**3**
2.1	Site Setting	3
2.2	Site Layout and Activities	3
2.3	Storage of Chemicals and Hazardous Substances	5
2.4	Water, Wastewater and Drainage	5
2.5	Waste Storage and Disposal	5
2.6	Deleterious Materials	6
2.7	Air Emissions	7
2.8	Other Issues	7
2.9	Potential for Ground Contamination from Current Uses	7
3.	**HISTORICAL & REGULATORY INFORMATION**	**8**
3.1	Map History	8
3.2	Environmental Database Records	9
3.3	Regulatory Authority Enquiries	10
3.4	Historical Potential for Ground Contamination	11
4.	**ENVIRONMENTAL SETTING**	**13**
4.1	Geology and Hydrogeology	13
4.2	Hydrology	14
4.3	Ecology	15
4.4	Environmental Sensitivity and Vulnerability	15
5.	**CONCEPTUAL SITE MODEL**	**17**
5.1	Introduction	17
5.2	Potential Sources of Contamination	17
5.3	Receptors	17
5.4	Potential Pathways	18
5.5	Preliminary Conceptual Site Model	19
6.	**CONCLUSIONS**	**21**

LIST OF TABLES

Table 2.1: Adjacent and Surrounding Land Uses 3
Table 3.1: Summary of Key Environmental Database Information 9
Table 4.1: Summary of Geology and Hydrogeology 13
Table 4.2: Licensed Groundwater Abstractions within 2km of the Application Site 14
Table 4.3: Licensed Surface Water Abstractions within 2km of the Application Site 15
Table 5.1: Potential Sources of Contamination 17
Table 5.2: Potential Receptors to Contamination 17
Table 5.3: Potential Pathways for Contamination 18
Table 5.4: Conceptual Site Model - Potential Pollutant Linkages – Completed Development 19
Table 5.5: Conceptual Site Model - Potential Pollutant Linkages - During Development 20

GROUND CONDITIONS PRELIMINARY RISK ASSESSMENT
READING STATION PARK

APPENDICES

Appendix 1
Figures

Appendix 2
Photographic Log

Appendix 3
Selected Historical Maps

R1700003910_2_Preliminary Risk Assessment

EXECUTIVE SUMMARY

Ramboll UK Limited ('Ramboll') was commissioned by Aviva Life & Pensions UK Limited (the 'Applicant') to carry out a Preliminary Risk Assessment of Reading Station Shopping Park, Vastern Court, Reading, RG1 8AL (the 'application site'). The review is required in support of a proposed redevelopment of the application site ('the proposed development'). Outline planning permission is being sought, because the exact mix of uses (commercial and residential) and site layout and specifications is not known at the present time. The excavation would extend to a maximum of 1.5 m below ground level. The objectives of the review were to assess the potential for soil or groundwater contamination, both at and in the vicinity of the application site.

The application site is occupied by a shopping park comprising four retail units and a restaurant, all of which were constructed in the late 1980s. No significant potentially contaminative current activities were identified during the site inspection.

The application site was historically part of the Great Western Railway Works including a coal depot by the late 1890s with multiple railway sidings. The railway sidings remained until approximately the late 1980s when the current buildings appear to have been developed. Other potential sources of historic ground contamination include two electricity substations that were present in the south and west of the site.

Potential historic ground contaminants could include oils and fuels, asbestos fibres, metals and other hydrocarbon compounds. Made Ground/fill of unknown composition is likely to be present at the application site from the construction of the current site buildings.

By 1879 the surrounding land was occupied by the Great Western Railway Works (adjacent south), goods station, railway line, malthouse, timber yard, railway station and a brewery. By the late 1890s heavy residential development had taken place. Potential contaminants from these off-site sources includes oils and fuels, metals and chemicals. The application site is not particularly identifiable from its surroundings.

The Environmental Health Department of Reading Borough Council has confirmed that the application site has been identified as being potentially contaminated due to its former use as a works and coal depot. The application site has also been identified for future investigation in RBC's inspection strategy under Part IIA of the Environmental Protection Act 1990. However, the application site is currently classified by the Council as 'low risk' and there is no schedule set for the investigation of the application site.

The application site is located in an area of moderate sensitivity with regard to groundwater resources. The application site is underlain by Unproductive Strata, which is further underlain by a Principal Aquifer. There are 10 groundwater abstractions recorded within 2 km, none of which are for public potable water supply. The abstractions are considered likely to be from the Chalk Principal Aquifer, which is separated from the Made Ground by the low permeability Langley Silt Member. The clay and silt deposits can be expected to provide some protection to downward migration of contamination (if present) within groundwater. The application site is not located within a groundwater Source Protection Zone.

The application site is located in an area of moderate sensitivity with regard to surface water resources given that the River Thames is located 150 m north-east. There are three surface water abstractions within 2 km of the application site; however, none of the abstractions are for sensitive uses such as for public potable water supply.

The majority of the application site (approximately 95%) is located in Flood Zone 2 (Medium Probability). Small areas (<5%) in the west and centre of the site are located in Flood Zone 1 (Low Probability), and small portion (<5%) of the north-eastern site boundary is located in Flood Zone 3

(High Probability). Flood risk will need to be considered as part of the proposed development and will be reported in a Flood Risk Assessment in Volume 3: Technical Appendix 2.5.

Potential pollutant linkages associated with the history of the application site include risks to groundwater through leaching of contaminants from the soil, and vapours or ground gases migrating into new buildings. Future building cover and clean soils in landscaping could mitigate some potential pollutant linkages (i.e. providing a barrier to the soil). As is standard for a brownfield site redevelopment, potential risks would need to be assessed through a site investigation and risk assessment. The investigation and risk assessment should be undertaken at an appropriate point before redevelopment work starts on-site. This does not necessarily have to be at the outline stage. Remediation works cannot, however, be completely ruled out until the investigation and risk assessment have been completed.

Development works will also need to consider the potential for contamination to be present and how this is managed. For example, this could include health and safety of workers, piling risk assessments, Sustainable Drainage System management, appropriate classification of contaminated soils, mobilisation of contaminants in a sensitive water environment and potential for asbestos and other contaminants to be present.

1. INTRODUCTION

1.1 Background

Ramboll UK Limited ('Ramboll') was commissioned by Aviva Life & Pensions UK Limited (the 'Applicant') to carry out a Preliminary Risk Assessment (PRA) of the site at Reading Station Shopping Park, Vastern Court, Reading, RG1 8AL (the 'application site'). The application site is within the jurisdiction of Reading Borough Council (RBC). The assessment is required in support of a proposed redevelopment of the application site. Outline planning permission is being sought, because the exact mix of uses (commercial and residential) and site layout and specifications is not known at the present time. An area for provision of a basement is proposed within three areas between the buildings of the proposed development as defined in Parameter Plan 105 (shown in Environmental Statement Chapter 4: Description of Development). The excavation would extend to a maximum of 1.5 m below ground level (bgl).

1.2 Objectives

The objectives of the review were to assess the potential for soil or groundwater contamination, both at and in the vicinity of the application site.

1.3 Scope and Limitation

The scope of the PRA is to deliver the following:

- Examination of historic, recent and current Ordnance Survey plans to identify activities which might have led to contamination of soil or groundwater (for example, from manufacturing processes, from storage activities or waste disposal practices) both on the application site and on adjacent sites;
- Examination of published records and plans on the shallow and deep geology and hydrogeology of the application site to assess the vulnerability and sensitivity of groundwater and surface water resources to contamination, if present, and the possible direction of movement off site, if mobile;
- Search of a proprietary database of environmental permits, records and incidents at the application site and surrounding area;
- Enquiries of the Local Authority Planning and Environmental Health Departments to obtain information on environmental conditions, incidents and known contamination risks and on the Local Authority's Contaminated Land Strategy;
- Enquiries of the Petroleum Officer to determine if records exist of above ground or below ground licensed (petrol) storage facilities; and
- A site walk-over inspection.

No sampling or analysis of soils, waters or other materials has been carried out as part of the PRA.

1.4 General Limitations and Reliance

This report has been prepared by Ramboll exclusively for the intended use by the client in accordance with the agreement between Ramboll and the client defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended or any other services provided by Ramboll.

In preparation of the report and performance of any other services, Ramboll has relied upon publicly available information, information provided by the client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the

information provided to Ramboll was accurate, complete and available to Ramboll within the reporting schedule.

Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and/or compliance. This report and accompanying documents are initial and intended solely for the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.

Unless otherwise stated in this report, the scope of services, assessment and conclusions made assume that the site will continue to be used for its current purpose and end-use without significant changes either on-site or off-site.

Ramboll's scope of services for this assignment did not include collecting samples of any environmental media. Ramboll cannot rule out the existence of conditions, including, but not limited to, contamination not identified and defined by the data and information available to and/or obtained by Ramboll. Specifically, this assessment must not be considered as an asbestos survey (whether in built structures, waste, soils, etc.), even though the subject of asbestos-containing materials may have been discussed in the report.

2. SITE INSPECTION

The following information was derived from a site inspection undertaken on 16 April 2019 by Olivia Naylor of Ramboll UK Limited (Ramboll). The application site was occupied by “The Station Shopping Park” comprising four terraced, warehouse-style retail units of varying sizes, located adjacent to the southern and eastern boundaries of the application site, and one detached building housing a restaurant located in the west of the application site. The remaining areas supported customer car parking and a small service yard located in the south-east of the application site.

The main purpose of the site inspection was to identify current potentially significant sources of soil and groundwater contamination within the application site.

A plan showing the location of the application site is presented in Appendix 1. Photographs taken during the site inspection are presented in Appendix 2.

2.1 Site Setting

The application site is located in Reading, approximately 30 m to the north of Reading Railway Station, at National Grid Reference 471430, 174040. The site operates a one-way traffic system for customer vehicles with an entrance roadway from Caversham Road which runs adjacent to the west of the application site and an exit roadway to Vastern Road, which runs adjacent to the north of the application site. A service yard located in the south-east of the site, utilised by the four terraced retail properties, is accessed from Trooper Potts Way which runs adjacent to the east of the application site.

Table 2.1: Adjacent and Surrounding Land Uses

Direction	Description	Distance
North	Vastern Road	Adjacent
	Residential and various commercial properties	25 m
	River Thames	150 m
South	Disused warehouse and associated car parking (possibly being prepared for redevelopment)	Adjacent
	Reading Railway Station – associated railway tracks running east to west	30 m
East	Trooper Potts Way	Adjacent
	Multi-storey car park	30 m
	Various commercial properties	170 m
West	Caversham Road	Adjacent
	Residential and various commercial properties	30 m

2.2 Site Layout and Activities

The application site is broadly rectangular in shape and covers an approximate area of 1.77 hectares (ha). The retail units are occupied as follows:

- The Range – home leisure and garden products retailer located in the eastern portion of the application site, bound by Vastern Road to the north, Trooper Potts way to the east, the and the entrance roadway to the shared service yard to the south. Customer car parking is located adjacent to the north-west of the unit, and Majestic Wine’s retail unit and the shared service yard are located adjacent to the west. The retail area is distributed over ground and

mezzanine level. Offices and employee areas are also located on the mezzanine level. A large stock room is located on the ground floor, adjacent to the service yard to the west. The unit operates a firefighting sprinkler pump room and associated fire water storage tanks situated adjacent to the unit in the shared service yard.

- Majestic Wine Warehouse – wine retailer and the smallest of the units, located adjacent to the west of The Range unit and to the east of the retail unit occupied by Aldi. The shared service yard is located adjacent to the south of the unit and car parking is located adjacent to the north. The retail area to the front of the unit (in the north) is arranged over ground floor only. The rear of the unit (in the south) supports a ground floor stock room with offices located on a mezzanine level.
- Aldi – supermarket, located adjacent to Majestic Wine and the shared service yard to the east and Mothercare to the west. The south of the unit is located adjacent to Mothercare’s stockroom (which runs from the Mothercare unit adjacent to the west to the shared service area adjacent to the east). Car parking is located adjacent to the north. The ground floor supports the unit’s retail area in the north, and a stock room and offices / employee areas in the east. Stock is also stored on a mezzanine level in the east of the unit.
- Mothercare – retailer of children’s clothes and other products, located adjacent to the north of Aldi and bound to the north and west by car parking. The south of the unit is located adjacent to the southern site boundary. The retail area of the unit is arranged over ground floor only, a stock room runs from the unit to the shared service yard to the east, adjacent to the south of Aldi’s unit. Offices and employee areas are located on a mezzanine level in the south of the site.
- TGI Fridays – restaurant and bar, located in the west of the application site and comprises a single-storey, detached building with a walled waste and other storage compound adjacent to the east. The unit is bound to the north, east and south by customer car parking and to the west by the western subject site boundary. Customer dining areas are located in the western and central portion of the building, with kitchens, storage rooms, offices and employee areas located in the east of the building.

The four terraced retail units store waste in various containers in their shared service yard. TGI Friday stores waste produced in various containers located in the external walled compound located adjacent to the east of the restaurant.

Aldi and TGI Friday both operate walk-in fridges and freezers, with Aldi also operating refrigeration units for perishable goods on the shop floor. The associated air handling units are located at various locations either externally or within plant rooms on mezzanine levels. Goods lifts are operated at Aldi and Mothercare and The Range operates moving walkways and one customer lift (for wheelchair access only) operating between the ground floor and mezzanine level retail areas. The Range operates one gas-powered forklift truck.

Hot water for each unit is provided by domestic style gas-fired or electric boilers located within various plant rooms or cupboards within each unit. Heating and cooling is provided via space heaters in the retail units and HVAC ceiling cassettes in the restaurant.

External areas mainly comprise asphalt-surfaced customer car parking in the northern and western areas of the subject site and a delivery yard located in the southeast. Areas of soft landscaping are located adjacent to car parking areas and at the northern and western site boundaries.

One electrical substation is located in the shared service yard adjacent to the southern site boundary. A second electrical substation is located offsite, adjacent to the southwestern site boundary.

Topographically, the application site and the immediate surrounds are approximately level, sitting at an elevation of approximately 38 m above Ordnance Datum (AOD).

No Environmental Permits are reportedly held by the application site.

2.3 Storage of Chemicals and Hazardous Substances

2.3.1 Underground Storage Tanks (USTs)

No former or current underground storage tanks (USTs) were reported to be present at the application site and no evidence of such was observed by Ramboll during the site visit (e.g. vent pipes, fill ports, or dispensing equipment).

2.3.2 Above Ground Storage Tanks (ASTs)

No former or current above ground storage tanks (ASTs) were reported to be present at the application site and no evidence of such was observed by Ramboll during the site visit (e.g. concrete bunds or plinths, dispensing equipment etc.).

Large water storage tanks associated with the firefighting sprinkler pump system operated by The Range are located in the shared service yard, adjacent to the west of their retail unit. It was not possible to ascertain the volume of these water storage tanks during the site visit.

2.3.3 Other Bulk Storage

Two 205-litre drums of diesel gas oil are stored by The Range within the locked sprinkler pump room to provide fuel to the firefighting sprinkler pump. These drums were noted to be stored directly on the concrete hardstanding within the room. No significant hydrocarbon staining was observed within the vicinity of these drums.

No other bulk storage of oils, chemicals or other hazardous substances was observed at the subject site. Cleaning chemicals are stored in various cupboards or store rooms throughout the units however TGI Fridays was noted to be storing several 5-litre containers of various cleaning fluids externally without secondary containment in the walled compound area adjacent to the east of the building. Some of this material was noted to be leaking from containers onto the concrete hardstanding within the compound.

2.4 Water, Wastewater and Drainage

Drainage plans were not made available to Ramboll for review during the site inspection and no evidence was observed, or information provided by unit representatives, to confirm the presence of oil water interceptors in the surface water drainage system across the application site.

Ramboll understands that the application site is supplied by municipal water mains, and that foul water is discharged to the municipal sewer system. Site contacts had no knowledge of discharge consents held by the application site.

A grease trap is located within the kitchens at TGI Fridays which receives wash water from the sinks and commercial dishwashers. The unit representative stated that this grease trap is cleaned out regularly. It was not possible to ascertain if internal floor drainage from these food production areas contained any grease traps. In addition, the water within a surface water drain located in TGI Fridays' external walled compound was noted to have a layer of fatty surface material present. Again, it was not possible to confirm if any grease trap was present within this drainage system.

2.5 Waste Storage and Disposal

Waste produced by The Range, Majestic Wine, Aldi and Mothercare is stored within various waste containment (including large and small wheeled bins and skips) in the shared service yard

adjacent to the unit producing the waste. Waste produced by TGI Fridays was observed to be stored within the walled compound adjacent to the east of the building in large and small wheeled bins. Waste streams across the application site was noted to be segregated to general, recyclables (paper, cardboard, glass) and food waste. In addition, TGI Fridays was noted to store used oil from kitchen fat fryers in a 100-litre blue plastic drum, located directly on the concrete hardstanding in their external walled compound area.

Some packaging waste and other waste materials was noted to have been dumped or escaped from storage containment and was collecting in various locations throughout the shared service yard.

2.6 Deleterious Materials

2.6.1 Asbestos Containing Materials (ACM)

The application site comprises four terraced, warehouse-style units and one single-storey, detached, brick construction building. Due to the age of these properties (c. 1980s), it is possible that ACMs may have been used during their construction.

An asbestos management survey for the application site was not made available for Ramboll to review.

An asbestos survey in accordance with HSG264 (Asbestos - The Survey Guide[1]) has not been undertaken by Ramboll as it is outside the scope of this assessment. Under the Control of Asbestos Regulations (2012), the "duty holder" for a building is required to assess where asbestos is or may be present and to develop and implement an ACM management plan, with review and updating as appropriate. The "duty holder" is the party who has, by virtue of contract or tenancy, an obligation for the repair and maintenance of the building.

2.6.2 Ozone Depleting Substances (ODS) and Fluorinated Greenhouse Gases (F-gases)

The heating and cooling for units across the application site, and food refrigeration provided in Aldi and TGI Fridays, are served by various air handling units, located either externally or in secure plant rooms on mezzanine levels in some of the retail units.

Accessible air handling units were observed to contain various quantities of R410A and R404A refrigerant gases, which are non-ozone depleting substances.

Under EC Regulation 2037/2000 on Substances that Deplete the Ozone Layer[2], ozone depleting chemicals are to be phased out. ODS used in air conditioning equipment must therefore be recovered during servicing, maintenance and decommissioning.

Under the Fluorinated Greenhouse Gases Regulations 2015[3], all systems with >3kg of fluorinated refrigerant gas require annual testing and good record keeping. It is good practice to make sure that all equipment containing F-gases is labelled with the type and amount of F-gas contained.

The responsibility for compliance with legislation regarding refrigerant gases would be expected to rest with the site operator, or in the case of tenant units, with the tenant. Refrigerant gases are not generally considered to pose a ground contamination risk.

2.6.3 Polychlorinated Biphenyls (PCB)

One electrical sub-station located in the shared service yard adjacent to the southern site boundary, is owned and operated by SSE Power Distribution. A second electrical sub-station

[1] HSG264 Asbestos: The survey guide, Second Edition, 2012
[2] Regulation (EC) No 2037/2000 of the European Parliament and of the Council of 29 June 2000 on substances that deplete the ozone layer
[3] The Fluorinated Greenhouse Gases 2015, as amended in 2018

observed during Ramboll's site visit is located offsite, adjacent to the southwestern site boundary. It was not possible to ascertain the owner of this equipment.

Goods lifts are operated within the stock room areas at both Aldi and Mothercare. In addition, The Range operates moving walkways and one customer lift (for wheelchair access only) operating between the ground floor and mezzanine level retail areas. It was not possible to confirm when the lift machinery was last serviced and Ramboll was unable to confirm whether the lift infrastructure includes hydraulic oil reservoirs.

No other potential PCB-containing equipment was observed by Ramboll on-site during the inspection.

2.7 Air Emissions

Knowledge of the heating systems in many of the units was limited therefore it was not possible to confirm the presence or absence of gas-fired boilers for water heating in units across the application site. However, no significant sources of air emissions were identified at the application site and it is considered unlikely that the application site would require emissions authorisation from the regulatory authorities.

2.8 Other Issues

Ramboll has not been provided with any intrusive site investigation reports or ground gas monitoring results for the application site.

Three monitoring well covers were identified in the western half of the application site during Ramboll's inspection, located at the north and west of Mothercare's retail unit and to the northeast of TGI Fridays, close to the northern site boundary.

2.9 Potential for Ground Contamination from Current Uses

2.9.1 Potential On-site Contamination Sources

The application site is occupied various units operated for retail or restaurant purposes, with associated car parking and service yard. No significant potentially contaminative activities from current uses were identified during the site inspection.

2.9.2 Potential Off-site Contamination Sources

The application site is located within an area of mixed commercial and residential properties with Reading Railway Station located approximately 30 m to the south of the application site at its closest point.

No significant potential off-site contamination sources were identified during the site inspection.

3. HISTORICAL & REGULATORY INFORMATION

3.1 Map History

A review of historical mapping and aerial imagery (where available) obtained from a proprietary environmental database has been undertaken which is summarised below. Selected historical maps are presented in Appendix 3.

3.1.1 The Application Site

The earliest available historical map dated 1879 shows that part of the Great Western Railway Works was present on-site running from the north-western to south-eastern corner, occupying approximately 20% of the application site. By the late 1890s a coal depot was labelled on-site as part of the Works, including multiple railway sidings occupying approximately 70% of the total application site area. A car park was present in the south-western corner of the application site by the early 1970s, occupying 20% of the application site.

Much of the railway sidings associated with the coal depot were no longer present by the mid-1980s, and all of the railway sidings were no longer present by the late 1980s. One building was present in the west of the application site occupying approximately 10% of the application site, and multiple interconnected buildings were present in the south and east of the application site occupying approximately 50% of the application site.

Maps from 1993 show two electricity substations in the south and west of the application site, and aerial photography from 1999 shows that the remaining 40% of the application site was occupied by asphalt hardstanding used for car parking.

No further significant changes up to and including the most recent map edition of 2019 were identified.

3.1.2 The Surrounding Area

The earliest available historical maps dated 1879 showed the Great Western Railway Works were present adjacent to the south of the application site. A goods station was 70 m south and associated railway line was 80 m south. Malthouses were present 80 m south-west, a timber yard was 120 m south-west, a railway station was 140 m south and the River Thames was approximately 150 m north-east. A rifle factory was present approximately 200 m south and a brewery was 310 m south-west.

By the late 1890s significant development had taken place in the immediate surrounds with residential dwellings from 30 m north and 30 m west. A blacksmith was present 80 m north-east, a saw mill was 90 m north-east, an electric works was 100 m north-east and the Thames Iron Works was approximately 110 m north-east. Maps from 1912 showed an electric works 90 m north-east and a timber yard 140 m north-east, and by the early 1930s the Thames Iron Works was an iron foundry and paint works.

By the late 1950s a large building labelled as a railway works was present adjacent to the south of the application site. A vehicle maintenance garage was present 40 m east, a warehouse was 60 m west and two engineering works were present approximately 80 m north-west and 140 m north-east. Maps from 1962 show a fire station 140 m south-west and a vehicle maintenance garage was 250 m south.

Maps from the mid-1980s show that the railway works building adjacent to the south of the application site was labelled as a sorting office. A River Conservancy Depot was 140 m north-east and a bus station was 240 m south-west.

No further significant changes to the surrounding area have been identified up to and including the most recent maps from 2019.

3.2 Environmental Database Records

The information presented in Table 3.1 has been obtained from a review of a proprietary environmental database relating to the application site and surrounding land.

Table 3.1: Summary of Key Environmental Database Information

Data Type	On site	Within 250m	Within 500m	Within 1km	Details of nearest relevant record within 250m of the application site
Contaminated Land Register entries	0	0	0	1	None
Prosecutions or enforcement actions	0	0	0	0	None
Pollution incidents	1	23	55	82	A Category 3 Minor Incident occurred on site involving pollution of unknown oils in April 1992. All of the 23 pollution incidents within 250m were classified as Category 3 Minor Incidents and involved pollution of unknown oils.
Historical landfill sites	0	0	1	1	None
Current landfill sites	0	0	0	1	None
Potentially infilled land (non-water)	0	0	0	0	None
Potentially infilled land (water)	0	1	3	7	Unknown filled ground (pond, marsh, river, stream, dock etc) 210m south.
Registered Waste Management Facilities /Waste Transfer Sites	0	0	0	1	None
Part A(1) Environmental Permits	0	0	0	2	None
Part A(2) Environmental Permits	0	0	0	0	None
Part B Environmental Permits	0	0	0	19	None
Control of Major Accident Hazards Sites (COMAH)	0	0	0	1	None
Explosive Sites	0	0	0	0	None
Notification of Installations Handling Hazardous Substances (NIHHS)	0	0	0	1	None

Table 3.1: Summary of Key Environmental Database Information

Data Type	On site	Within 250m	Within 500m	Within 1km	Details of nearest relevant record within 250m of the application site
Planning Hazardous Substance Consents	0	0	0	0	None
Fuel Stations	0	0	1	5	None
Contemporary trade directory entries	0	22	101	288	Active listings within 250 m: electricity companies 40m NE, bus & coach operators & stations 120m SE, electrical goods sales, manufacturers & wholesalers 200m W.
Registered Radioactive Substances	0	0	0	0	None
EA discharge consents	0	2	7	26	Consent for trade effluent discharge to the Vastern Ditch 160m E and discharge of other-matter surface water into the River Thames 180m NE.
Radon affected area	N	N	N	N	The site is in a lower probability radon area (less than 1% of homes are estimated to be at or above the Action Level). No radon protective measures are necessary in the construction of new dwellings or extensions.
Designated ecological sites	0	0	0	0	None

The minor pollution incident recorded on-site relates to oils and no further details are given. This is unlikely to be significant given the time since the pollution occurred and that it was described as a minor incident.

The LinesearchbeforeUdig database[4] lists pipelines distributing crude oil and refined hydrocarbon products owned and/or operated by a number of UK pipeline operators, including BPA, BP, ConocoPhillips, Esso, Government Pipelines and Storage System, Sabic, Shell and Total. According to the database, there are no records of underground oil or refined hydrocarbon products pipelines on the application site or within 250 m. Zayo Group UK Ltd (fibre optics) are recorded to have apparatus within 250 m of the application site and SGN (gas) are recorded to have low pressure mains in the north-east and south east of the application site, and medium pressure mains running along the northern, eastern, western and south-eastern site boundaries.

3.3 Regulatory Authority Enquiries

3.3.1 Local Authority Environmental Health Department

The Environmental Health Department at Reading Borough Council has provided the following information:

- The application site has been identified by RBC as being potentially contaminated due to its former use as a works and a coal depot;

[4] Found online at https://www.linesearchbeforeudig.co.uk/

- The application site has been identified for future investigation under the Council's Part IIA inspection strategy. The application site is currently classified as a low risk. There is no schedule set for the investigation of the application site;
- RBC does not hold any records of historic pollution incidents within 250 m of the application site;
- There are no landfills located within a 250 m radius of the application site;
- RBC has no records of radon protection measures having been installed or elevated indoor radon gas identified within buildings within 100 m of the application site;
- RBC does not hold records of any nuisance issues, prosecutions or enforcements associated with the application site or adjoining properties;
- One private water supply has been identified within a distance of 2 km, however RBC were unable to provide details on the exact location and nature of the supply as they consider that Regulation 12 (5) (f) of the Environmental Regulations 2004 applies. RBC considers that disclosure of the exact location of this supply would adversely affect the interests of the person who provided the information to RBC by compromising their right to privacy because they provided the information for the sole use of the Local Authority and the Drinking Water Inspectorate and they have not consented to its disclosure; and
- There are no Environmental Permits issued to the application site or adjoining properties.

3.3.2 Local Authority Planning Department

Recent planning history information is provided on RBC's planning portal website, accessed 10 April 2019. Relevant applications are summarised below.

- 87/TP/1105: Development of site to provide three retail warehouses, one restaurant, together with car parking, internal site roads, service area and landscaping on land at junction of Caversham Road and Vastern Road, Reading. Application approved with conditions on 18/03/1988, none of which relate to contaminated land.
- 07/01140/FUL: Minor external alterations to shopfront, erection of canopy to front of building, minor external alterations to south-east elevation and siting of secure compound in rear service yard. Application permitted 30/10/2007. No contaminated land related conditions
- 07/01638/FUL: Change of use of 2322 m^2 of ground floor from retail (A1) to leisure (D2) or retail (A1). Application permitted 11/04/2008. No contaminated land related conditions.
- 10/00644/FUL: Erection of sprinkler tank, associated pump house and new metal louvers on the site elevation. Application permitted 16/06/2010. No contaminated land related conditions.

3.3.3 Petroleum Licensing Authority

The Petroleum Officer at RBC has confirmed that the Authority holds no records of historical petroleum storage tanks at the application site.

3.4 Historical Potential for Ground Contamination

3.4.1 The Application Site

The application site was occupied by part of the Great Western Railway Works including a coal depot by the late 1890s with multiple railway sidings. The railway sidings were no longer present by the late 1980s and the site appeared to have been developed into its current configuration. Two electricity substations were present in the south and west of the application site.

Potential contaminants from historic site uses could include oils and fuels, asbestos fibres, metals and chemicals.

There is the likelihood of Made Ground/fill being present at the application site from the construction of the current site building. Mage ground and fill can sometimes contain contaminants.

3.4.2 The Surrounding Area

The surrounding land has since 1879, been occupied by the Great Western Railway Works (adjacent south), goods station (70m south), railway line (80m south), malthouse (80m south-west), timber yard (120m south-west), railway station (140m south) and a brewery (310m south). By the late 1890s heavy residential development had taken place from 30m north and 30m west, as well as a blacksmith (80m north-west), electric works (100m north-east) and an iron works (110m north-east).

The railway works adjacent to the south was labelled as a sorting office by the mid-1980s, a vehicle maintenance garage was present (40m east), a warehouse (60m west) and two engineering works (80m north-west and 40m north-east).

Potential contaminants from the above sources includes oils and fuels, metals and chemicals.

The potential for the off-site or on-site migration of contamination (if present) would be dependent on the underlying geological conditions, which are discussed in Section 4 below.

4. ENVIRONMENTAL SETTING

Desk-based research of the local geology, hydrogeology and hydrology was carried out in order to establish the potential for migration of contamination onto or away from the application site, and to assess the sensitivity and vulnerability of the site's setting with respect to surface water, groundwater and ecological resources.

Information was obtained from a number of sources, including:

- examination of published geological maps produced by the British Geological Survey (BGS) and associated sheet memoirs (where available);
- a proprietary environmental database; and
- Regulatory Authority websites including the Environment Agency (EA).

4.1 Geology and Hydrogeology

According to the BGS 1:50,000 Solid and Drift map of the area (Sheet 268, Reading) and the BGS online geology of Britain Viewer, the application site is underlain by superficial deposits of the Langley Silt Member comprising clay and silt. According the BGS, the Langley Silt Member is reported to be 1-5m thick. Beneath the superficial deposits is the Seaford Chalk Formation and Newhaven Chalk Formation comprising chalk.

The BGS holds records of five trial pits located on the application site dated March 1988. The ground conditions encountered in the trial pits are summarised as follows:

- Made Ground comprising sandy gravel with ash, gravel, brick, ceramic pipes, limestone cobbles, flints and traces of tar to a depth of 1.45 m below ground level (bgl); underlain by
- Alluvium comprising soft to firm dark greenish grey sandy clay with traces of fine gravel to a final depth of 2.6 m bgl.

The hydrogeological significance of the strata at the application site is summarised in Table 4.1 below.

Table 4.1: Summary of Geology and Hydrogeology

Formation	Description	EA Aquifer Designation	Hydrogeological Significance
Langley Silt Member	Clay and silt	Unproductive Strata	Layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.
Seaford Chalk Formation and Newhaven Chalk Formation	Chalk bedrock	Principal Aquifer	High intergranular and/or fracture permeability that usually provide a high level of water storage.

The groundwater body beneath the application site is the Berkshire Downs Chalk which was assessed by the EA under the Water Framework Directive classification scheme as having 'poor' quantitative and chemical status, last assessed in 2016.

According to EA information presented in the Landmark Envirocheck database[5], the following licensed groundwater abstractions are located within a 2 km radius of the application site, as detailed in Table 4.2 below.

[5] A Landmark Information Group Service, datasheet ordered 06-April-2019, Order Number: 200059226_1_1

Table 4.2: Licensed Groundwater Abstractions within 2km of the Application Site

Licence Holder	Distance from Site	Abstraction source	Purpose of Abstraction
Manrose Manufacturing Ltd	400 m W	Meadow Road	Commercial/Industrial/Public Services: Drinking; Cooking; Sanitary; Washing; (Small Garden) and Other Industrial/Commercial/Public Services: Non-Evaporative Cooling
Berendsen UK Limited	510 m NE	Borehole A at 72 George Street	Industrial; Commercial and Public Services: Laundry Use
Primark Stores Limited	560 m SW	Cheapside	Retail: Drinking; Cooking; Sanitary; Washing; (Small Garden)
Hillier Group of Companies	700 m W	Point B at Cardiff Road	Metal: Process Water
Hillier Group of Companies	900 m W	Point A at Cardiff Road	Metal: Process Water
Mr D A Drayton	1.22 km W	Little John's Farm (five boreholes)	General Farming and Domestic
Mr J Gleeson Group Plc	1.22 km E	Former Gasworks, Kenavon Drive	Environmental: Pump & Treat: Pollution Remediation
Royal Berkshire Hospital	1.45 km SE	Royal Berkshire Hospital	Hospitals: Drinking; Cooking; Sanitary; Washing; (Small Garden)
West Berkshire Health Authority	1.51 km W	Battle Hospital	Hospitals: Drinking; Cooking; Sanitary; Washing; (Small Garden)
University of Reading	1.95 km E	Well A at Reading University Research Site	Schools and Colleges: General Use (Medium Loss)

The application site is not located within an EA designated groundwater Source Protection Zone (SPZ).

The Environmental Health Department at RBC has confirmed that there is one private water supply within 2 km of the application site; however, the location and nature of this supply could not be disclosed as the operator has not consented to its disclosure.

4.2 Hydrology

The nearest identified surface watercourse is the River Thames located 150 m north-east of the application site at its nearest point. This section of the River Thames (Wallingford to Caversham) has been classified by the EA in 2016 as having 'moderate' ecological quality and 'good' chemical quality under the Water Framework Directive classification scheme.

According to EA information presented in the Landmark Envirocheck database, the following licensed surface water abstractions are located within a 2 km radius of the application site, as detailed in Table 4.3 below.

Table 4.3: Licensed Surface Water Abstractions within 2km of the Application Site

Licence Holder	Distance from Site	Abstraction source	Purpose of Abstraction
Reading Borough Council	340m N	River Thames, Christchurch Meadows	Environmental: Non-remedial River/Wetland Support: Transfer between sources
The Reading Sustainability Centre Cic	540m E	River Thames at Caversham Weir	Other Environmental Improvements: Transfer between sources
Oracle Shopping Centre Ltd	810m S	St. Giles Stream at the Oracle Centre	Amenity: Land and Pond Throughflow

According to the EA, the majority of the application site (approximately 95%) is located in Flood Zone 2 (Medium Probability). This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1% in any year) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1% in any year). Small areas (<5%) in the west and centre of the site are located in Flood Zone 1 (Low Probability), and small portion (<5%) of the north-eastern site boundary is located in Flood Zone 3 (High Probability).

Flood Zone 1 comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1% in any year). Flood Zone 3 comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1% in any year) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5% in any year).

A separate flood risk assessment (FRA) is presented in Volume 3: Technical Appendix 2.5.

4.3 Ecology

There are no statutorily designated ecologically sensitive areas (Nature Reserves, National Parks, Ramsar Sites, Sites of Special Scientific Interest, Special Areas of Conservation or Special Protection Areas) located at or within 2 km of the application site.

4.4 Environmental Sensitivity and Vulnerability

The application site is located in an area of moderate sensitivity with regard to groundwater resources. The application site is underlain by Unproductive Strata, which is further underlain by a Principal Aquifer.

There are 10 groundwater abstractions recorded within 2 km, none of which are for public potable water supply. The abstractions are considered likely to be from the Chalk Principal Aquifer, which is separated from the Made Ground by the low permeability Langley Silt Member. The clay and silt deposits can be expected to provide some protection to downward migration of contamination (if present) within groundwater. The application site is not located within a groundwater Source Protection Zone.

The application site is located in an area of moderate sensitivity with regard to surface water resources given that the River Thames is located 150m north-east. There are three surface water abstractions within 2 km of the application site; however, none of the abstractions are for sensitive uses such as for public potable water supply.

The majority of the application site (approximately 95%) is located in Flood Zone 2 (Medium Probability). Small areas (<5%) in the west and centre of the site are located in Flood Zone 1

(Low Probability), and small portion (<5%) of the north-eastern site boundary is located in Flood Zone 3 (High Probability).

5. CONCEPTUAL SITE MODEL

5.1 Introduction

In the UK ground contamination is assessed by identifying whether a pollutant linkage is present (or potentially present) between a contaminant, a pathway and a receptor in the form of a Conceptual Site Model (CSM). The CSM takes into account the known information from the application site, surroundings and the environmental setting and is a simplified representation of the possible environmental conditions at and in the vicinity of the application site, and is used to initially identify potential sources, potentially sensitive receptors, pathways, and pollutant linkages.

The information provided in the preliminary CSM is based on the findings of the Phase 1 assessment of this report.

5.2 Potential Sources of Contamination

The potential sources of contamination identified from the desk study are summarised in Table 5.1 below.

Table 5.1: Potential Sources of Contamination

	On-site	Off-site
Current	Made Ground on-site. This may include demolition materials, asbestos, and unknown contaminants from previous uses.	Made Ground used in construction of current buildings.
	Diesel storage drums and cleaning chemicals stored in multiple units on site. Minor storage only and unlikely to be significant.	Railway Depot adjacent to the south of the application site and railway lines beyond to the south.
Historic	Use as part of the Great Western Railway Works from the 1870s with a coal depot on site from the late 1890s until the late 1980s. Potential sources of contamination include metals and a variety of hydrocarbon compounds.	Great Western Railway Works and associated infrastructure adjacent to the south.

5.3 Receptors

The identified receptors are summarised in Table 5.2 below.

Table 5.2: Potential Receptors to Contamination

Receptor	Location	Rationale	Receptor Present
Humans	On-Site	The application site is currently occupied by retail units, a restaurant and associated car parking area. Future redevelopment is proposed to be a mixed-use scheme. The exact mix of uses (commercial and residential) and site layout and specifications is not known at the present time. Receptors include residential site users, commercial site users and construction workers.	Yes
	Off-Site	The application site is located within a mixed commercial/residential setting.	Yes

Table 5.2: Potential Receptors to Contamination

Receptor	Location	Rationale	Receptor Present
Water Environment	On-Site	Shallow groundwater is likely to be present in the Chalk Aquifer and in hydraulic continuity with the River Thames. The Chalk is classified by the EA as a Principal Aquifer and therefore has the ability to support a high level of water storage. As such it is considered to be a receptor.	Yes
	Off-Site	Groundwater beneath the application site is likely to be in continuity with the wider Chalk aquifer. There are 10 licensed groundwater abstractions situated within a 2 km radius of the application site, however none of these are for public water supply. Surface Water: the River Thames is located 150m north east of the application site. No sensitive surface water abstractions are located within 2 km of the application site.	Yes
Ecological Receptors	On-Site	There are no statutorily designated ecological receptors identified on application site.	No
	Off-Site	There are no statutorily designated ecological receptors identified on application site.	No
Built Environment	On-Site	The application site is proposed to be re-developed in future for a mixed-use scheme with residential units.	Yes

5.4 Potential Pathways

The identified potential pathways for contamination are summarised in Table 5.3 below.

Table 5.3: Potential Pathways for Contamination

Pathway	Discussion	Pathway present
Direct Physical Contact, Ingestion and Inhalation	Direct contact with, ingestion, and dust and particulate inhalation pathways are considered unlikely for future site users, as extensive hardstanding and building cover across most of the future development break the pathway from these contaminants to site users. Future site users would be considered receptors to these pathways in exposed soft landscaped areas only. There is a potential pathway between contamination in soil and construction workers.	Yes, once site developed - in soft landscaping areas only. Yes
Contaminant volatilisation into indoor and outdoor airspace.	There is a potential pathway from volatile contaminant migration/soil gas migration to indoor and outdoor air.	Yes
Migration from soils to groundwater via leaching.	Contaminants may leach from soils and pollute groundwater.	Yes
Migration within groundwater vertically and laterally to deeper	Some protection of groundwater will be afforded by the Langley Silt. However, the Chalk is considered vulnerable to contaminants associated with past site uses.	Yes

Table 5.3: Potential Pathways for Contamination		
Pathway	**Discussion**	**Pathway present**
groundwater, and to surface watercourses.	Lateral migration of contaminants in groundwater is considered possible as the Chalk Aquifer allows significant groundwater flows. There is likely to be hydraulic continuity with the River Thames, where groundwater from the site and surrounding area is likely to discharge.	Yes
Migration of volatile contaminants via service lines.	There is a potential pathway through permeable gravels used to surround service lines.	Yes
Volatilisation of contaminants from groundwater to human receptors.	Volatile contaminants in groundwater on-site and off-site have the potential to migrate into buildings and outdoor space.	Yes
Migration of potentially hazardous ground gases.	There is a potential for ground gas ingress from the application site into future commercial and hotel/serviced apartment buildings.	Yes

5.5 Preliminary Conceptual Site Model

The potential contaminant sources, pathways and receptors have been combined into potential pollutant linkages that are detailed in the CSM in Tables 5.4 and 5.5 below.

Table 5.4: Conceptual Site Model - Potential Pollutant Linkages – Completed Development			
Receptor Type	**Location**	**Description of Pollutant Linkage**	**Pollutant Linkage**
Humans	On-site	Dermal contact, inhalation and ingestion of contaminated soils by residential and commercial site users in landscaped areas.	PL1
	On-site	Contaminant volatilisation into indoor and outdoor airspaces and inhalation by residential and commercial site users.	PL2
	Off-site	Lateral migration and volatilisation of contaminants from groundwater to off-site commercial workers and residential areas.	PL3
Water Environment	On-site	Migration of soil contaminants to shallow groundwater via leaching.	PL4
	On-Site / Off-site	Lateral migration of contaminants in groundwater to the wider Principal Aquifer, and off-site surface waters	PL5
Built Environment	On-Site	Migration of potentially hazardous ground gases into on-site buildings.	PL6

Table 5.5: Conceptual Site Model - Potential Pollutant Linkages - During Development			
Receptor Type	**Location**	**Description of Pollutant Linkage**	**Pollutant Linkage**
Humans	On-site	Dermal contact, inhalation and ingestion of contaminated soils by construction workers.	PL1
	On-site	Contaminant volatilisation and dust into indoor and outdoor airspaces and inhalation by construction workers.	PL2
	Off-site	Lateral migration and volatilisation of contaminants from groundwater to off-site commercial workers and residential areas.	PL3
Water Environment	On-site	Migration of soil contaminants to shallow groundwater via leaching.	PL4
	On-Site / Off-site	Lateral migration of contaminants in groundwater to the wider Principal Aquifer, and off-site surface waters	PL5
Built Environment	On-Site	Migration of potentially hazardous ground gases into on-site buildings.	PL6

6. CONCLUSIONS

The application site is occupied by a shopping park comprising four retail units and a restaurant, all of which were constructed in the late 1980s. No significant potentially contaminative current activities were identified during the site inspection. An asbestos survey was not available for review by Ramboll and will be required as part of any redevelopment.

The application site was historically occupied by part of the Great Western Railway Works including a coal depot by the late 1890s with multiple railway sidings, and electricity transformers. The railway sidings were no longer present by the late 1980s, when the application site appears to have been developed into its current configuration. Potential contaminants could include oils and fuels, asbestos fibres, metals and other hydrocarbon compounds. It is also likely that Made Ground is present at the application site from the construction of the current site buildings and past uses. Made Ground can comprise contaminants including asbestos.

The surrounding land has historically been occupied by the Great Western Railway Works and other railway infrastructure with similar historical development. In addition, past land uses have also included timber yard, blacksmith, electric works and a sorting depot. The application site has a similar potential for contamination to the surrounding area and is not especially identifiable.

The Environmental Health Department of RBC has confirmed that the application site has been identified as being potentially contaminated due to its former use as a works and coal depot. The application site has also been identified for future investigation under the Council's Part IIA inspection strategy. However, the application site is currently classified by the Council as 'low risk' and there is no schedule set for the investigation of the application site.

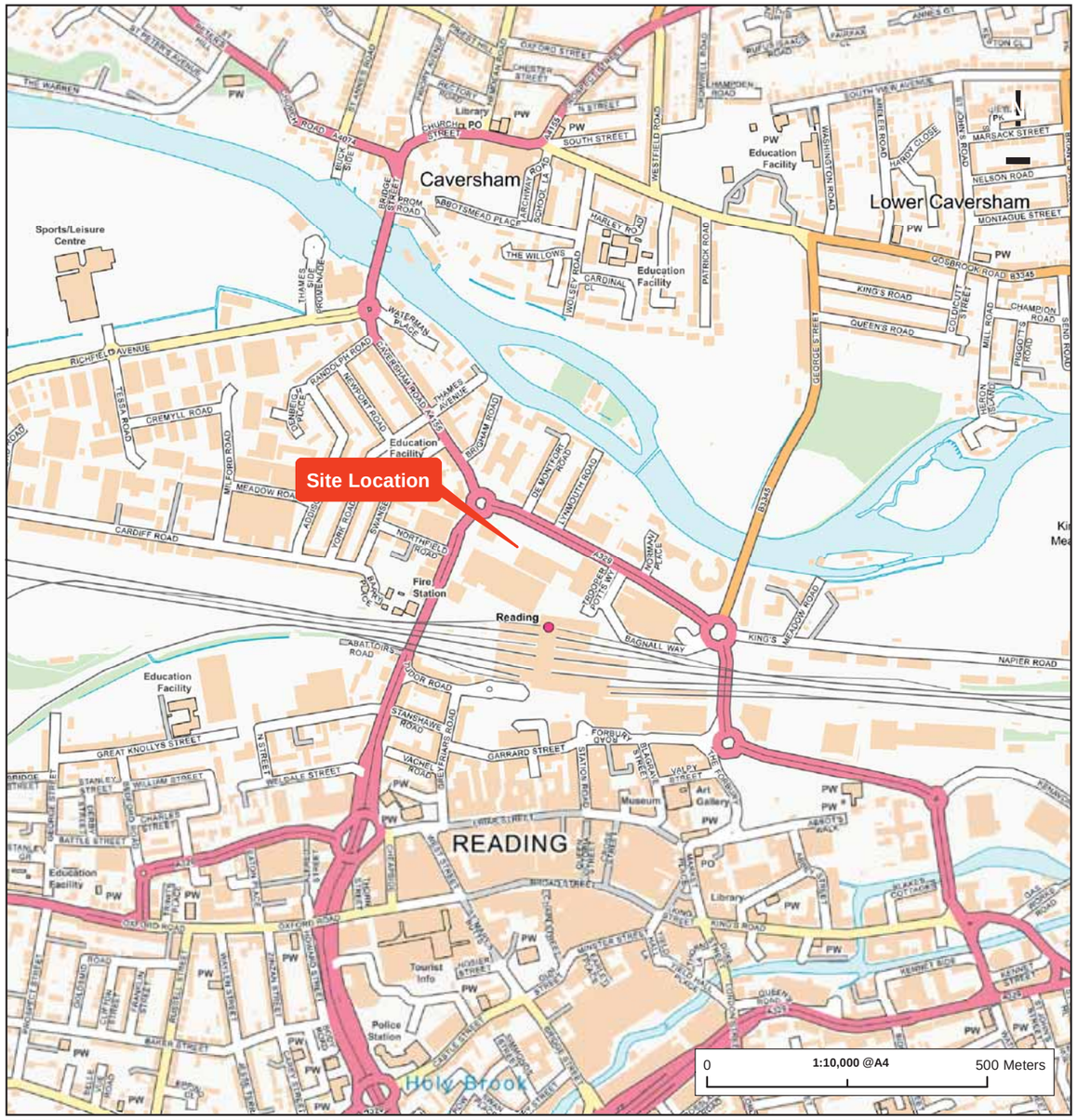
The application site is located in an area of moderate sensitivity with regard to groundwater and surface water resources. The site is underlain by a Principal Aquifer and is 150m from the River Thames.

The majority of the application site (approximately 95%) is located in Flood Zone 2 (Medium Probability). Small areas (<5%) in the west and centre of the site are located in Flood Zone 1 (Low Probability), and small portion (<5%) of the north-eastern site boundary is located in Flood Zone 3 (High Probability). Further assessment of flood risk is presented in the flood risk assessment (Volume 3: Technical Appendix 2.5).

Potential pollutant linkages associated with the history of the application site include risks to groundwater through leaching of contaminants from the soil, and vapours or ground gases migrating into new buildings. Future building cover and clean soils in landscaping could mitigate some potential pollutant linkages (i.e. providing a barrier to the soil). As is standard for a redevelopment of this nature, potential risks would need to be assessed through a site investigation and risk assessment. The investigation and risk assessment should be undertaken at an appropriate point before redevelopment work starts on-site. This does not necessarily have to be at the outline stage. Remediation works cannot, however, be completely ruled out until the investigation and risk assessment have been completed.

Development works will also need to consider the potential for contamination to be present and how this is managed. For example, this could include health and safety of workers, piling risk assessment, Sustainable Drainage System (SuDS) assessment, appropriate classification of contaminated soils, mobilisation of contaminants in a sensitive water environment and potential for asbestos and other contaminants to be present.

APPENDIX 1
FIGURES





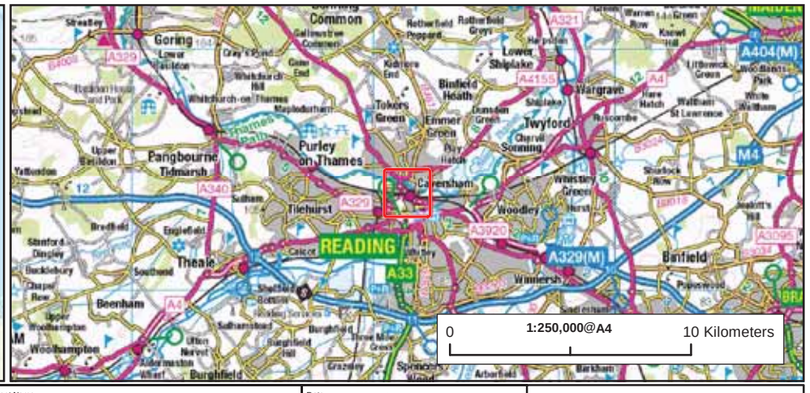


Figure Title: Figure 1: Site Location	Project Name: Reading Station Shopping Park	Date: December 2019	
		Scale: As shown	
Project Number: 1620003910	Client: Aviva Life & Pensions UK Limited	Issue: 1	Prepared By: LB

Reproduced from Ordnance Survey digital map data © Crown copyright 20179. All rights reserved. Licence number 100040631

Coordinate System: British National Grid. Projection: Transverse Mercator. Datum: OSGB 1936.

APPENDIX 2
PHOTOGRAPHIC LOG



Photo 1. View of the western elevation of The Range retail unit



Photo 2. View of the northern elevation of Majestic Wine Warehouse

Title:	Photographic Log	**Client:**	Aviva Investors
Site:	Reading Station Shopping Park	**Date:**	April 2019



Photo 3. View of the northern elevations of Aldi and Mothercare



Photo 4. View to the west of the four terraced retail units

Title:	Photographic Log	**Client:**	Aviva Investors
Site:	Reading Station Shopping Park	**Date:**	April 2019



Photo 5. View of the shared service yard from an elevated position to the south of the subject site (brick-built sprinkler pump room and associated water storage tanks visible on the right)



Photo 6. Escaped and dumped waste observed in the western corner of the shared service yard

Title:	Photographic Log	**Client:**	Aviva Investors
Site:	Reading Station Shopping Park	**Date:**	April 2019



Photo 7. View of the northern elevation of TGI Fridays



Photo 8. View to the north of TGI Fridays' external brick-built compound)

Title:	Photographic Log	**Client:**	Aviva Investors
Site:	Reading Station Shopping Park	**Date:**	April 2019



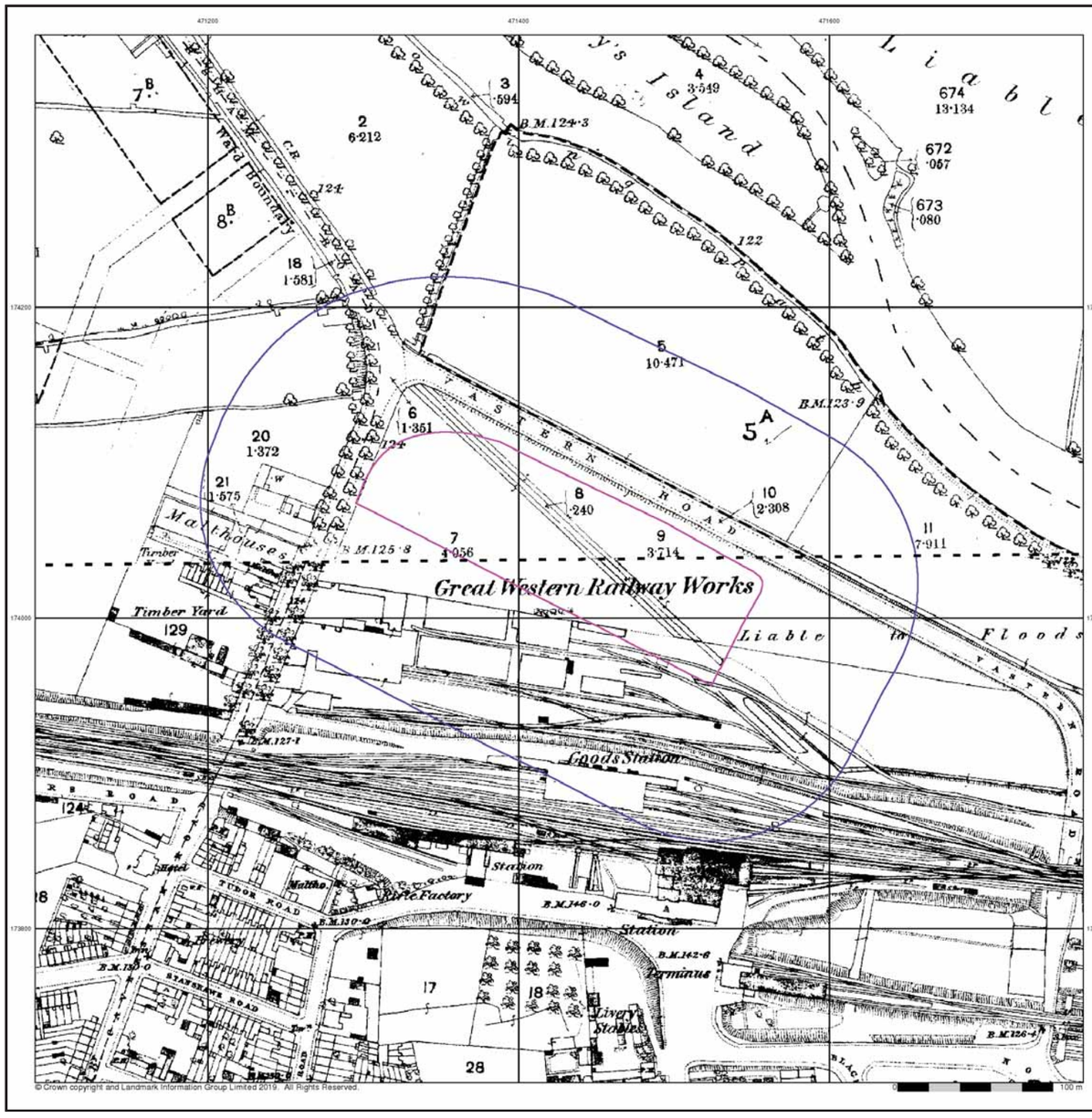
Photo 9. Surface water drain located centrally in TGI Fridays' walled compound area – fatty material visible on the surface of the water



Photo 10. Storage of cleaning chemicals in TGI Fridays' compound (staining from leakage of these materials visible on concrete hardstanding)

Title: Photographic Log	**Client:** Aviva Investors
Site: Reading Station Shopping Park	**Date:** April 2019

APPENDIX 3
SELECTED HISTORICAL MAPS



RAMBOLL

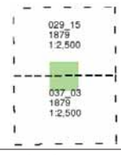
Berkshire

Published 1879

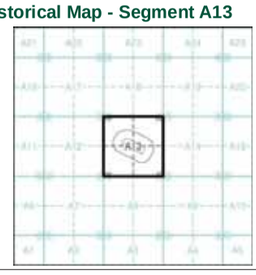
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	200059226_1_1
Customer Ref:	1700003910
National Grid Reference:	471430, 174040
Slice:	A
Site Area (Ha):	1.93
Search Buffer (m):	100

Site Details

Reading Station Shopping Park, Vastern Court, READING, RG1 8AL

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



RAMBOLL

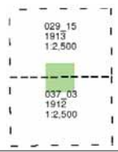
Berkshire

Published 1912 - 1913

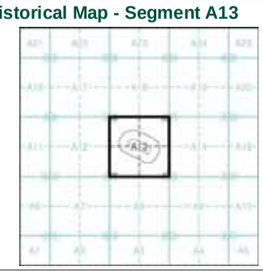
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



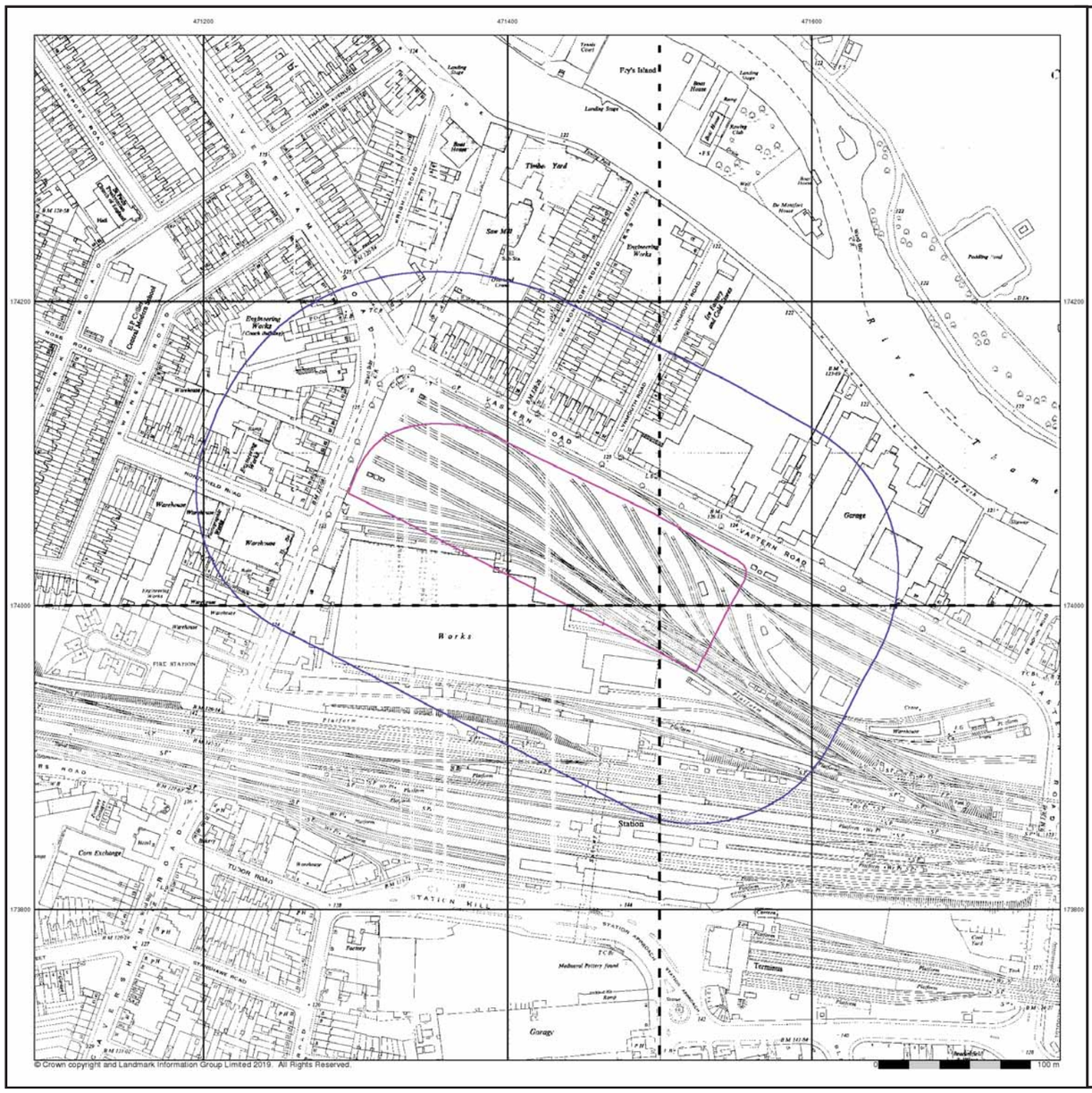
Order Details

Order Number:	200059226_1_1
Customer Ref:	1700003910
National Grid Reference:	471430, 174040
Slice:	A
Site Area (Ha):	1.93
Search Buffer (m):	100

Site Details

Reading Station Shopping Park, Vastern Court, READING, RG1 8AL

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



RAMBOLL

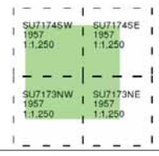
Ordnance Survey Plan

Published 1957

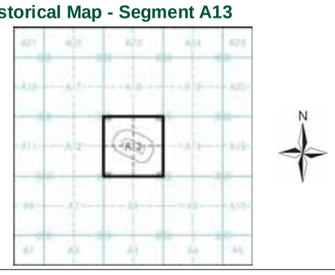
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



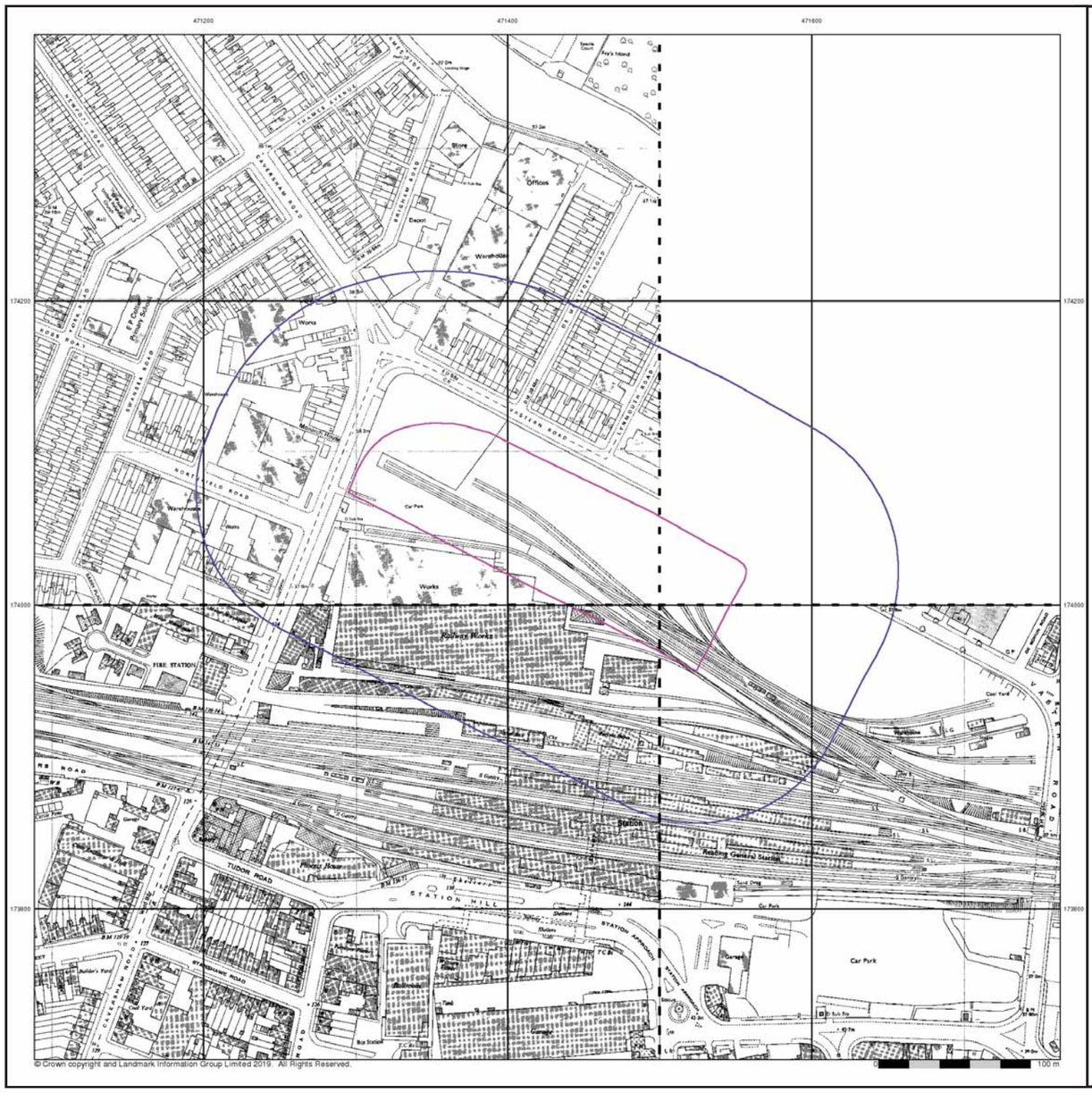
Order Details

Order Number:	200059226_1_1
Customer Ref:	1700003910
National Grid Reference:	471430, 174040
Slice:	A
Site Area (Ha):	1.93
Search Buffer (m):	100

Site Details

Reading Station Shopping Park, Vastern Court, READING, RG1 8AL

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



RAMBOLL

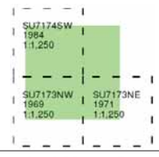
Ordnance Survey Plan

Published 1969 - 1984

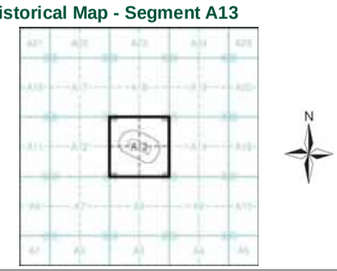
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



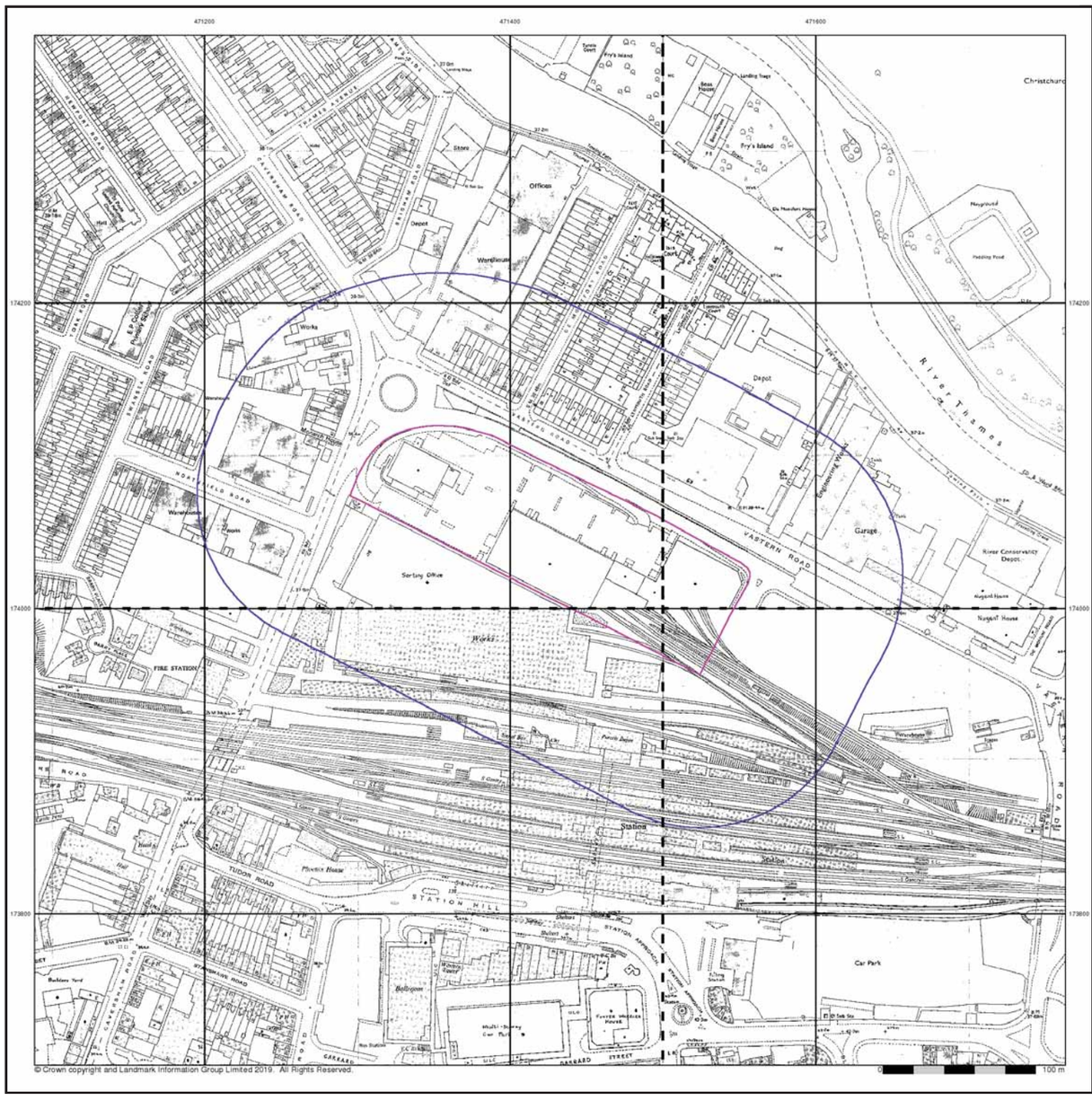
Order Details

Order Number:	200059226_1_1
Customer Ref:	1700003910
National Grid Reference:	471430, 174040
Slice:	A
Site Area (Ha):	1.93
Search Buffer (m):	100

Site Details

Reading Station Shopping Park, Vastern Court, READING, RG1 8AL

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



RAMBOLL

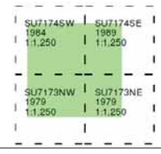
Additional SIMs

Published 1979 - 1989

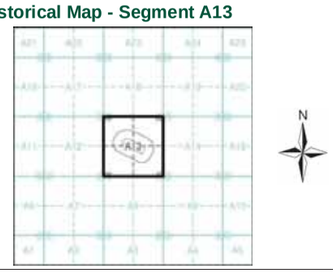
Source map scale - 1:1,250

The SIM cards (Ordnance Survey's `Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1994, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



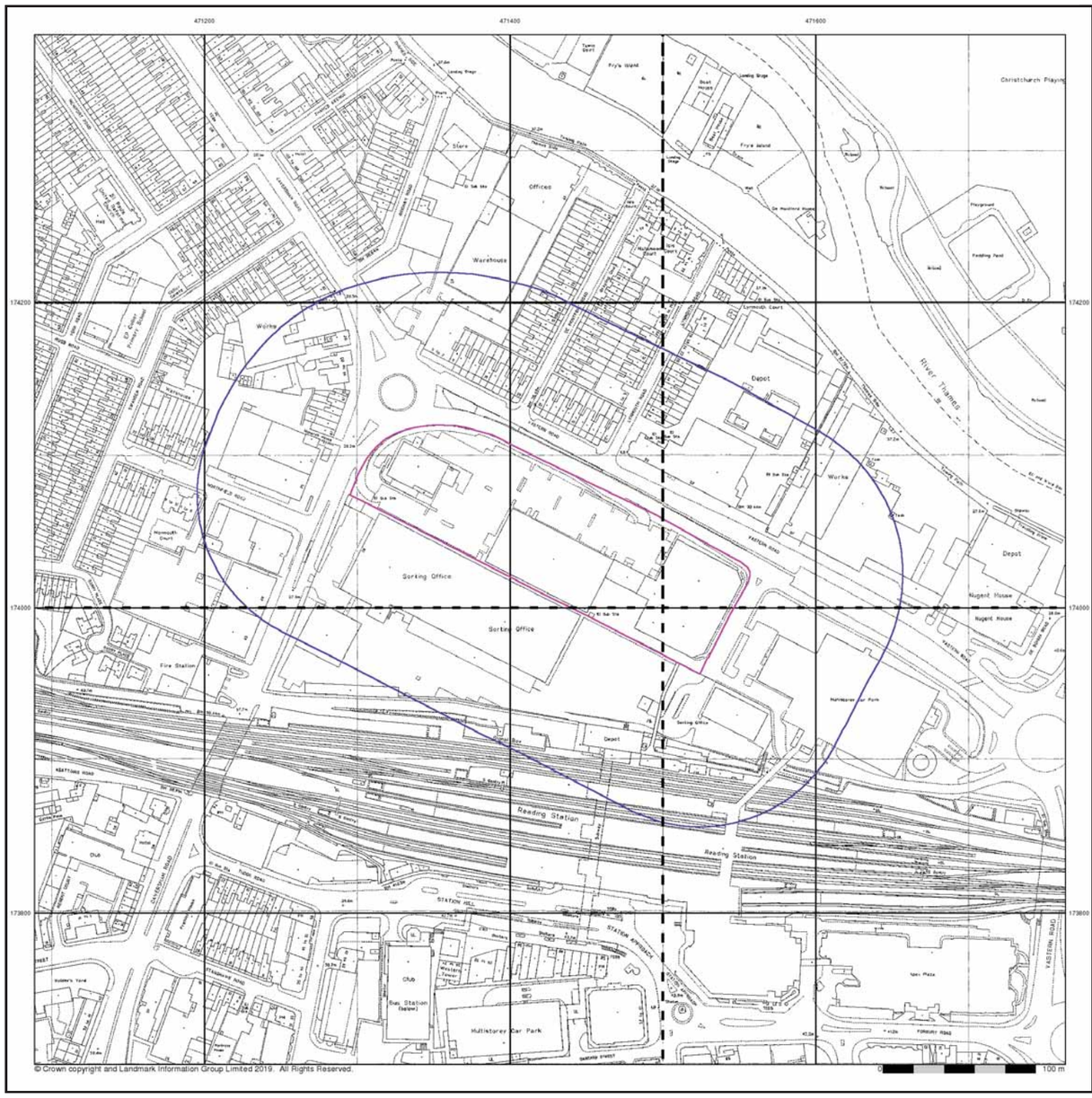
Order Details

Order Number:	200059226_1_1
Customer Ref:	1700003910
National Grid Reference:	471430, 174040
Slice:	A
Site Area (Ha):	1.93
Search Buffer (m):	100

Site Details

Reading Station Shopping Park, Vastern Court, READING, RG1 8AL

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



RAMBOLL

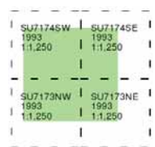
Large-Scale National Grid Data

Published 1993

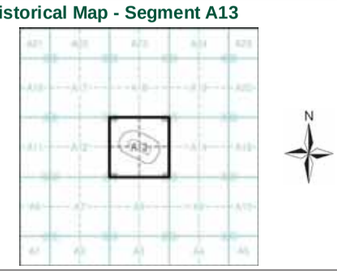
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details

Order Number:	200059226_1_1
Customer Ref:	1700003910
National Grid Reference:	471430, 174040
Slice:	A
Site Area (Ha):	1.93
Search Buffer (m):	100

Site Details

Reading Station Shopping Park, Vastern Court, READING, RG1 8AL

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

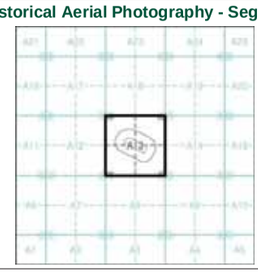
RAMBOLL

Historical Aerial Photography

Published 1999

This aerial photography was produced by Getmapping, these vertical aerial photographs provide a seamless, full colour survey of the whole of Great Britain

Historical Aerial Photography - Segment A13



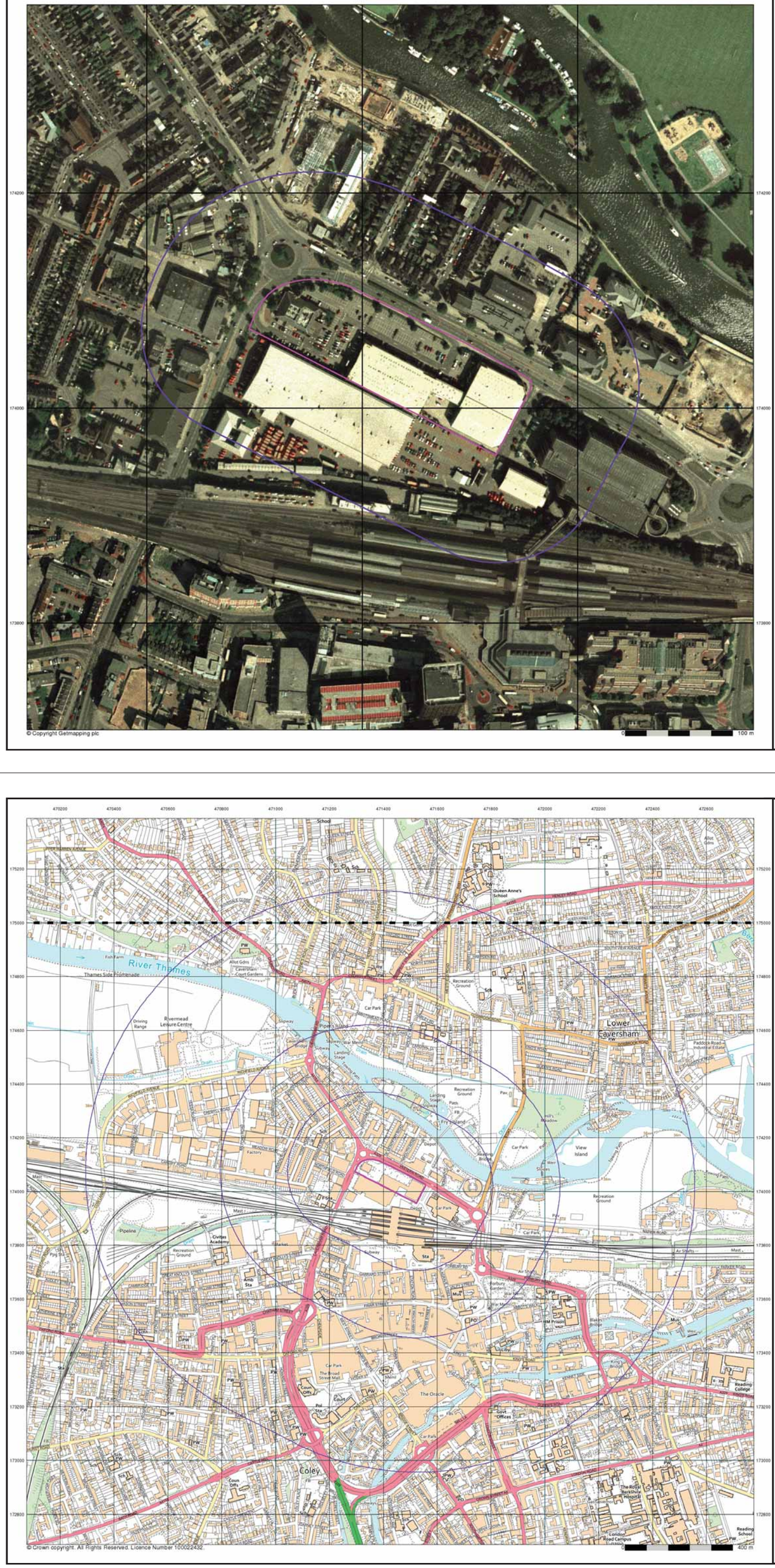
Order Details

Order Number:	200059226_1_1
Customer Ref:	1700003910
National Grid Reference:	471430, 174040
Slice:	A
Site Area (Ha):	1.93
Search Buffer (m):	100

Site Details

Reading Station Shopping Park, Vastern Court, READING, RG1 8AL

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



RAMBOLL

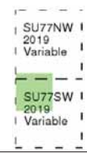
VectorMap Local

Published 2019

Source map scale - 1:10,000

VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities),1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number:	200059226_1_1
Customer Ref:	1700003910
National Grid Reference:	471430, 174040
Slice:	A
Site Area (Ha):	1.93
Search Buffer (m):	1000

Site Details

Reading Station Shopping Park, Vastern Court, READING, RG1 8AL

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

Technical Appendix 2.3: Ecological Impact Assessment

Intended for
Aviva Life & Pensions UK Limited

Date
February 2020

Project Number
1700003910

READING STATION SHOPPING PARK ECOLOGICAL IMPACT ASSESSMENT

RAMBOLL

READING STATION SHOPPING PARK
ECOLOGICAL IMPACT ASSESSMENT

Project No.	**1700003910**
Issue No.	**2**
Date	**14/02/2020**
Made by	**Sharon Yardy & Chris Savage**
Checked by	**Laura Sanderson**
Approved by	**Michael Elliott**

Made by:

Checked/Approved by:

This report has been prepared by Ramboll UK Limited with all reasonable skill, care and diligence, and taking account of the Services and the Terms agreed between Ramboll UK Limited and the Client. This report is confidential to the Client, and Ramboll UK Limited accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by Ramboll UK Limited beforehand. Any such party relies upon the report at their own risk.
Ramboll UK Limited disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the Services.

Version Control Log

Revision	Date	Made by	Checked by	Approved by	Description
1	12/12/19	SY/CS	LS	ME	First Issue for Client Review
2	14/02/20	SY/CS	LS	ME	Final Issue for Planning Submission

Ramboll
240 Blackfriars Road
London
SE1 8NW
United Kingdom
T +44 20 7808 1420
www.ramboll.co.uk

CONTENTS

EXECUTIVE SUMMARY		**I**
1.	**INTRODUCTION**	**1**
1.1	Background	1
1.2	Objectives	1
1.3	Proposed Development	2
1.4	Legislation and Policy Framework	3
1.5	Legal	3
2.	**METHODOLOGY**	**4**
2.1	Desk Study	4
2.2	Extended Phase 1 Habitat Survey	4
2.3	Daytime Building and Tree Inspection for Bats	5
2.4	Assessment of Importance of Ecological Features	6
2.5	Method of Assessment	7
2.6	Significance	7
2.7	Limitations	8
3.	**BASELINE CONDITIONS**	**9**
3.1	Desk Study	9
3.2	Other Habitats of Conservation Importance	9
3.3	Habitats	9
3.4	Species	11
3.5	Target Notes	13
3.6	Assessment of Importance of Ecological Features	13
4.	**ASSESSMENT OF POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS**	**14**
4.2	Mitigation Measures and Enhancement	14
4.3	Assessment	16
4.4	Monitoring	17
4.5	Recommendations for Further Survey	17
5.	**CONCLUSIONS**	**19**

LIST OF TABLES

Table 2.1: Building, Structure and Tree Bat Roost Potential Categories 6
Table 3.2: Local Wildlife Sites within 1 km of the Application Site 9
Table 3.3: Ecological Importance of Features Present on the application site (in accordance with CIEEM, 2018) 13

LIST OF FIGURES

Figure 1.1: Application Site Location 1

APPENDICES

Appendix 1
Figures

Appendix 2
Relevant Legislation and Policy

Appendix 3
Site Photographs

EXECUTIVE SUMMARY

Ramboll UK Ltd was commissioned by Aviva Life & Pensions UK Limited to undertake an Ecological Impact Assessment of the Reading Station Shopping Centre re-development. The proposals include the construction of up to four new buildings, along with associated car parking, cycle storage, open space and landscaping.

The content of this report is based on the findings of an extended Phase 1 Habitat survey undertaken on 02 April 2019.

Habitats within the application site comprised buildings with associated hardstanding areas used as paths and car parking, scattered trees, introduced shrub, amenity grassland and bare ground. The habitats present on the application site were considered to be of Negligible to Site level importance and are therefore not a significant constraint to development, beyond their potential to support protected species.

The application site could support species including invertebrates, breeding birds and foraging/commuting bats, and a number of recommendations are made concerning these species.

Mitigation and enhancement measures have been recommended to reduce residual negative effects on biodiversity and to increase the ecological value of the application site post development. These measures include the adoption of a Construction Environmental Management Plan, timing of vegetation clearance works to avoid impacts on nesting birds, introducing a landscape planting plan which includes native species or species with a known value to wildlife, and the provision of bat and bird boxes.

By undertaking the work in accordance with the recommendations in this report, the proposed development would be in conformity with relevant planning policy and legislation relating to ecology.

1. INTRODUCTION

1.1 Background

Ramboll UK Limited ('Ramboll') was commissioned by Aviva Life & Pensions UK Limited (the 'Applicant') to undertake an Ecological Impact Assessment (EcIA) of a site at Reading Station Park, Reading (the 'application site') in advance of the application site's redevelopment (the 'proposed development'). The application site is located at OS grid reference SU 7141 7406, as shown in Figure 1.1. The application site is within the jurisdiction of Reading Borough Council (RBC).

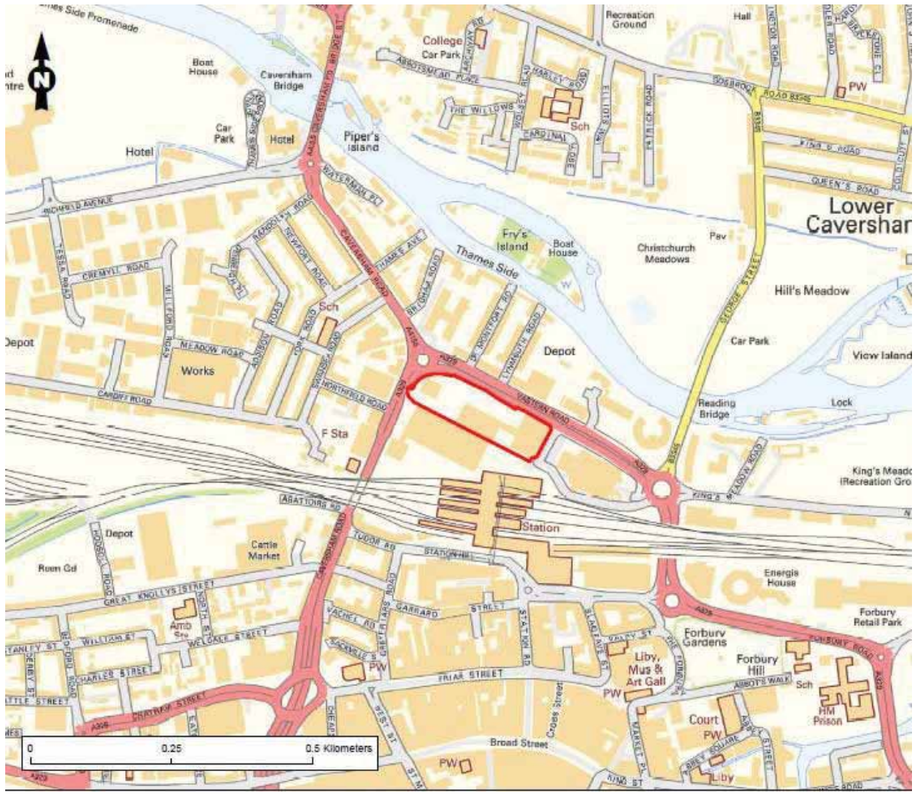


Figure 1.1: Application Site Location

1.2 Objectives

The aim of this report is to provide an EcIA in relation to the application site and the zone of influence (ZoI) of the proposed development (CIEEM, 2018)[1]. The ZoI is the area over which ecological features may be affected by the biophysical changes caused by the proposed development and its associated activities.

The EcIA comprises a description of the existing on-site ecological conditions, as well as the ecological context of the application site and its ZoI; an appraisal of the application site's ecological value; and an assessment of likely impacts in relation to the proposed development and is associated activities, taking into account the mitigation and enhancement measures incorporated into the proposed development. The structure and content of the

[1] CIEEM (2018) Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland: Terrestrial, Freshwater and Coastal. Chartered Institute of Ecology and Environmental Management, London.

report is based on current ecological report writing guidance (CIEEM, 2017[2] and BSI Standards Institution, 2013[3]).

The objectives of this report are to:

- identify designated nature conservation sites located either within the application site or the ZoI of the proposed development;
- assess the potential for the application site and the ZoI of the proposed development to support populations of protected species or species of nature conservation importance[4];
- record the main habitats and features of ecological interest on the application site; and
- assess the ecological importance of the application site;
- provide recommendations for any additional further surveys (if required); and
- provide recommendations for the protection and enhancement of the application site's ecological features.

The content of this report is based on the findings of:

- a desk study;
- an extended Phase 1 habitat survey; and
- a daytime inspection of buildings, structures and trees for bats.

The report is supported by the following appendices:

- Appendix 1: Figures;
- Appendix 2: Relevant Legislation and Policy Context; and
- Appendix 3: Site Photographs.

1.3 Proposed Development

Outline planning permission is being sought, with the details of access, appearance, landscaping, layout and scale reserved for later determination. The proposed development would comprise:

- Demolition of existing on-site buildings;
- Construction of four new builds (Blocks A - D);
- Provision of up to 115,000 m^2 GEA in one or more land uses comprising:
  - residential (Class C3 and including Private Rental Sector);
  - offices (Use Class B1(a)); and
  - development in use classes A1, A2, A3 (retail), A4 (public house), A5 (take away), C1 (hotel), D1 and D2 (community and leisure).
- Provision of associated facilities, including:
  - car parking;
  - new plant and renewable energy equipment; and

[2] CIEEM (2017) Guidelines on Ecological Report Writing. Chartered Institute of Ecology and Environmental Management, Winchester

[3] BSI Standards Institution, 2013. BS 42020:2013. Biodiversity – Code of Practice for Planning and Development. BSI Standards Limited, London.

[4] The following species are considered to be of nature conservation importance i) listed as a national priority for conservation (such as those listed as habitats and species of principal importance for the conservation of biodiversity under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006; ii) listed as a local priority for conservation, for example in the relevant local Biodiversity Action Plan (BAP); iii) assessed as a threatened or near-threatened species according to International Union for the Conservation of Nature (IUCN) red list criteria; iv) Red or Amber Listed species in national Species of Conservation Concern assessments; v) listed as a Nationally Rare or Nationally Scarce species (e.g. in one of the Species Status Project reviews) or a Nationally Notable species where a more recent assessment of the taxonomic group has not yet been undertaken; and/or vi) endemic to a country or geographic location (including endemic sub-species, phenotypes, or cultural behaviours of a population that are unique to a particular place).

  - servicing areas and associated services (including waste, refuse, cycle storage, and lighting);
- Creation of open space and landscape areas.

1.4 Legislation and Policy Framework

Various legislation and planning policies refer to the protection of wildlife. Relevant legislation and policy are summarised in Appendix 2 but should not to be regarded as a definitive legal opinion. When dealing with individual cases, the full texts of the relevant documents should be consulted, and legal advice obtained if necessary.

1.5 Legal

This report has been prepared by Ramboll exclusively for the intended use by the Applicant in accordance with the agreement between Ramboll and the Applicant defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended or any other services provided by Ramboll.

Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and/or compliance. This report and accompanying documents are initial and intended solely for the use and benefit of the Applicant for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.

Unless otherwise stated in this report, the scope of services, assessment and conclusions made assume that the site will continue to be used for its current purpose and end-use without significant changes either on- or off-site.

2. METHODOLOGY

2.1 Desk Study

The purpose of the desk study was to collect existing baseline data about the application site and the ZoI, such as the location of designated sites or other natural features of potential ecological value such as woodland and ponds. The following ZoI has been considered:

- All statutory designated sites up to 1 km from the application site, including Special Areas of Conservation (SAC), Special Protection Areas (SPA), National Nature Reserves (NNR), Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNR);
- Non-statutory designated sites: Local Wildlife Sites (LWS's), ancient woodland and Habitats of Principal Importance (HPI) up to 1 km from the application site; and
- Records of protected species up to 1 km from the application site.

Thames Valley Environmental Records Centre (TVERC) was contacted to provide details of designated sites and protected species within 1 km of the application site (Report Ref. TVERC/18/739, dated 09 April 2019). Due to data ownership restrictions in the reproduction of the TVERC report, it is not appended to this EcIA, but the information provided is summarised in the relevant sections.

In addition, the Multi Agency Geographic Information for the Countryside (MAGIC) website[5] was searched for supplementary information on statutory sites. This included a search for European Protected Species licences issued within 1 km of the application site. Supplementary information on the application site and its surroundings were obtained from aerial images available from Google™ Earth.

2.2 Extended Phase 1 Habitat Survey

An extended Phase 1 habitat survey of the application site was undertaken by Sharon Yardy BSc (Hons) MSc ACIEEM on 02 April 2019. Sharon has a BSc in Ecology and an MSc in Applied Ecology and Conservation and has worked professionally as an ecologist since 2015. The weather during the survey period was light rain.

The survey involved a site walkover and preliminary assessment of key habitats, land use and ecological features, particularly focusing on areas of natural interest which will be affected by the proposed development. The main habitats present were recorded using standard Phase 1 Habitat survey methodology as described in the Handbook for Phase 1 Habitat Survey (JNCC, 2010)[6]. Target notes were used to record habitats and features of particular interest. In addition to general habitat classification, a list was compiled of observed plant species (using the nomenclature of Stace, 2019[7], with common and Latin names referred to in the first instance after which only the common names are used). The abundance of each species was estimated for each habitat respectively using standard 'DAFOR' codes:

- D = Dominant.
- A = Abundant.
- F = Frequent.
- O = Occasional.
- R = Rare.

[5] www.magic.gov.uk, accessed 12 March 2019
[6] Joint Nature Conservation Committee (JNCC) (2010). Handbook for Phase 1 Habitat survey – a technique for environmental audit. JNCC Peterborough
[7] Stace, C. (2019) New Flora of the British Isles 3rd Edition. Cambridge University Press

The application site was assessed for its potential to support protected and notable species such as reptiles and bats and was inspected for signs of any invasive plant species subject to legal controls. This was in order to identify potential ecological constraints and to guide recommendations for further survey requirements for these species.

2.3 Daytime Building and Tree Inspection for Bats

A daytime inspection of buildings, trees and structures was completed on 02 April 2019 during the extended Phase 1 habitat survey by Sharon Yardy. Sharon holds a Natural England (NE) Level 2 Licence for bats (Natural England licence number 2017-28708-CLS-CLS). The exterior elevations of the application site's building, structures and trees were visually inspected for field evidence of roosting bats including droppings, urine staining, feeding remains and potential roosting points. In accordance with the guidance outlined in Bat Surveys for Professional Ecologists: Good Practice Guidelines 3rd edition (Collins, 2016)[8] each building was assessed for its potential to support bats. The following building types and features are considered to be of particular suitability to support roosting bats:

- Buildings of pre-20th or early 20th century construction;
- Agricultural buildings of brick, stone or timber construction;
- Large and complicated roof void(s) with unobstructed flying spaces;
- Large (>20 cm) roof timbers with mortise joints, cracks and holes;
- Entrances into buildings for bats to fly through;
- Poorly maintained buildings such that they provide access points for bats into roofs, walls, bridges, but at the same time not being too cool and draughty;
- Roof warmed by the sun e.g. south facing;
- Weatherboarding and/or hanging tiles with gaps;
- Undisturbed building roofs and structures;
- Buildings and built structures in proximity to each other providing a variety of roosting opportunities throughout the year; and
- Buildings and built structures close to good foraging habitat e.g. mature trees, parkland, woodland or wetland.

The following tree features are considered of particular suitability to support roosting bats:

- Natural holes;
- Woodpecker holes;
- Cracks / splits in major limbs;
- Loose bark;
- Bat, bird or mammal boxes;
- Partially detached large-stemmed ivy; and
- Other hollows / cavities.

Each building has been classified into a category dependent on the presence of features suitable to support bat roosts. The categories assigned were: Confirmed Roost, High, Moderate, Low and Negligible Potential for use by bats. Trees have only been classified if it has potential to support bats.

Table 2.1 below provides criteria for each of these categories. In addition, the suitability of the application site for foraging and commuting bats was assessed.

[8] Collins, J. (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust (BCT)

Table 2.1: Building, Structure and Tree Bat Roost Potential Categories

Roost Potential	Description
Confirmed	A building, structure or tree that is confirmed to support a bat roost.
High	A building, structure or tree with one or more potential roost site that is obviously suitable for use by larger numbers of bats on a regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.
Moderate	A building, structure or tree with one or more potential roost site that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status.
Low	A building or structure with one or more potential roost site that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection and / or suitable surrounding habitat to be used on a regular basis or by a large number of bats (i.e. unlikely to be suitable for hibernation or maternity). Trees of sufficient size and age to contain potential roost features but with none seen from the ground or features seen with very limited roosting potential.
Negligible	Negligible habitat features likely to be used by roosting bats and bats very unlikely to be present.
Notes: Category descriptions drawn from Collins (2016)	

2.4 Assessment of Importance of Ecological Features

The importance of ecological features (i.e. designated sites, habitats and species), identified within the ZoI has been assessed using a scale that classifies ecological features within a defined geographic context in accordance with CIEEM guidelines (2018)[9]. The following frame of reference has been used for the application site:

- International and European Importance;
- National Importance (England);
- Regional Importance;
- County Importance (Berkshire);
- Local Importance;
- Site-level Importance (limited to the application site boundary or ZoI); and
- Negligible Importance.

Various characteristics contribute to the importance of ecological features. These include recognised and published criteria (e.g. Ratcliffe, 1977[10], Wray *et al.* 2010[11]) where the ecological features are assessed in relation to their size, diversity, naturalness, rarity, fragility, typicalness, connectivity with surroundings, intrinsic value, recorded history and potential value.

A wide range of sources can be used to assign importance to ecological features, including legislation and policy. In the case of designated sites, their importance reflects the geographic context of the designation. For example, sites designated as Special Areas of

[9] CIEEM, 2018. Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal. Chartered Institute for Ecology and Environmental Management, Winchester.
[10] Ratcliffe, D.A. (Ed). (1977) A Nature Conservation Review. 2 vols. Cambridge University Press.
[11] Wray S, Wells D, Long E, Mitchell-Jones T. (2010) Valuing Bats in Ecological Impact Assessment, CIEEM In-Practice. 23-25

Conservation (SACs) are recognised as being of importance at an International level. Ecological features not included in legislation and policy may also be assigned importance, due to, for example, local rarity or decline, or provision of a functional role for other ecological features. Professional judgement is used to assign such importance.

2.5 Method of Assessment

The EcIA has been undertaken by means of existing good practice tools and techniques as recommended by CIEEM. As such, potential impacts and effects on ecological features (as defined by baseline conditions) have been assessed taking into consideration mitigation measures integral to the proposed development; consideration has been given to the need for additional mitigation to reduce or offset potential significant effects, and finally all residual effects have been assessed as either significant or not significant at the relevant geographic level. As part of this, consideration was given to the avoidance, mitigation, restoration, compensation and enhancement measures (the 'mitigation hierarchy') integral to the proposed development.

2.6 Significance

The potential impacts on ecological features were considered in relation to the proposed development at the application site. The assessment was made by reference to the pre-development baseline conditions at the application site. The impacts have been characterised according to the following variables:

- Magnitude and extent - quantitative size of an impact (e.g. area of habitat/number of individuals);
- Timing – when the impact may occur;
- Duration and reversibility - timescale of impact (days/weeks/months/years) until recovery. Permanent impacts are described as such, and likelihood of recovery is detailed where appropriate;
- Frequency - frequency of impact (if appropriate; described as low to high and quantified where possible);
- Complexity - whether the impact will directly or indirectly affect the feature; and
- Negative/positive - if the impact will be beneficial or detrimental to the feature.

The assessment only describes those characteristics relevant to the ecological effect when determining the significance. For example, timing of when a habitat is destroyed may not be relevant in relation to the assessment of the effect on the habitat. However, it may be relevant to assess the impact to the species that occur within the habitat (e.g. roosting bats).

In accordance with CIEEM guidance, each impact has been assessed as having a significant effect or not having a significant effect upon each ecological feature qualified with reference to the appropriate geographic scale. The importance level of the ecological feature concerned may be a determinant of the geographical level at which the effect is significant. For example, a significant effect to a Site of Special Scientific Interest (SSSI), is likely to be significant at a national level. However, it may be the case that the effect could be considered significant at a lower or higher geographical level than that at which the feature is important, depending on the magnitude of the effect. A significant effect is an effect that either enhances or undermines the conservation objectives of an ecological feature. Conservation objectives may be specific (e.g. for a designated site), or broad (e.g. national conservation policy).

2.7 Limitations

The ecological assessment has been undertaken based on CIEEM's 2017 Guidelines for Preliminary Ecological Appraisal[12] and CIEEM EcIA guidelines (2018), taking a proportional approach to the level of survey effort and reporting required due to the small size and urban nature of the application site.

It should be noted that availability and quality of the data obtained during desk studies is reliant on third party responses, for example from local bat groups. This varies from region to region and for different species groups. Furthermore, the comprehensiveness of data often depends on the level of coverage, the expertise and experience of the recorder and the submission of records to the local recorder.

The extended Phase 1 habitat survey provides a snapshot of ecological conditions and does not record plants or animals that may be present at the application site at different times of the year. The survey was undertaken within the optimum period for Phase 1 habitat surveys (April to September).

The absence of a particular species cannot definitely be confirmed by a lack of field signs and only concludes that an indication of its presence was not located during the survey effort.

A small narrow fenced off area was present at the south of the application which could not be physically accessed (TN1 on Appendix 1, Figure 1). It could be viewed from the edge however and determined that the habitat present was of limited value. The lack of access is therefore not considered a significant constraint to the assessment.

Ramboll is satisfied that this report represents a robust appraisal of the application site. If any action or development has not taken place on this land within 12 months of the date of this report, the findings of this survey should be reviewed by a suitably qualified ecologist and may need to be updated.

[12] CIEEM (2017). Guidelines for Preliminary Ecological Appraisal, Second Edition. Chartered Institute of Ecology and Environmental Management (CIEEM), Winchester

3. BASELINE CONDITIONS

3.1 Desk Study

3.1.1 Landscape Context

The application site is located in Reading town centre and encompasses a shopping centre and associated hard standing. The application site is bounded by roads to the north (Vastern Road), east (Trooper Potts Way) and west (Caversham Road). Buildings, hard standing and beyond these railway lines are located to the south. The immediate surroundings are urban, with the River Thames approximately 150 m to the north-east. The Kennet and Avon Canal, which is connected to the River Thames is situated 700 m to the south-east.

3.1.2 Designated Sites

Statutory Sites

The application site does not fall within a statutory designated site, nor are there any statutory designated sites within 1 km of the application site.

Non-Statutory Sites

TVERC identified three LWS's within 1 km of the application site. These are listed in Table 3.2. No further designated sites were identified within 1 km of the application site.

Table 3.1: Local Wildlife Sites within 1 km of the Application Site

Name	Type	Location	Area (ha)	Reason for Designation
Cow Lane Depot	LWS	700 m to south-west	1.54	Habitats include mature trees, scrub, open water with swamp and tall herb grassland
The Warren Woodlands Complex	LWS	900 m to north-west	7.64	Woodland complex of six sites
The Coal, Kennetmouth and Kings Meadow East	LWS	950 m to east	3.62	Habitats include mature trees, river banks with wetland species and areas of grassland

3.2 Other Habitats of Conservation Importance

Ancient Woodland

No parcels of ancient woodland were identified on MAGIC within 1 km of the application site.

Habitats of Principal Importance (HPIs)

There are several parcels of HPIs within 1 km, which are listed under the Natural Environment and Rural Communities (NERC) Act 2006, including deciduous woodland and good quality semi-improved grassland. The nearest of these is over 250 m away and to the north-east the application site.

3.3 Habitats

The following descriptions of habitats should be read in conjunction with the Extended Phase 1 Habitat Plan in Appendix 1.

3.3.1 General Site Description

The application site is dominated by buildings and hardstanding with small areas of amenity grassland, introduced shrub, bare ground and scattered trees.

3.3.2 Buildings

There are two buildings on the application site: Building 1 and Building 2.

Building 1 consists of a complex of three interconnected two-storey warehouse buildings, currently in use as commercial spaces. The facades are covered with a combination of red brick, glass and corrugated metal; and appeared to be in good condition. The roof, which is a slight pitch, is also covered in corrugated metal. There are soffits present, constructed from a combination of timber and UPVC.

Building 2 is a rectangular two-storey building, with a façade constructed from redbrick and glass. The building has two conjoined section. The larger section has a hipped roof, covered with slate, while the smaller section has a cupula on the roof, covered with slate and with a louvred vent on each side of the cupula.

Building 1 and Building 2 are of Negligible ecological importance.

3.3.3 Hardstanding

Approximately 50 % of the application site is covered with areas of hard standing. This includes the asphalt access road, car parking and pavements.

Hardstanding is of Negligible ecological importance.

3.3.4 Amenity Grassland

Amenity grassland is present around the northern and western edge of the application site. Species present include abundant perennial rye-grass *Lolium perenne* along with occasional yarrow *Achillea millefolium*, ribwort plantain *Plantago lanceolata*, daisy *Bellis perennis* and cut-leaved cranesbill *Geranium dissectum*. Species present rarely include bulbous buttercup *Ranunculus bolbosus* and lesser celandine *Ficaria verna*. Sward height was generally below 3 cm at the time of the survey and appears closely managed and maintained.

Amenity grassland is a common habitat. The sward height is low which limits its value for wildlife, especially invertebrates. It is therefore considered to be of Site level ecological importance only.

3.3.5 Introduced Shrub

There are small areas of introduced shrub at the centre and north of the application site. Species present include frequent Mexican orange blossom *Choisya ternata*, ivy *Hedera helix*, hebe *Hebe* spp., together with frequent Oregon grape *Mahonia aquifolium*, Photinia *Photinia x fraseri* and cherry laurel *Prunus laurocerasus*.

The areas of introduced shrub provide common habitat and are considered to be of Site level ecological importance only.

3.3.6 Scattered Broadleaved Trees

Scattered trees (18 no.) are present within the amenity grassland and introduced shrub on the application site. Species present include London Plane *Platanus x acerifolia,* apple *Malus sp.,* rowan *Sorbus acuparia* and Norway maple *Acer platanoides;* and are a combination of mature and semi-mature.

Scattered trees, especially when mature, have a value not just in terms of their potential to support wildlife but also due to their intrinsic and landscape value. The wider landscape contains a large amount of broadleaved woodland and considering many of the scattered trees on the application site are either introduced or semi-mature, these can be considered to be of Site level ecological importance only.

3.3.7 Bare ground

There is a small strip of bare ground present at the east of the application site, adjacent to Building 1. Bare ground is of Negligible ecological importance.

3.4 Species

3.4.1 Invertebrates

TVERC provided records of a number of invertebrate species identified within 1 km of the application site including 20 records of stag beetle *Lucanus cervus*, listed as an Annex II species under the Conservation of Habitat and Species Regulations 2017. Other species included Species of Principal Importance (SPI) under the Natural Environment and Rural Communities (NERC) Act 2014, such as the butterfly small heath *Coenonympha pamphilus* and the dragonfly common club-tail *Gomphus vulgatissimus*.

The application site includes limited habitat to support invertebrates, with the amenity grassland, introduced shrub and trees suitable to support assemblages of common invertebrate species. There is no dead wood present on the application site suitable to support stag beetles. The application site is unlikely to support significant populations of rare or protected invertebrates due to it comprising largely hardstanding and buildings in an urban setting.

Based on the above, the application site is considered to be of Site level ecological importance for use by common invertebrate assemblages.

3.4.2 Amphibians

TVERC provided one record for great crested newt *Triturus cristatus* within 1 km of the application site. Other records included smooth newt *Lissotriton vulgaris,* common toad *Bufo bufo* and common frog *Rana temporaria* within 1 km of the application site.

There is no aquatic habitat present within the application site or within the vicinity, nor suitable terrestrial habitat which could support amphibians. The great crested newt record was 580 m to the north-east of the application site, to the north of the River Thames which is likely to form a barrier to dispersal. Water bodies identified within 500 m were all north of the River Thames. The application site is therefore considered to have Negligible potential to support great crested newt.

Based on the above, the application site is considered to be of Negligible ecological importance for great crested newt and other amphibians.

3.4.3 Reptiles

TVERC returned three records of slow-worm *Anguis fragilis* within 1 km of the application site. However, the application site does not offer suitable habitat for reptiles. The application site is widely dispersed and lacks connectivity to offsite areas which would support this species. The 'cut off' nature of the application site, i.e. surrounded by walls, roads and buildings, limits the potential for a reptile population to become established.

Based on the above, the application site is considered to be of Negligible importance for reptiles.

3.4.4 Birds

TVERC provided records for a number of notable bird species which are protected under Schedule 1 of the Wildlife and Countryside Act 1981 (WCA) and/or listed as SPIs under Section 41 of the NERC Act or Birds of Conservation Concern (BoCC) red or amber lists. Notable species recorded within 1 km of the application site include black redstart *Phoenicurus ochruros*, swift *Apus apus*, house martin *Delichon urbicum*, bullfinch *Pyrrhula pyrrhula* and starling *Sturnus vulgaris*.

The application site is unlikely to support large numbers of rare or notable species of bird given the application site is predominantly covered by hard standing and buildings. Hardstanding is not valuable as either nesting or foraging habitat for birds. Black redstart records are south of the application site, with the nearest one approximately 250 m to the south of the application site. The buildings within the application site were considered unlikely to have crevices or holes suitable for black redstart nesting. The introduced shrub and trees could offer limited potential for common bird species for nesting purposes, while the application site as a whole may offer foraging potential for common bird species.

Based on the above, the application site is considered to be of Site level ecological importance for use by common species of nesting and foraging bird.

3.4.5 Bats

TVERC returned records of six species of bat within 1 km of the application site including serotine *Eptesicus serotinus*, Daubenton's bat *Myotis daubentonii*, noctule *Nyctalus noctula*, common pipistrelle *Pipistrellus pipistrellus*, soprano pipistrelle *Pipistrellus pygmaeus* and brown long-eared bat *Plecotus auritus*.

There were three granted European Protected Species Mitigation (EPSM) licence applications for bats identified on MAGIC within 1 km of the application site. These were for common pipistrelle, soprano pipistrelle and Daubenton's bat.

No signs of bats were recorded externally on Building 1 or 2 during the extended Phase I habitat survey.

Building 1 did not contain external features which could support roosting bats and is considered to have Negligible potential to support roosting and hibernating bats.

Building 2 contained a limited number of features that could potentially support bats, including two areas with slight damage to the fascia boards and two slipped tiles on the roof. However, Building 2 is of modern construction, based in an extremely well-lit urban environment and subject to much disturbance. Additionally, there is a lack of connectivity to suitable foraging habitat. Because of this, Building 2 is considered to have Negligible potential to support roosting and hibernating bats

The trees on the application site were not found to contain any Potential Roosting Features (PRF) which could be utilised by roosting bats, and are therefore considered to have Negligible potential to support roosting and hibernating bats.

The application site contains limited habitat suitable to support foraging bats and is unlikely to function as a commuting corridor due to the lack of linear habitat and its urban context. Because of this, the application site is considered to have Negligible potential to support roosting and hibernating bats.

Based on the above, the application site is considered to be of Negligible importance for bats.

3.4.6 Otter

TVERC returned three records of otter *Lutra lutra* from within 1 km of the application site. Two records are associated with the River Thames to the north and one with the Kennet and Avon Canal. The application site does not offer suitable habitat for otter.

Based on the above, the application site is therefore considered to be of Negligible importance for otter.

3.4.7 Badger and Hedgehog

GiGL returned a single record of hedgehog *Erinaceus europaeus* and a single record of badger *Meles meles* within 1 km of the application site. However, the application site does not offer suitable habitat to support badgers or hedgehogs.

Based on the above, the application site is considered to be of Negligible importance for these species.

3.4.8 Invasive Species

TVERC returned records of species listed on Schedule 9 of the WCA within 1 km including Japanese knotweed *Fallopia japonica*.

No invasive species were identified on application site.

3.5 Target Notes

Target Note 1: A fenced off area at the south of Building 1 which could be viewed but not accessed (see Appendix 1).

3.6 Assessment of Importance of Ecological Features

Table 3.3 presents the ecological importance of habitats and species present on the application site, in accordance with CIEEM guidance. Species assessed as being unlikely to be present on the application site are not considered further in this assessment.

Table 3.2: Ecological Importance of Features Present on the application site (in accordance with CIEEM, 2018)

Feature	Ecological Importance	Rationale
Buildings	Negligible	Does not contribute to biodiversity value of the application site.
Hard standing	Negligible	Does not contribute to biodiversity value of the application site.
Amenity grassland	Site Level	Contributes limited biodiversity value to the application site and provides potential habitat for common invertebrates.
Introduced Shrub	Site Level	Contributes to biodiversity value of the application site, and provides potential habitat for common invertebrates, birds and bats but value is unlikely to extend beyond the Site Level.
Scattered Trees	Site Level	Common in the local landscape and provides habitat potentially used by a range of species.
Bare Ground	Negligible	Does not contribute to biodiversity value of the application site.
Invertebrates	Site Level	The application site is likely to support a common assemblage of invertebrates.
Amphibians	Negligible	The application site is unlikely to support amphibians.
Reptiles	Negligible	The application site is not likely to support reptiles.
Birds	Site Level	The trees and introduced shrub present could provide foraging or nesting opportunities for a small number of common nesting birds.
Bats	Site Level	The application site is unlikely to support roosting bats and likely provides limited foraging and commuting opportunities.
Otters	Negligible	The application site is unlikely to support otters.
Hedgehog and Badgers	Negligible	The application site is unlikely to support hedgehogs and badgers.

4. ASSESSMENT OF POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS

The proposed development would result in the removal of habitats of up to Site level ecological importance, with all existing buildings, hardstanding, introduced shrub and amenity grassland within the application site removed. Of the 18 scattered trees on the application site, a maximum of 15 would be removed to facilitate development, while three at the western edge are proposed to be retained as per advice provided in the Arboricultural Impact Assessment (AIA) produced by Tim Moya Associates.[13].

4.1.1 Proposed landscaping

At least 10 % of the application site area would be provided as open space, which shall include, but not be limited to, hard and soft landscaping, public realm, and the provision of amenity spaces, including play space provision.

Landscape planting would be included as part of the proposed development. The following habitats are currently proposed as part of the illustrative landscaping strategy:

- Wildflower meadow;
- Podium gardens;
- Rain gardens;
- Shrub planting;
- Amenity lawn;
- Biodiverse roofs; and
- Tree planting.

The precise habitats, species mix, locations and areas of landscape planting would be confirmed at the detailed design stage.

4.2 Mitigation Measures and Enhancement

4.2.1 Embedded Mitigation

Habitats

The loss of habitats of up to Site level ecological importance would be mitigated through the inclusion of an appropriate planting scheme being bought forward at the detailed design stage, such as that detailed in 4.1.1, which would be secured by means of an appropriately worded planning condition.

Construction works in the vicinity of trees to be retained could damage overhanging branches or roots, possibly leading to significant adverse impacts upon the trees (potentially premature death). Therefore, retained trees would be protected during construction activities in accordance with BS 5837: 2012 ‘Trees in Relation to Design, Demolition and Construction’, in order to reduce the possibility of any damage, to both crown and roots of the trees.

Trees, shrubs and herbs of native species would be incorporated into soft landscaping and non-native species should be avoided to prevent introducing invasive species. Any invasive species identified during the demolition and planting process would be discarded and disposed of appropriately.

[13] Tim Moya Associates, 2019. Arboricultural Impact Assessment Report – Reading Station Shopping Park. Report reference: 190314-PD-11

Invertebrates

The loss of habitat of Site importance would be addressed through the inclusion of a suitable planting scheme, which would provide high quality foraging habitat for invertebrates, for example through the inclusion of a wildflower meadow.

Birds

Works at the application site, including the removal of vegetation would take place between September and January inclusive. If this is not possible, a nesting bird check would be undertaken by an experienced ecologist prior to removal. If evidence of nesting birds is identified, work would stop and a suitable no-work buffer zone around the nest area should be installed, until such time as chicks have fledged. In addition, bird scarers could be installed across the application site including hawk eyes to help to prevent birds from nesting on the buildings on the application site, prior to demolition. Netting to prevent birds from nesting within trees and other vegetation would not be used.

Construction Environmental Management Plan (CEMP)

The proposed development would be subject to a CEMP, to include measures to reduce run-off, noise, lighting and dust impacts caused during the demolition and construction period, to avoid impacting designated sites, habitats and species on the sites and in the ZoI.

The CEMP would include the following:

- Pollution prevention measures to prevent work causing run-off, pollution or hydrological changes to habitats;
- Measures to ensure exposed excavations would be secured (with appropriate fencing), or provided with provision of mammal ladders and capping of pipework and services, at night time to prevent animals becoming trapped; and
- Measures to reduce construction impacts on bats and birds, such as appropriate timing of works and minimising night time lighting of the site.

Habitat Management Plan (HMP)

A Habitat Management Plan (HMP) would be developed to ensure that new and retained habitats are appropriately managed for biodiversity in the long term.

4.2.2 Enhancement

In order to comply with planning policy[14,15] to achieve no net loss of biodiversity and provide a net gain, additional biodiversity enhancement measures could be introduced to the application site.

Enhancement for invertebrate species would be provided through provision of log piles, pebbles or insect boxes ('bug hotels') within the landscape planting.

The addition of insect loggeries would lead to an increase in the invertebrate assemblage while this in turn would provide foraging opportunities for bats.

A native wildflower seed mix could be applied to any areas of grassland within the landscape planting, to provide an additional foraging resource for pollinating bees and other insects.

The installation of bird and bat boxes built into buildings and on suitable retained mature trees around the perimeter of the application site would provide additional nesting and roosting opportunities respectively for these species groups.

[14] Department for Communities and Local Government, 2019. National Planning Policy Framework (NPPF). London. HMSO
[15] Defra, 2011. Natural Environment White Paper. The natural choice: securing the value of nature https://www.gov.uk/government/publications/the-natural-choice-securing-the-value-of-nature

The possibly of incorporating SuDS features into the application site would be investigated at detailed design. Options could include a swale and rain gardens. If incorporated, these features could provide valuable habitat for wetland plant species, aquatic invertebrates and potentially amphibians.

4.3 Assessment

This section describes the potential impacts arising from the proposed development, at both the demolition and construction stage and for the completed development stage. It considers the embedded mitigation, as well as enhancement commitments.

4.3.1 Demolition and Construction

Designated Sites

There are three designated sites within 1 km of the application site: Cow Lane Depot LWS, The Warren Woodlands Complex LWS, and The Coal, Kennetmouth and Kings Meadow East LWS.

No negative impacts are envisaged on these designated sites due to their distance from the application site. Mitigation for designated sites is therefore not required, and **no significant residual effects** on designated sites are expected during the demolition and construction phase.

Habitats

The proposed development would lead to the loss of the following habitat:

- Buildings and Hardstanding: Two buildings on the application site, as well as associated hardstanding totalling 17,069 m^2;
- Amenity Grassland: Four areas totalling 708 m^2;
- Introduced Shrub: Five small areas totalling 330 m^2;
- Bareground: One area measuring 58 m^2; and
- Scattered trees: 15 treto be removed.

Provision of new landscape planting would mitigate for the loss of habitat that would occur during the demolition and construction phase.

Indirect impacts on retained and adjacent off-site habitats has the potential to occur. This includes potential noise and contamination / pollution events, including dust and run-off, during the demolition and construction process.

However, with the implementation of the CEMP, **no significant residual effects** on habitats are expected during the demolition and construction stage.

Species

Invertebrates

Loss of vegetation would lead to loss of small areas of habitat suitable for use by common invertebrates, for which the application site is of Site level importance. Potential negative effects on invertebrates are unlikely to be significant beyond the Site Level.

Due to the temporary nature of these effects, **no significant residual effects** on invertebrates are expected to arise during the construction phase.

Birds

All wild birds are protected whilst nesting, with disturbance and destruction of active nests constituting an offence under the WCA. Loss of vegetation would remove suitable nesting habitat for breeding birds. Were this to take place during the breeding season (March to

August inclusive), there would be a risk that nests would be damaged or destroyed during the process. These negative effects have the potential to be significant at up to the Site Level.

With the implementation of mitigation, **no significant residual effects** on birds are expected during the construction phase.

Bats

The results of the inspection found no evidence of roosting bats. The application site is also considered to be of Negligible importance for foraging and commuting bats. **No significant residual effects** on bats are expected to arise during the construction phase.

4.3.2 Completed Development

Designated Sites

No negative impacts are envisaged on these designated sites due to their distance from the application site. Mitigation for designated sites is therefore not required, and **no significant residual effects** on designated sites are expected as a result of the completed development.

Habitats

The habitats currently present on the application site are of site level importance only. With the implementation of a suitable landscaping scheme, which incorporates a variety of good quality habitats of known value for wildlife; and the production of a HMP to ensure the appropriate management of the new and retained habitats; the residual effects of the proposed development on habitats are predicted to be **positive**, significant at the **Site level**.

Species

Invertebrates

Provision of landscape planting with known biodiversity value (including nectar-producing flowers) would be of benefit to invertebrate species using the application site, mitigating for this loss of habitat in the medium term, once new habitats become established.

For the completed proposed development, it is expected that the residual effects would be **positive,** significant at the **Site level**.

Birds

Provision of new landscape planting including trees, hedges and shrubs would provide replacement foraging and nesting habitat for use by common bird species.

With the implementation of mitigation, **no significant residual effects** on birds are expected for the completed development.

Bats

Following mitigation, it is expected that there would be a **positive residual effect,** significant at the **Site level** as a result of the completed development.

4.4 Monitoring

Due to the lack of residual effects that are expected, specific ecological monitoring is not considered necessary for the proposed development.

4.5 Recommendations for Further Survey

No further surveys are recommended at this time. However, further surveys or update surveys may become necessary in the future depending on when works commence on site.

Such surveys may include, but not be limited to, an updated extended Phase 1 habitat assessment.

5. CONCLUSIONS

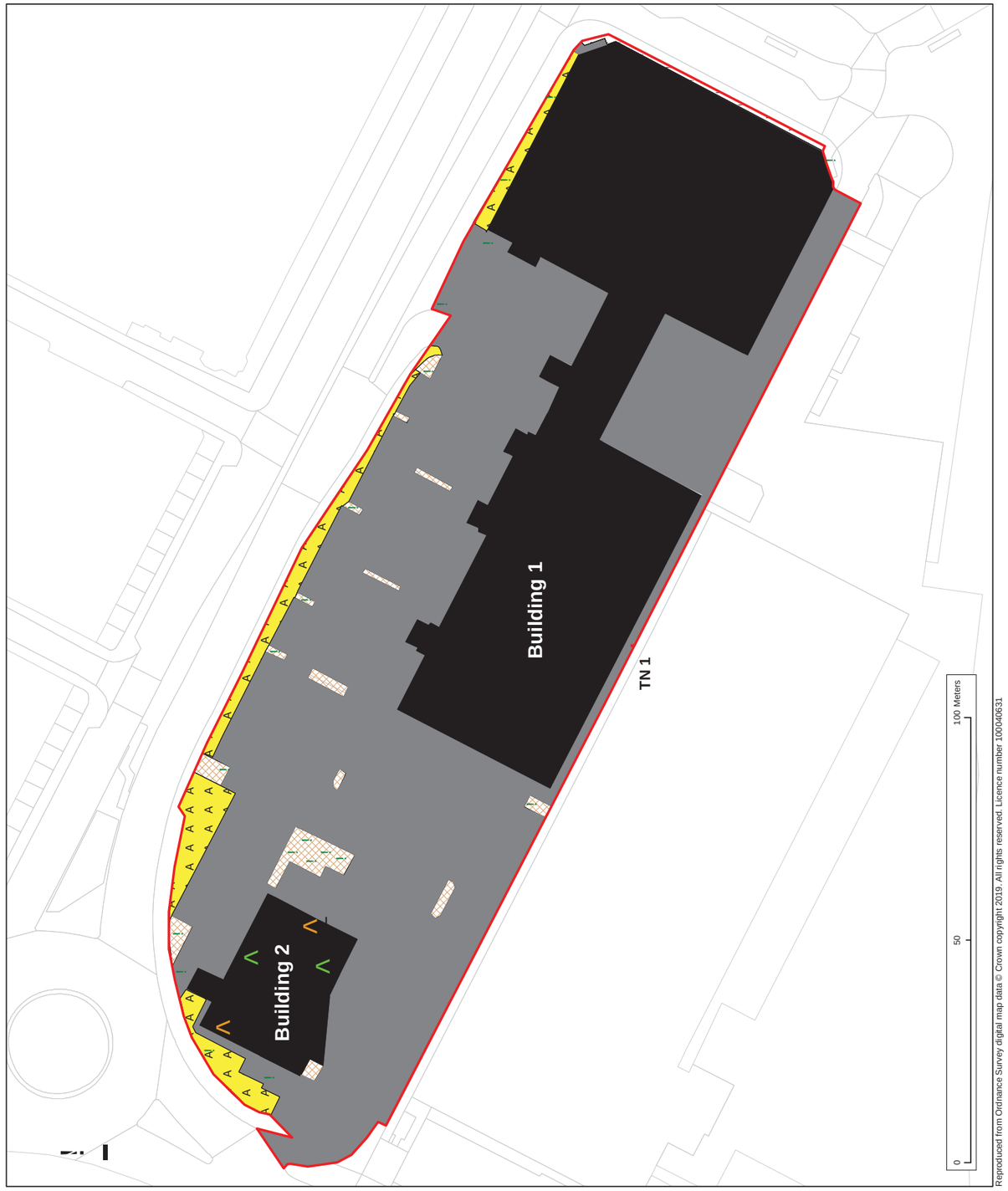
The extended Phase 1 Habitat survey and external building and tree inspections for bats confirmed that the application site is of ecological importance at up to the Site level. By undertaking the work in accordance with the mitigation measures outlined in this report, the proposed development would be in conformity with relevant planning policy and legislation relating to ecology.

Following the implementation of the mitigation, no significant residual effects on biodiversity are expected at either the demolition or construction stage. Following completion of the proposed development, and with the implementation of the recommended enhancements; the proposed development would bring considerable benefits for biodiversity. It is anticipated that there would be a positive residual effects on habitats, significant at the Site level, and a positive residual effect on invertebrates and bats, significant at the Site level.

No additional mitigation is required over and above those embedded within the proposed development.

APPENDIX 1
FIGURES

APPENDIX 2
RELEVANT LEGISLATION AND POLICY



Ecological features are protected under various United Kingdom (UK) and European legislative instruments. These are described below. European legislation is not included as it is incorporated in UK legislation by domestic provisions.

The Conservation of Habitats and Species Regulations, 2017, as amended

The Habitats Directive (Council Directive 92/43/EEC)[16] came into force in 1992 and provides for the creation of a network of protected wildlife areas across the European Union, known as 'Natura 2000'. The Natura 2000 network consists of Special Areas of Conservation (SACs) designated under the Habitats Directive and Special Protection Areas (SPAs) designated under the Birds Directive (Council Directive 79/409/EEC)[17]. These sites are part of a range of measures aimed at conserving important or threatened habitats and species.

The Conservation of Habitats and Species Regulations 2017[18] commonly known as 'the Habitats Regulations' transposes the Habitats Directive into national law and set out the provisions for the protection and management of species and habitats of European importance, including Natura 2000 sites. The 2017 bill consolidated all previous versions of the regulations and subsequent amendments since initial transposition, bringing them all under the single heading, and made a number of minor amendments. It extends to England and Wales, and to a limited extent Scotland and Northern Ireland. In Scotland, the Habitats Directive is transposed through a combination of the Habitats Regulations 2017 (in relation to reserved matters) and the Conservation (Natural Habitats &c.) Regulations 1994. The Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) transposes the Habitats Directive in relation to Northern Ireland.

In addition to providing for the designation and protection of Natura 2000 sites, the Habitats Regulations provide strict protection for plant and animal species as European Protected Species. Derogations from prohibitions are transposed into the Habitats Regulations by way of a licensing regime that allows an otherwise unlawful act to be carried out lawfully for specified reasons and providing certain conditions are met. Under the Habitats Regulations, competent authorities have a general duty, in the exercise of any of their functions, to have regard to the Habitats Directive and Wild Birds Directive including in the granting of consents or authorisations. They may not authorise a plan or project that may adversely affect the integrity of a European site, with certain exceptions (considerations of overriding public interest).

The Countryside and Rights of Way Act 2000

The Countryside and Rights of Way Act 2000[19] primarily extends to England and Wales. It provides a new statutory right of access to the countryside and modernises the rights of way system, bringing into force stronger protection for both wildlife and countryside.

The Act is divided into five distinct sections, Part III is of relevance to ecology:

Part III - Nature Conservation and Wildlife Protection: The Act details a number of measures to promote and enhance wildlife conservation. These measures include improving protection for Sites of Special Scientific Interest (SSSIs) and increasing penalties for deliberate damage to SSSIs. Furthermore, the Act affords statutory protection to Ramsar Sites which are wetlands designated under the International Convention on Wetlands[20].

[16] European Commission (1992) Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. European Commission, Brussels
[17] European Commission (1979) Council Directive 79/409/EEC on the conservation of wild birds, European Commission, Brussels
[18] Secretary of State (2017) The Conservation of Habitats and Species Regulations. Her Majesty's Stationery Office (HMSO)
[19] Secretary of State (2000) The Countryside and Rights of Way Act. HMSO
[20] United Nations Educational, Scientific and Cultural Organization (UNESCO) (1971) Convention on Wetlands of International Importance especially as Waterfowl Habitat, as amended in 1982 and 1987. Ramsar, Iran Published in Paris, 1994

Wildlife and Countryside Act 1981, as Amended in Quinquennial Review and by the Countryside and Rights of Way Act 2000 and the Natural Environment and Rural Communities Act 2006

The Wildlife and Countryside Act 1981[21] forms the basis of much of the statutory wildlife protection in the UK. Part I deals with the protection of plants, birds and other animals and Part II deals with the designation of SSSIs.

This Act covers the following broad areas:

- Wildlife - listing endangered or rare species in need of protection and creating offences for killing, disturbing or injuring such species. Additionally, the disturbance of any nesting bird during breeding season is also noted as an offence, with further protection for species listed on Schedule 1. Measures for preventing the establishment of non-native plant and animal species as listed on Schedule 9 are also provided;
- Nature Conservation - protecting those Sites which are National Nature Reserves (NNR) and SSSI;
- Public Rights of Way - placing a duty on the local authority (normally the County Council) to maintain a definitive map of footpaths and rights of way. It also requires that landowners ensure that footpaths and rights of way are continually accessible; and
- Miscellaneous General Provisions.

The Act is enforced by Local Authorities.

Natural Environment and Rural Communities (NERC) Act 2006

Under the NERC Act 2006[22] Section 40, public authorities must show regard for conserving biodiversity in all their actions. Public authorities should consider how wildlife or land may be affected in all the decisions that they make. The commitment to the biodiversity duty must be measured by public authorities.

NERC Act 2006 Section 41 requires the Secretary of State to publish a list of habitats and species that are of principal importance for the conservation of biodiversity in England.

Protection of Badgers Act 1992

The Protection of Badgers Act 1992[23] consolidated previous legislation relating specifically to badgers. This makes it an offence to kill, injure or take a badger, or to damage or interfere with a sett unless a licence is obtained from a statutory authority.

Biodiversity Action Plans

In 1994, Government produced the UK Biodiversity Action Plan (BAP)[24], a national strategy for the conservation of biodiversity. This led to the creation of the UK Biodiversity Steering Group, which has listed 1,150 Species Action Plans (SAPs) and 65Habitat Action Plans (HAPs). Regional and District/Borough BAPs apply the UK BAP at a local level.

From July 2012, the UK Post-2010 Biodiversity Framework[25] succeeds the UK BAP and Conserving Biodiversity - the UK Approach. This is as a result of a change in strategic thinking following the publication of the Convention on Biological Diversity's Strategic Plan for Biodiversity 2011 - 2020 and its 20 'Aichi targets', at Nagoya, Japan in October 2010, and the launch of the new EU Biodiversity Strategy (EUBS) in May 2011.

[21] Secretary of State (1981) Wildlife and Countryside Act. HMSO
[22] Natural Environment and Rural Communities Act 2006. HMSO
[23] Secretary of State (1992) Protection of Badgers Act 1992. HMSO
[24] Her Majesty's Stationery Office, 1994. Biodiversity: The UK Action Plan. London
[25] JNCC and Defra (on behalf of the Four Countries' Biodiversity Group), 2012. UK Post-2010 Biodiversity Framework. July 2012. jncc.defra.gov.uk/pdf/UK_Post2010_Bio-Fwork.pdf

The UK Post-2010 Biodiversity Framework constitutes the UK's response to these new 'Aichi' strategic goals and associated targets. The Framework recognises that most work which was previously carried out under the UK BAP is now focussed on the individual countries of the United Kingdom and Northern Ireland, and delivered through each countries' own strategies.

Following the publication of the new Framework, the UK BAP partnership no longer operates. However, many of the tools and resources originally developed under the UK BAP remain of use. The UK list of priority species has been used to help draw up statutory lists of priorities in England, Scotland, Wales and Northern Ireland. For England, this is in line with the NERC Act 2006 Section 41.

Biodiversity in the Planning Process

Administrative and policy guidance on the application of some of these statutory obligations is provided through relevant government policy guidance and advice. In England, this includes National Planning Policy Framework 2012, National Planning Practice Guidance, Circular 06/2005: Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System, Biodiversity 2020 and Natural Environment White Paper The natural choice: securing the value of nature.

National Planning Policy Framework, 2019

The National Planning Policy Framework (NPPF)[26] adopted in 2018 sets out the Government's planning policies for England and how these are expected to be applied. The NPPF contains the following statements which are of relevance (not an exhaustive list, but including those of highest relevance):

- Section 15, paragraph 170 states that the planning system should contribute to and enhance the natural and local environment by: "minimising impacts on biodiversity and providing net gains in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;";
- Section 15, paragraph 174 states that planning applications should "promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity".
- Section 15, paragraph 174 states that - "To protect and enhance biodiversity and geodiversity, planning policies [local authorities] should: identify, map and safeguard components of local wildlife-rich habitats and wider ecological networks, including the hierarchy of international, national and locally designated sites of importance for biodiversity; wildlife corridors and stepping stones that connect them; and areas identified by national and local partnerships for habitat management, enhancement, restoration or creation"; and
- Section 15, paragraph 175 states that: "When determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principles: if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused". It also states that: "planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of ancient or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss and a suitable compensation strategy exists".

[26] Department for Communities and Local Government (2018) National Planning Policy Framework (NPPF). London. HMSO

National Planning Practice Guidance, 2014

The National Planning Practice Guidance[27] is a web-based resource launched in March 2014. This guidance is divided into sections, of which Natural Environment: Biodiversity, Ecosystems and Green Infrastructure provides information on biodiversity issues within planning and guidance on where to find further information on biodiversity issues.

Circular 06/2005: Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System.

This circular[28] provides administrative guidance on the application of the law relating to planning and nature conservation as it applies in England. It complements the national planning policy in the National Planning Policy Framework and the Planning Practice Guidance.

Natural Environment White Paper. The natural choice: securing the value of nature

The Natural Environment White Paper[29] outlines the government's vision for the natural environment over the next 50 years, shifting the emphasis to an integrated landscape-scale approach. It describes the actions that will be taken to deliver that goal.

Biodiversity 2020

The Biodiversity 2020[30] strategy for England builds on the Natural Environment White Paper and provides a comprehensive picture of how England is implementing its international and EU commitments. It sets out the strategic direction for biodiversity policy on land (including rivers and lakes) and at sea.

The mission for this strategy is to halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people.

It is anticipated that this will be delivered through:

- a more integrated large-scale approach to conservation on land and at sea;
- putting people at the heart of biodiversity policy;
- reducing environmental pressures; and
- improving our knowledge.

Local Planning Policy

Reading Borough Local Plan (Adopted November 2019)

Policy EN12: BIODIVERSITY AND THE GREEN NETWORK

b) On all sites, development should not result in a net loss of biodiversity and geodiversity, and should provide a net gain for biodiversity wherever possible. Development should:

- *Protect and wherever possible enhance features of biodiversity interest on and adjacent to the application site, incorporating and integrating them into development proposals wherever practicable; and*
- *Provide new tree planting, wildlife friendly landscaping and ecological enhancements (such as wildlife ponds, bird and bat boxes) wherever practicable.*

[27] Department for Communities and Local Government (2014) National Planning Practice Guidance: http://planningguidance.planningportal.gov.uk/

[28] Office of the Deputy Prime Minister (2005) Circular 06/2005: Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System. https://www.gov.uk/government/publications/biodiversity-and-geological-conservation-circular-06-2005

[29] Defra (2011) Natural Environment White Paper. The natural choice: securing the value of nature https://www.gov.uk/government/publications/the-natural-choice-securing-the-value-of-nature

[30] Defra, 2011. Biodiversity 2020. https://www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services

In exceptional circumstances where the need for development clearly outweighs the need to protect the value of the site, and it is demonstrated that the impacts cannot be: 1) avoided; 2) mitigated or; 3) compensated for on-site; then new development will provide off-site compensation to ensure that there is "no net loss" of biodiversity. Provision of off-site compensation shall be calculated in accordance with nationally or locally recognised guidance and metrics. It should not replace existing alternative habitats, and should be provided prior to development.

EN14: TREES, HEDGES AND WOODLANDS

"Individual trees, groups of trees, hedges and woodlands will be protected from damage or removal where they are of importance, and Reading's vegetation cover will be extended. The quality of waterside vegetation will be maintained or enhanced. New development shall make provision for tree retention and planting within the application site, particularly on the street frontage, or off-site in appropriate situations, to improve the level of tree coverage within the Borough, to maintain and enhance the character and appearance of the area in which a site is located, to provide for biodiversity and to contribute to measures to reduce carbon and adapt to climate change. Measures must be in place to ensure that these trees are adequately maintained".

Reading Biodiversity Action Plan

The Reading Biodiversity Action Plan sets out a methodology to protect, conserve and enhance Reading's diversity of wildlife.

ECOLOGICAL IMPACT ASSESSMENT
READING STATION PARK

APPENDIX 3
SITE PHOTOGRAPHS

1700003910_2_Reading Station Shopping Centre_EcIA



Photo 1. Building 1 (background) and hard standing (foreground)



Photo 2. Building 1 (background) and hard standing (foreground)

Title:	Photographs of Application Site	**Client:**	Aviva Investors
Site:	Reading Station Shopping Park	**Date:**	03/04/2019



Photo 3. Building 2 (background) and hard standing (foreground)



Photo 4. Introduced shrub and scattered trees to the west of Building 2

Title:	Photographs of Application Site	**Client:**	Aviva Investors
Site:	Reading Station Shopping Park	**Date:**	03/04/2019



Photo 5. Amenity grassland and introduced shrub at northern boundary



Photo 6. Rear of Building 1, marked as TN1 on Appendix 1, Figure 1

Title: Photographs of Application Site	**Client:** Aviva Investors
Site: Reading Station Shopping Park	**Date:** 03/04/2019

1 INTRODUCTION

Introduction

1.1 This Environmental Statement (ES) has been prepared for Aviva Life & Pensions UK Limited (hereafter referred to as 'the Applicant'), in accordance with the statutory procedures set out in the Town and Country Planning (Environmental Impact Assessment) Regulations 2017[1] (hereafter referred to as 'the EIA Regulations').

1.2 The ES relates to the intended redevelopment (hereafter referred to as 'the proposed development') of the Reading Station Park, Reading, within the jurisdiction of Reading Borough Council (RBC) (hereafter referred to as 'the application site'). This ES accompanies an application by the Applicant for outline planning permission for the proposed development on the application site ('the application').

1.3 Outline planning permission is being sought, because the exact mix of uses (commercial and residential) and site layout and specifications is not known at the present time, and will be subject to market demand at the time of the scheme being delivered.

1.4 The Applicant recognises that the proposed development falls within Schedule 2, Category 10b of the EIA Regulations as an 'urban development project' which, owing to its nature, scale and location, has the potential to give rise to significant effects on the environment. The Applicant has therefore commissioned an environmental impact assessment (EIA) for the proposed development, the findings of which are presented within this ES.

1.5 The ES comprises the following:

- Non-Technical Summary (NTS);
- Volume 1: Environmental Statement Main Report (this document);
- Volume 2: Townscape, Visual and Built Heritage Assessment;
- Volume 3: Technical Appendices.

1.6 EIA is a formal process in which the likely significant effects of certain types of development projects on the environment are identified, assessed and reported upon. For certain types of development, the process must be followed in order for such effects to be taken into account before a decision is made on whether planning permission should be granted.

1.7 This ES presents the results of the EIA that has been undertaken of the proposed development. In accordance with the EIA Regulations, the ES reports on the potential environmental impacts and likely significant environmental effects of the proposed development during the demolition and construction stage, as well as during the subsequent completion and operational stage.

1.8 The EIA has taken into account the mitigation measures that are being proposed by the Applicant, including those measures that have been integrated into the planning and design of the proposed development to prevent and, where prevention is not possible, to reduce and/or mitigate likely significant adverse effects. It then evaluates the significance of the residual effects.

1.9 Further information on how the scope of the EIA was defined and on the structure of this ES, is provided in Chapter 2: EIA Process and Methodology.

1.10 The EIA has been carried out by Ramboll UK Limited ('Ramboll') and a number of technical specialists. The EIA specialists, in addition to the Applicant's wider design and planning team, are presented in Table 1.2, along with their respective disciplines.

1.11 RBC is the 'relevant planning authority' for the purposes of the EIA Regulations and will determine the application taking into account the likely significant environmental effects of the proposed development as determined through the EIA process.

1.12 This chapter provides a general description of the application site, the relevant planning context, planning application details, as well as the content and structure of the ES. More detailed information on the application site is provided in the technical assessments of this Volume, as well as ES Volume 2.

1.13 The proposed development that has been assessed within the EIA is as described in Chapter 4: Proposed Development Description and Chapter 5: Demolition and Construction Environmental Management of this Volume.

Development Context

Application Site Location and Context

1.14 The application site is located at national grid reference SU 71399 74085, within Reading city centre, as shown in Figure 1.1.

1.15 Geographically, the application site is located approximately:

- 150 m south-west of the River Thames; and
- 50 m north of Reading Railway Station.

1.16 The application site is located within the electoral ward of Abbey, which has a population of approximately 14,700 people. Abbey ward has a younger population profile than both the RBC area and England. The 2011 Census recorded approximately 65,551 households in the RBC area, 10% of which (6,783) are within Abbey ward.

1.17 Accommodation within the study area is mainly private rented (51 %), which is in contrast to the RBC area and England where the majority of accommodation is owner occupied (55 % and 63 % respectively). Only 28 % of accommodation in the study area is owner occupied.

1.18 According to the Indices of Deprivation 2019[2], the RBC area is ranked the 141st most deprived local authority in England (out of 326).

1.19 As shown in Figure 1.2, the wider context of the application site is characterised by urban development with a fragmented mixture of commercial, industrial and residential uses.

[1] Secretary of State, 2017. Town and Country Planning (Environmental Impact Assessment) Regulations 2017, London, HMSO.

[2] Ministry of Housing, Communities and Local Government, 2019. The English Indices of Deprivation 2019, London, MHCLGH.

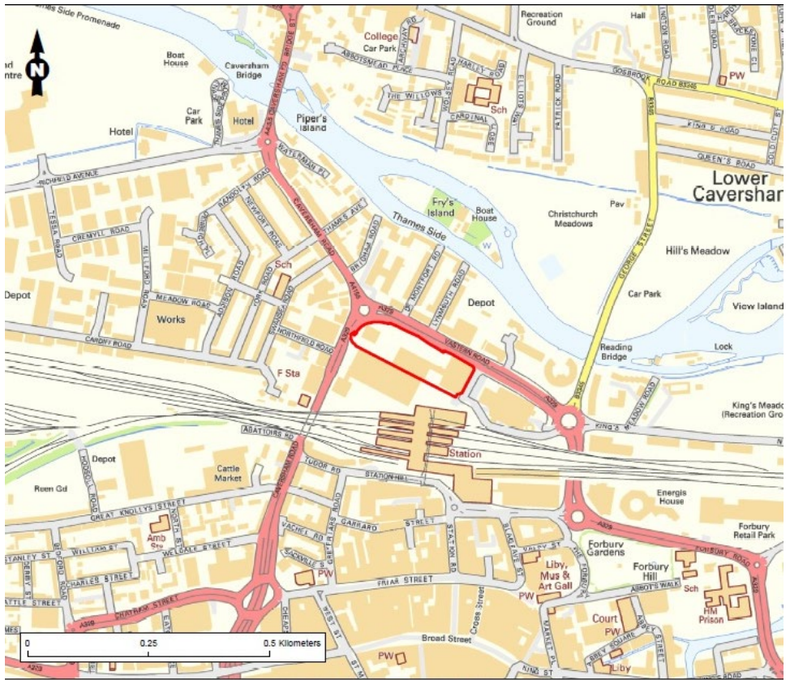


Figure 1.1: Application Site Location Plan

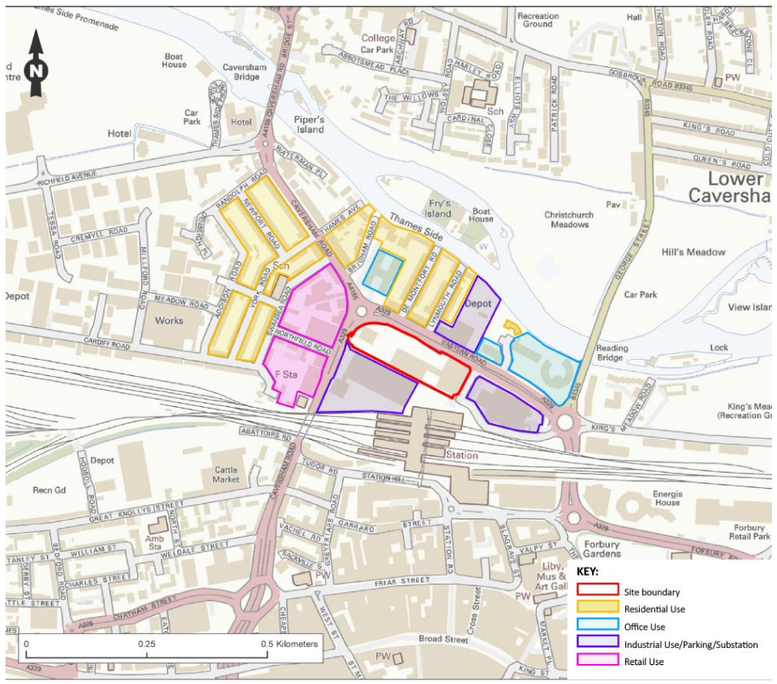


Figure 1.2: Existing Surrounding Land Uses

Application Site Description

1.20 The application site boundaries are defined by:

- Vastern Road (A329) to the north, beyond which are residential units and a Scottish and Southern Energy (SSE) office unit;
- Trooper Potts Way to the east, beyond which is Reading Railway Station car park;
- Network Rail Thames Valley Area site office to the south, beyond which is Reading Railway Station railway lines; and
- Caversham Road to the west, beyond which are a range of commercial, residential and industrial units.

1.21 The application site covers an area of approximately 1.77 hectares (ha). The application site lies at an elevation of between approximately 37.8 and 38.8 m Above Ordnance Datum (m AOD).

1.22 Representative photographs of the application site are shown in Figure 1.3.



South-east facing view of Aldi and the Range from Vastern Road



South-west facing view of TGI Fridays from Vastern Road



North-west facing view from behind commercial units in the south of the application site



South facing view of Reading Railway Station from Trooper Potts Way

Figure 1.3: Application Site Photographs

1.23 The application site is occupied by a commercial unit (including an Aldi, The Range, Mothercare and Majestic Wine) and a separate building in restaurant use (TGI Fridays), associated surface car parking, and delivery yard. The units are low rise, approximately 2-3 storeys high. There is currently provision for 280 surface car parking spaces.

1.24 There are no existing basements on the application site.

1.25 An electrical sub-station is located in the shared service yard within the southern extent of the application site adjacent to the site boundary, which is owned and operated by SSE Power Distribution. A second electrical sub-station is located off-site, immediately adjacent to the south-western application site boundary.

1.26 On-site habitats comprise buildings, hardstanding, amenity grassland, introduced shrub, scattered trees, and slate chippings.

Environmental Sensitivity

1.27 The application site is a site of a utilitarian character, comprising retail warehouse buildings; hard standing serving as frontage car parking and a service yard to the rear of the retail units; a restaurant, with associated hard landscape; and soft landscape forming the southern edge of Vastern Road and eastern edge of Caversham Road. This includes soft landscape including a number of canopy trees, in addition to grass and shrub planting.

1.28 The nearest surface water feature is the River Thames located 150 m north-east of the application site. There are three surface water abstractions within 2 km of the application site; however, none of the abstractions are for sensitive uses such as for public potable water supply.

1.29 The majority of the application site (approximately 95 %) is located in Flood Zone 2 (Medium Probability). Small areas (<5 %) in the west and centre of the application site are located in Flood Zone 1 (Low Probability), and a small portion (< 5 %) of the north-eastern site boundary is located in Flood Zone 3 (High Probability) where the annual probability of flooding from rivers is 1 in 100 (1%) or greater, and from the sea is 1 in 200 (0.5 %) or greater.

1.30 The application site is underlain by Clay and Silt (Unproductive Strata), which is further underlain by a Principal Aquifer. There are 10 groundwater abstractions recorded within 2 km, none of which are for public potable water supply. The abstractions are considered likely to be from the Chalk Principal Aquifer, which is separated from the Made Ground by the low permeability Langley Silt Member. The clay and silt deposits can be expected to provide some protection to downward migration of contamination (if present) within groundwater. The application site is not located within a groundwater Source Protection Zone.

1.31 No Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Site of Special Scientific Interest (SSSIs), National Nature Reserves (NNRs) or Local Nature Reserves (LNRs) are located within 1 km of the application site.

1.32 Three Local Wildlife Sites (LWS's) are located within 1 km of the application site. This includes Cow Lane Depot designated for habitats including mature trees, scrub, open water with swamp and tall herb grassland; The Warren Woodlands Complex designated as it is a woodland complex of six sites; and The Coal Kennetmouth and Kings Meadow East designated for habitats including mature trees, banks of Rivers with wetland species and areas of grassland.

1.33 The application site is not subject to any environmental designations such as listed buildings, scheduled monuments and it is not within an area of archaeological potential as designated by RBC.

1.34 There have been no archaeological investigations within the application site but 29 have been carried out within the study area (550 m radius of the application site). Of these there are four which are within 50 to 150 m of the application site; two are to the north on the northern side of Vastern Road (the A329), one on the eastern side of Vastern Road/Forbury Road (the A329) and one to the south side of the railway lines and west of Reading Railway Station. All these investigations recorded approximately 2 m of made ground directly over alluvium. Further, none of the investigations recorded buried heritage assets earlier than the late post medieval, i.e. 1800s and onwards.

1.35 The application site does not contain any nationally designated (protected) heritage assets, such as scheduled monuments or registered parks and gardens. There are also no statutory listed buildings on the application site, or in its immediate vicinity. The closest listed building is the Grade II listed Main Building of Reading Station approximately 130 m south of the application site. There are 25 Grade II listed buildings within 500 m of the application site including the Grade II* town council chamber and offices with clock tower (Listing Entry 1113400) and the Grade I Listed Greyfriars Church (Listing Entry 1321952).

1.36 The application site is not within or adjacent to a Conservation Area (CA). The closest CA is Market Place/London Street Conservation Area located approximately 390 m south-east of the application site. The Forbury Garden Registered Grade II is a registered park and garden located 430 m from the application site centre.

1.37 The application site and its immediate setting fall within Reading Tall Building Strategy (RTBS) (2018)[3] Character Area 22: Vastern Road. The northern edge of the application site immediately abuts Character Area 12 - Caversham Road. Character Area 1 - Station Hill abuts the boundary of Character Area 22 to the south and Character Area 23 - King's Meadow abuts the northern and eastern boundaries of Character Area 22.

1.38 The application site is located within an urban area, comprising a mix of different uses including commercial and residential developments. The application site benefits from good transport infrastructure in close proximity which facilitates travel by non-car modes such as walking, cycling and public transport.

1.39 The application site is located approximately 50 m north of Reading Railway Station, which can be accessed by pedestrians via Caversham Road.

1.40 There are six bus stops accessible within 400 m of the application site on Trooper Potts Way to the east of the application site and on Caversham Road to the west and north-west. There are approximately 12 different bus services available from these stops combined.

1.41 There are good walking linkages in the local area, with extensive footway provision along Caversham Road, Vastern Road and Trooper Potts Way.

1.42 Due to the application site's urban location, the main existing noise sources comprise road traffic noise from the A329 and noise from passing trains from Reading Railway Station located approximately 50 m south of the application site. The application site is surrounded by residential dwellings to the north and west.

1.43 The application site is located within the Reading Air Quality Management Area (AQMA) which covers the town centre and areas along the major arterial roads leading into Reading. The AQMA was declared for exceedances of the annual mean NO_2 objective.

1.44 The Oxkem Controls of Major Accidents Hazards (COMAH) Establishment is located approximately 1.65 km east of the application site. The application site does not lie within the consultation zones of the COMAH Establishment.

1.45 A selection of the key considerations is presented spatially in Figure 1.4.

[3] Reading Borough Council, 2018. Reading Tall Buildings Strategy Update Note 2018. RBC.

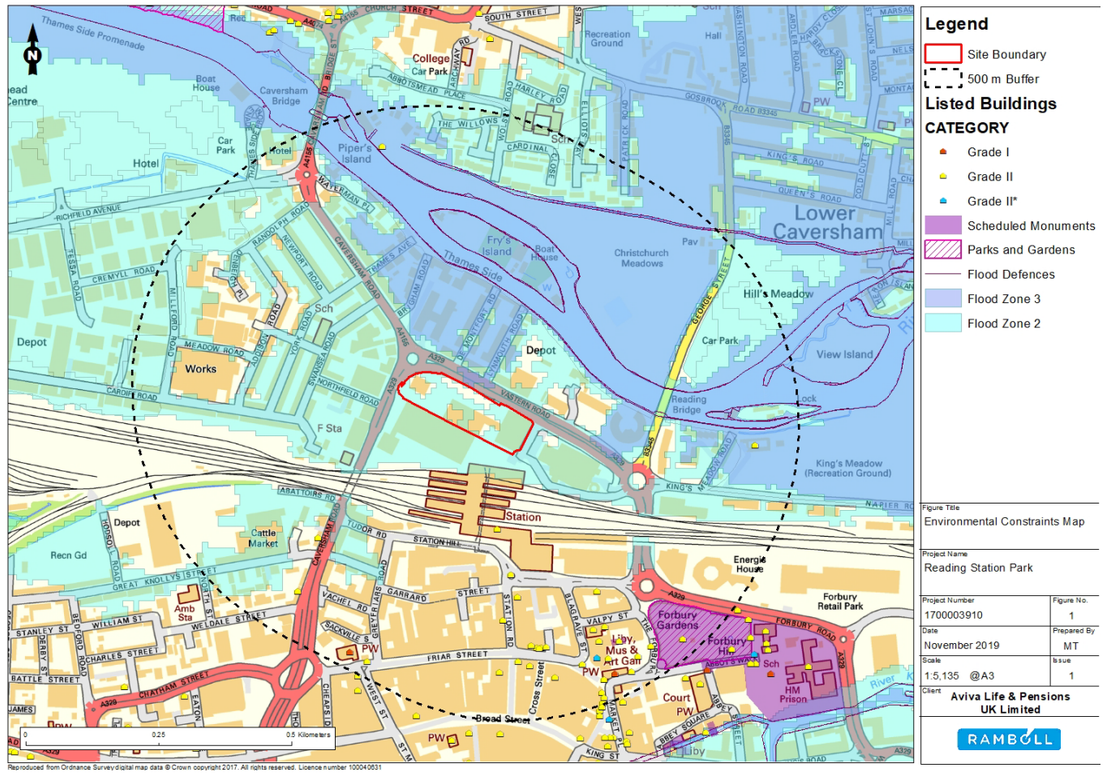


Figure 1.4: Surrounding Environmental Considerations

Planning Context

Planning Policy Context

1.46 It is necessary to consider the proposed development against relevant policies and guidance at national, regional and local levels. At the national level, planning policy is contained within the National Planning Policy Framework (NPPF)[4].

1.47 The Ministry of Housing, Communities and Local Government published the revised NPPF on 24 July 2018, and was then updated on 19 February 2019. It sets out the Government's planning policies for England. It provides within a single document the greater part of national planning policy advice and articulates the Government's vision for delivering sustainable development. The NPPF is supported by the online National Planning Practice Guidance (PPG) and both are a material planning consideration.

1.48 The EIA has regard to the following local planning documents:

- Reading Borough Local Plan (2019)[5]; and
- Reading Station Area Framework (2010)[6].

1.49 The new Local Plan for Reading has been formally adopted following a committee meeting on 5 December 2019, superseding the Reading Borough Local Development Framework Core Strategy (2015)[7]. The Local Plan will decide how the town is developed over the next 17 years, dictating how residential dwellings can be built in the future and provide a blueprint for important developments.

Planning History

1.50 Table 1.1 summarises the key planning history of most relevance to the application site and provides background to the existing and consented land uses at the application site.

Table 1.1: Application Site Planning History

Application Number	Development	Decision	Date of Decision
87/TP/1105	Development of site to provide three retail warehouses, one restaurant, together with car parking, internal site roads, service area and landscaping on land at junction of Caversham Road and Vastern Road, Reading.	Approved	18/03/1988
070767	Minor external alterations to shopfront, erection of canopy to front of building, minor external alterations to south-east elevation and siting of secure compound in rear service yard.	Approved	30/10/2007
071279	Change of use of 2322 m^2 of ground floor from retail (A1) to leisure (D2) or retail (A1).	Approved	11/04/2008

Application Details

1.51 The description of the proposed development as stated on the application form is:

"Outline planning permission with the details of access, appearance, landscaping, layout and scale reserved for later determination. Demolition and redevelopment to comprise: up to 115,000 sqm GEA in one or more land uses comprising: Residential (Class C3 and including PRS); Offices (Use Class B1(a); development in Use Classes A1, A2, A3 (retail), A4 (public house), A5 (take away), C1 (hotel), D1 and D2 (community and leisure); car parking; provision of new plant and renewable energy equipment; creation of servicing areas and provision of associated services, including waste, refuse, cycle storage, and lighting; and for the laying out of the buildings; routes and open spaces within the development; and all associated works and operations including but not limited to: demolition; earthworks; provision of attenuation infrastructure; engineering operations. All development, works and operations to be in accordance with the approved Development Parameters Schedule and Plans."

Applicant

1.52 The Application is submitted on behalf of Aviva Life & Pensions UK Limited. The application is by care of:

Barton Willmore Partnership
7 Soho Square
Soho
London
W1D 3QB

[4] Department for Communities and Local Government, 2019. The National Planning Policy Framework. HMSO.
[5] Reading Borough Council, 2019. Reading Borough Local Plan. RBC.
[6] Reading Borough Council. 2010. Reading Station Area Framework. RBC.
[7] Reading Borough Council, 2015. Reading Borough Local Development Framework. Core Strategy.

Project Team

1.53 The Applicant has appointed a design team to assist in the development of the application and has concurrently appointed an EIA team to undertake the EIA and prepare the ES in accordance with Regulation 18(5)(a) of the EIA Regulations. The team members and their respective roles are presented in Table 1.2.

Table 1.2: Design and EIA Team

Company	Role
WT Partnership	Project Managers
Barton Willmore	Planning Consultants
Collado Collins	Architect
Fabrik	Landscape Architect
Cole Easdon	Transport and Highways Consultant
Cast Consult	Cost Consultant
Mace	Construction Advisor
Watkins Payne Partnership	Site Wide Utilities Consultant and Sustainability Consultant
RPS Group	Waste Consultant
Simpson Associates Consulting Engineers LLP	Flood Risk and Drainage Consultant
Ramboll	ES Project Manager and Co-ordinator, Air Quality Assessment, Noise and Vibration Assessment, Ecological Impact Assessment, Ground Conditions Preliminary Risk Assessment
Barton Willmore	Socio-Economic Assessment
Barton Willmore	Townscape/Landscape and Visual Assessment
AVR London	Verified Visual Images
CHP Surveyors	Daylight, Sunlight, Overshadowing and Solar Glare Consultant
Museum of London Archaeology	Archaeology Consultant, Built Heritage Consultant
Xi Engineering	Wind Microclimate Consultants
Tim Moya Associates	Arboriculture Consultant

Environmental Statement

Environmental Statement Structure

1.54 The ES comprises the following documents:

- Non-Technical Summary (NTS);
- Volume 1: Main Environmental Statement, comprising the following chapters:
  - Table of Contents, List of Figures, List of Tables
  - Chapter 1: Introduction
  - Chapter 2: EIA Process and Methodology
  - Chapter 3: Alternatives and Design Evolution
  - Chapter 4: Proposed Development Description
  - Chapter 5: Demolition and Construction Environmental Management
  - Chapter 6: Socio-Economics
  - Chapter 7: Air Quality
  - Chapter 8: Noise and Vibration
  - Chapter 9: Wind Microclimate
  - Chapter 10: Daylight, Sunlight, Overshadowing and Solar Glare
  - Chapter 11: Cumulative Effects
  - Chapter 12: Summary of Residual Effects
  - Glossary of Terms and Abbreviations
- Volume 2: Townscape, Visual and Built Heritage Assessment
  - Chapter 1: Townscape and Visual Impact Assessment
  - Chapter 2: Built Heritage Assessment
- Volume 3: Technical Appendices
  - Technical Appendix 1.1: IEMA Quality Mark Checklist
  - Technical Appendix 1.2: Regulation 18(5)(b) Statement
  - Technical Appendix 2.1: EIA Scoping Report
  - Technical Appendix 2.2: Ground Conditions Preliminary Risk Assessment
  - Technical Appendix 2.3: Ecological Impact Assessment
  - Technical Appendix 2.4: Flood Risk Assessment
  - Technical Appendix 2.5: Historic Environment Assessment
  - Technical Appendix 2.6: Summary Planning Policies
  - Technical Appendix 7.1: Environmental Health Officer Consultation
  - Technical Appendix 7.2: Legislation, Dust Risk Methodology, Model Verification
  - Technical Appendix 8.1: Legislation and Guidance
  - Technical Appendix 8.2: Baseline Survey
  - Technical Appendix 8.3: Construction Plant Noise
  - Technical Appendix 8.4: Site Suitability
  - Technical Appendix 8.5: Daytime Ambient Noise Levels
  - Technical Appendix 9.1: Wind Microclimate Results
  - Technical Appendix 10.1: Drawings of the Baseline, the Proposed Development and the Cumulative Scenario
  - Technical Appendix 10.2: Daylight and Sunlight Results for Neighbouring Properties for both the Proposed Development and the Cumulative Scenario
  - Technical Appendix 10.3: Overshadowing Assessment
  - Technical Appendix 10.4: Solar Glare Assessment

Environmental Statement Content

1.55 The required content of an ES is set out in Schedule 4 of the EIA Regulations. Table 1.3 presents these requirements and indicates where in this ES the requirements have been met.

Table 1.3: EIA Regulations Schedule 4 Requirements

Required Information		Section of ES
Part I		
1	A description of the development, including in particular: • a description of the location of the proposed development; • a description of the physical characteristics of the proposed development, including, where relevant, requisite demolition works, and the land-use requirements during the operation stage; • a description of the main characteristics of the operational phase of the proposed development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; • an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the operation stage.	Volume 1: ES Chapter 1: Introduction, ES Chapter 4: Proposed Development Description, ES Chapter 5: Demolition and Construction Environmental Management. ES Chapters 6-12, Volume 1 ES Volumes 2 and 3
2	A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the Applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	ES Chapter 3: Alternatives and Design Evolution, Volume 1
3	A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the proposed development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.	ES Chapter 3: Alternatives and Design Evolution, Volume 1
4	A description of the factors specified in Regulation 4(2) likely to be significantly affected by the proposed development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape, and the interaction between such factors.	ES Chapters 6-12, Volume 1, ES Volumes 2 and 3
5	A description of the likely significant effects of the proposed development on the environment resulting from, *inter alia*: a) the existence of the development; b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters); e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems	ES Chapters 4-12, Volume 1, Volumes 2 and 3

Table 1.3: EIA Regulations Schedule 4 Requirements

Required Information		Section of ES
Part I		
	relating to areas of particular environmental importance likely to be affected or the use of natural resources; f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change; and g) the technologies and the substances used. The description of the likely significant effects on the factors specified in Regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. The description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the proposed development, including in particular those established under Council Directive 92/43/EEC and Directive 2009/147/EC.	
6	A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	ES Chapters 6-12, Volume 1 ES Volumes 2 and 3
7	A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). The description should explain the extent to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover the operation stage.	ES Chapter 5: Demolition and Construction Environmental Management, Volume 1 Mitigation sections of ES Chapters 6-12, Volume 1 and ES Volumes 2 and 3
8	A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU(c) of the European Parliament and of the Council or Council Directive 2009/71/Euratom or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.	ES Chapters 6-12, ES Volume 1 ES Volumes 2 and 3
9	A non-technical summary of the information provided under paragraphs 1 to 8.	Non-Technical Summary
10	A reference list detailing the sources used for the descriptions and assessments included in the ES.	ES Chapters 1-12, ES Volume 1 ES Volumes 2 and 3

Environmental Statement Good Practice

1.56 As with EIA, good practice in the preparation of the ES is defined in a number of sources, with more specific issues covered by ES review checklists. Many of these checklists are very detailed and go to some length. In terms of widely applicable and practical guidance, the Institute of Environmental Management and Assessment (IEMA) Quality Mark indicator check has been referenced in undertaking the EIA and in producing this ES as described in Technical Appendix 1.1, ES Volume 3.

1.57 Ramboll is a Registrant on the IEMA Quality Mark. Accordingly, as part of Ramboll's QA procedures and Quality Mark Commitments, the EIA has been undertaken to meet the Quality Mark Commitments as set out in Technical Appendix 1.1, ES Volume 3.

1.58 As required by Regulation 18(5)(b), Technical Appendix 1.2 presents a statement from the Applicant outlining the relevant expertise or qualifications of the competent experts that have undertaken the EIA and prepared this ES.

2 EIA PROCESS AND METHODOLOGY

Introduction

2.1 This chapter of the ES sets out the general approach to the process and to the methodology that is adopted when undertaking an EIA. It describes the legislative framework in which the EIA for the proposed development was undertaken and identifies the key guidance that was considered. The scoping and consultation process that was adopted to identify the key environmental topics for inclusion in the EIA is outlined, as well as the overall EIA methodology adopted.

2.2 Whilst the overall approach and methodology is described in this chapter, further detail on how the methodology was tailored to each environmental topic of the EIA is presented in the relevant technical assessment chapters of the ES.

2.3 This chapter is accompanied by the following technical appendices within ES Volume 3:

- Technical Appendix 2.1: EIA Scoping Report;
- Technical Appendix 2.2: Preliminary Risk Assessment;
- Technical Appendix 2.3: Ecological Impact Assessment;
- Technical Appendix 2.4: Flood Risk Assessment;
- Technical Appendix 2.5: Historic Environment Assessment; and
- Technical Appendix 2.6: Summary Planning Policies.

Environmental Impact Assessment

2.4 Legislation on EIA was first implemented in the UK in 1988 following the adoption of the 1985 European Commission (EC) Directive (No. 85/337/EEC)[1] on the assessment of the effects of certain public and private projects on the environment. Legislation was subsequently introduced in 1999, following the adoption of the amended 1997 EC Directive (No. 97/11/EEC)[2]. In England, the 1997 Directive was transposed into law through the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (SI 1999/293)[3]. These regulations were amended by the Town and Country Planning (Environmental Impact Assessment) (Amendment) Regulations 2006 (Statutory Instrument 2006/3295)[4] and the Town and Country Planning (Environmental Impact Assessment) (Amendment) (England) Regulations 2008 (Statutory Instrument 2008/2093)[5]. These were then superseded by the Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (Statutory Instrument 2011/1824)[6], with The Town and Country Planning (EIA) (Amendment) Regulations, 2015[7] coming into force on 6 April 2015.

2.5 More recently, the European Parliament adopted a fully updated version of the EIA Directive (2014/52/EU) in 2014. This Directive was transposed into law through the Town and Country Planning (Environmental Impact Assessment) Regulations, 2017[8] on 16 May 2017, superseding all previous EIA Regulations. This ES has been prepared pursuant to the Town and Country Planning (Environmental Impact Assessment) Regulations 2017, which are referred to throughout this ES as the 'EIA Regulations'.

2.6 The EIA Regulations set out the statutory process and minimum requirements for EIA and the contents of the ES. Specifically, they prohibit the granting of planning permission for developments likely to have significant effects on the environment, defined in the EIA Regulations as 'EIA development', unless information on those effects is considered by the competent authority in reaching its decision on a planning application. That information includes both the ES, which is the Applicant's own assessment, and any other information provided by consultees, the public, and any other persons about the proposal's environmental effects.

2.7 In addition to the EIA Regulations, there is also additional guidance available on EIA and the application of the EIA Regulations, which has been considered in undertaking this EIA, including:

- Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Impact Assessment[9];
- IEMA Special Report into the State Environmental Impact Assessment Practice in the UK[10];
- Department for Communities and Local Government (DCLG) (now Ministry of Housing, Communities and Local Government (MHCLG)) Amended Circular on Environmental Impact Assessment (consultation paper)[11];
- DCLG (now MHCLG) Environmental Impact Assessment: A guide to good practice and procedures (consultation paper)[12];
- MHCLG National Planning Policy Framework[13];
- MHCLG Online Resource – Guidance for Environmental Impact Assessment[14];
- Department for Transport (DfT) Design Manual for Roads and Bridges Volume 11: Environmental Assessment[15];
- Institute of Environmental Assessment (IEA) (now IEMA) Guidelines for Environmental Assessment of Road Traffic[16];
- IEMA Shaping Quality Development[17]; and
- EC EIA of Projects: Guidance on Scoping[18].

[1] The Council of the European Union (CEU), 1985. Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment. CEU.
[2] The Council of the European Union (CEU), 1997. Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment. CEU.
[3] Secretary of State, 1999. Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999. London. HMSO.
[4] Secretary of State, 2006. Town and Country Planning (Environmental Impact Assessment) (Amendment) (Wales) Regulations 2006. London. HMSO.
[5] Secretary of State, 2008. Town and Country Planning (Environmental Impact Assessment) (Amendment) (England) Regulations 2008. London. HMSO.
[6] Secretary of State, 2011. Town and Country Planning (Environmental Impact Assessment) Regulations 2011. London. HMSO.
[7] Secretary of State, 2015. Town and Country Planning (Environmental Impact Assessment) (Amendment) Regulations 2015, London, HMSO.
[8] Secretary of State, 2017. Town and Country Planning (Environmental Impact Assessment) Regulations 2017, London, HMSO.
[9] Institute of Environmental Management and Assessment (IEMA), 2004. Guidelines for Environmental Impact Assessment. IEMA.
[10] Institute of Environmental Management and Assessment (IEMA), 2011. Special Report into the State Environmental Impact Assessment Practice in the UK. IEMA.
[11] Department for Communities and Local Government (now Ministry of Housing, Communities and Local Government (MHCLG)), 2006. Amended Circular on Environmental Impact Assessment: A consultation paper. DCLG.
[12] Department for Communities and Local Government (now Ministry of Housing, Communities and Local Government), 2006. Environmental Impact Assessment: A guide to good practice and procedures – a consultation paper. DCLG.
[13] Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework. London. HMSO.
[14] Ministry of Housing, Communities and Local Government, 2019. Guidance for Environmental Impact Assessment. MHCLG.
[15] Department for Transport, 2008. Design Manual for Roads and Bridges Volume 11: Environmental Assessment. Department for Transport.
[16] Institute for Environmental Assessment (IEA) (now the Institute of Environmental Management and Assessment (IEMA)), 1994. Guidelines for Environmental Assessment of Road Traffic. IEA.
[17] Institute of Environmental Management and Assessment (IEMA), November 2015. Shaping Quality Development. IEMA.
[18] European Commission, 2017. Environmental Impact Assessment of Projects Guidance on Scoping. Luxembourg.

2.8 In accordance with the EIA Regulations, this EIA has been undertaken based on the proposed development, as described in ES Chapter 4: Proposed Development Description and ES Chapter 5: Demolition and Construction Environmental Management, of this Volume.

EIA Process

2.9 EIA is a process that identifies the likely significant environmental effects (both beneficial and adverse[19]) of a proposed development. The process aims to prevent, reduce and mitigate any significant adverse environmental effects, where these are identified, and to enhance any beneficial effects. Proposed developments to which EIA is applied are those that are likely to have significant effects on the environment by virtue of factors such as their nature, size or location.

2.10 The process and outcomes of the EIA are presented in a single document known as an environmental statement (ES). The contents of an ES are prescribed by the EIA Regulations and should be a clear and concise summary of the proposed development and its likely environmental effects - including direct, indirect and cumulative effects - on the natural, built and human environments. The ES is submitted to a relevant competent authority (in the case of planning applications, to local planning authorities) to accompany an application for planning permission. In this way, the aim of EIA is to protect the environment by ensuring that a local planning authority, when deciding whether to grant planning permission for a project which is likely to have significant effects on the environment, does so in the full knowledge of the project's likely significant effects and takes this into account in the decision-making process. Alongside this, an EIA's objective is also to ensure that the public and statutory consultees are given early and effective opportunities to participate in decision making procedures.

Screening

2.11 Screening is the term in the EIA Regulations used to describe the process by which the need for EIA is considered in respect of a proposed development. Some developments are automatically subject to EIA due to their size, nature and effects. These projects, known as Schedule 1 developments, include mainline railways, airports, waste facilities and large power stations. The proposed development is not such a project.

2.12 The need for an EIA for all other projects is determined on the basis of the following set criteria:

- The development is within one of the classes of development stated in Schedule 2 of the EIA Regulations; AND
- EITHER it meets or exceeds the size threshold for that class of development in Schedule 2; OR a part of the project is in a sensitive area; AND
- It is likely to have significant effects on the environment by virtue of factors such as its nature, size, or location.

2.13 These are known as Schedule 2 developments. Given the scale of the proposed development and the location of the application site, it is accepted by the Applicant that the proposed development has the potential to have significant effects on the environment and that it falls within Schedule 2 paragraph 10(b) within the category of 'Urban Development Project'. The proposed development will exceed the applicable size threshold for Urban Development Projects because more than 150 dwellings are proposed and/or the non-dwelling house floor space area will exceed 10,000 m^2 gross external area (GEA). Given the size and nature of the proposed development, an EIA has been undertaken and the results are reported in this ES. Accordingly, a request for formal screening to RBC was not considered necessary.

Scoping

2.14 Scoping is the term used in the EIA Regulations whereby an applicant can request a formal opinion from the local planning authority on the content of an ES and the extent of the information to be considered in the assessments. The purpose of scoping is to focus the EIA on the environmental issues and potential impacts which need the most thorough attention; to identify those which are unlikely to need detailed study; and to provide a means to discuss methods of impact assessment so as to reach agreement on the most appropriate.

2.15 The EIA Scoping Report was formally submitted to the RBC on 05 December 2019 and accompanied a request for a formal EIA Scoping Opinion pursuant to Regulation 15(1) of the EIA Regulations. The EIA Scoping Report is provided in Technical Appendix 2.1 of ES Volume 3, and sets out a description of the emerging proposed development; the potential key environmental impacts and likely effects to be considered as part of the EIA; as well as the proposed approach that would be adopted for the EIA including the proposed scopes and assessment methodologies to predict the scale of effects and to assess the significance in each case.

2.16 A formal EIA Scoping Opinion has not been received at the time of submitting this application. Therefore, the EIA has been undertaken in accordance with the proposed scope and methodologies as set out in the EIA Scoping Report.

2.17 As part of the EIA scoping process, technical consultations were undertaken with:

- officers at the RBC in respect of socio-economics, air quality, noise, ground contamination and townscape and visual; and
- EA and Thames Water in respect of the FRA.

Scope of EIA

Non-Significant Issues

2.18 The aim of the EIA scoping process is to ensure that the EIA is proportionate and focussed only on the likely significant environmental effects of the proposed development.

2.19 Accordingly, the EIA scoping process identified that the proposed development is unlikely to give rise to significant environmental effects in respect of the following environmental topics and therefore would not need to be assessed as part of the EIA process:

- Archaeology;
- Transport and Accessibility;
- Ground Conditions and Contamination;
- Water Resources and Flood Risk
- Ecology;
- Telecommunication Interference;
- Climate Change;
- Major Accidents and Disasters;
- Population and Human Health; and
- Waste.

[19] The use of 'neutral' can also be applied to certain assessments when determining significance of effects (e.g. due to their guidance, a townscape and visual impact assessment can result in a 'moderate neutral' effect, which would be classed as 'significant'). In this instance neutral does not only cover no meaningful change but also situations in which the 'net equation' of positive and negative impacts considered together results in an overall effect which is neither positive or negative on balance.

2.20 Justification for scoping these topics areas out of the EIA is provided in Technical Appendix 2.1 and is therefore not repeated here.

2.21 Whilst significant environmental effects are not likely to arise in respect of archaeology, transport and accessibility, ground conditions,, water resources and flood risk; ecology; telecommunication interference; climate change; major accidents and disasters; population and human health; and waste and are therefore not required for inclusion within the EIA, the following environmental technical reports were prepared to inform the design process and are included within ES Volume 3: Technical Appendices for information:

- Ground Conditions Preliminary Risk Assessment (PRA) (Technical Appendix 2.2);
- Ecological Impact Assessment (EcIA) (Technical Appendix 2.3);
- Flood Risk Assessment (FRA) (Technical Appendix 2.4); and
- Historic Environment Assessment (HEA) (Technical Appendix 2.5).

2.22 These reports confirm that significant effects are not likely to arise in respect of ground contamination, ecology, flood risk and archaeology. Standard good practice, mitigation and enhancement measures identified during the course of preparing these reports were integrated into the development proposals as described in ES Chapter 4: Proposed Development Description and ES Chapter 5: Demolition and Construction Environmental Management.

Potentially Significant Issues

2.23 The potentially significant environmental issues that were identified during the EIA scoping process and that have been addressed within the EIA are as follows:

- Socio-Economics (ES Volume 1, Chapter 6);
- Air Quality (ES Volume 1, Chapter 7);
- Noise and Vibration (ES Volume 1, Chapter 8);
- Wind Microclimate (ES Volume 1, Chapter 9);
- Daylight, Sunlight, Overshadowing and Solar Glare (ES Volume 1, Chapter 10);
- Cumulative Effects (ES Volume 1, Chapter 11);
- Townscape and Visual (ES Volume 2, Chapter 1); and
- Built Heritage (ES Volume 2, Chapter 2).

EIA Approach

Consideration of Alternatives

2.24 The EIA Regulations require that the Applicant provides an outline of any alternatives studied and to provide an indication of the reasons for selecting the preferred alternative taking into account environmental effects. The EIA Regulations do not define the term 'alternative' and good practice has tended to consider alternative design proposals and to explain the process through which the proposed development has evolved.

2.25 ES Volume 1 Chapter 3: Alternatives and Design Evolution explores the objectives of the proposed development and describes how the development proposals have evolved in response to environmental and planning opportunities and constraints, as well as consultation comments.

2.26 The following alternatives have been considered:

- The 'Do-Nothing' alternative where the existing site conditions remain unchanged with no redevelopment; and
- Alternatives considered in site selection and the course of the design process (such as land uses, layouts and designs) taking into account environmental and other relevant planning and design constraints as part of the design evolution.

Baseline

2.27 The purpose of the EIA is to predict how environmental conditions may change as a result of a proposed development and to specify any investigative measures. This requires that the current environmental conditions and those in the future, are established. This is referred to as the 'baseline' and is usually established through a combination of desk-based research, site survey and empirical studies and projections. Together, these describe the existing and future character of a site and the value and vulnerability of key environmental resources and receptors, against which any changes or effects resulting from a proposed development can be identified, understood and assessed. For the EIA of the proposed development, the baseline represents the existing environmental conditions of the application site and the surrounding study area at the time of the assessments as described in ES Chapter 1: Introduction. The technical assessments in ES Volume 1 (6 - 10) and ES Volume 2 (1 -2) provide a description of topic specific baseline conditions against which the proposed development has been assessed.

2.28 For the air quality and noise and vibration assessments, consideration has been given to a projected environmental condition in the future at 2025, which is the projected year of completion of the proposed development.

2.29 The baseline conditions have been characterised by means of desk studies, application site visits, surveys and modelling.

Receptors

2.30 Receptors that may be sensitive to potential environmental impacts as a result of the proposed development, can be summarised as follows, with further detail provided in respective technical assessments:

- Existing community facilities in proximity to the application site, in particular; dentists and GPs and hospitals; schools including the nearby E P Collier Primary School; Thameside Primary, The Heights Primary and Civitas Academy;
- Existing open space, outdoor sport facilities and parks;
- Existing residential occupants in proximity to the application site, in particular those along Vastern Road and Caversham Road;
- Existing commercial occupants on-site and in proximity to the application site;
- Future residential and commercial occupants of the proposed development;
- Potential buried heritage assets on-site;
- Existing above ground heritage assets such as listed buildings and conservation areas, most notably those located within 250 m of the application site (Main Building of Reading General Station (Grade II*). In addition, the locally listed building, No. 55 Vastern Road;
- Existing Surrounding Townscape Character;
- Local views;
- Local Air Quality;
- Existing transport infrastructure, in particular the local highway network and public transport facilities;
- Pedestrians and users of existing and proposed amenity areas;
- Existing water resources, in particular ground water and public potable water supplies; and
- Existing ecological receptors.

Impact Assessment

Basis of EIA

2.31 The application is made in outline. In accordance with the EIA Regulations and case law, the EIA has been undertaken based on the:

- Application site as shown and described in Chapter 1: Introduction, as well as the individual technical assessments of this Volume and ES Volume 2; and
- Proposed development as shown and described in ES Chapter 4: Proposed Development Description and Chapter 5: Demolition and Construction Environmental Management of this Volume.

2.32 In accordance with the EIA Regulations and case law[20], an outline planning application can be subjected to EIA so long as there is sufficient information provided in the ES to enable the local planning authority, in this case the RBC, to form a view on all the likely environmental effects of the project as a whole and there is sufficient prescription in how the future details are to be submitted for approval. In this case the Applicant is volunteering parameters on the basis that the reserved matters must fit within the scope of these parameters.

2.33 The assessments have been undertaken on this assumption i.e. that the reserved matters brought forward for the proposed development will fall within the parameters that have been tested. Adopting this approach allows the EIA to be carried out in a manner which is legally robust. In order to ensure that the proposed development remains strictly within the scope of the assessment, RBC will be invited to impose planning conditions on any resultant planning permission requiring that the details to be submitted for approval at a later date must be in accordance with the assumptions and commitments assessed at this outline stage of the application.

2.34 The outline planning application seeks to reserve all matters associated with land use; scale and massing; internal layout; appearance; and landscaping. Therefore, these matters have been defined by means of the following:

- Development Parameters (Schedule and Plans);
- Design Code; and
- Associated maximum area schedules (and minimum in the case of Use Classes A1-A5, D1-D2, Retail units/ Community Facilities/ Gym) and an indicative residential unit and tenure.

2.35 The Development Parameters identified and assessed through the EIA comprise the following:

- Maximum development footprint;
- Site access and egress points;
- Maximum building plots;
- Maximum plot heights (residential, non-residential, and mixed use);
- Maximum quantum and type of land use;
- Minimum areas of open space; and
- Extent of basement footprint and depth.

2.36 The parameter plans are presented in Chapter 4: Proposed Development Description, and in summary comprise:

- Development Footprint;
- Site Access and Egress.
- Building Plots;
- Maximum Building Heights (residential, non-residential, and mixed use); and
- Basement Footprint.

2.37 The following supporting documents have been considered during the EIA for the proposed development:

- Ground Conditions Preliminary Risk Assessment (PRA) (Technical Appendix 2.2);
- Ecological Impact Assessment (EcIA) (Technical Appendix 2.3);
- Flood Risk Assessment (FRA) (Technical Appendix 2.4); and
- Historic Environment Assessment (HEA) (Technical Appendix 2.5).

2.38 Where information is not available due to the outline nature of the proposed development, the EIA has made reasonable assumptions which are clearly set out and which are based on professional experience of developments of a similar type and scale.

Sources of Proposed Development Information

2.39 In addition to the above, information on the proposed development has been drawn from the following planning submission documents, as appropriate:

- Planning Statement (and appendices);
- Design and Access Statement (including Landscape Strategy);
- Statement of Community Involvement;
- Operational Waste Management Plan and Site Waste Management Plan;
- Energy Statement; and
- Utilities Statement.

Assessment Methodology

General

2.40 The aim of the EIA is not to assess the proposed development's compliance/performance against planning policy as this is considered within the Planning Statement that accompanies the application. Instead reference has been made to national, regional and local policy to inform the scope of technical assessments, the assessment methodologies applied and the existence of any sensitive receptors to be considered. The key policies are summarised in Appendix 2.6 as relevant to individual technical topics assessed within the EIA.

2.41 Detailed methodologies for the assessment of each of the environmental topic areas scoped into the EIA are provided within each technical chapter of this ES Volume, as well as ES Volume 2 (1 -2); however, in general terms, the assessments have been based upon:

- Review of the existing conditions at and surrounding the application site for the environmental topic area under consideration via various sources of existing information, data and reports;
- Desk-top studies;
- Site surveys;
- Consideration of relevant legislation;
- Consideration of relevant planning policies (national, regional and local);

[20] Rochdale Envelope arising from two cases: R. v Rochdale MBC ex parte Milne (No.1) and R.v Rochdale MBC ex parte Tew [1999] and R. v Rochdale MBC ex parte Milne (N0.2) [2000]. These cased dealt with outline planning applications for a proposed business park in Rochdale.

- Consultations with stakeholders and consultees as appropriate;
- Consideration of potentially sensitive receptors that could be affected by the proposed development;
- Use of technical guidance and best practice;
- Use of quantitative and qualitative assessment methods, professional judgement and expert opinion;
- Identification of potential environmental impacts and likely effects, with an evaluation of their likely duration, magnitude and significance, taking into consideration embedded mitigation; and
- Recommendation for additional mitigation and/or enhancement measures, followed by an assessment of the significance of the residual effects.

2.42 How the proposed development might affect the environment relies on predictions about what impact a certain action would have. Some predictions can be made using mathematical or simulation models, particularly where there are well known relationships between cause and effect. For example, the degree to which noise levels may increase as a result of additional traffic flows can be predicted using a mathematical equation. The level of air pollution from a known traffic flow can also be predicted from a computer-based simulation model. The visibility of a building can be predicted by accurately superimposing its outline and position over a photograph. Other impacts are less easy to predict in quantitative terms; for example, whilst the extent of a loss of a habitat can be measured, the effect on the abundance of individual species is more difficult to predict. In such cases, the EIA attempts to quantify the anticipated magnitude of impact and scale of effect using empirical experience, literature and professional judgement.

2.43 In all cases, the overall approach and specific methods of predicting the likely nature and magnitude of impact, as well as the scale of effect is set out in each of the technical assessments. Where used, recognised specific predictive methods are referenced. Any assumptions or limitations to knowledge are stated. In either case the thought process leading to the conclusions is based on reasonably reliable data and so is considered to be prudent and robust.

2.44 Where detailed information on the proposed development has not been available, reasonable assumptions have been made, and have been clearly set out, based on experience of developments of similar type and scale to enable assessment of likely significant effects.

2.45 The proposed development has not yet been approved so the conditional tense ('would') has been used to describe the development proposals, situations, potential impacts and likely effects that could/would arise from the introduction of the proposed development, as well as the mitigation measures that would be delivered or would be required upon approval of the proposed development. This approach does not lessen the Applicant's commitment to deliver the proposed development as presented within this ES. Furthermore, each technical assessment (and in particular summary tables at the conclusion of each chapter) clearly sets out the means by which any required mitigation measures relied upon, would be secured.

Proposed Development Stages

2.46 The EIA considers the following stages of the proposed development:

- Demolition and Construction Stage;
- Completed Development Stage; and
- Cumulative Stage.

2.47 Although it is acknowledged that the construction programme of the proposed development would be sequenced over a period of four years, the EIA has assessed and reported on the completed development. This is because no significant delay (i.e. of more than 12 months) is anticipated between the development phases.

Assessment Scenarios

2.48 The assessment of the proposed development has been carried out against the current baseline conditions as described in Chapter 1: Introduction and supplemented by relevant existing and updated surveys.

2.49 However, in accordance with standard practice, Chapter 7: Air Quality and Chapter 8: Noise and Vibration also considers a 'future baseline' which comprises the year in which the proposed development would be fully completed, occupied and operational. Accordingly, these assessments consider the following scenarios:

- Existing Baseline (2019);
- Future Baseline (2025), which is the anticipated opening year of the proposed development (existing baseline + future growth derived from tempro factors);
- Future Baseline + cumulative schemes; and
- Future Baseline + cumulative schemes + proposed development.

2.50 The future baseline is used to account for predicted background growth associated with transport movements on the surrounding network.

2.51 In respect of the proposed development's area schedule, it is noted that the Applicant is seeking flexibility in respect of the type and range of floorspace to be delivered. Accordingly, the minimum and maximum floorspace areas for each use class that could be brought forward by the proposed development are presented in Table 4.3 in ES Chapter 4: Proposed Development Description. In respect of socio-economics, noise and vibration, and air quality, the assessment presented in the respective technical chapters has been based upon a worst case interpretation of the minimum and maximum floorspace schedule. In the case of the socio-economics assessment, assumptions have also been made in relation to a likely unit and tenure mix.

2.52 In respect of the proposed development's built form, height and massing, the development parameters allow three separate maximum heights for each of the development plots according to the potential future land use. These are referred to as 'Non-Residential', 'Residential', and 'Mixed Use' and their maximum plot heights are presented in Parameter Plans PP-103, PP-104, and PP-105 respectively. In respect of the wind, daylight, sunlight, overshadowing and solar glare, townscape and visual, and built heritage, the assessments have been based upon a worst-case interpretation of the maximum building heights parameter plans.

2.53 Further detail in respect of the worst-case assumptions that have informed each of the technical assessment is provided within the relevant ES Chapter.

Mitigation

2.54 Mitigation is the term used to refer to the process of avoiding where possible and, if not, minimising, controlling and/or off-setting potentially significant adverse impacts and effects of a development. Mitigation measures relate to the design stage; the demolition and construction stage; or the activities associated with the completed and operational development.

2.55 As part of the EIA, an iterative approach has been adopted where significant environmental effects have been avoided where possible in the first instance through the design refinements and iterations, as reported upon within Chapter 3: Alternatives and Design Evolution of this ES. Where adverse environmental effects were identified through early assessment work, opportunities to reduce or control impacts and effects, or in some cases, to compensate for impacts and effects, were identified and incorporated into the proposed development. In addition, opportunities to enhance the beneficial environmental effects of the proposed development have also been sought and incorporated into the proposed development. These are referred to as 'embedded' mitigation.

2.56 Within each technical chapter of this ES, the assessment of the effects that are likely to arise as a consequence of a potential impact/change to environmental receptors from the proposed development is initially presented. If any additional mitigation measures are required, further to that already embedded into the proposed development throughout its evolution, these are proposed and the proposed development is reassessed to ascertain the likely residual effects and the likely significant environmental effects. This is reported on within each technical assessment of the ES.

2.57 In all cases, mitigation measures are presented as embedded, specific commitments or statements of fact. It is anticipated that the implementation of mitigation identified throughout the ES, would be secured by means of approval of the planning drawings, appropriately worded planning conditions, planning obligations secured pursuant to section 106 of the Town and Country Planning Act 1990, the collection of any applicable community infrastructure levy (CIL) or through other statutory and building control regimes.

Impacts and Effects

2.58 Unless otherwise required by published assessment guidance (such as air quality), the EIA has made distinction between:

- impacts: the change or action; and
- effects: the result/consequence/outcome of the change.

2.59 As a general rule, the EIA assesses the effects that are likely to arise as a consequence of a potential impact/change to environmental receptors following the application/consideration of embedded mitigation measures.

2.60 A range of likely effects have been considered, including direct or indirect (or secondary) and cumulative:

- Direct effects are those which arise as a direct consequence of a project action (e.g. the loss of habitat or the run-off of surface water to a watercourse);
- Indirect effects include, for example, the decline in the abundance of a species as a result of the loss of habitat or the damage to aquatic vegetation as a result of water pollution. Other common examples include the effect on air quality and ambient noise as a result of increased traffic movements; and
- Inter- and Intra-project cumulative effects are those that could arise concurrently (refer to Cumulative Effects section later in this chapter).

2.61 Furthermore, consideration has been given to the temporal and spatial nature of effects including permanent or temporary; reversible and irreversible; short-, medium- or long-term; local, borough, and national levels. In the context of the proposed development, temporary (short- and medium-term) effects would be typically those associated with the demolition and construction works, and permanent (long-term) effects would typically be those associated with the completed and operational development.

2.62 Typically, local effects would be those affecting receptors neighbouring the application site, whilst effects upon receptors within the wider study area are assessed at a borough level. Effects upon different parts of the country, or England as a whole, are considered to be at a national level and effects across national boundaries would be considered at an international level (albeit there are no such effects at national or international level).

Significance

2.63 The assessment of residual environmental effects is important in that it informs the determination by the local planning authority of the overall acceptability of a proposed development. Determining significance relies on accepted thresholds and criteria where available or, for situations in which such are not available, expert interpretations and value judgments.

2.64 Significance is usually a function of the vulnerability or importance (sensitivity) of the resource affected (receptor) and the magnitude of the potential impact. Importance might be a function of international designation or local relevance. Thus, significance is a concept that can be applied objectively to individual effects. Throughout this ES the same terminology is used to describe these individual effects, unless specific alternative terminology exists in recognised issue specific guidance (e.g. in ES Chapter 7: Air Quality).

2.65 Within this ES, significance has been evaluated with reference to definitive standards, accepted/published criteria and legislation, where available. Where it has not been possible to quantify potential impacts and residual effects, qualitative assessments have been carried out, based on expert knowledge and professional judgement. Where uncertainty exists, it has been noted in the relevant assessment and a prudent or conservative approach adopted so that the significance will not be under-estimated.

2.66 Specific conventions have been developed to define significance, wherever possible, defined and structured as transparently as possible using the following criteria:

- The sensitivity of the receptor to the potential impact, based on a scale of high, medium and low;
- The magnitude of the potential impact, based on a scale of high, medium, small and unknown;
- The likelihood of the effect occurring, based on a scale of certain, likely or unlikely;
- The duration of the effect, based on a scale of short- (temporary), medium- and long-term;
- The geographical extent of the effects at local, borough, national and international levels; and
- The reversibility of the effect, being either reversible or irreversible.

2.67 Unless indicated otherwise within a technical assessment the duration of the effect is defined as follows:

- Short-term: up to 5 years;
- Medium-term: 5-10 years; and
- Long-term: 10 years +.

2.68 In order to provide a consistent approach to the presentation of the significance of residual effects, the following terminology has been used throughout the ES to describe the type/nature of residual effect:

- **Adverse** – detrimental or negative effect to an environmental resource or receptor;
- **Neutral**: an effect that on balance, is neither beneficial nor adverse to an environmental resource or receptor; and
- **Beneficial** – advantageous or positive effect to an environmental resource or receptor.

2.69 The scale of the predicted residual effect has then been classified according to the following semantic scale:

- **Negligible** – imperceptible effect;
- **Minor** – slight, very short or highly localised effect;
- **Moderate** – limited effect (by magnitude, duration, reversibility, value and sensitivity of receptor) which may be considered significant; and
- **Major** – considerable effect (by magnitude, duration, reversibility, value and sensitivity of receptor) which may be more than of a local significance or lead to a breach of a recognised environmental threshold, policy, legislation or standard.

2.70 There are some exceptions to this scale due to established terminology for certain topic specific assessments. For example, the Air Quality assessment uses 'slight' instead of 'minor'. This is set out in the relevant chapter.

2.71 The specific benchmarks have been established by the project team using available national and local policy together with other relevant guidance, recognised good practice and expert judgement. The development of these benchmarks is explained in more detail in each assessment or technical appendix.

2.72 Throughout the ES, residual effects have been predicted as either 'significant' or 'not significant'. Significant effects are considered material to the planning decision process. Residual effects of 'moderate' and 'major' significance are typically considered significant, but would be dependent on the relevant technical assessment, as well as the existence of published assessment guidance. Where published assessment guidance is not definitive in respect of categorising/determining significant environmental effects, professional judgement would be applied, taking into account the duration, extent and context of the effect, to determine significant effects.

Cumulative Assessment

2.73 The EIA Regulations require that, in assessing the effects of a particular development proposal, consideration is also given to the cumulative impacts and effects which might arise from the proposal in conjunction with other development proposals in the vicinity.

2.74 Two types of Cumulative Effect have been considered within Chapter 11 of the ES, namely:

- Intra Effects: Combined effects of different types of impact or 'impact interactions', for example the multiplying effects arising from noise, dust and visual impacts during the construction of the Proposed Development on a particular sensitive receptor; and
- Inter Effects: Combined effects generated from the proposal together with other planned developments and also referred to as 'in-combination effects'. These other developments may generate their own individually insignificant effects but when considered together could amount to significant cumulative effects, for example, combined townscape and visual impacts from two or more (proposed) developments.

2.75 There is however an exception to this approach. The Townscape, Visual and Built Heritage Assessment in ES Volume 2 follows the good practice guidance produced by the Landscape Institute and Institute of Environmental Management and Assessment, 'Guidelines for Landscape and Visual Impact Assessment' ('GLVIA')[21] which sets out that an acceptable approach to assessing 'inter-effects' between any given proposed development and cumulative schemes can be as follows:

- to focus *"primarily on the **additional effects** of the main project under consideration…on top of the cumulative baseline"*.

Intra-Project Cumulative Effects

2.76 As mentioned above, there is no established EIA methodology for assessing and quantifying the intra-project cumulative effects of individual effects on sensitive receptors, therefore Ramboll has developed an approach which uses the defined residual effects of the proposed development to determine the potential for effect interactions and so the potential for intra effects of individual effects.

2.77 Intra-project cumulative effects from the proposed development itself on surrounding sensitive receptors during the demolition and construction works and also once the proposed development is completed, have been considered.

2.78 Dependent on the relevant sensitive receptors, the assessment focusses either on key individual receptors or on groups considered to be most sensitive to potential interacting effects. The criteria for identifying those receptors which are considered to be potentially sensitive include existing land uses, proximity to the demolition and construction works and the application site, and likely duration of exposure to impacts.

2.79 It should be noted that only residual effects that are 'minor', 'moderate' or 'major' in scale have been considered within this assessment, as 'negligible' effects are, by definition, imperceptible in their nature. Dependent on the relevant sensitive receptors, the assessment will focus either on key individual receptors or on groups considered to be most sensitive to potential interacting effects. The criteria for identifying those receptors which are considered to be potentially sensitive will include existing land uses, proximity to the demolition and construction works and the application site, and likely duration of exposure to impacts. The results are presented within a discrete assessment chapter (ES Chapter 11: Cumulative Effects).

2.80 With regard to the potential for cumulative effects to occur, it is anticipated that standard mitigation measures (such as dust suppression measures, use of quiet plant, restrictions on working hours) as referred to in Chapter 5: Demolition and Construction Environmental Management, can be applied to prevent temporary unacceptable effects from the interaction of effects occurring on-site. It is also anticipated that the requirement for a detailed site-specific Construction Environmental Management Plan (CEMP) would form part of the planning conditions, to be imposed by RBC.

Inter-Project Effects

2.81 The EIA Regulations require an assessment of potentially significant cumulative effects of a proposed development along with other 'existing and/or approved projects'. There are no legislative or policy requirements which set out how an inter-project cumulative impact assessment should be undertaken.

2.82 Accordingly, inter-project effects arising from the proposed development in combination with 'cumulative schemes' during the demolition and construction works and also once the proposed development is complete and operational, have been considered in the EIA.

2.83 Each technical ES chapter presents the assessment of combined effects of the proposed development with certain other cumulative schemes. In accordance with Schedule 4 of the EIA Regulations, schemes which are existing and/or approved have been considered, i.e. schemes built or under construction or with approved planning permission. However, to ensure a robust assessment, other reasonably foreseeable schemes that have been submitted but not yet approved have also been taken into consideration in the assessment of effects.

2.84 Spatial considerations and scale of development criteria has been developed based on professional judgement to determine whether cumulative schemes have the potential for cumulative effects when combined with the proposed development's effects. The criteria applied have been developed to account for those schemes which are likely to generate significant effects, which are:

- Have a total floor space area of 10,000 m^2 gross external area (GEA) and/or comprise >150 residential units; **and**
- Either:
  - Within 1 km of the redline boundary/application site; or
  - Spatially linked to the application site by means of the local road network; or
  - Visible in protected/important views to and from the application site.

2.85 The 1 km study area is considered appropriate as this is generally beyond the distance to which effects are experienced at the proposed development. The viewpoints have been considered based on the extent of visibility and agreed with RBC in advance of the scoping opinion as explained in Volume 2.

2.86 The cumulative assessment has adopted a quantitative assessment where it is relevant, appropriate and reasonable to do so. Where this was not possible a qualitative assessment has been undertaken.

2.87 The list of cumulative schemes that have been considered in the EIA was included in the EIA Scoping Report, and repeated below in Table 2.2. Each technical assessor has reviewed the list and has included within their individual technical assessment those cumulative schemes which have the potential for

[21] Landscape Institute and Institute of Environmental Management and Assessment, 2013. Guidelines for Landscape and Visual Impact Assessment: Third Edition. New York: Routledge.

cumulative effects. Where a cumulative scheme has been excluded this has been clearly stated within each technical chapter with reasons why.

2.88 The location of each cumulative scheme is shown in Figure 2.1 and the nature of each cumulative scheme is described in Table 2.2 based on publicly available information.

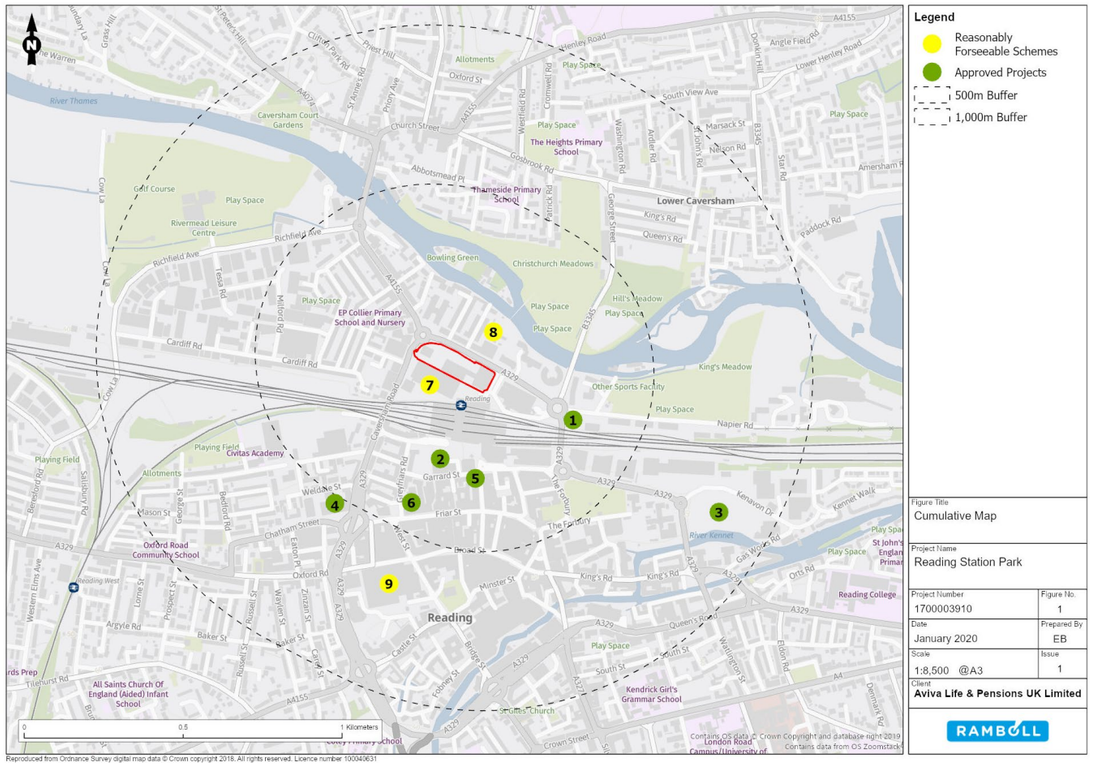


Figure 2.1: Location of Cumulative Schemes

Table 2.2: Description of Cumulative Schemes

No	Address	App. Ref.	Description of Cumulative Scheme	Assessment Approach
Approved Projects (including Resolution to Approve)				
1	Former BMW Site – Thames Quarter	190809	Erection of a part 13-storey, part 23 storey building comprising 335 apartments in a mix of studio, one-bedroom, two-bedroom and three- bedroom units, residents' lounges, tech-hub, dining room, and cinema room, various rooftop outdoor amenity spaces, concierge/reception with coffee meeting area, gym, residents' storage facilities, post room, ancillary back-of-house facilities, 335 secure cycle parking spaces, car parking spaces, landscaping, and associated works.	Quantitative
2	Station Hill	151426 and 151427	Outline application with all matters reserved for mixed use redevelopment of Plot E of the Station Hill site and neighbouring Telecom House site (48 to 51 Friar Street	Quantitative

Table 2.2: Description of Cumulative Schemes

No	Address	App. Ref.	Description of Cumulative Scheme	Assessment Approach
		(as varied by 190441 and 190442 which relate to non-compliance with conditions)	and 4 to 20 Garrard Street) to comprise the demolition of existing buildings and erection of new buildings/ structures to provide residential units, a range of town centre uses including retail and related uses (Use Class A1 - A5), associated infrastructure, public realm works and ancillary development.	
		190465	Application for the approval of reserved matters (access, scale, appearance, layout and landscaping) for Plot E within the development site known as Station Hill submitted pursuant to Outline Planning Permission ref. 190442 and submission of details for approval pursuant to conditions attached to that permission. The proposals comprise the construction of a 12 storey building (plus basement storey) containing 370 'Build to Rent' residential units (Use Class C3), 1,151 m^2 (GEA) of flexible retail floorspace (Use Classes A1, A2, A3, A4, A5), cycle storage, car parking, servicing, plant areas, landscaping, new public realm and other associated works (amended description).	
		190466	Application for approval of reserved matters (access, scale, appearance, layout and landscaping) for Plot F within the development site known as Station Hill submitted pursuant to Outline Planning Permission ref. 190441, and submission of details for approval pursuant to Conditions attached to that permission. The proposals comprise construction of a 12 storey (plus basement storey) building containing 168 Build to Rent residential units (Use Class C3), 390 m^2 (GEA) of flexible retail floorspace (Use Classes A1, A2, A3, A4, A5, D2), 656 m^2 (GEA) of leisure floorspace (Use Class D1 or D2), cycle storage, car parking, servicing, plant areas, landscaping, new public realm and other associated works (amended description).	
3	Kenavon Drive	170509	Demolition of the two existing retail (Homebase and former Toys R Us) structures and the erection of new buildings ranging between 2 and 11 storeys in height, providing 765 (18 x studio, 302x1, 409x2 and 36x3- bed) residential units (Class C3), 5 commercial units (1x flexible Class A1-A4, B1 or D1-D2, 1x flexible D1 or D2, 1x flexible Class A1- A5, 1x flexible Class A3 or A4, 1x flexible A1-A5 or D1-D2 uses), various works to the public realm, including a new riverside square, landscaping, accesses, parking and associated works.	Quantitative
4	Land between Weldale Street	170326	Demolition of all existing buildings (including three retail units) and structures, and erection of new buildings ranging between lower ground and 4 storeys to lower ground and 11 storeys in height, providing 427 (233x1,	Quantitative

Table 2.2: Description of Cumulative Schemes

No	Address	App. Ref.	Description of Cumulative Scheme	Assessment Approach
	and Chatham Street, Reading		182x2 and 12x3-bed) residential units (Class C3) and one flexible ground floor retail shop (Class A1) or restaurant and cafe (Class A3) unit, together with new public realm, landscaping, accesses, parking and associated works (amended description).	
5	29 Station Road Reading, RG1 1LG	181930	Demolition of the existing vacant 6-storey retail and office building and erection of a replacement basement and part 4, part 22 (with rooftop plant above) storey building to provide flexible retail (Class A1, A2, A3, A4 or A5) use at part ground floor level, a 135- bedroom hotel (Class C1) at 1st to 16th floors and offices (Class B1a) at 17th to 21st floors, associated servicing from Garrard Street and other associated works(amended description).	Qualitative
6	52 to 55 Friar Street and 12 Greyfriars Road, Reading RG1 1DX	162210	Demolition of existing building and structures (Class A1) and erectionof three new buildings ranging between 6 - 12 (and basement) storeys in height to provide 135 (1xstudio, 54x1, 73x2 and 7x3-bed) residential units (Class C3), a flexible Class A1-A5 use at ground floor level fronting onto Friar St, a flexible Class A1-5, B1(a) or D2 (gym only) use at ground floor level fronting onto Greyfriars Road, with associatedaccess, parking, servicing, landscaping and engineering works.	Quantitative
Reasonably Foreseeable Schemes				
7	Network Rail Thames Valley Area site office/ Former Royal Mail site	182252 Validated (allocation CR11e)	Outline application considering access, landscaping, layout and scale involving the demolition of all existing buildings and structures (Classes B1a and B2) and erection of new buildings ranging between basement and 2 - 25 storeys in height, providing 658 (79 x studio, 227x1, 335x2 & 17x3-bed) residential units, office accommodation (Class B1a), flexible ground floor Class A1-3 uses, a community centre(Class D1), health centre uses (Class D1) and various works including car parking, servicing, public and private open space, landscaping, highways, pedestrian and vehicular access and associated works.	Quantitative
8	Former Scottish and Southern Energy site	Awaiting application (allocation CR11e)	Demolition of a number of structures on the site and the erection of a new residential scheme (up to 210 units), with a max height of 11 storeys (up to 36 m above ground level) including a new north south pedestrian link, connecting Christchurch Bridge to Vastern Road towards the station as well as drainage infrastructure and landscaping.	Qualitative
9	Broad Street Mall Broad Street Reading, RG1 7QG	182137 (allocation CR12c)	Construction of three residential buildings (Use Class C3) ranging in height from 5 to 22 storeys (Site E to provide 52 units, Site B to provide 139 Units and Site A to provide 172 units) above Broad Street Mall and provision of a podium level amenity area; construction of an 18 storey building on South Court comprising ground and first floor retail (Use Class A1/A2/A3) and residential over upper floors (Use Class C3, Site C to provide 99 units); change of use and extension of Quadrant House to form a 3 storey residential building (Use Class C3, Site D to provide 31 units); and creation of three ground floor retail units (Use Class A1/A2/A3) fronting Dusseldorf Way and Queens Walk.	Qualitative

Assumptions and Limitations

2.89 The principal assumptions that have been made, and any limitations that have been identified, in undertaking the EIA are set out below: (assumptions specifically relevant to each topic have been set out in their respected technical assessment of the ES)

- Baseline conditions have been established from a variety of sources, including historical data, but due to the dynamic nature of certain aspects of the environment, conditions at the application site and surrounding land uses may change;
- The assessments contained within each of the technical assessments of ES Volume 1 and within ES Volume 2 are based on the current or emerging legislative and policy framework;
- It is assumed that information received from third parties is accurate, complete and up to date;
- The assessments contained within each of the technical assessments of ES Volume 1 and within ES Volume 2 are based upon the planning application drawings submitted as part of the application;
- The assessments contained within each of the ES Volume 1 technical assessments and in ES Volume 2 are based on the assumption that embedded mitigation measures set out in application drawings, through regulatory regimes or via the management controls as set out in ES Chapter 4: Proposed Development Description and ES Chapter 5: Demolition and Construction Environmental Management are implemented;
- The assessments contained within the ES Chapter 7: Air Quality and ES Chapter 8: Noise and Vibration are based on industry-average specifications for construction, mechanical and services plant as project-specific details will be finalised during the demolition and construction planning and procurement stages;
- Demolition and construction works across the application site would take place substantially in accordance with the phasing and programme of works described in Chapter 5: Demolition and Construction Environmental Management;
- Where detailed information has not been available, reasonable assumptions have been made, and have been clearly set out, based on experience of developments of similar type and scale to enable assessment of likely significant effects; and
- Cumulative schemes will be implemented substantially in accordance with information that is publicly available or that has been provided to the Applicant, and subject to the same regulatory regimes and good practice management controls.

Technical Assessment Chapters

2.90 A consistent approach to the presentation of EIA findings in the ES has been adopted for each of the technical areas, including:

- an explanation of the information gathering and assessment methodology;
- a description of the baseline conditions;
- the identification of the potential impacts arising during the demolition and construction stage and the completed development stage of the proposed development;
- a description of additional opportunities for mitigation to reduce the significance of any adverse environmental effects, including the requirements for post-development monitoring; and
- an assessment of the environmental effects these impacts are expected to cause and an evaluation of their significance against defined criteria.

2.91 Each environmental topic considered in the EIA has been assigned a separate chapter in ES Volume 1 (Chapter 6-10 inclusive) with the exception of the Townscape and Visual Impact Assessment and Built Heritage Assessment chapters which are assigned separate chapters in ES Volume 2. Within each technical chapter the assessment is presented and reported in the following format:

- Introduction – a brief introduction to the assessment;
- Consultation Feedback – a summary of the EIA Scoping Opinion and concurrent technical consultations undertaken and where these have been addressed in the assessment;
- Assessment Scope – an explanation of the spatial, temporal and technical scope that the assessment has been based on.
- Baseline Characterisation Method – an explanation of how the information relating to the baseline conditions has been procured.
- Assessment Method and Assessment Criteria- an explanation of the information gathering and assessment methodology, as well as an explanation of the approach to defining the significance of likely environmental effects;
- Baseline Conditions – a description of the baseline conditions;
- Assessment of Effects – an assessment of the likely effects of the proposed development and an evaluation of their significance against defined criteria taking into account embedded mitigation;
- Assessment of Residual Effects and Additional Mitigation – a description of the additional mitigation and enhancement measures, if required, and then an assessment of the likely residual effects of the proposed development;
- Summary of Residual Effects – a tabulated summary of the conclusions of the assessment;
- Cumulative Effects – an assessment of inter-project cumulative effects; and
- Summary – a summary of the assessment.

3 ALTERNATIVES AND DESIGN EVOLUTION

Introduction

3.1 The EIA Regulations require the ES to report on the reasonable alternatives (for example in terms of design, technology, location, size and scale) studied by the Applicant, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

3.2 This chapter of the ES therefore explores the objectives of the proposed development, its design evolution and the reasonable alternatives considered. It outlines the analysis of the application site and existing environmental conditions which informed the design evolution of the proposed development. The 'Do Nothing' scenario is also addressed.

3.3 Throughout the design process there has been regular consultation with RBC and other key stakeholders. In addition, the Applicant has undertaken a community engagement programme which has also informed the design process.

3.4 Further details can be found in the Design and Access Statement and the Statement of Community Involvement (SCI) which accompany the planning application.

Development Objectives

3.5 The Applicant's development aspiration for the application site seeks to ensure the comprehensive and high-quality redevelopment of the application site which will optimise the use of the site and integrate positively with the surrounding area.

3.6 Accordingly, the overall guiding objectives for the proposed development have been as follows:

- Create a new urban neighbourhood that is economically thriving and resilient;
- Produce a flexible development envelope for future reserved matters applications to comply with;
- Provide a new activated frontage within key routes within the application site;
- Improve connectivity and permeability throughout the application site; and
- Work closely with communities and stakeholders.

Development Considerations

Policy Requirements

3.7 Development considerations for the application site are set out in the adopted planning policy and guidance documents summarised in Chapter 1 of this ES Volume. These were considered and informed the design of the proposed development.

Site Constraints

3.8 Analysis of the existing application site conditions identified the key environmental factors (see ES Chapter 1) and the following physical constraints which were taken into account in the design evolution process:

- The application site is enclosed to the north and west by Vastern Road and Caversham Road respectively. These roads are busy and congested, they present a source of noise and high level of vehicle emissions to existing and future site users.
- The majority of the application site (approximately 95 %) is located in Flood Zone 2 (Medium Probability). Small areas (<5 %) in the west and centre of the site are located in Flood Zone 1 (Low Probability), and a small portion (< 5 %) of the north-eastern site boundary is located in Flood Zone 3 (High Probability) where the annual probability of flooding from rivers is 1 in 100 (1 %) or greater, and from the sea is 1 in 200 (0.5 %) or greater. This informed site levels and location of habitable rooms.
- The existing buildings offer a limited amount of active frontage onto the Vastern and Caversham Roads as they are set back from these boundaries and discourage pedestrian use as there are no through routes provided.
- The application site has on-site trees predominantly around the application site perimeter. Whilst none of the trees are subject to a Tree Protection Order (TPO), consideration was given to maximising the number of trees to be retained and minimising impacts to retained trees during the demolition and construction works, with continued measures for protection once the proposed development has been completed.
- In addition to the arboricultural survey, ecological surveys were undertaken to determine any constraints in respect of ecology, in particular, protected species (roosting bats) and nesting birds.
- There are low rise terrace houses to the north of the application site, on the other side of Vastern Road, which have informed the height and massing proposals.

Environmental Considerations

3.9 Analysis of the existing application site conditions identified the key environmental factors (as summarised in ES Chapter 1: Introduction). The following factors have influenced the design evolution process.

Socio-Economics

3.10 The application site currently comprises retail warehouse units housing Aldi, Mothercare, The Range, Majestic Wines and a TGI Fridays. These uses offer job opportunities and contribute to spending in the local economy. The proposed development would create a range of employment opportunities both through the demolition and construction stage and the completed development stage.

Air Quality

3.11 The application site is located within an AQMA declared under the Environment Act 1995, which incorporates the whole of the RBC. The AQMA has been designated due to NO_2 and PM_{10} concentrations in excess of the current National Air Quality Standard objectives.

3.12 The proposed development could introduce a new residential population, and therefore early specialist design advice was provided to ensure that the application site is suitable for residential occupation and that residents would not be adversely affected by both existing and future air quality.

Noise

3.13 The application site is located in an area where railway and road traffic noise are noticeable. Baseline noise surveys were undertaken at the application site to characterise existing conditions and noise modelling undertaken to inform potential mitigation measures.

3.14 Measures to minimise noise emissions from the proposed development (such as those from demolition and construction works, plant, servicing and delivery arrangements and vehicle movements) were actively explored during the design evolution process.

Daylight, Sunlight and Overshadowing

3.15 Various height and massing options for the application site were explored during the design evolution process, taking into consideration the strategic policy requirements for the application site's redevelopment and the daylight, sunlight and overshadowing amenity of sensitive receptors.

3.16 The proposals were subject to daylight, sunlight and overshadowing assessments to consider impacts to the surrounding sensitive receptors, as well as at the potential on-site residential units and open space provisioning.

3.17 These assessments resulted in the refinement of building heights and massing, and where possible, building plots were set back or reduced in height to improve daylight and sunlight levels.

Townscape, Views and Built Heritage

3.18 The application site and its immediate setting fall within Reading Tall Building Strategy (RTBS) (2018) Character Area (CA) 22: Vastern Road. The northern edge of the application site immediately abuts CA12: Caversham Road. CA1: Station Hill abuts the boundary of CA22 to the south and CA23: King's Meadow abuts the northern and eastern boundaries of CA22.

3.19 There are no established key views within CA22 but views towards it are obtained from elevated land to the north and Oxford Road to the west. The Reading Station Area Framework (RSAF, 2010) sets out the location for two new views to be created within the CA from the Station Square North and Christchurch Bridge.

3.20 The CA is considered to be suitable for tall buildings, albeit not along the roadsides and the tallest structures should be nearest to the railway line. The RSAF includes a number of corridor views towards the application site from the west and north and a view to be created from the station subway south of the application site. Accordingly, careful consideration was given to the design proposals and their visual impact.

Transport and Accessibility

3.21 The application site is located within an established mixed-use area, comprising both commercial and residential land uses. The site benefits from good transport infrastructure in close proximity which facilitates travel by non-car modes such as walking, cycling and public transport.

3.22 The emerging proposals have sought to maximise permeability across the proposed development. At the detailed design stage, the proposed movement routes would be further developed to ensure that an appropriate permeability across the application site is delivered.

3.23 Measures to minimise the demolition and construction transport impacts of the proposed development were explored, including other potential routes for construction traffic to and from the application site.

Climate Change

3.24 Due to the outline nature of the development proposals, opportunities to integrate climate change resilience and adaptation have been limited to the following:

- Incorporation of measures to reduce the risk of flooding through sustainable drainage.

3.25 At the detailed design stage, opportunities would be sought to future–proof the proposed development against climate change effects; whilst at the same time, limiting the proposed development's contribution to climate change. Accordingly, measures would be considered and explored during the detailed design process to:

- minimise water consumption, such as the installation of water saving devises;
- reduce carbon dioxide emissions and overheating through energy efficient design;
- minimise the generation of waste and to maximise re-use or recycling;
- use native species within the landscape proposals;
- avoid overheating within residential units; and
- sustainably source and procure materials with lasting life spans.

Health and Wellbeing

3.26 Due to the outline nature of the development proposals, opportunities to integrate health and wellbeing have been limited to the provision of:

- a range of residential unit types and tenures;
- a range of open space and amenity space;
- safe, accessible spaces; and
- opportunities for walking and cycling.

3.27 At the detailed design stage, opportunities would be sought to promote healthy lifestyles and to improve personal wellbeing as far as reasonably possible. Accordingly, the Applicant would seek to deliver:

- high quality homes, appropriately sized, energy efficient, warm and dry;
- access to new open space amenity;
- internal and external noise levels that comply with the World Health Organisation (WHO) requirements;
- appropriately designed public open space to enable active play and opportunities for community engagement; and
- appropriately designed public open pace that comply with 'secure by design' principles.

Environmental Opportunities

3.28 The redevelopment of the application site presents the following opportunities:

- **Ground Contamination** - Due to the application site's industrial past, hotspots of contamination may be present. The proposed development offers the opportunity to improve conditions by virtue of the removal of existing made ground as part of the proposed excavation for the surface water attenuation tanks;
- **Landscape, Amenity and Public Realm** - The proposed development represents an opportunity to provide public and private amenity space; landscaping and playspace to create a more accessible and welcoming environment;
- **Ecology** - The proposed development provides opportunities for ecological and biodiversity enhancement through the planting of new trees and landscaping; and
- **Socio-Economics -** The proposed development presents the opportunity to provide high-quality residential units; to create employment opportunities and to generate additional local spend in the area.

Alternatives

Do-Nothing

3.29 The 'Do-Nothing' alternative is a hypothetical alternative considered in EIA as the basis for comparing the development proposals under consideration.

3.30 The application site could be left in its current state as a retail park. This would result in the following environmental effects:

- **Socio-economics** – The application site currently comprises retail warehouse units. In the Do-Nothing scenario there would be no opportunity to deliver housing in accordance with planning policy objectives and no new employment opportunities which would be generated through both the demolition and construction and completed development stage;
- **Transport** – in the Do-Nothing scenario, there would be no improvement in neighbourhood connectivity and permeability and no reduction in the number of vehicle movements on the surrounding road network;
- **Health and Wellbeing** – in the Do-Nothing scenario, there would be no improvement in public realm or creation of open space which would provide amenity areas for on and off-site users; and
- **Ecology** - No improvement in biodiversity.

3.31 The Local Plan provides a clear framework for development on the application site and in the wider area. If the Applicant were not to bring forward the proposed development, the objectives of the Local Plan would not be met.

3.32 Consequently, the Applicant ruled out the 'Do-Nothing' alternative.

Alternative Sites

3.33 No alternative application sites have been considered by the Applicant for the following reasons:

- The application site is owned by the Applicant and therefore application sites belonging to third parties were not given consideration;
- The application site is suitable for this type of development, as demonstrated by site allocation within adopted local policy; and
- The proposed development presents an opportunity to optimise the use of land in accordance with the NPPF.

Alternative Designs and Layouts

3.34 The proposed development submitted for approval is the result of a thorough analysis of environmental constraints and opportunities, access issues and market demand. Consultation with RBC, the statutory consultees, the local community and other local stakeholders has been a key influence in design evolution.

Alternative Layouts

3.35 The following principles and parameters have been carried forward for the proposed development:

- The layout design continues the south to north pedestrian connection, which links the south of Reading to the north and onwards, creating a quality pedestrian connection from the train station to Caversham;
- The development plots respond to vehicular and pedestrian routes to ensure continuity and additional connections within the local movement network; and
- The location and heights of the development plots within the application site have been refined to respond to provision of daylight and sunlight amenity to surrounding receptors.

3.36 Following discussions with RBC, the separation distance between Plots C and D were increased to reflect RBC aspirations for connectivity and increased public realm, as shown in Figure 3.1. This amendment to the proposed development parameters improves visibility from the railway underpass/Station Square north and Vastern Road in line with the RSAF.

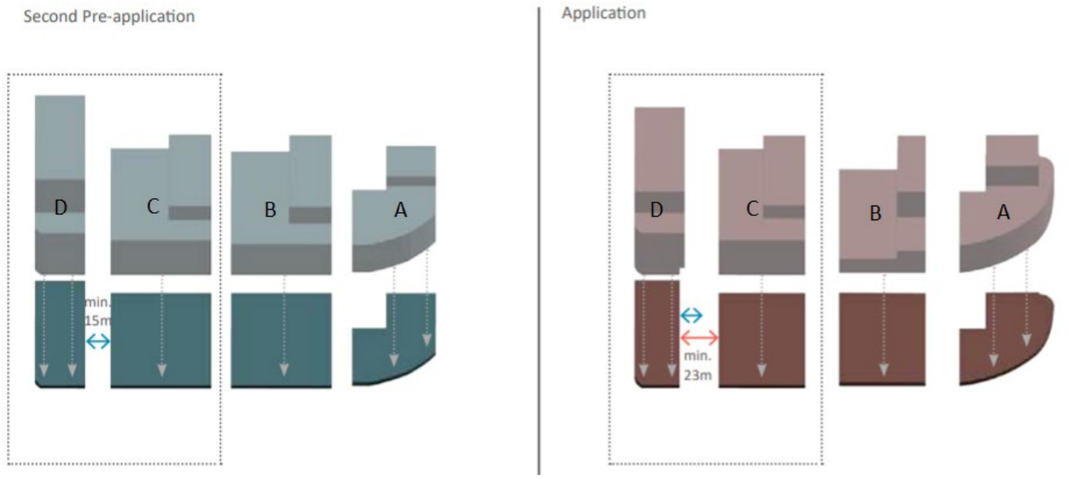


Figure 3.1: Amendment to Separation Distances of Plot C and D

3.37 Further amendments to the layouts following discussions with RBC include:

- The development footprint previously extended to the junction of Vastern Road with Caversham Road. This has been amended to allow for retention of existing trees;
- Distance between development plots has been widened from the minimum 12 m required for commercial use to 15 m to allow for more public realm; and
- Plots A and B were set back from the application site boundary with Vastern Road to allow for a future shared pedestrian and cycle route to be accommodated, should this be progressed by RBC.

Alternative Heights and Massing

3.38 Throughout the design evolution, alternative height and massing options were explored to ensure there would be no significant impacts to surrounding sensitive receptors with regard to daylight and sunlight amenity. In addition, the RSAF recommends future developments to create a gradient of height and density that would reach maximums around Station Square North.

3.39 Following discussions with RBC, the height of Plot D was reduced to demonstrate a clearer hierarchy between Station Hill and the application site. In order to maintain the RSAF's recommendation for the allocated location of a Local Landmark, Plot D was reduced by 14 m, equating to four office storeys or five residential storeys, as shown in Figure 3.2.

3.40 Following extensive daylight and sunlight assessments, the height of the proposed development along Vastern Road was lowered to ensure no unacceptable impact on neighbouring properties. Additional guidelines relating to maximum building heights have been captured in the parameters development schedule to ensure that the tallest elements will not have an adverse effect on existing and future sensitive receptors. The Development Parameters restrict the width of tall elements. In addition, use related height parameter plans were developed following additional daylight and sunlight assessments to ensure that different scenarios are individually covered for schemes coming forwards at reserved matters stage.

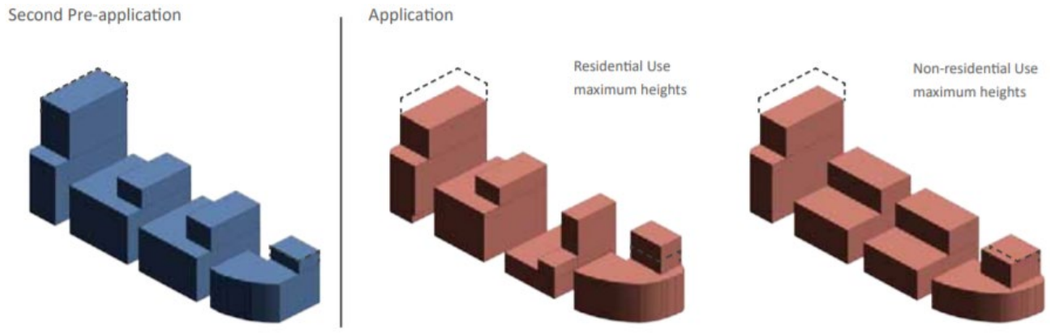


Figure 3.2: Alternative Heights of Plot D

Alternative Materials

3.41 Due to the outline nature of the proposed development, alternative materials were not explored for this stage of the planning process. A Design Code has been developed to support the planning application for the proposed development and would inform the detailed design.

Public Engagement and Consultation

3.42 During the design process and in preparing the application, the Applicant carried out a programme of statutory and community consultation.

3.43 The Applicant's approach to consultation comprised the following:

- Meetings with officers from the RBC and relevant statutory consultees; and
- Two public exhibition events undertaken on the 25 and 26 September 2019 and 30 and 31 October 2019.

3.44 The verbal and written feedback provided by local stakeholders as part of the consultation process has directly fed into the evolution of the proposed development.

3.45 A detailed description of the consultation undertaken is provided in the SCI appended to the supporting Planning Statement which accompanies the application.

3.46 In addition to public consultation, pre-application meetings were held with the RBC during the preparation of the planning application. Further information on design-related consultation can be found in the Design and Access Statement which accompanies the application.

Conclusion

3.47 The Applicant's objective for the proposed development is to provide a high-quality development supported by publicly accessible, open space to create an accessible, safe and sustainable urban extension.

3.48 Key environmental considerations informed the design evolution process, especially in the case of Daylight, Sunlight and Overshadowing and Townscape, Built Heritage and Visual.

3.49 No alternative sites were considered for the proposed development as the application site is owned by the Applicant and presents an opportunity to maximise the use of land in accordance with the NPPF.

Appendix 1.5: Cumulative Assessment

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Cumulative Schemes (including Resolution to Approve)						
National Landscape Character Area						
Natural England's NCA Profile 110: Chilterns	The proposed development and approved cumulative schemes set out below would all be located within the large scale NCA 110: • Former BMW Site, • Station Hill, • Kenavon Drive, • Land between Weldale Street and Chatham Street, • 29 Station Road Reading, • 52 to 55 Friar Street and 12 Greyfriars Road. Due to the urban context of this part of the NCA, its susceptibility to tall building development is considered to be low. The combination of the low value and low susceptibility results in a Low cumulative sensitivity.	Very Small	Negligible Adverse	Very Small	Negligible Adverse	The temporary demolition and construction stage of the proposed development would introduce plant and machinery into a localised part of the NCA. Should the demolition and construction stage of the proposed development overlap with demolition and construction stage of other approved cumulative schemes, the influence of the demolition and construction activities would not be perceived over a wide area and only would influence a small proportion of the large scale NCA and the key characteristics of the Chilterns would remain unaffected. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact, resulting in a Negligible Adverse cumulative effect. Although the proposed development would be located within the same NCA as the other approved cumulative schemes, they would all be located within the urban context of Reading, where large built form is typical. The proposed development would cause a cumulative magnitude of effect that is considered to be Very Small as the proposed development and all approved cumulative schemes would not extend the influence of the existing urban area within the large scale NCA. When considered alongside the other approved cumulative schemes, the proposed development would be located within an existing urbanised section of the much larger NCA and not detract from the defining characteristics of the Chilterns where the proposed development would cause a Very Small magnitude of impact. As such, the proposed development would result in a Negligible Adverse cumulative effect.
Reading Tall Building Strategy Townscape Character Area						
CA 22: Vastern Road	The proposed development would be located within CA 22: Vastern Road, as would the approved project of Former BMW Site. The CA contains several warehouses and a retail parks, with built forms comprising low-rise, large-scale blocks of utilitarian massing and appearance (e.g. unarticulated facades and metal cladding), set within extensive areas of surface car parking, which are of a commonplace type in the wider area. No parts of the CA are covered by statutory heritage designations and as such, the value of the CA is considered to be low. The CA comprises an area of existing large-scale built form and road infrastructure within a built-up urban context where the susceptibility of the CA to tall building development is considered to be Low. Furthermore, the RTBS notes that the large block size and lack of any key views or visual focal pints, make the CA an appropriate location for tall buildings; and the RCAAP identifies the application site as falling within 'area of potential for tall buildings' (i.e. RC13a Station Area Cluster). As such, the CA is considered to have a Low sensitivity to cumulative development.	Large	Moderate Adverse	Large	Moderate Beneficial	The temporary demolition and construction stage of the proposed development would introduce plant and machinery into the CA. Should the demolition and construction stage of the proposed development overlap with demolition and construction stage of the approved project of the Former BMW Site, the demolition and construction works would temporarily detract from the character of the Vastern Road CA for a short duration. In addition, any perceived effects from the demolition and construction stages of any other approved cumulative schemes in adjacent CA's occurring in parallel to demolition and construction of the proposed development would further enhance the level of disturbance within the urban area. The temporary demolition and construction stage for the proposed development would cause a Large magnitude of impact that would result in a Moderate Adverse cumulative effect. The proposed development with a height of 23 storeys would be located within the same urban townscape CA as the part 13 and part 23 storey development on the Former BMW Site where the two schemes would frame the station area, helping to establish a strong local identity in the townscape. The two developments would combine to increase wayfinding, articulation and legibility of the townscape of the Vastern Road CA and the vicinity of Reading Station by creating greater permeability and a recognisable scale of built form. The proposed development would cause a Large magnitude of impact that would result in a Moderate Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Cumulative Schemes (including Resolution to Approve)						
CA 12: Caversham Road	The proposed development would be located in an adjacent CA to CA 12: Caversham Road, with the approved cumulative schemes also all located outside the predominantly residential area that is made up of largely Victorian and Edwardian two-storey red brick terraces and semi-detached properties. The CA contains no statutory heritage designations, although the Thames Path extends along its northern boundary, following the southern bank of the river. Based on the above, the value of the CA is considered to be Medium. The small-scale townscape exhibits built forms of a consistent height, massing and form, resulting in a coherent character, albeit with larger scale built form in its wider setting to the east and south and as such, the townscape is considered to have a Medium susceptibility to tall building development. The combination of the Medium value and Medium susceptibility results in a Medium sensitivity to cumulative development.	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Caversham Road CA, nor would the demolition and construction works for other approved cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 12. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Minor Adverse cumulative effect. Although neither the proposed development nor any of the approved cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, would cause some perceived changes to the residential area of Caversham Road. The proposed development, in addition to the other approved cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's while maintaining the more domestic scale of development within CA 12, causing a Very Small magnitude of impact. The proposed development would combine with the other approved cumulative schemes to increase the number of landmark buildings perceptible from CA 12, as well as improving wayfinding, causing a Very Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would result in a Negligible Beneficial cumulative effect.
CA 23: King's Meadow	The proposed development would be located outside of CA 23: King's Meadow, as would all of the approved cumulative schemes. The series of open green spaces and playing fields located along the River Thames offer numerous recreational opportunities and contain a wealth of mature trees, which contribute to a well-vegetated character. Whilst it contains no statutory heritage designations, the vast majority of the CA is identified as a 'Major Landscape Feature' and an 'Important Areas of Open Space' (Policy LE14 and RC14) within the RCAAP (2008). Based on the above, the value of the CA is considered to be High. This is an area of undeveloped green spaces which is locally protected open space, albeit within a built-up urban context. On balance the susceptibility of the CA to the tall building development proposed in its setting is considered to be Medium. The combination of the High value and Medium susceptibility results in a High sensitivity to cumulative development.	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the King's Meadow CA, nor would the demolition and construction works for other approved cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 23. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Minor Adverse cumulative effect. Although neither the proposed development nor any of the approved cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, would cause some perceived changes to the residential area of Caversham Road. The proposed development, in addition to the other approved cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's while maintaining the green spaces of CA 23, causing a Very Small magnitude of impact. The proposed development would combine with the other approved cumulative schemes to increase the number of landmark buildings perceptible from CA 23, as well as improving wayfinding, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would result in a Negligible Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Cumulative Schemes (including Resolution to Approve)						
CA 1: Station Hill	Although the proposed development would not be located within the CA, the approved cumulative schemes of Station Hill and 29 Station Road would be. This CA includes Reading Station and the adjacent office, retail and residential development and areas of high-quality public realm. The height and massing of built forms ranges from between 3 and 15 storeys. Station Square provides a large public open space, with high levels of movement and vibrancy. Overall the value of the CA is considered to be Medium. The CA comprises an area of existing large scale built development and rail infrastructure, including tall buildings, within an urban context. Therefore, the susceptibility of the CA to tall building development is considered to be Low. Furthermore, the RCAAP identifies the application site as falling within 'area of potential for tall buildings' (i.e. RC13a Station Area Cluster). The combination of the Medium value and the Low susceptibility results in a Low sensitivity to cumulative development.	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Station Hill CA, but the demolition and construction activities for the approved cumulative schemes, of Station Hill and 29 Station Road, would. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of these approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance the Station Hill CA. The temporary demolition and construction stage of the proposed development would cause a Minor adverse magnitude of impact that would result in a Minor Adverse cumulative effect. The proposed development adjacent to the Station Hill CA, would cause perceived changes to the CA in addition to direct changes from the approved cumulative schemes within the Station Hill CA and those approved cumulative schemes in adjacent CA's such as Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market which would increase the mass of built form causing a Very Small magnitude of effect. The permeability in the adjacent Vastern Road CA, resulting from the proposed development blocks would help to connect the Station Hill CA to the River Thames corridor and open spaces at Christchurch Meadows, through the application site which would cause a Small magnitude of impact. The proposed development would result in a Negligible Beneficial cumulative effect.
CA 2: Reading Station East	The proposed development would be located outside CA 2, with all approved cumulative schemes also located outside the area of large-scale office blocks. Overall the value of the CA is considered to be Low. The CA comprises an area of existing large-scale built form and highway infrastructure within an urban context. Therefore, the susceptibility of the CA to tall building development in its setting is considered to be Low. Furthermore, the RTBS notes that the CA has a low sensitivity to the development of further tall buildings. The combination of the Low value and Low susceptibility results in a Low sensitivity to cumulative development.	Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Reading Station East CA, nor would the demolition and construction works for other approved cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 2. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Negligible Adverse cumulative effect. Although neither the proposed development nor any of the approved cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, would cause some perceived changes to the urban area of Reading Station East due to the increase in building mass which would cause a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the quality of built form and wayfinding perceptible from CA 2, causing a Small magnitude of effect. As such, the proposed development in addition to the approved cumulative schemes would result in a Negligible Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Cumulative Schemes (including Resolution to Approve)						
CA 7: Reading Station West	The proposed development would be located outside CA 7, with all approved cumulative schemes also located outside the predominantly low rise residential CA. Overall the value of the CA is considered to be Medium. Whilst the CA has little scope to directly accommodate tall buildings (as noted within the RTBS), there is some scope to accommodate it within its setting. Accordingly the townscape is of Medium susceptibility to tall building development. The combination of the Medium value and Medium susceptibility results in a Medium sensitivity to cumulative development.	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Reading Station East CA, nor would the demolition and construction works for other approved cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 7. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact, resulting in a Negligible Adverse cumulative effect. Although neither the proposed development nor any of the approved cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, would cause some perceived changes to the largely residential area of Reading Station West by increasing the mass of development and causing a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the legibility of built form and wayfinding perceptible from CA 7 causing a Small magnitude of change. As such, the proposed development in addition to the approved cumulative schemes would result in a Negligible Beneficial cumulative effect.
CA 13: Cattle Market and Chatham Place	The proposed development would be located outside CA 13, but the approved project of Land between Weldale Street and Chatham Street, would be located within the largely commercial and industrial CA 13 that is centred around the site of the former cattle market. The townscape is overall in a relatively poor condition and there is a proliferation of security fencing that diminishes the scenic quality of the CA. Overall the value of the CA is considered to be Very Low. The susceptibility of CA 13 to tall building development is considered to be Low. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity to cumulative development.	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within CA 13, but the demolition and construction activities for the approved project of Land between Weldale Street and Chatham Street, would. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of these approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance the Cattle Market and Chatham Place CA. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact, resulting in a Negligible Adverse cumulative effect. The proposed development would cause perceived changes to the CA in addition to direct changes from the approved project on Land between Weldale Street and Chatham Street in CA 13: Cattle Market and Chatham. The proposed development would contribute to any perceived changes caused by approved cumulative schemes in adjacent CA's such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, and Kenavon Drive in CA 10: Forbury Retail Park, causing a Very Small magnitude of effect due to the increased mass of development. The proposed development, in addition to the other approved cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the quality of legibility and wayfinding perceptible from CA 13: Cattle Market and Chatham Place, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would result in a Negligible Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Cumulative Schemes (including Resolution to Approve)						
CA 3: Friar Street	The proposed development would be located outside CA 13, but the approved cumulative schemes of Station Hill and 52-55 Friar Street would be located within the CA that is centred along the retail centre of Friar Street. The low architectural quality of many buildings along Friar Street is bookended by views towards the landmarks of Greyfriars Church and St Lawrence Church to the east and west of the CA. Overall the value of the CA is considered to be Very Low. The susceptibility of the CA to tall building development is considered to be Low. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity to cumulative development.	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within CA 3, but the demolition and construction activities for the approved cumulative schemes of Station Hill and 52-55 Friar Street would. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of these approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance the Cattle Market and Chatham Place CA. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. The proposed development would cause perceived changes to the CA in addition to direct changes from the approved cumulative schemes of Station Hill and 52-55 Friar Street. The proposed development would contribute to any perceived changes caused by approved cumulative schemes in adjacent CA's such as Station Hill and 29 Station Road in CA 1: Station Hill, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market and Chatham, where it would contribute to the increase in mass of development causing a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the legibility of built form and wayfinding perceptible from CA 3: Friar Street, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would result in a Negligible Beneficial cumulative effect.
CA 4: Station Road	The proposed development would be located outside CA 4, with all approved cumulative schemes also located outside the retail and commercial centre of Friar Street. Overall the value of the CA is considered to be Low as although it is in close proximity to the Market Place and London Road Conservation Area, it is not subject to any landscape or townscape designations. The susceptibility of the CA to tall building development within its setting is considered to be Low. The combination of the Medium value and the Low susceptibility results in a Low sensitivity to cumulative development.	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Station Road CA, nor would the demolition and construction works for other approved cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 4. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. Although neither the proposed development nor any of the approved cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, would cause some perceived changes to the largely commercial area of Station Road due to the increase in mass that would cause a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the quality of built form and wayfinding perceptible from CA 4, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would result in a Negligible Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Cumulative Schemes (including Resolution to Approve)						
CA 11: Napier Road	The proposed development would be located outside CA 11, with all approved cumulative schemes also located outside the residential, commercial and retail development that lines the northern edge of the railway line. The Low architectural quality of the development within the CA means that it is considered to have an overall value of Very Low. The CA is considered to have a Low susceptibility to tall building development within its setting due to the weak townscape character. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity to cumulative development.	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Napier Road CA, nor would the demolition and construction works for other approved cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 11. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. Although neither the proposed development nor any of the approved cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, would cause some perceived changes to the largely commercial area of Napier Road that would increase the mass of development causing a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the legibility of built form and wayfinding perceptible from CA 11, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would result in a Negligible Beneficial cumulative effect.
CA 10: Forbury Retail Park	The proposed development would be located outside CA 10, but the approved project of Kenavon Drive would be located within the CA that is largely influenced by retail park development along the southern edge of the railway line. The Low architectural quality of the development within the CA means that it is considered to have an overall value of Very Low. The CA is considered to have a Low susceptibility to tall building development due to the weak townscape character. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity to cumulative development.	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within CA 10, but the demolition and construction activities for the approved project of Kenavon Drive would. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of the approved project, the perceived effects of combined demolition and construction activities would provide indirect disturbance the Forbury Retail Park CA. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. The proposed development would cause perceived changes to the CA in addition to the direct changes caused by the approved project of Kenavon Drive in CA 10: Forbury Retail Park. The proposed development would contribute to any perceived changes caused by approved cumulative schemes in adjacent CA's such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street and Land between Weldale Street and Chatham Street in CA 13: Cattle Market and Chatham where the mass of development would cause a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the legibility of built form and wayfinding perceptible from CA 10: Friar Street, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would result in a Negligible Beneficial cumulative effect.
Application Site Character						

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Cumulative Schemes (including Resolution to Approve)						
Application Site	The application site is largely comprised by warehousing and car parking with a weak townscape character. No parts of the application site are covered by statutory heritage designations and as such, the value of the application site is considered to be low. The application site exhibits an urban context where its susceptibility to tall building development is considered to be Low. As such, the application site is considered to have a Low sensitivity to cumulative development.	Medium	Minor Adverse	Large	Minor Beneficial	Demolition and construction works on the application site would occupy the land currently occupied by the existing retail units and car parking. Any perceived effects on the application site from demolition and construction operations for approved cumulative schemes on other sites would consolidate the sense of disturbance on the application site. The temporary demolition and construction stage for the proposed development would cause a Medium magnitude of impact upon the Low sensitivity application site that would result in a Minor Adverse cumulative effect. The proposed development would cause direct changes to the application site in addition to the perceived changes caused by those approved cumulative schemes on other sites. The proposed development in addition to any perceived changes caused by approved cumulative schemes, would contribute to the increase in mass of development and would cause a Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes would combine to provide the perception of increased urbanisation on the application site as well as an improvement in the legibility of built form and wayfinding, causing a Large magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would result in a Minor Beneficial cumulative effect on the application site.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes						
National Landscape Character Area						
Natural England's NCA Profile 110: Chilterns	The proposed development and approved cumulative schemes set out below would all be located within the large scale NCA 110: • Former BMW Site, • Station Hill, • Kenavon Drive, • Land between Weldale Street and Chatham Street, • 29 Station Road Reading, • 52 to 55 Friar Street and 12 Greyfriars Road, As well as the reasonably foreseeable cumulative schemes of: • Network Rail Thames Valley Area site office/Former Royal Mail Site, • Former Scottish and Southern Energy Site, • Broad Street Mall. Due to the urban context of this part of the NCA, its susceptibility to tall building development is considered to be low. The combination of the low value and low susceptibility results in a Low cumulative sensitivity.	Very Small	Negligible Adverse	Very Small	Neutral	The temporary demolition and construction stage of the proposed development would introduce plant and machinery into a localised part of the NCA. Should the demolition and construction stage of the proposed development overlap with demolition and construction stage of other approved cumulative schemes, the influence of the demolition and construction activities would not be perceived over a wide area and only would influence a small proportion of the large scale NCA and the key characteristics of the Chilterns would remain unaffected. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. Although the proposed development would be located within the same NCA as the other approved cumulative schemes and reasonably foreseeable cumulative schemes, they would all be located within the urban context of Reading, where large built form is typical. The proposed development would cause a cumulative magnitude of effect that is considered to be Very Small as the proposed development, approved cumulative schemes and reasonably foreseeable cumulative schemes would not extend the influence of the existing urban area within the large scale NCA. When considered alongside the other approved cumulative schemes and reasonably foreseeable cumulative schemes, the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect, as it would be located within an existing urbanised section of the much larger NCA and not detract from the defining characteristics of the Chilterns.
Reading Tall Building Strategy Townscape Character Area						

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes						
CA 22: Vastern Road	The proposed development would be located within CA 22: Vastern Road, as would the approved project of Former BMW Site, and reasonably foreseeable cumulative schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site. The CA contains several warehouses and a retail parks, with built forms comprising low-rise, large-scale blocks of utilitarian massing and appearance (e.g. unarticulated facades and metal cladding), set within extensive areas of surface car parking, which are of a commonplace type in the wider area. No parts of the CA are covered by statutory heritage designations and as such, the value of the CA is considered to be low. The CA comprises an area of existing large-scale built form and road infrastructure within a built-up urban context where the susceptibility of the CA to tall building development is considered to be Low. Furthermore, the RTBS notes that the large block size and lack of any key views or visual focal pints, make the CA an appropriate location for tall buildings; and the RCAAP identifies the application site as falling within 'area of potential for tall buildings' (i.e. RC13a Station Area Cluster). As such, the CA is considered to have a Low sensitivity to cumulative development.	Large	Moderate Adverse	Large	Moderate Beneficial	The temporary demolition and construction stage of the proposed development would introduce plant and machinery into the CA. Should the demolition and construction stage of the proposed development overlap with demolition and construction stage of the approved project of the Former BMW Site, Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site, the demolition and construction works would temporarily detract from the character of the Vastern Road CA for the duration of overlapping works. In addition, any perceived effects from the demolition and construction stages of any other approved cumulative schemes in adjacent CA's occurring in parallel to demolition and construction of the proposed development would further enhance the level of disturbance within the urban area. The temporary demolition and construction stage of the proposed development would cause a Large magnitude of impact, resulting in a Moderate Adverse cumulative effect. The proposed development with a height of 23 storeys would be located within the same urban townscape CA as the part 13 and part 23 storey development on the Former BMW Site, up to 25 storey development on the Network Rail Thames Valley Area Site Office/Former Royal Mail Site and up to 11 storey development on the Former Scottish and Southern Energy Site. The proposed development in addition to these approved cumulative schemes and reasonably foreseeable cumulative schemes would significantly improve the quality of built form, and provide a strong local identity in the townscape that identifies Reading Station as a key area within the townscape, improving articulation and legibility of the townscape within the Vastern Road CA. This would cause a Large cumulative magnitude of impact that would result in a Moderate Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes						
CA 12: Caversham Road	The proposed development would be located in an adjacent CA to CA 12: Caversham Road, with the approved cumulative schemes and reasonably foreseeable cumulative schemes also all located outside the predominantly residential area that is made up of largely Victorian and Edwardian two-storey red brick terraces and semi-detached properties. The CA contains no statutory heritage designations, although the Thames Path extends along its northern boundary, following the southern bank of the river. Based on the above, the value of the CA is considered to be Medium. The small-scale townscape exhibits built forms of a consistent height, massing and form, resulting in a coherent character, albeit with larger scale built form in its wider setting to the east and south and as such, the townscape is considered to have a Medium susceptibility to tall building development. The combination of the Medium value and Medium susceptibility results in a Medium sensitivity to cumulative development.	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Caversham Road CA, nor would the demolition and construction works for other approved cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 12. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Minor Adverse cumulative effect. Although none of the proposed development, approved cumulative schemes or reasonably foreseeable cumulative schemes would be located within the CA, the proposed development in addition to the approved cumulative schemes of the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22 Vastern Road, and Broad Street Mall in CA 15: Cheapside, would cause some perceived changes to the residential area of Caversham Road due to the increased building mass causing a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes and reasonably foreseeable cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's while maintaining the more domestic scale of development within CA 12. The proposed development would combine with the other approved cumulative schemes and reasonable foreseeable schemes to increase the legibility of built form perceptible from CA 12, as well as improving wayfinding and cause a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would result in a Negligible Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes						
CA 23: King's Meadow	The proposed development would be located outside of CA 23: King's Meadow, as would all of the approved cumulative schemes and reasonably foreseeable cumulative schemes. The series of open green spaces and playing fields located along the River Thames offer numerous recreational opportunities and contain a wealth of mature trees, which contribute to a well-vegetated character. Whilst it contains no statutory heritage designations, the vast majority of the CA is identified as a 'Major Landscape Feature' and an 'Important Areas of Open Space' (Policy LE14 and RC14) within the RCAAP (2008). Based on the above, the value of the CA is considered to be High. This is an area of undeveloped green spaces which is locally protected open space, albeit within a built-up urban context. On balance the susceptibility of the CA to the tall building development proposed in its setting is considered to be Medium. The combination of the High value and Medium susceptibility results in a High sensitivity to cumulative development.	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the King's Meadow CA, nor would the demolition and construction works for other approved cumulative schemes or reasonably foreseeable cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 23. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Minor Adverse cumulative effect. Although none of the proposed development, approved cumulative schemes or reasonably foreseeable cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22 Vastern Road, and Broad Street Mall in CA 15: Cheapside, would cause some perceived changes to the residential area of Caversham Road due to the increase in building mass causing a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes and reasonably foreseeable cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's while maintaining the green spaces of CA 23. The proposed development would combine with the other approved cumulative schemes and reasonably foreseeable cumulative schemes to increase the legibility of built form perceptible from CA 23, as well as improving wayfinding, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would result in a Negligible Beneficial cumulative effect.
CA 1: Station Hill	Although the proposed development would not be located within the CA, the approved cumulative schemes of Station Hill and 29 Station Road would be. This CA includes Reading Station and the adjacent office, retail and residential development and areas of high-quality public realm. The height and massing of built forms ranges from between 3 and 15 storeys. Station Square provides a large public open space, with high levels of movement and vibrancy. Overall the value of the CA is considered to be Medium. The CA comprises an area of existing large scale built development and rail infrastructure, including tall buildings, within an urban context. Therefore, the susceptibility of the CA to tall building development is considered to be Low. Furthermore, the RCAAP identifies the application site as falling within 'area of potential for tall buildings' (i.e. RC13a Station Area Cluster). The combination of the Medium value and the Low susceptibility results in a Low sensitivity to cumulative development.	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Station Hill CA, but the demolition and construction activities for the approved cumulative schemes, of Station Hill and 29 Station Road, would. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of these approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance the Station Hill CA. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Minor Adverse cumulative effect. The proposed development adjacent to the Station Hill CA, would cause perceived changes to the CA in addition to direct changes from the approved cumulative schemes within the Station Hill CA and those approved cumulative schemes in adjacent CA's such as Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22 Vastern Road, and Broad Street Mall in CA 15: Cheapside, where the additional building mass would cause a Very Small magnitude of impact. The permeability in the adjacent Vastern Road CA, resulting from the proposed development blocks would help to connect the Station Hill CA to the River Thames corridor and open spaces at Christchurch Meadows, through the application site, causing a Small magnitude of impact. The proposed development would result a Negligible Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes						
CA 2: Reading Station East	The proposed development would be located outside CA 2, with all approved cumulative schemes and reasonably foreseeable cumulative schemes also located outside the area of large-scale office blocks. Overall the value of the CA is considered to be Low. The CA comprises an area of existing large-scale built form and highway infrastructure within an urban context. Therefore, the susceptibility of the CA to tall building development in its setting is considered to be Low. Furthermore, the RTBS notes that the CA has a low sensitivity to the development of further tall buildings. The combination of the Low value and Low susceptibility results in a Low sensitivity to cumulative development.	Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Reading Station East CA, nor would the demolition and construction works for other approved cumulative schemes or reasonably foreseeable cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 2. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Negligible Adverse cumulative effect. Although none of the proposed development nor any of the approved cumulative schemes or reasonably foreseeable cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22 Vastern Road, and Broad Street Mall in CA 15: Cheapside, would cause some perceived changes to the urban area of Reading Station East due to the additional building mass causing a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes and reasonably foreseeable cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the legibility of built form and wayfinding perceptible from CA 2, causing a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes						
CA 7: Reading Station West	The proposed development would be located outside CA 7, with all approved cumulative schemes and reasonably foreseeable cumulative schemes also located outside the predominantly low rise residential CA. Overall the value of the CA is considered to be Medium. Whilst the CA has little scope to directly accommodate tall buildings (as noted within the RTBS), there is some scope to accommodate it within its setting. Accordingly the townscape is of Medium susceptibility to tall building development. The combination of the Medium value and Medium susceptibility results in a Medium sensitivity to cumulative development.	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Reading Station East CA, nor would the demolition and construction works for other approved cumulative schemes or reasonably foreseeable cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes or reasonably foreseeable cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 7. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. Although none of the proposed development, approved cumulative schemes or reasonably foreseeable cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22 Vastern Road, and Broad Street Mall in CA 15: Cheapside, would cause a Very Small magnitude of impact on the largely residential area of Reading Station West due to the additional building mass. The proposed development, in addition to the other approved cumulative schemes and reasonably foreseeable cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the legibility of built form and wayfinding perceptible from CA 7, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would result in Negligible Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes						
CA 13: Cattle Market and Chatham Place	The proposed development would be located outside CA 13, but the approved project of Land between Weldale Street and Chatham Street, would be located within the largely commercial and industrial CA 13 that is centred around the site of the former cattle market. The townscape is overall in a relatively poor condition and there is a proliferation of security fencing that diminishes the scenic quality of the CA. Overall the value of the CA is considered to be Very Low. The susceptibility of CA 13 to tall building development is considered to be Low. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity to cumulative development.	Very Small	Negligible Adverse	Very Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within CA 13, nor would any demolition and construction activities for the reasonably foreseeable cumulative schemes, but the demolition and construction activities for the approved project of Land between Weldale Street and Chatham Street, would. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of the approved project, the perceived effects of combined demolition and construction activities would provide indirect disturbance the Cattle Market and Chatham Place CA. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. The proposed development would cause perceived changes to the CA in addition to direct changes from the approved project on Land between Weldale Street and Chatham Street in CA 13: Cattle Market and Chatham. The proposed development would contribute to any perceived changes caused by approved cumulative schemes in adjacent CA's such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, and Kenavon Drive in CA 10: Forbury Retail Park, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22 Vastern Road, and Broad Street Mall in CA 15: Cheapside, with the additional building mass causing a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes and reasonably foreseeable cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the legibility of built form and wayfinding perceptible from CA 13: Cattle Market and Chatham Place, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would result in a Negligible Beneficial cumulative effect.
CA 3: Friar Street	The proposed development would be located outside CA 13, but the approved cumulative schemes of Station Hill and 52-55 Friar Street would be located within the CA that is centred along the retail centre of Friar Street. The low architectural quality of many buildings along Friar Street is bookended by views towards the landmarks of Greyfriars Church and St Lawrence Church to the east and west of the CA. Overall the value of the CA is considered to be Very Low. The susceptibility of the CA to tall building development is considered to be Low. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity to cumulative development.	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within CA 3, but the demolition and construction activities for the approved cumulative schemes of Station Hill and 52-55 Friar Street would. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of these approved cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance the Cattle Market and Chatham Place CA. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. The proposed development would cause perceived changes to the CA in addition to direct changes from the approved cumulative schemes of Station Hill and 52-55 Friar Street. The proposed development would contribute to any perceived changes caused by approved cumulative schemes in adjacent CA's such as Station Hill and 29 Station Road in CA 1: Station Hill, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market and Chatham, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22 Vastern Road, and Broad Street Mall in CA 15: Cheapside, where the additional building mass would cause a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes and reasonably foreseeable cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the legibility of built form and wayfinding perceptible from CA 3: Friar Street, which would cause a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would result in a Negligible Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes						
CA 4: Station Road	The proposed development would be located outside CA 4, with all approved cumulative schemes and reasonably foreseeable cumulative schemes also located outside the retail and commercial centre of Friar Street. Overall the value of the CA is considered to be Low as although it is in close proximity to the Market Place and London Road Conservation Area, it is not subject to any landscape or townscape designations. The susceptibility of the CA to tall building development within its setting is considered to be Low. The combination of the Medium value and the Low susceptibility results in a Low sensitivity to cumulative development.	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Station Road CA, nor would the demolition and construction works for other approved cumulative schemes or reasonably foreseeable cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes or reasonably foreseeable cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 4. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. Although none of the proposed development, the approved cumulative schemes or reasonably foreseeable cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22 Vastern Road, and Broad Street Mall in CA 15: Cheapside would cause a Very Small magnitude of impact to the largely commercial area of Station Road due to the increased building mass. The proposed development, in addition to the other approved cumulative schemes and reasonably foreseeable cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the legibility of built form and wayfinding perceptible from CA 4, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would result in a Negligible Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes						
CA 11: Napier Road	The proposed development would be located outside CA 11, with all approved cumulative schemes and reasonably foreseeable cumulative schemes also located outside the residential, commercial and retail development that lines the northern edge of the railway line. The Low architectural quality of the development within the CA means that it is considered to have an overall value of Very Low. The CA is considered to have a Low susceptibility to tall building development within its setting due to the weak townscape character. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity to cumulative development.	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within the Napier Road CA, nor would the demolition and construction works for other approved cumulative schemes or reasonably foreseeable cumulative schemes, and so would not give rise to any direct cumulative changes. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of other approved cumulative schemes and reasonably foreseeable cumulative schemes, the perceived effects of combined demolition and construction activities would provide indirect disturbance to CA 11. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. Although none of the proposed development, the approved cumulative schemes or the reasonably foreseeable cumulative schemes would be located within the CA, the proposed development in addition to the Former BMW Site in the adjacent Vastern Road CA, and the other approved cumulative schemes such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Kenavon Drive in CA 10: Forbury Retail Park, and Land between Weldale Street and Chatham Street in CA 13: Cattle Market, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22 Vastern Road, and Broad Street Mall in CA 15: Cheapside would cause a Very Small magnitude of impact to the largely commercial area of Napier Road due to the addition of building mass. The proposed development, in addition to the other approved cumulative schemes and reasonably foreseeable cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the legibility of built form and wayfinding perceptible from CA 11. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would cause a Small magnitude of impact, resulting in a Negligible Beneficial cumulative effect.
CA 10: Forbury Retail Park	The proposed development would be located outside CA 10, but the approved project of Kenavon Drive would be located within the CA that is largely influenced by retail park development along the southern edge of the railway line. The Low architectural quality of the development within the CA means that it is considered to have an overall value of Very Low. The CA is considered to have a Low susceptibility to tall building development due to the weak townscape character. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity to cumulative development.	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within CA 10, but the demolition and construction activities for the approved project of Kenavon Drive would. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of the approved project, the perceived effects of combined demolition and construction activities would provide indirect disturbance the Forbury Retail Park CA. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. The proposed development would cause perceived changes to the CA in addition to the direct changes caused by the approved project of Kenavon Drive in CA 10: Forbury Retail Park. The proposed development would contribute to any perceived changes caused by approved cumulative schemes in adjacent CA's such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street and Land between Weldale Street and Chatham Street in CA 13: Cattle Market and Chatham, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22 Vastern Road, and Broad Street Mall in CA 15: Cheapside, where the increased building mass would cause a Very Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes and reasonably foreseeable cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the quality of built form and wayfinding perceptible from CA 10: Forbury Retail Park, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would result in a Negligible Beneficial cumulative effect.

Cumulative Townscape Receptor		Cumulative Townscape Effects				
Area	Sensitivity to Cumulative Development	Demolition and construction Stage		Operational Stage		Notes
		Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved Schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes						
CA 15: Cheapside	The proposed development would be located outside CA 15, but the vreasonably foreseeable scheme of Broad Street Mall would be located within the CA that is characterised by large scale blocks with absence of notable townscape features. The low architectural quality of the development within the CA that is bisected by the IDR means that it is considered to have an overall value of Very Low. The CA is considered to have a Low susceptibility to tall building development due to the weak townscape character and it is noted in the RTBS that CA 15 has a suitability for re-development. The combination of the Very Low value and the Low susceptibility results in a Low sensitivity to cumulative development.	Very Small	Negligible Adverse	Very Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would not occur within CA 15, but the demolition and construction activities for the approved project of Broad Street Mall would. Should the demolition and construction stage of the proposed development overlap with the demolition and construction stage of the approved project, the perceived effects of combined demolition and construction activities would provide indirect disturbance the Cheapside CA. The temporary demolition and construction stage of the proposed development would cause a Very Small magnitude of impact that would result in a Negligible Adverse cumulative effect. The proposed development would cause perceived changes to the CA in addition to the direct changes caused by the reasonably foreseeable scheme of Broad Street Mall in CA 15: Cheapside. The proposed development would contribute to any perceived changes caused by approved cumulative schemes in adjacent CA's such as Station Hill and 29 Station Road in CA 1: Station Hill, Station Hill and 52-55 Friar Street in CA 3: Friar Street, Land between Weldale Street and Chatham Street in CA 13: Cattle Market and Chatham and Kenavon Drive in CA 10: Forbury Retail Park, as well as the reasonable foreseeable schemes of Network Rail Thames Valley Area Site Office/Former Royal Mail Site and the Former Scottish and Southern Energy Site in CA 22: Vastern Road. The proposed development, in addition to the other approved cumulative schemes and reasonably foreseeable cumulative schemes would combine to provide the perception of increased urbanisation in adjacent CA's as well as an improvement in the legibility of built form and wayfinding perceptible from CA 15: Cheapside, causing a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would result in a Negligible Beneficial cumulative effect.
Application Site Character						
Application Site	The application site is largely comprised by warehousing and car parking with a weak townscape character. No parts of the application site are covered by statutory heritage designations and as such, the value of the application site is considered to be low. The application site exhibits an urban context where its susceptibility to tall building development is considered to be Low. As such, the application site is considered to have a Low sensitivity to cumulative development.	Small	Negligible Adverse	Large	Minor Beneficial	Demolition and construction works on the application site would occupy the land currently occupied by the existing retail units and car parking. Any perceived effects on the application site from demolition and construction operations for approved cumulative schemes and reasonably foreseeable cumulative schemes on other sites would consolidate the sense of disturbance on the application site. The temporary demolition and construction stage for the proposed development would cause a Small magnitude of impact upon the Low sensitivity application site that would result in a Negligible Adverse cumulative effect. The proposed development would cause direct changes to the application site in addition to the perceived changes caused by those approved cumulative schemes and reasonably foreseeable cumulative schemes on other sites. The proposed development in addition to any perceived changes caused by approved cumulative schemes and reasonably foreseeable cumulative schemes, would contribute to the increase in mass of development and would cause a Small magnitude of impact. The proposed development, in addition to the other approved cumulative schemes and reasonably foreseeable cumulative schemes would combine to provide the perception of increased urbanisation on the application site as well as an improvement in the legibility of built form and wayfinding, causing a Large magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would result in a Minor Beneficial cumulative effect on the application site.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve)											
03	View north from Station Square North	The viewpoint position is located at Station Square North, approximately 25m to the south of the Site. The view obtained is considered to be of medium value as it is noted as a new view (view 62) within the RSAF. The receptors at this location will comprise people arriving at Reading Station, whose attention will be partially focussed on the surrounding townscape, meaning their susceptibility to tall building development is considered to be medium. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Fixed	Open	Full	Most	None	Neutral	None	Neutral	The temporary demolition and construction stage of the proposed development would largely occupy the foreground of views available from the northern station entrance where the demolition and construction activities of approved cumulative schemes would be screened from view, should they coincide. The demolition and construction stage of the proposed development would be seen at close range and would occupy the entirety of views to the north where there would be no views of other demolition and construction stages works. The temporary demolition and construction stage of the proposed development would cause a magnitude of impact of None and result in a Neutral cumulative effect. The completed proposed development would not be seen alongside any approved cumulative schemes and so would cause cumulative magnitude impact of None, resulting in a Neutral cumulative effect.
04	View south-east from Caversham Road	The viewpoint position is located on Caversham Road (A4155), approximately 100m to the north-west of the Site. The value of the view obtained from this location is considered to be medium as it is designated as a shorter distance view (view 39) within the RSAF. As the receptors at this location would comprise people travelling along a busy urban road, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Low.	Fixed and Transient	Filtered	Partial	Most	Small	Minor Adverse	Very Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in addition to the demolition and construction works for the development at 29 Station Road, the Former BMW site, and Station Hill should the demolition and construction stages overlap. The demolition and construction works in the foreground of views would partially screen some views of demolition and construction activities at 29 Station Road, and Station Hill, but extend the amount of view that demolition and construction works are seen in where they appear alongside the activities on the Former BMW site. Demolition and construction works on the application site in addition to the demolition and construction works at the Former BMW site, Station Hill and 29 Station Road would extend demolition and construction activities across larger parts of views along Caversham Road. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact, resulting in a Minor Adverse cumulative effect. The proposed development in addition to the approved cumulative schemes on the Former BMW site, Station Hill and 29 Station Road, would increase the amount of view occupied by tall buildings but would prevent views towards the approved cumulative schemes of development at 29 Station Road, and Station Hill, with the built form at the Former BMW site largely screened from view by foreground vegetation, causing a Very Small magnitude of impact. The proposed development would combine with other approved cumulative schemes to improve views towards the centre of Reading through locally distinctive built form with variety in massing and heights as well as improvements to legibility of the public realm that would cause a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would cause a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve)											
05	View south from the Thames Path/De Montfort Road	The viewpoint position is located on the Thames Path at its junction with De Montfort Road, approximately 190m to the north of the Site. The view obtained is considered to be of high value as it is designated as a shorter distance view (view 44) within the RSAF. As the receptors at this location will include people using the Thames Path or people at their place of residence, their susceptibility to tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be High.	Fixed and Transient	Filtered/ restricted	Partial	Partial	None	Neutral	None	Neutral	The temporary demolition and construction stage of the proposed development would largely occupy views south along the residential street where any demolition and construction activities for approved schemes would be screened from view, should they coincide. The demolition and construction stage of the proposed development would cause a magnitude of impact of None to views and would result in a Neutral cumulative effect. The proposed development would not be seen alongside any approved cumulative schemes and so would cause a magnitude of impact of None, resulting in a Neutral cumulative effect.
07	View east from Swansea Road/North field Road	The viewpoint position is located at the junction of Swansea Road and Northfield Road, approximately 150m to the east of the Site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 38) within the RSAF. As the receptors at this location will include people at their place of residence, their susceptibility to tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be High.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views east from the residential street in addition to the demolition and construction works for the development at the Former BMW site, and Station Hill should the demolition and construction stages overlap. The demolition and construction works for the proposed development would partially screen some views of demolition and construction activities at the Former BMW site, but would extend the amount of view that demolition and construction works are seen in where they appear alongside the activities at Station Hill. Demolition and construction works on the application site in addition to the demolition and construction works at the Former BMW site, and Station Hill would extend demolition and construction activities across a wider amount of views. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact, resulting in a Minor Adverse cumulative effect. The proposed development would screen views of the approved project at the Former BMW site, but would extend the amount of view occupied by tall buildings as the proposed development would be seen in addition to a small part of the approved project at Station Hill, that would be visible above residential properties lining the road, adding to the mass of buildings and causing a Very Small magnitude of impact. The proposed development would combine with other approved cumulative schemes to deliver built form with variety in massing and heights as well as improvements to legibility of the public realm that would cause a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would cause a Small magnitude of impact, resulting in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve)											
08	View west from Reading Bridge	This viewpoint is located Reading Bridge, approximately 250m to the east of the Site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 46 and 47) within the RSAF. As the receptors at this location will include people travelling along George Street towards central Reading, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Transient	Filtered/ restricted	Partial	Partial	None	Neutral	None	Neutral	The temporary demolition and construction stage of the proposed development would be partially visible above the existing development that lines the southern banks of the River Thames where any demolition and construction activities for approved schemes would be screened from view, should they coincide. The demolition and construction stage of the proposed development would cause a magnitude of impact of None to views and would result in a Neutral cumulative effect. The proposed development would not be seen alongside any approved cumulative schemes and so would cause a magnitude of impact of None, resulting in a Neutral cumulative effect.
09	View south-west from Christchurch Meadows	The viewpoint position is located on a pedestrian/cycle route within Christchurch Meadows, approximately 380m to the north-east of the Site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 43) within the RSAF. As the receptors at this location comprise visitors to the public open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be High.	Transient	Filtered/ restricted	Partial	Partial	Medium	Minor Adverse	Medium	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would appear in addition to the demolition and construction activities at 29 Station Road, and Station Hill, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would partially screen some views of demolition and construction activities at the Station Hill, but would extend the amount of view that demolition and construction works are seen in where they appear alongside the activities at 29 Station Road. Demolition and construction works on the application site in addition to the demolition and construction works at 29 Station Road, and Station Hill, would extend demolition and construction activities across a wider amount of views causing a Medium magnitude of impact. The temporary demolition and construction stage of the proposed development would result in a Minor Adverse cumulative effect. The proposed development would be seen in addition to the approved cumulative schemes of 29 Station Road, and Station Hill, where it would occupy the same section of views but would extend the amount of view that tall buildings are visible against the skyline, causing a Small magnitude of impact. Where the proposed development is visible in addition to the approved cumulative schemes and existing built form, it would provide strong visual interest in views to the south-west. As the proposed development would partially screen views of the approved project at Station Hill, and increase the height variance of built form, it would cause a Medium magnitude of impact, resulting in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve)											
10	View north from Station Road	This viewpoint is located on Station Road, approximately 340m to the south of the application site. Station Road extends into the background of the view, perpendicular to the viewer. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 58) within the RSAF and has cultural associations due to views of the listed station building. As the receptors at this location will comprise people who are passing through the townscape along a main route, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Negligible Adverse	The temporary demolition and construction stage of the proposed development would appear in addition to the demolition and construction activities at 29 Station Road, should the demolition and construction stages overlap. Should the demolition and construction stage of the proposed development coincide with the demolition and construction stage of 29 Station Road, the proposed development would contribute to additional visual disturbance along Station Road where it would extend the amount of views occupied by demolition and construction activities. The temporary demolition and construction stage of the proposed development would cause a Small magnitude of impact that would result in a Minor Adverse cumulative effect. The proposed development would be seen in addition to the approved project of 29 Station Road, where it would occupy the same section of views but would extend the amount of view that tall buildings are visible against the skyline and reduce the prominence of the Main Building of Reading Station (Grade II Listed) causing a Very Small magnitude of impact but would introduce locally distinctive built form with variety in massing and heights that would complement the approved project of 29 Station Road. The proposed development, seen in addition to the approved project of 29 Station Road, would result in a Negligible Adverse cumulative effect as it would appear below the existing skyline in views causing a Small magnitude of impact. This would result in a Negligible Adverse cumulative effect.
11	View south-east from Christchurch Meadows	This viewpoint is located on the towpath along the River Thames, adjacent to the War Memorial within Christchurch Meadows, approximately 425m to the north-west of the application site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 41) within the RSAF. As the receptors at this location comprise visitors to the public open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to the tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Medium	Moderate Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would appear in addition to the demolition and construction activities for the approved cumulative schemes of Former BMW site, 29 Station Road, and Station Hill, in views south-east along the Thames should the demolition and construction stages overlap. The demolition and construction activities for the proposed development in addition to the approved cumulative schemes would contribute to additional visual disturbance that would be seen above the existing development along the southern bank of the river. The addition of the demolition and construction activities for the proposed development would extend the amount of view that demolition and construction works are visible in and the amount of skyline that they occupy, causing a Medium magnitude of impact. This would result in Moderate Adverse cumulative effect. The proposed development would appear against the skyline above the existing built form on the southern bank of the Thames, where it would constitute an increase in tall buildings seen against the skyline in views towards the centre of Reading, causing a Very Small magnitude of impact. The proposed development in addition to the approved cumulative schemes of Former BMW site, and Station Hill, would occupy a wide section of the view, while the proposed development would screen views of the approved project at 29 Station Road. The variety of heights and the consolidation of views towards the centre of an urban area where improvements to the legibility of the urban centre would cause a Small magnitude of impact that would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve)											
12	View north-east from Great Knollys Street	This viewpoint position is located on Great Knollys Street, approximately 460m to the south-west of the application site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 29) within the RSAF. As the receptors at this location will comprise people travelling along a busy road and people at their place of work, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Low.	Fixed and Transient	Filtered/ restricted	Partial	Limited	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would appear in addition to the demolition and construction activities for the approved cumulative schemes of Former BMW site, 29 Station Road, and Station Hill, in views north-east, should the demolition and construction stages overlap. The demolition and construction activities for the proposed development in addition to the approved cumulative schemes would contribute to additional visual disturbance that would be seen above the existing development and clutter that occupies the foreground of views. The addition of the demolition and construction activities for the proposed development would extend the amount of view that demolition and construction works are visible in and the amount of skyline that they occupy, causing a Very Small magnitude of impact. This would result in Negligible Adverse cumulative effect. The proposed development would appear against the skyline above the low quality built form and clutter that occupies the foreground in views to the north-east, where it would constitute an increase in tall buildings seen against the skyline in views towards the centre of Reading. The proposed development in addition to the approved cumulative schemes of Former BMW site, 29 Station Road, and Station Hill, would occupy a wide section of the view, causing a Ver Small magnitude of impact. The variety of heights and the consolidation of views towards the centre of an urban area where improvements to the legibility of the urban centre would cause a Small magnitude of impact that would result in a Negligible Beneficial cumulative effect.
14	View west from Kings Meadow	The viewpoint location in Kings Meadow, approximately 560m to the east of the application site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 49) within the RSAF. As the receptors at this location comprise visitors to the public open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be High.	Transient	Filtered/ restricted	Glimpse	Limited	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views to the west from Kings Meadow, in addition to the demolition and construction works for the approved cumulative schemes at the Former BMW site, and Station Hill should the demolition and construction stages overlap. The demolition and construction works for the proposed development would slightly extend the amount of view that demolition and construction works are seen in where they appear alongside the activities for the approved cumulative schemes and cause a Very Small magnitude of impact, resulting in a Negligible Adverse cumulative effect. The proposed development would be partially visible in addition to the approved cumulative schemes of the Former BMW site, and Station Hill, where it would extend the amount of view occupied by tall buildings. The proposed development would combine with other approved cumulative schemes where improvements to the legibility of the urban centre would cause a Small magnitude of impact that would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve)											
16	View south from Balmore Park	This viewpoint position is located within Balmore park approximately 1.2km to the north of the application site. The view obtained is considered to be of medium value as it is designated as a longer distance key view (view 14) within the RTBS (views from Balmore Park are also designated as a longer distance view (view 5) within the RSAF. As the receptors at this location visitors to Balmore Park in the pursuit of outdoor recreation, their susceptibility to tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be High.	Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views to the south from Balmore Park, in addition to the demolition and construction works for the approved cumulative schemes at Former BMW site, Station Hill, and 29 Station Road, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would slightly extend the amount of view that demolition and construction works are seen in where they appear alongside the activities for the approved cumulative schemes in views towards the urban area, causing a Small magnitude of impact. This would result in a Minor Adverse cumulative effect. The proposed development would appear in front of the approved cumulative schemes of Station Hill and 29 Station Road, as well as alongside the approved project of Former BMW site where it would increase the mass of development visible and cause a Very Small magnitude of impact. The addition of the proposed development to the approved cumulative schemes in views towards the urban centre of Reading would add to the variety in heights and architectural form visible in the centre of Reading where it would not only mark the urban centre in views but would also add to landmark buildings visible by virtue of its scale and height, causing a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial cumulative effect.
17	View north from Mount Pleasant/ Southampton Street	The viewpoint position is located at junction of Mount Pleasant and Southampton Street, approximately 1.6km to the south of the application site. The view obtained is considered to be of medium value as it is designated as a longer distance view (view 12) within the RSAF. As the receptors at this location will comprise people travelling along the busy Mount Pleasant and Southampton Street, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Low.	Transient and Fixed	Filtered/ restricted	Glimpse	Partial	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views to the north from Mount Pleasant, in addition to the demolition and construction works for the approved cumulative schemes at Station Hill, and 29 Station Road, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would slightly extend the amount of view that demolition and construction works are seen in where they appear alongside the activities for the approved cumulative schemes in views towards the urban area and cause a Small magnitude of impact, resulting in a Minor Adverse cumulative effect. The proposed development would appear in addition to the approved cumulative schemes of Station Hill and 29 Station Road. The addition of the proposed development to the approved cumulative schemes in views towards the urban centre of Reading would increase the mass of buildings visible, causing a Very Small magnitude of impact. The addition of the proposed development would add to the variety in heights and l form visible in the centre of Reading where it would not only mark the urban centre in views but would also add to landmark buildings visible, causing a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve)											
22	View west from London Road, Shepherds Hill	This viewpoint is located on London Road, approximately 3.3km to the east of the application site. The foreground and middle ground of the view comprise the busy London Road and adjacent predominantly 2 storey residential dwellings. The view obtained is considered to be of medium value as it is designated as a longer distance view (view 11) within the RSAF. As the receptors at this location will comprise people travelling along the busy London Road on approach to central Reading, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Low.	Transient and Fixed	Filtered/ restricted	Glimpse	Limited	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views to the west from London Road, in addition to the demolition and construction works for the approved cumulative schemes at Former BMW site, Station Hill, and 29 Station Road, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would slightly extend the amount of view that demolition and construction works are seen in where they appear alongside the activities for the approved cumulative schemes in views towards the urban area where it would cause a Very Small magnitude of impact, resulting in a Negligible Adverse cumulative effect. The very top of the proposed development would appear in addition to the very tops of the approved cumulative schemes of Former BMW site, Station Hill and 29 Station Road. The addition of the top of the proposed development to the tops of the approved cumulative schemes in views towards the urban centre of Reading would add to mass of buildings visible and cause a Very Small magnitude of impact. The proposed development would increase the variety in heights and built form visible in the centre of Reading where it would not only mark the urban centre in views but would also add to landmark buildings visible, causing a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial cumulative effect.
23	View south-west from Dunsden Way	This viewpoint is located on Dunsden Way in Dunsden Green, approximately 3.7km to the north-east of the application site. The value of the view obtained from this location is considered to be low as it is not designated and has minimal or no cultural associations. As the receptors at this location will comprise transient receptors on the country lane that is lined on both sides by hedgerow vegetation, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Transient and Fixed	Filtered/ restricted	Glimpse	Limited	Very Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views to the south-west from Dunsden Way, in addition to the demolition and construction works for the approved cumulative schemes at Former BMW site, Station Hill, 29 Station Road, and Kenavon Drive, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would slightly extend the amount of view that demolition and construction works are seen above vegetation on intervening land where they appear in addition the activities for the approved cumulative schemes in views towards the urban area where it would cause a Very Small magnitude of impact, resulting in a Negligible Adverse cumulative effect. The very top of the proposed development would appear in addition to the very tops of the approved cumulative schemes of Former BMW site, Station Hill, 29 Station Road, and Kenavon Drive. The addition of the top of the proposed development to the tops of the approved cumulative schemes in views towards the urban centre of Reading would increase the mass of buildings visible, causing a Very Small magnitude of impact. The proposed development would add to the variety in heights and form visible in the centre of Reading where it would not only mark the urban centre in views but would also add to landmark buildings visible, causing a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[i]	Nature[ii]	Intrusion [iii]	Proportion[iv]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve)											
25	View north from Station Square	This viewpoint is located at the Station Hill, approximately 230m to the south of the application site. The view obtained is considered to be of medium value as although it is not designated within the RSAF, it has cultural associations due to views of the listed station building. As the receptors at this location will comprise people who are passing through the townscape along a main route, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Fixed and Transient	Filtered/ restricted	Partial	Partial	None	Neutral	None	Neutral	The temporary demolition and construction stage of the proposed development would be seen in the backdrop against the skyline above the Main Building of Reading General Station (Grade II Listed) in views where any demolition and construction activities for approved schemes would be screened from view, should they coincide. The demolition and construction stage of the proposed development would cause a magnitude of impact of None, resulting in a Neutral cumulative effect. The proposed development would not be seen in addition to any approved cumulative schemes and so would cause a cumulative magnitude of impact of None, resulting in a Neutral cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
03	View north from Station Square North	The viewpoint position is located at Station Square North, approximately 25m to the south of the application site. The view obtained is considered to be of medium value as it is noted as a new view (view 62) within the RSAF. The receptors at this location will comprise people arriving at Reading Station, whose attention will be partially focussed on the surrounding townscape, meaning their susceptibility to tall building development is considered to be medium. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Fixed	Open	Full	Most	None	Neutral	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would largely occupy the foreground of views available from the northern station entrance. The demolition and construction stage of the proposed development would be seen at close range and would partially prevent views further north towards development on the Former Scottish and Southern Energy site where any demolition and construction occurring at the same time would occupy views between the foreground demolition and construction activities. These demolition and construction works would occupy the entirety of views to the north where they would replace views of the poor quality built form that exhibits little architectural merit. As such, the temporary demolition and construction stage of the proposed development would cause a magnitude of impact of None, resulting in a Neutral cumulative effect The proposed development in addition to development on the Former Scottish and Southern Energy site, would introduce a large mass of built form into the close range views that would occupy the entirety of views to the north in the same way that the existing built form does, causing a Very Small magnitude of impact. The addition of the proposed development to views north would increase the length of the views north as they would be channelled along the gap between development blocks. The proposed development in addition to reasonably foreseeable scheme at the Former Scottish and Southern Energy site, would add to the level of visual amenity experienced due to the combination variety in massing and heights, improvements to the legibility of the public realm and the way in which views would be re-focused by the variety of built forms, causing a Small magnitude of impact upon. The proposed development in addition to development on the Former Scottish and Southern Energy site, would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
04	View south-east from Caversham Road	The viewpoint position is located on Caversham Road (A4155), approximately 100m to the north-west of the application site. The value of the view obtained from this location is considered to be medium as it is designated as a shorter distance view (view 39) within the RSAF. As the receptors at this location would comprise people travelling along a busy urban road, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Low.	Fixed and Transient	Filtered	Partial	Most	Medium	Minor Adverse	Medium	Negligible Beneficial	The temporary demolition and construction stage of the proposed development occupy views towards the centre of Reading where it would be seen in addition to the demolition and construction activities for the approved cumulative schemes of 29 Station Road, Former BMW site, and Station Hill, as well as the reasonably foreseeable cumulative schemes of Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site. The proposed development would increase the amount and scale of demolition and construction activities visible along Caversham Road, causing a Medium magnitude of impact. This would result in a Minor Adverse effect. The proposed development in addition to the approved cumulative schemes on the Former BMW site, Station Hill and 29 Station Road, as well as the reasonably foreseeable cumulative schemes of Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site would increase the amount of view occupied by tall buildings but would prevent views towards the approved cumulative schemes at 29 Station Road, and Station Hill as well as screening all but the top of the reasonably foreseeable scheme at Network Rail Thames Valley site office/Former Royal Mail site, causing a Very Small magnitude of impact. The built form of the approved project at the Former BMW site, and the reasonably foreseeable scheme at the Former Scottish and Southern Energy site, would largely screened from view by foreground vegetation. The proposed development in addition to other approved cumulative schemes and reasonably foreseeable cumulative schemes would improve views towards the centre of Reading through variety in massing and heights and improvements to the legibility of public realm that would cause a Medium magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
05	View south from the Thames Path/De Montfort Road	The viewpoint position is located on the Thames Path at its junction with De Montfort Road, approximately 190m to the north of the application site. The view obtained is considered to be of high value as it is designated as a shorter distance view (view 44) within the RSAF. As the receptors at this location will include people using the Thames Path or people at their place of residence, their susceptibility to tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be High.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would largely occupy views south along the residential street where any demolition and construction activities for approved schemes would be screened from view, but the demolition and construction activities would been seen in addition to those taking place for the reasonably foreseeable scheme on the Network Rail Thames Valley site office/Former Royal Mail site, should the demolition and construction stages coincide. The demolition and construction works for the proposed development would occupy the same section of views as those for the reasonably foreseeable scheme and would cause a Small magnitude of impact, resulting in a Negligible Adverse cumulative effect The proposed development would be seen in addition to the reasonably foreseeable scheme at the Network Rail Thames Valley site office/Former Royal Mail site, where it would occupy the same section of views along the residential street, and the same section of the skyline in views towards the centre of Reading, causing a Very Small magnitude of impact. The proposed development in addition to the reasonably foreseeable cumulative schemes contribute to the variety in massing and heights as well as improvements to the public realm of views towards the urban centre where it would cause a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
07	View east from Swansea Road/North field Road	The viewpoint position is located at the junction of Swansea Road and Northfield Road, approximately 150m to the east of the application site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 38) within the RSAF. As the receptors at this location will include people at their place of residence, their susceptibility to tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be High.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Medium	Moderate Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views east from the residential street in addition to the demolition and construction works for the approved project at the Former BMW site, and Station Hill, as well as the reasonably foreseeable scheme at the Network Rail Thames Valley site office/Former Royal Mail site, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would increase the amount of views that demolition and construction operations at Network Rail Thames Valley site office/Former Royal Mail site occupy, as well as extending the amount of view that demolition and construction works are seen in alongside the activities at Station Hill. Demolition and construction works on the application site in addition to the demolition and construction works at the Former BMW site, Station Hill, and Network Rail Thames Valley site office/Former Royal Mail site, would extend demolition and construction activities across a wider amount of views, causing a Medium magnitude of impact. This would result in a Moderate Adverse cumulative effect. The proposed development in addition to the approved project of Station Hill and the reasonably foreseeable scheme of Network Rail Thames Valley site office/Former Royal Mail site, would extend the amount of view occupied by tall buildings which would cause a Very Small magnitude of impact. The proposed development would combine with other approved cumulative schemes and reasonably foreseeable cumulative schemes the deliver variety in massing and heights as well as improvements to legibility of the public realm, marking the location of the railway station and the urban centre of Reading which would cause a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would result in a Negligible Beneficial cumulative effect.
08	View west from Reading Bridge	This viewpoint is located Reading Bridge, approximately 250m to the east of the application site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 46 and 47) within the RSAF. As the receptors at this location will include people travelling along George Street towards central Reading, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would be partially visible above the existing development that lines the southern banks of the River Thames where it would extend the amount of view that is occupied by demolition and construction activities for the reasonably foreseeable scheme at the Former Scottish and Southern Energy site, should they coincide. The demolition and construction stage of the proposed development in addition to the reasonably foreseeable scheme would cause a Small magnitude of impact, resulting in a Minor Adverse cumulative effect. The proposed development in addition to development on the Former Scottish and Southern Energy site, would extend the amount of built form that is visible above existing development along the southern banks of the Thames, causing a Very Small magnitude of impact. The proposed development in addition to reasonably foreseeable scheme at the Former Scottish and Southern Energy site, would increase visual interest in views along the Thames where the it would mark the northern station entrance and connection between the station and the Thames corridor, causing a Small magnitude of impact. This would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
09	View south-west from Christchurch Meadows	The viewpoint position is located on a pedestrian/cycle route within Christchurch Meadows, approximately 380m to the north-east of the application site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 43) within the RSAF. As the receptors at this location comprise visitors to the public open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be High.	Transient	Filtered/ restricted	Partial	Partial	Small	Negligible Adverse	Small	Negligible beneficial	The temporary demolition and construction stage of the proposed development would appear in addition to the demolition and construction activities for the approved cumulative schemes at 29 Station Road, and Station Hill, as well as the reasonably foreseeable cumulative schemes at Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would occupy the same section of views as demolition and construction works for Station Hill, Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site. The proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would constitute a very slight extension of the amount of view that demolition and construction works occupy which would cause a Small magnitude of impact. This would result in a Negligible Adverse cumulative effect. The proposed development would be seen in addition to the approved cumulative schemes of 29 Station Road, and Station Hill, as well as the reasonably foreseeable cumulative schemes of the Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site where it would increase the mass of built form visible and cause a Very Small magnitude of impact. Where the proposed development is visible in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes as well as existing built form, it would provide visual interest in views to the south-west as well as legibility to the townscape, causing a Small magnitude of impact. The addition of the proposed development to views would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
10	View north from Station Road	This viewpoint is located on Station Road, approximately 340m to the south of the application site. Station Road extends into the background of the view, perpendicular to the viewer. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 58) within the RSAF and has cultural associations due to views of the listed station building. As the receptors at this location will comprise people who are passing through the townscape along a main route, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Small	Negligible Adverse	Small	Negligible Adverse	The temporary demolition and construction stage of the proposed development would appear in addition to the demolition and construction activities for the approved project at 29 Station Road, and the reasonably foreseeable scheme at Former Scottish and Southern Energy site should the demolition and construction stages overlap. The proposed development would contribute to an additional level of visual disturbance along Station Road, where it would slightly extend the amount of views occupied by demolition and construction activities which would cause a Small magnitude of effect. This would result in a Negligible Adverse cumulative effect. The proposed development would be seen in addition to the approved project of 29 Station Road, where it would occupy the same section of views but would extend the amount of view that tall buildings are visible against the skyline and reduce the prominence of the Main Building of Reading Station (Grade II Listed) where it would cause a Very Small magnitude of impact. The proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would increase variety in massing and heights that would complement the approved project of 29 Station Road. The proposed development, seen in addition to the approved project of 29 Station Road, would cause a Small magnitude of impact that would result in a Negligible Adverse cumulative effect as it would appear below the existing skyline in views offering an improvement in architectural forms but altering the composition of the station building.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
11	View south-east from Christchurch Meadows	This viewpoint is located on the towpath along the River Thames, adjacent to the War Memorial within Christchurch Meadows, approximately 425m to the north-west of the application site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 41) within the RSAF. As the receptors at this location comprise visitors to the public open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to the tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Medium	Moderate Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would appear in addition to the demolition and construction activities for the approved cumulative schemes at 29 Station Road, and Station Hill, as well as the reasonably foreseeable cumulative schemes at Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would occupy the same section of views as demolition and construction works for Station Hill, Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site. The proposed development in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes would constitute a very slight extension of the amount of view that demolition and construction works occupy which would cause a Medium magnitude of impact. This would result in a Moderate Adverse cumulative effect. The proposed development would be seen in addition to the approved cumulative schemes of 29 Station Road, and Station Hill, as well as the reasonably foreseeable cumulative schemes of the Former Scottish and Southern Energy site, and Network Rail Thames Valley site office/Former Royal Mail site where it would increase the mass of buildings in the view and cause a Very Small magnitude of impact. Where the proposed development is visible in addition to the approved cumulative schemes and reasonably foreseeable cumulative schemes as well as existing built form, it would provide visual interest in views to the south-west as well as increase legibility of the urban realm. The addition of the proposed development to views would cause a Small magnitude of impact that would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
12	View north-east from Great Knollys Street	This viewpoint position is located on Great Knollys Street, approximately 460m to the south-west of the application site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 29) within the RSAF. As the receptors at this location will comprise people travelling along a busy road and people at their place of work, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Low.	Fixed and Transient	Filtered/ restricted	Partial	Limited	Small	Negligible Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development would appear in addition to the demolition and construction activities for the approved cumulative schemes of Former BMW site, 29 Station Road, and Station Hill, in views north-east, should the demolition and construction stages overlap. The demolition and construction activities for the proposed development in addition to the reasonably foreseeable scheme of Network Rail Thames Valley site office/Former Royal Mail site would occupy the same section of the view where it would contribute to additional visual disturbance above the existing clutter that occupies the foreground of views. The addition of the demolition and construction activities for the proposed development would extend the amount of view that demolition and construction works are visible in and the amount of skyline that they occupy, causing a Small magnitude of impact. This would result in Negligible Adverse cumulative effect. The proposed development would appear against the skyline above the low quality built form and clutter that occupies the foreground in views to the north-east, where it would constitute an increase in tall buildings seen against the skyline in views towards the centre of Reading and cause a Very Small magnitude of impact. The proposed development would be partially screened by the reasonably foreseeable scheme of Network Rail Thames Valley site office/Former Royal Mail site, where it would combine with the approved cumulative schemes of Former BMW site, 29 Station Road, and Station Hill, offering a variety of heights and the consolidation of views towards the centre of an urban area where it would cause a Small magnitude of impact. This would result in a Negligible Beneficial cumulative effect.
14	View west from Kings Meadow	The viewpoint location in Kings Meadow, approximately 560m to the east of the application site. The view obtained is considered to be of medium value as it is designated as a shorter distance view (view 49) within the RSAF. As the receptors at this location comprise visitors to the public open space in the pursuit of outdoor recreation with their focus on their surroundings, their susceptibility to tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be High.	Transient	Filtered/ restricted	Glimpse	Limited	Very Small	Negligible Adverse	Very Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views to the west from Kings Meadow, in addition to the demolition and construction works for the approved cumulative schemes at the Former BMW site, and Station Hill should the demolition and construction stages overlap. The demolition and construction works for the proposed development would slightly extend the amount of view that demolition and construction works are seen in where they appear alongside the activities for the approved cumulative schemes, causing a Very Small magnitude of impact. This would result in a Negligible Adverse cumulative effect. The proposed development would be partially visible in addition to the approved cumulative schemes of the Former BMW site, and Station Hill, where it would extend the amount of view occupied by tall buildings and cause a Very Small magnitude of impact. The proposed development would combine with other approved cumulative schemes to form variety in massing and heights that would increase the legibility of the urban ream and cause a Small magnitude of impact. As such, the proposed development in addition to the approved cumulative schemes would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
16	View south from Balmore Park	This viewpoint position is located within Balmore park approximately 1.2km to the north of the application site. The view obtained is considered to be of medium value as it is designated as a longer distance key view (view 14) within the RTBS (views from Balmore Park are also designated as a longer distance view (view 5) within the RSAF. As the receptors at this location visitors to Balmore Park in the pursuit of outdoor recreation, their susceptibility to tall building development is considered to be high. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be High.	Transient	Filtered/ restricted	Partial	Partial	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views to the south from Balmore Park, where it would appear in the same section of views as the demolition and construction works for the approved cumulative schemes at Former BMW site, Station Hill, and 29 Station Road, as well as the reasonably foreseeable scheme of Network Rail Thames Valley site office/Former Royal Mail site, and Broad Street Mall, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would slightly extend the amount of view that demolition and construction works are seen in where they appear alongside the activities for the approved cumulative schemes and reasonably foreseeable cumulative schemes in views towards the urban area which would cause a Small magnitude of impact. This would result in a Minor Adverse cumulative effect. The proposed development would appear in front of the approved cumulative schemes and reasonably foreseeable cumulative schemes of Station Hill, 29 Station Road, and Network Rail Thames Valley site office/Former Royal Mail site, as well as alongside the approved cumulative schemes of Former BMW site, Broad Street Mall and Former Scottish and Southern Electricity Site where it would increase the mass of built form visible and cause a Very Small magnitude of impact. The addition of the proposed development to the approved cumulative schemes and reasonably foreseeable cumulative schemes in views towards the urban centre of Reading would add to the variety in heights and visible in the centre of Reading where it would not only mark the urban centre in views but would also add to landmark buildings visible by virtue of its height and scale where it would cause a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial cumulative effect.

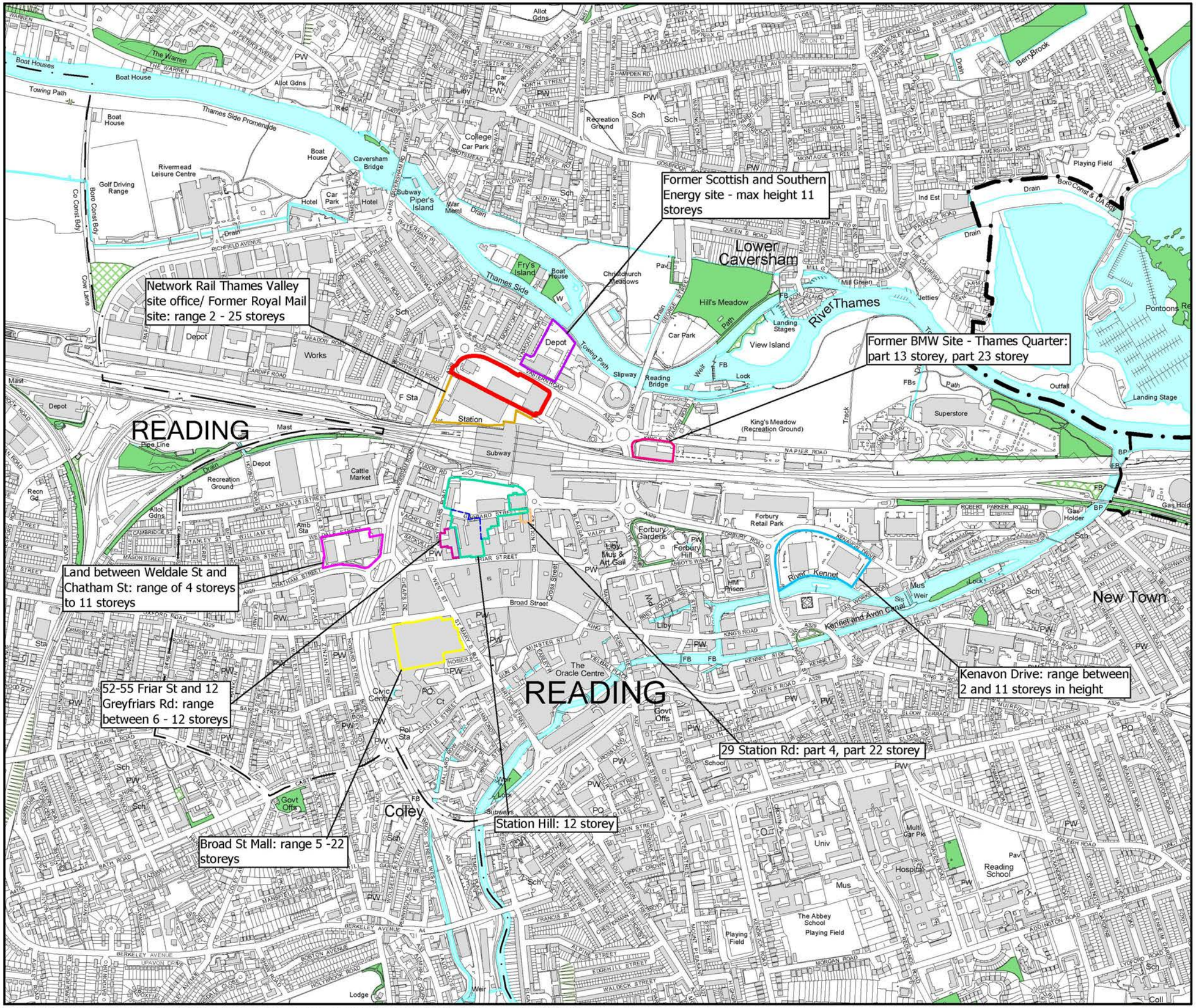
Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
17	View north from Mount Pleasant/ Southampton Street	The viewpoint position is located at junction of Mount Pleasant and Southampton Street, approximately 1.6km to the south of the application site. The view obtained is considered to be of medium value as it is designated as a longer distance view (view 12) within the RSAF. As the receptors at this location will comprise people travelling along the busy Mount Pleasant and Southampton Street, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Low.	Transient and Fixed	Filtered/ restricted	Glimpse	Partial	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views to the north from Mount Pleasant, in addition to the demolition and construction works for the approved cumulative schemes at Station Hill, 29 Station Road, and the reasonably foreseeable cumulative schemes of Network Rail Thames Valley site office/Former Royal Mail site and Broad Street Mall, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would extend the amount of view that demolition and construction works are seen in where they appear alongside the activities for the approved cumulative schemes and reasonably foreseeable cumulative schemes in views towards the urban area, causing a Small magnitude of impact. This would result in a Minor Adverse cumulative effect. The proposed development would appear in addition to the approved cumulative schemes of Station Hill and 29 Station Road, as well as the reasonably foreseeable cumulative schemes of Network Rail Thames Valley site office/Former Royal Mail site, and Broad Street Mall. Where it would contribute to the increase in mass of built form visible, causing a Very Small magnitude of impact. The addition of the proposed development to the approved cumulative schemes and reasonably foreseeable cumulative schemes in views towards the urban centre of Reading would add to the variety in heights and form visible, where it would not only mark the urban centre in views but would also add to landmark buildings visible by virtue of its height and scale where it would cause a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
22	View west from London Road, Shepherds Hill	This viewpoint is located on London Road, approximately 3.3km to the east of the application site. The foreground and middle ground of the view comprise the busy London Road and adjacent predominantly 2 storey residential dwellings. The view obtained is considered to be of medium value as it is designated as a longer distance view (view 11) within the RSAF. As the receptors at this location will comprise people travelling along the busy London Road on approach to central Reading, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Low.	Transient and Fixed	Filtered/ restricted	Glimpse	Limited	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views to the west from London Road, in addition to the demolition and construction works for the approved cumulative schemes at Former BMW site, Station Hill, and 29 Station Road, as well as the reasonably foreseeable cumulative schemes of Broad Street Mall, Network Rail Thames Valley site office/Former Royal Mail site, and the Former Scottish and Southern Energy Site, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would slightly extend the amount of view that demolition and construction works are seen in but would appear in the same section of views as Network Rail Thames Valley site office/Former Royal Mail site. Demolition and construction works for the proposed development in addition to demolition and construction work for the approved cumulative schemes and reasonably foreseeable cumulative schemes would cause a Small magnitude of impact. This would result in a Minor Adverse cumulative effect. The very top of the proposed development would appear in addition to the very tops of the approved cumulative schemes of Former BMW site, Station Hill and 29 Station Road, as well as the reasonably foreseeable cumulative schemes of Broad Street Mall, Network Rail Thames Valley site office/Former Royal Mail site, and the Former Scottish and Southern Energy Site where it would contribute to the increase in mass of buildings visible and cause a Very Small magnitude of impact. The addition of the top of the proposed development to the tops of the approved cumulative schemes and reasonably foreseeable cumulative schemes in views towards the urban centre of Reading would add to the variety in heights and architectural form where it would not only mark the urban centre in views but would also constitute a landmark building by virtue of its height and scale which would cause a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial cumulative effect.

Cumulative Wireline				Cumulative Visual Effects							
Ref	Name	Sensitivity to Cumulative Development	Type[v]	Nature[vi]	Intrusion [vii]	Proportion [viii]	Demolition and construction Stage		Operational Stage		Notes
							Magnitude of Impact	Significance of Effect	Magnitude of Impact	Significance of Effect	
Approved cumulative schemes (including Resolution to Approve) and Reasonably foreseeable cumulative schemes											
23	View south-west from Dunsden Way	This viewpoint is located on Dunsden Way in Dunsden Green, approximately 3.7km to the north-east of the application site. The value of the view obtained from this location is considered to be low as it is not designated and has minimal or no cultural associations. As the receptors at this location will comprise transient receptors on the country lane that is lined on both sides by hedgerow vegetation, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Transient and Fixed	Filtered/ restricted	Glimpse	Limited	Small	Minor Adverse	Small	Negligible Beneficial	The temporary demolition and construction stage of the proposed development may appear in views to the south-west from Dunsden Way, in addition to the demolition and construction works for the approved cumulative schemes at Former BMW site, Station Hill, 29 Station Road, and Kenavon Drive, as well as the reasonably foreseeable cumulative schemes of Broad Street Mall, and Network Rail Thames Valley site office/Former Royal Mail site, should the demolition and construction stages overlap. The demolition and construction works for the proposed development would occupy the same part of views as the Station Hill and Network Rail Thames Valley site office/Former Royal Mail site developments where they are seen above vegetation on intervening land in views towards the urban area which would cause a Small magnitude of impact, resulting in a Minor Adverse cumulative effect. The very top of the proposed development would appear in the same section of views as the Station Hill and Network Rail Thames Valley site office/Former Royal Mail site developments where it would add to the mass of buildings visible. The addition of the top of the proposed development to the tops of the approved cumulative schemes and reasonably foreseeable cumulative schemes in views towards the urban centre of Reading would add to the variety in heights and form visible where it would not only mark the urban centre in views but would also add to landmark buildings visible by virtue of its height and scale, causing a Small magnitude of impact. As such, the proposed development would result in a Negligible Beneficial cumulative effect.
25	View north from Station Square	This viewpoint is located at the Station Hill, approximately 230m to the south of the application site. The view obtained is considered to be of medium value as although it is not designated within the RSAF, it has cultural associations due to views of the listed station building. As the receptors at this location will comprise people who are passing through the townscape along a main route, their susceptibility to tall building development is considered to be low. On the basis of the above the sensitivity of receptors to cumulative development at this location is considered to be Medium.	Fixed and Transient	Filtered/ restricted	Partial	Partial	Medium	Moderate Adverse	Medium	Moderate Adverse	The temporary demolition and construction stage of the proposed development would be seen in the backdrop against the skyline above the Main Building of Reading General Station (Grade II Listed) in addition to the demolition and construction activities for Network Rail Thames Valley site office/Former Royal Mail site, should they coincide. The demolition and construction stage of the proposed development would extend the amount of view demolition and construction activities are visible in behind the historic station building where it would cause a Medium magnitude of impact. This would result in a Moderate Adverse cumulative effect. The proposed development would be seen in addition to the reasonably foreseeable scheme of Network Rail Thames Valley site office/Former Royal Mail site, where it would occupy the same section of views but would extend the amount of view that tall buildings are visible against the skyline and reduce the prominence of the Main Building of Reading Station (Grade II Listed) causing a Medium magnitude of impact. However, the proposed development in addition to the Network Rail Thames Valley site office/Former Royal Mail site would introduce built form with variety in massing and heights. This would result in a Moderate Adverse cumulative effect as it would alter the composition of the station building in close range views.

[i] Type of receptor: Fixed, Transient

[ii] Nature of the view of the Development: Open, Filtered/restricted, None
[iii] Degree of visual intrusion of the Development (extent of the view occupied by the Development): Full, Partial, Glimpse, None
[iv] Proportion of the Development visible: Full, Most, Partial, Limited, None
[v] Type of receptor: Fixed, Transient
[vi] Nature of the view of the Development: Open, Filtered/restricted, None
[vii] Degree of visual intrusion of the Development (extent of the view occupied by the Development): Full, Partial, Glimpse, None
[viii] Proportion of the Development visible: Full, Most, Partial, Limited, None



The scaling of this drawing cannot be assured

Revision	Date	Drn	Ckd
-	-	-	-

N

LEGEND

- Site Boundary
- 29 Station Road - 121m
- 52-55 Friar Street & 12 Greyfiars - 84.92m
- Broad Street Mall - 125.89m
- Former BMW Site - 112.23m
- Former Scottish and Southern Energy Site - 71.36m
- Kenavon Drive - 72.98m
- Land Between Weldale St and Chatham Street - 78.57m
- Network Rail Thames Valley site - 123.18m
- Station Hill - 128m

TVIA FIGURE 6

Project
Reading Station Park

Drawing Title
Cumulative Schemes

Date	Scale	Drawn by	Check by
10.01.2020	1:10,000 @A3	LH	RG

Project No	Drawing No	Revision
17127	RG-LP-09	-

0 100 200 300 400 500m

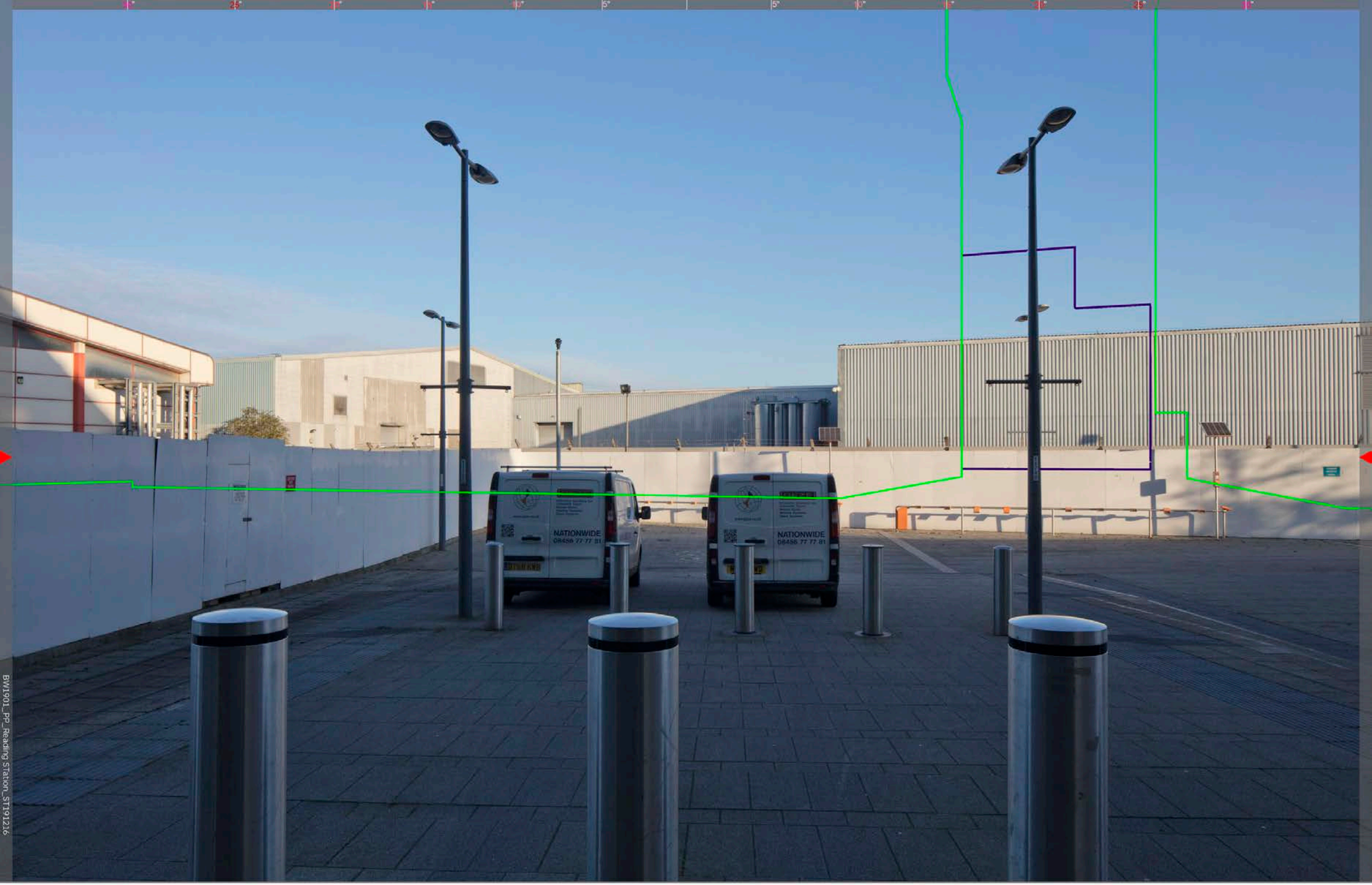
BARTON WILLMORE

Planning • Master Planning & Urban Design • Architecture • Landscape Planning & Design • Environmental Planning • Graphic Communication • Public Engagement • Development Economics

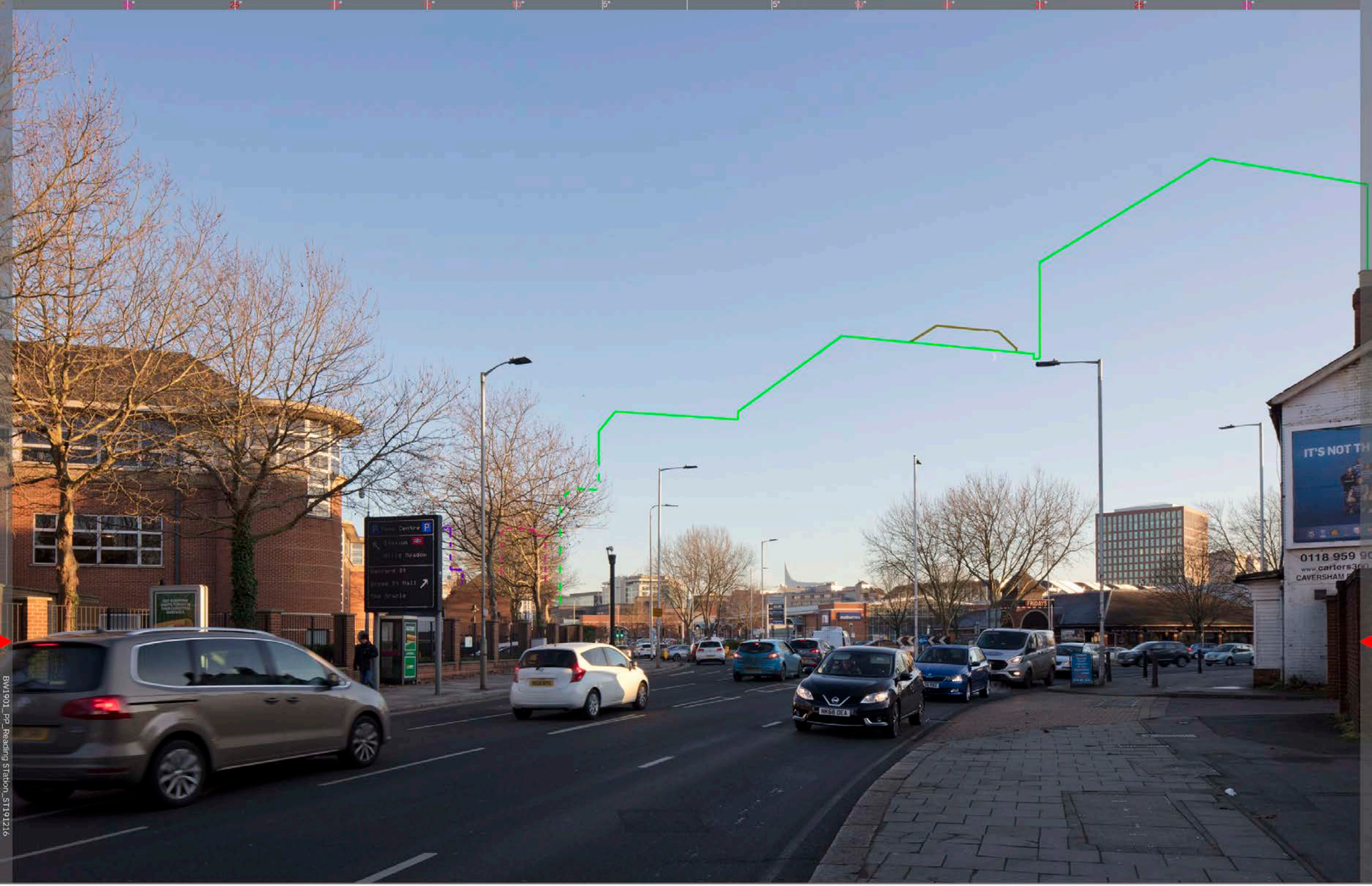
bartonwillmore.co.uk

Offices at Birmingham Bristol Cambridge Cardiff Ebbsfleet Edinburgh Glasgow Leeds London Manchester Newcastle Reading Southampton

Reproduced from the Ordnance Survey Map with the permission of the Controller of HMSO. Crown Copyright Reserved. Licence No 100019279.



BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading Station_ST191216

© AVR LONDON

1.6 m above ground 14:58 02 December 2019



BW1901_PP_Reading Station_ST191216

© AVR LONDON

1.6 m above ground 08:42 02 December 2019



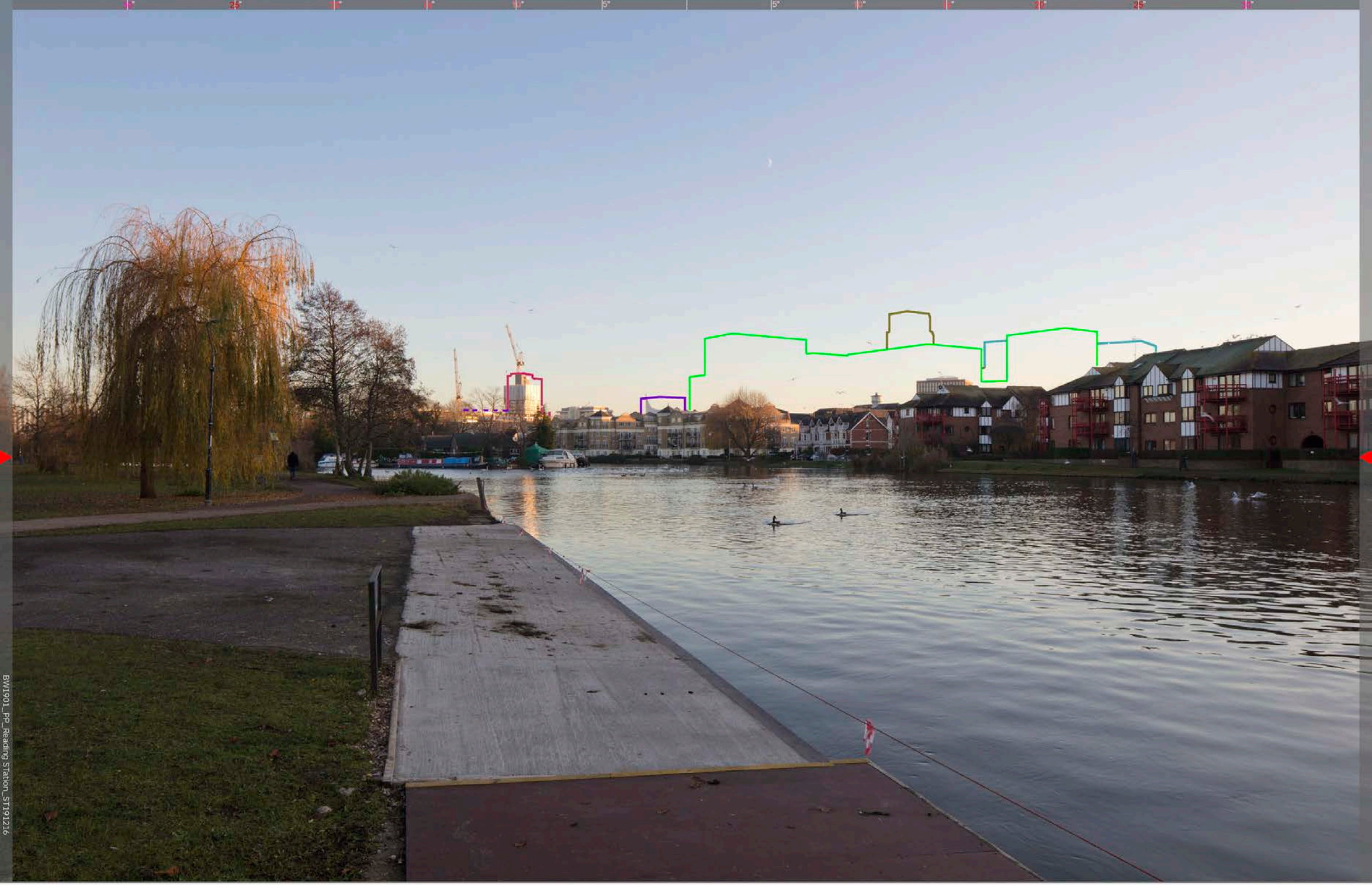
© AVR LONDON

1.6 m above ground 08:28 02 December 2019

BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading STation_ST191216



BW1901_PP_Reading Station_ST191216



© AVR LONDON

1.6 m above ground 13:21 02 December 2019

BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading Station_ST191216



BW1901_PP_Reading STation_ST191216

© AVR LONDON

1.6 m above ground 15:54 02 December 2019



BW1901_PP_Reading STation_ST191216

© AVR LONDON

1.6 m above ground 11:27 02 December 2019



BW1901_PP_Reading Station_ST191216

© AVR LONDON

1.6 m above ground 12:29 02 December 2019



BW1901_PP_Reading STation_ST191216

© AVR LONDON

1.6 m above ground 10:24 02 December 2019



BW1901_PP_Reading Station_ST191216

© AVR LONDON

1.6 m above ground 09:34 02 December 2019

Appendix 1.6: Verified View Methodology

AVR LONDON VERIFIED VIEW METHODOLOGY

Project: **Reading Station Shopping Park**
Date: **January 2020**

AVR London was commissioned by Barton Willmore to produce a number of verified views of the proposals for Reading Station Shopping Park. The AVR positions were identified by Barton Willmore.

2D plans, Ordnance Survey Mapping, local survey data, and the 3D model for the proposed development were provided by Collado Collins Architects.

1. Photography

Equipment
Canon 5DS
Canon TS-E 24mm f/3.5L II

1.1 All photography is undertaken by AVR London's in-house professional photographers.

1.2 In professional architectural photography, having the camera level with the horizon is desirable in order to prevent three point perspective being introduced to the image and to ensure the verticals within the photographed scene remain parallel. This is standard practice and more realistically reflects the viewing experience.

1.3 The lens used by the photographer has the ability to shift up or down while remaining parallel to the sensor, allowing for the horizon in the image to be above, below or central within the image whilst maintaining two point perspective. This allows the photographer to capture the top of a taller proposed development which would usually be cropped, without introducing three point perspective.

1.4 Once the view positions are confirmed by the townscape consultant, AVR London takes professional photography from each location. At each location the camera is set up over a defined ground point using a plumb line to ensure the position can be identified later.

1.5 The centre of the camera lens is positioned at a height of 1.60 metres above the ground to simulate average viewing height. For standard verified photography, each view is taken with a lens that gives a 68 degree field of view, approximately, a standard which has emerged for verified architectural photography. The nature of digital photography means that a record of the time and date of each photograph is embedded within the photo file; this metadata allows accurate lighting timings to be recreated within the computer model.

1.6 Once the image is taken, the photographer records the tripod location by photographing it in position to ensure the position can be accurately located for surveying (figure 1).

1.7 Each image is processed by the photographer to ensure it visually matches the conditions on site when the photograph is taken.

1.8 For 360 degree photography a panoramic head is used to ensure the lens is orientated around the nodal point preventing parallax distortion and an overlap of 33 - 50% is maintained between images to provide adequate control points for stitching. The camera/lens is set up in portrait orientation to provide greater vertical context.

1.9 Night time photography is taken after 'astronomical twilight', officially night, once the sun is 18 degrees below the horizon, to ensure all the images are at the same level of darkness. View positions are visited in daylight before the night photos are taken so the photographer is familiar with the locations and environment. Head torches are often used to ensure safe working. Ground positions are clearly marked by the surveyor (using pins, stakes and UV paint) in daylight before night photography commences. This ensures positions can be identified consistently in the dark by the photographers. GPS is also used if necessary. The photographs are exposed to accurately represent the lighting conditions experienced by the photographer onsite. Stitching of night time 360 degree photography is completed using proprietary stitching software which brightens each image to ensure accuracy of control points before returning it to the original exposure

Point Number	Easting	Northing	Height	Desciption	View
25	471487.304	173752.845	44.111	Camera Position	View 25
2501	471471.592	173768.695	44.243	Front top right corner of bench	View 25
2502	471480.413	173761.642	44.395	Front top right corner of bench	View 25
2503	471484.649	173757.784	44.454	Front top right corner of bench	View 25
2504	471487.175	173756.049	44.480	Front of bracket on bench	View 25
2505	471487.428	173759.424	43.922	Front right corner of cover	View 25
2506	471486.746	173763.507	43.903	Bottom centre of bollard	View 25
2507	471493.681	173766.453	43.944	Bottom centre of bollard	View 25
2508	471513.523	173806.160	54.526	Top right corner of building	View 25
2509	471499.929	173807.084	54.923	Top right corner of building frontage	View 25
2510	471479.830	173810.972	54.578	Top left corner of building	View 25
2511	471481.051	173775.395	51.002	Inside top right corner of screen	View 25
2512	471473.153	173774.043	47.002	Bottom left corner of screen	View 25
2513	471476.559	173774.491	44.152	Front top left corner of base	View 25
2514	471465.453	173791.220	45.541	Front top corner of wall	View 25
2515	471493.689	173801.189	44.926	Top left corner of "B" on wooden screening	View 25
2516	471504.149	173794.911	45.176	Top right corner of wooden screening	View 25

Table 1: Sample surveying data



Figure 1: Tripod location as documented by photographer

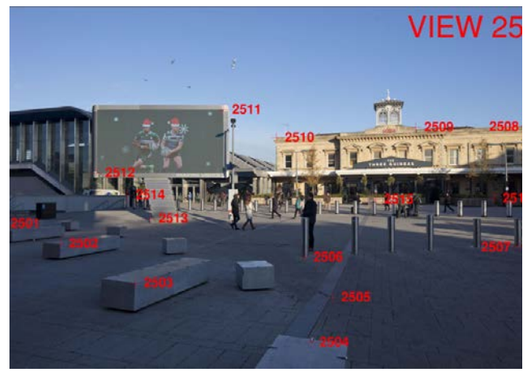


Figure 2: Survey points as highlighted by surveyor

2. Survey

Equipment

Leica Total Station Electronic Theodolite which has 1" angle measuring accuracy and 2mm + 2ppm distance accuracy.
Leica Smart Rover RTK Global Positioning System.
Wild/Leica NAK2 automatic level which a standard deviation of +/- 0.7mm/km

2.1 The photographer briefs the surveyor, sending across the prepared photographs, ground positions and appropriate data.

2.2 The surveyor establishes a line of sight, two station baseline, coordinated and levelled by real time kinetic GPS observations, usually with one of the stations being the camera location. The eastings and northings are aligned to the Ordnance Survey National Grid (OSGB36) and elevation to Ordnance Survey Datum (OSD) using the OSTN15 GPS transformation program.

2.3 Once the baseline is established, a bearing is determined and a series of clearly identifiable static points across the photograph are observed using the total station. These observations are taken throughout the depth of field of the photograph and at differing heights within the image.

2.4 The survey control stations are resected from the OS base mapping and wherever possible, linked together to form a survey network. This means that survey information is accurate to tolerances quoted by GPS survey methods in plan and commensurate with this in level.

2.5 Horizontal and vertical angle observations from the control stations allow the previously identified points within the view to be surveyed using line of sight surveying and the accurate coordination of these points determined using an intersection program. These points are then related back to the Ordnance Survey grid and provided in a spreadsheet format showing point number, easting, northing and level of each point surveyed, together with a reference file showing each marked up image (Figure 2 and Table 1).

2.6 The required horizon line within the image is established using the horizontal collimation of the theodolite (set to approximately 1.60m above the ground) to identify 3 or 4 features that fall along the horizon line.

2.7 Using the surveyed horizon points as a guide, each photograph is checked and rotated, if necessary, in proprietary digital image manipulation software to ensure that the horizon line on the photograph is level and coincident with the information received from the surveyor.



Figure 3: Example AVR London graticule

3. Accurate Visual Representation Production

Process

3.1 The 3D computer model is precisely aligned to a site plan on the OS coordinate grid system.

3.2 Within the 3D software a virtual camera is set up using the coordinates provided by the surveyor along with the previously identified points within the scene. The virtual camera is verified by matching the contextual surveyed points with matching points within the overlaid photograph. As the surveyed data points, virtual camera and 3D model all relate to the same 3-dimensional coordinate system, there is only one position, viewing direction and field of view where all these points coincide with the actual photograph from site. The virtual camera is now verified against the site photograph.

3.3 For fully-rendered views a lighting simulation (using accurate latitude, longitude and time) is established within the proprietary 3D modelling software matching that of the actual site photograph. Along with the virtual sunlight, virtual materials are applied to the 3D model to match those advised by the architects. The proprietary 3D modelling software then uses the verified virtual camera, 3D digital model, lighting and material setup to produce a computer generated render of the proposed building.

3.4 The proposal is masked where it is obscured behind built form or street furniture.

3.5 Using the surveyed information and verification process described above, the scale and position of a proposal with a scene can be objectively calculated. However, using the proprietary software currently available the exact response of proposed materials to their environment is subjective so the exact portrayal of a proposal is a collaboration between illustrator and architect. The final computer generated image of the proposed building is achieved by combining the computer-generated render and the site photography within proprietary digital compositing software.

4. Presentation

Graticule

4.1 Each Accurate Visual Representation is framed by a graticule which provides further information including time and date of photography, horizon markers and field of view of the lens (Figure 3).

4.2 The Field of View is represented along the top of the image in the form of markers with degrees written at the correct intervals.

4.3 The horizon markers indicate where the horizontal plane of view from the camera lies, this is defined as described above, by the surveyor.

4.4 The date and time stamp documents the time the photograph was taken and this information is taken directly from the EXIF data of the camera.

5. References

5.1 GLA - London View Management Framework: Supplementary Planning Guidance (2012)

5.2 Landscape Institute - Visual Representation of Development Proposals - Technical Guidance Note (September 2019)

5.3 Landscape Institute - Advice Note (January 2011) Photography and Photomontage in Landscape and Visual Impact Assessment

5.4 Landscape Institute - Guidelines for Landscape and Visual Impact Assessment: 3rd edition (April 2013)

2 BUILT HERITAGE

Introduction

2.1 This chapter of the ES reports on the likely significant effects of the proposed development on built heritage. The assessment considers direct effects on the particular significance of the built heritage assets at the application site and within the surrounding study area (including statutory listed buildings, conservation areas, registered parks and gardens and special historic interest and locally listed buildings), as well as indirect effects through change in their settings. For the purposes of this assessment, the term 'built' heritage refers to above-ground heritage assets.

2.2 The chapter provides a description of the methods used to conduct the assessment, the relevant baseline conditions of the application site, and an assessment of the potential impacts and likely effects of the proposed development with respect to built heritage associated with the demolition and construction stage and completed development/operational stage of the proposed development. Additional mitigation measures are identified, where appropriate, to avoid, reduce or offset any adverse effects identified. The nature and scale of any residual effects are also described.

2.3 This chapter is supported by Appendix 2.1: Heritage Statement.

Methodology

2.4 There is no published guidance for built heritage assessment in EIA. Accordingly, the assessment has been informed by the following legislation, policies and published guidance:

- NPPF[1];
- PPG[2];
- Planning (Listed Building and Conservation Areas) Act 1990[3];
- General Planning Advice 3 (GPA3), Historic England 2015[4];
- Historic Environment Good Practice Advice in Planning Note 2, Historic England 2015[5];
- Principles of Selection for Listing Buildings, Department for Digital, Culture, Media and Sport's[6]; and
- Reading Borough Local Plan 2019[7].

2.5 In addition, professional judgment has been applied.

Consultation

2.6 No consultations have been undertaken in addition to the formal EIA scoping process. At the time of undertaking the assessment, the EIA Scoping Opinion remains outstanding.

Assessment Scope

2.7 The assessment has been based on a series of development parameters, commitments and assumptions as described in Chapter 2: EIA Process and Methodology; Chapter 4: Proposed Development Description; and Chapter 5: Demolition and Construction Environmental Management. Due to the flexibility being sought in respect of land use classes and associated development scenarios, the built heritage assessment has been undertaken of the worst-case massing proposals, represented by Parameter Plan 105.

Technical Scope

2.8 Historic environment and planning legislation identifies the significance of heritage assets (listed buildings, conservation areas etc.) and the contribution that setting makes to that significance. Accordingly, this assessment considers both likely direct (on the assets) and indirect (on the settings and views/visual appearance of the assets) impacts and effects. Setting is not a heritage asset and not a heritage designation. Its importance lies in what it may, or may not, contribute to the significance of a heritage asset. On this basis, the receptors addressed in this assessment comprise those heritage assets within the study area, the settings of which may be affected by the proposed development.

Spatial Scope

2.9 The assessment has considered the potential for the proposed development, as a whole, to affect those elements of setting that contribute to the heritage significance of the relevant heritage assets within 500 m of the application site centre. This radius is a typical one in EIA procedures and no inference about the area of actual effect should necessarily be drawn from this dimension.

2.10 Following on from the identification of heritage assets within the study area, analysis focussed on those whose setting could be affected by the proposed development. Not all identified heritage assets within a study radius will be affected by the proposed development due to local street alignment and the height of existing buildings on these streets. Analysis of the heritage assets that could be affected was aided by the TVIA in Chapter 1 of ES Volume 2.

Temporal Scope

2.11 The assessment has considered the following scenarios:

- Existing baseline;
- Existing baseline + proposed development; and
- Existing baseline + proposed development + cumulative schemes.

Baseline Characterisation Method

Desk Study

2.12 Historic Environment Records (HER), historic mapping and archival data were used to establish the built historical development of the application site and study area. Historic England's National Designation List also provided information on nearby designated heritage assets. Information from RBC provided details on locally listed buildings and Conservation Areas.

Field Study

2.13 A site visit was undertaken in April 2019. This involved a visit of the application site and the surrounding study area. Photographs were taken of the application site and the nearby heritage assets and are included in the Technical Appendix 10.1.

[1] Secretary of State for Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework.
[2] https://www.gov.uk/government/collections/planning-practice-guidance
[3] HM Government, The Planning (Listed Buildings and Conservation Areas) Act 1990
[4] https://historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/
[5] https://historicengland.org.uk/images-books/publications/gpa2-managing-significance-in-decision-taking/
[6] DCMS, 2010, Principles of Selection for Listing Buildings
[7] Reading Borough Council, 2019. Reading Borough Local Plan. RBC.

Assessment Method

Methodology

2.14 The baseline for the assessment of built heritage effects is the existing site conditions. A description of the baseline characterisation is presented within the 'Baseline Conditions' section of this chapter and has been derived from the detailed information provided in the Heritage Statement in ES Volume 2: Technical Appendix 2.1.

2.15 Sensitive receptors for the purposes of this assessment are heritage assets as defined by the NPPF. Designated heritage assets include listed buildings, conservation areas, scheduled monuments and registered parks and gardens. Locally listed buildings are non-designated heritage assets and so do not benefit from any statutory protection.

Defining 'Heritage Significance'

2.16 The term 'significance' is defined in the NPPF as: "*the value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic*". The Historic England 'Historic Environment Good Practice Advice in Planning Note 2' provides an alternative definition as "*the sum of its architectural, historic, artistic or archaeological interest*".

2.17 The quality in a heritage asset that is affected by change is described as 'significance', referred to for clarity throughout the assessment as 'heritage significance'. This incorporates the concepts of 'special architectural and historic interest' (in relation to listed buildings and conservation areas) and 'character and appearance' in relation to conservation areas. The 'significance' of a heritage asset is a quality that may be more or less sensitive to change, depending on the specific circumstances of the asset and the nature of that change.

2.18 The heritage significance of heritage assets, both designated and non-designated, varies according to the nature and circumstances of the asset in question. A number of listed buildings at the same grade, for instance, may have greater or lesser levels of heritage significance depending on:

- the nature of their special architectural or historic interest (i.e. the reason for listing);
- the degree to which the listed building has changed since it was listed (i.e. whether physical alteration of the building since listing has preserved or enhanced its special interest); or
- the degree to which the setting of the listed building has changed since listing.

2.19 A general classification of a heritage asset (into grades) does not equate to an identical or similar level of heritage significance in every asset of the same grade. The Planning (Listed Buildings and Conservation Areas) Act 1990 does not refer to grades of listed building or conservation area, referring only to 'special architectural or historic interest', and the statutory tests are applied equally to the designated heritage assets concerned. The Department for Digital, Culture, Media and Sport's 'Principles of Selection for Listing Buildings' states that "*Buildings on the list are graded to reflect their relative architectural and historic interest*". Grading therefore provides a helpful general indication of a level of heritage significance, and that has been used in assessing the sensitivity of heritage assets to change.

Approach to Assessing Heritage Significance

2.20 The heritage significance of a listed building that may be affected is its 'special architectural and historic interest'. More precisely, a development may affect this special architectural and historic interest by harming or reducing the degree to which such interest can be appreciated (i.e. the potential impact).

2.21 The heritage significance of a conservation area that may be affected by the proposed development is its 'character and appearance'. Conservation areas are defined in the Planning (Listed Buildings and Conservation Areas) Act 1990 as being "*areas of special architectural or historic interest the character or appearance of which it is desirable to preserve or enhance*". A development may affect this character and appearance by harming or reducing the degree to which these qualities can be appreciated (the potential impact).

2.22 Unlike listed buildings where it is the special architectural and historic interest that may be effected by a development, it is the general architectural and historic interest that can affect the heritage significance of a locally listed building or a building considered to make a positive contribution to the character and appearance of a conservation area..

2.23 The methodology adopted to assess the potential impacts of the proposed development upon the heritage significance of the heritage receptors is to measure those impacts – using professional judgement - against criteria contained in national and local policy and guidance relating to the historic built environment.

2.24 The methodology that was used to determine the significance of built heritage assets, the severity of any impacts upon them, and the resulting significance of environmental effect, is as follows:

- Evaluation of the significance (i.e. sensitivity) of built heritage assets (based on existing designations; and professional judgement where such resources have no formal designation);
- Prediction of the magnitude of likely impacts upon the known significance of built heritage assets;
- Consideration of any inherent mitigation measures that have been included within the development proposals (and any additional mitigation that might be required in the design and construction or operational lifetime of the proposed development) in order to reduce or eliminate any significant adverse effects upon heritage assets; and
- Quantification of residual effects (those that might remain after mitigation).

2.25 The likely significance of any effect the proposed development may have on a built heritage asset or its setting is a function of the sensitivity of a built heritage asset and the magnitude of the impact resulting from the proposed development.

Demolition and Construction

2.26 The methodology utilised for assessing the demolition and construction effects has been consistent with that utilised for the completed development stage effects. Demolition and construction works are a necessary first step in the redevelopment of any site. It is common across urban environments and means that receptors would have a general awareness of demolition and construction activities taking place. In this instance, demolition and construction impacts would not be considered to be significant in EIA terms, as they are indirect, temporary in nature and short-medium term in duration. Accordingly, a qualitative assessment has been undertaken.

Completed Development

2.27 The effect of the proposed development on each of the identified heritage assets has been considered and a judgement formed as to the importance and sensitivity of the heritage assets (as considered in the baseline study); the magnitude of impact; and the duration, extent and scale of the effect. In doing so, consideration has been given to embedded mitigation measures. Appropriate cross-referencing has been made to the Accurate Visual Representations (AVRs) in Technical Appendix 1.4 of Chapter 1: Townscape and Visual in ES Volume 2.

Assessment Criteria

2.28 The criteria used to assess if an effect is significant, is set out in subsequent sub-sections. This is determined by consideration of the sensitivity of the receptor, magnitude of impact, duration of the effect, geographical extent of the effect and application of professional judgement.

Receptor Sensitivity Criteria

2.29 While the heritage significance of a heritage asset may be an assessable quality that can be analysed and described for each asset, and may be at a higher or lower level, the sensitivity of that significance to change varies depending on the specific circumstances of the asset in relation to the source of the change.

2.30 The relative sensitivity of heritage assets is assessable in the abstract (without considering a specific physical relationship to a specific type and magnitude of change) up to a certain point, given the distinction between designated and non-designated heritage assets, which is principally the distinction between national special architectural or historic interest (designated heritage assets including conservation areas) and purely local architectural or historic interest (locally listed buildings). Designated heritage assets are considered to have a higher sensitivity to change and non-designated heritage asset are considered to have less sensitivity. By virtue of the potentially greater level of heritage significance contained in the fabric and appearance of a statutorily listed building than, say, a locally listed building, its significance is considered to be greater and thus it is more sensitive to change in its context. The sensitivity of a conservation area to potential impacts is less than that of listed buildings as conservation areas are larger in scale than individual buildings, with variations in levels of heritage significance and areas of no heritage significance, and thus more capable of accepting change. Registered landscapes are considered to be comparable to listed buildings in terms of sensitivity and are thus assessed in a similar fashion.

2.31 This approach is applied to the specific circumstances of the heritage assets that could be affected by the proposed development. The sensitivity of individual heritage assets to change are considered against the general levels of significance outlined above, and are varied by the specific circumstances of individual heritage assets, their relationship to the application site and the nature of the change. A heritage asset, regardless of its type, that is within the application site or in close proximity to the application site, has a higher sensitivity to change than a heritage asset that is further away from the application site and, for instance, lacks inter-visibility with the proposed development. This approach is intended to provide a realistic assessment of the sensitivity of heritage assets in the vicinity of the application site to change. This approach to sensitivity to change is then combined with consideration of the magnitude of change in order to arrive at a reliable and realistic assessment of effects.

2.32 Following the application of this approach, the sensitivity of individual heritage assets in the study area is set out in Table 2.1, taking into account the nature of the receptor in question and its relationship with the application site. The sensitivity of heritage assets to change is described as High, Medium or Low. To be clear, this approach acknowledges the statutory or locally designated status of the heritage assets in question and is consistent with the objective measure of their heritage significance.

Table 2.1: Receptor Sensitivity Criteria

Sensitivity	Criteria
Low	• Buildings/sites/areas with some evidence of significance but in an incoherent or eroded form, of local interest and generally with no statutory protection. • The asset has low importance by virtue of its overall low evidential, historical, aesthetic and communal value. • Often buildings of local interest. Assets may be so badly damaged that too little remains to justify inclusion into a higher grade.
Medium	• Buildings/sites/areas of national and/or regional significance, or local assets of particular significance. • The asset has moderate importance by virtue of its overall moderate evidential, historical, aesthetic and communal value. • Often Listed Buildings Grade II and their settings, Conservation Areas and their settings, and registered Historic Parks and Gardens Grade II and their settings.
High	• Building/site/area of international and/or national significance. • The asset has high importance by virtue of its overall high evidential, historical, aesthetic and communal value. • Often Listed Buildings with Grade I and II* and their settings, Scheduled Monuments, registered Historic Parks and Gardens Grade I and II* and their settings. Always World Heritage Sites.

Impact Magnitude Criteria

2.33 The magnitude of impact has been classified as nil to high, in accordance with the criteria set out in Table 2.2.

Table 2.2: Impact Magnitude Criteria

Magnitude of Impact	Criteria
Nil	There would be no change to the fabric of the built heritage receptor or its setting.
Negligible	There would be change, but it would not be perceptible.
Low	Slight change to the built heritage receptor or its setting that would not be readily noticed.
Medium	An obvious change to the fabric of the built heritage receptor or its setting that would be noticeable but not necessarily in contrast to the existing urban fabric.
High	Considerable change to the fabric of the built heritage receptor or its setting in complete contrast with the existing urban fabric.

Scale of Effects

2.34 The environmental effect is determined by comparing the sensitivity of heritage assets with the magnitude of impact, as outlined in Table 2.3. Effects are assessed as being beneficial, negligible or adverse. For effects described as beneficial or adverse, significance levels of minor, medium and major are assessed.

Table 2.3: Scale of Effects Criteria

Magnitude of Impact	Sensitivity of Receptors		
	Low	Medium	High
Nil	Nill	Nill	Nil
Negligible	Negligible	Negligible	Negligible
Low	Negligible	Minor	Minor/Moderate
Medium	Minor	Minor/Moderate	Moderate
High	Minor/Moderate	Moderate	Major

2.35 Combining respective value and magnitude of change matrices may not provide the appropriate category of significance. These judgements are supported by qualitative assessment text describing the effects and a professional judgement about their significance. This is necessary because heritage impact assessment is not a strict quantitative process and some of these considerations will depend upon professional judgement. Accordingly, there is an emphasis on narrative text throughout the report to describe the receptors and the judgements in reference to the significance of the identified effects.

2.36 Note that moderate and major effects are considered to be 'significant' (the shaded cells in Table 2.3).

2.37 The nature of effects has been described as:

- Beneficial or adverse;

- Temporary or Permanent;
- Short, medium or long term; and
- Significant (moderate or major) or insignificant (indiscernible or minor).

2.38 Following their identification, significant beneficial or adverse effects have been classified on the basis of their nature and duration as follows:

- Temporary: Effects that persist for a limited period only (due, for example, to particular activities taking place for a short period of time);
- Permanent: Effects that result from an irreversible change to the baseline environment (e.g. alterations to built fabric) or which will persist for the foreseeable future (e.g. noise from regular or continuous operations or activities);
- Direct: Effects that arise from the effect of activities that form an integral part of the proposed development (e.g. construction of a new building);
- Indirect: Effects that arise from the effect of activities that do not explicitly form part of the proposed development; and
- Secondary: Effects that arise as a consequence of an initial effect of the proposed development (e.g. induced employment elsewhere)

2.39 All listed buildings and historic buildings that make a positive contribution to the character of a conservation area have been identified. Where these have a group value relationship, or if they are in a similar location, the assessment has considered the effects of the proposed development on the built heritage receptors as a whole in order to avoid repetitive assessment. Notwithstanding this, each assessment has identified each building that is considered to fall within that group.

Assumptions and Limitations

2.40 The assessment of effects has been undertaken on the basis of the information supplied on the proposed development works and estimated completion date for the proposed development, as presented in ES Chapter 5: Demolition and Construction Management in ES Volume 1. The assessment relies on available data, and best endeavours have been made to ensure that the data are accurate and up to date.

2.41 The proposed development has assessed the potential impact and likely effects on heritage assets based on the worst case height and massing and, in the absence of detailed information, commitments in respect of building materiality, articulation, and landscaping. Where appropriate, assumptions have been based on commitments made in the Design Code.

Baseline Conditions

Existing Baseline

2.42 This chapter is supported by a Heritage Statement (ES Volume 2: Technical Appendix 2.1) which describes the history of the application site and its surroundings, and analyses and describes any heritage significance. The Heritage Statement includes illustrations.

2.43 The application site is bounded by Vastern Road to the north; Trooper Potts Way to the east; the former Royal Mail sorting office and Reading Railway Station to the south; and Caversham Road to the west . To the north of the application site are residential buildings and low lying industrial buildings which front on to the River Thames. Further residential and commercial areas extend to the east, west and south of the application site.

2.44 The application site is occupied by pavilion style commercial units (including an Aldi, The Range, TGI Fridays, Mothercare, Majestic Wine) and associated surface car parking. The units are low rise, approximately two storeys high.

2.45 The application site does not contain any designated or undesignated heritage assets, nor is it located within a conservation area. Within the 500 m radius study area, 14 designated heritage assets (listed buildings) have been identified. These are presented in the Table 2.4.

Table 2.4: Designated Heritage Assets within Study Area

Number	NHL Number	Grade	Name	Distance from Centre of Application Site
1	1321892	II	Main building of Reading General Station	230 m south-east
2	1113434	II	Regent Place	366 m south-west
3	1113433	II	29 and 31 Caversham Road	464 m south-west
4	1113589	II	Statue of King Edward VII	320 m south-east
5	1113591	II	Great Western House	365 m south-east
6	1113590	II	13 and 15 Station Road	401 m south-east
7	1113486	II	15 Friar Street	458 m south-east
8	1113485	II	14 Friar Street	466 m south-east
9	1321950	II	13 Friar Street	468 m south-east
10	1113484	II	12 Friar Street	469 m south-east
11	1321949	II	11 Friar Street	468 m south-east
12	1321990	II	Reading Museum	478 m south-east
13	1113600	II	Former School of Art	484 m south-east
14	1248738	II	Walter Parsons Corn Stores	420 m south-east

2.46 Furthermore, the application site is located approximately 360 m north of the Market Place Conservation Area.

2.47 All the designated heritage assets are located south-east of the application site within the historic centre of Reading and obscured from the application site by the railway viaduct and new railway station. The exception to this is 29 and 31 Caversham Road, as well as Regent Place which are to the south-west of the application site.

2.48 There is a locally listed building (non-designated heritage asset) on the opposite side of Vastern Road (No 55), approximately 35 m north of the centre of the application site. The locally listed building does not benefit from statutory protection. The locally listed building is the front façade of a house associated with the offices of SSE behind it, as such it is semi-industrial in nature. As a locally listed building, it does not benefit from any statutory protection.

Sensitive Receptors

2.49 Table 2.4 lists all heritage assets, both designated and non-designated identified within the 500 m study area. Subsequent analysis of the setting of these heritage assets and the intervening built townscape form undertaken as part of the Heritage Statement concluded that only those identified in Table 2.5. have the potential to be affected by the proposed development. The remaining analysis focuses on these.

Table 2.5: Summary of Sensitive Receptors

Receptor	Sensitivity
Main building of Reading General Station	Medium
Regent Place	Medium

Table 2.5: Summary of Sensitive Receptors	
29 and 31 Caversham Road	Medium
Great Western House	Medium
13 and 15 Station Road	Medium
Statue of King Edward VII	Medium
Reading Museum	Medium
No 55 Vastern Road	Low

2.50 The other designated heritage assets identified within the study area have not been considered in the assessment due to the intervening built landscape form and infrastructure providing visual and physical barriers. Many of the streets south of the application site and within the identified Market Place Conservation Area are narrow and have 4-5 storey buildings on either side of the street. As such, views from the Conservation Area to the proposed development would remain unaffected.

2.51 The Forbury Gardens, which a registered park and garden, lies just beyond the study area to the south east of the application site and is not considered in this assessment as the proposed development would not be visible from the garden due to the intervening built landscape form.

Assessment of Effects

Demolition and Construction Effects

2.52 The impact on heritage receptors caused by the demolition and construction stage would be indirect, temporary and short-term compared to completed development effects which are longer term or permanent.

2.53 The effects caused by the demolition and construction phases relate to the enclosure of the application site with hoardings; demolition of the buildings on-site; and effects related to construction traffic and noise. The latter effects are directly related to this assessment because the experience of a built heritage asset (which is influenced by uses or activity) can contribute to setting, and therefore also contribute to the heritage significance.

2.54 This approach is taken from page 6 of GPA3 (2015),[8] which states: "the setting of a heritage asset is the surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of an asset, may affect the ability to appreciate that significance or may be neutral".

2.55 None of the identified designated heritage assets would be affected during the demolition and construction phases due to their distance from the application site and the intervening built townscape form. Taking into account the embedded mitigation measures that would be adopted as part of the CEMP, the overall effect of the demolition and construction works would be temporary, indirect, **Negligible Adverse.**

2.56 The locally listed building on Vastern Road would suffer some demolition and construction effects, mainly noise related due to its proximity. The setting of this heritage asset is semi-industrial in nature and it has already been altered by the presence of the dual carriageway Vastern Road. Taking into account the embedded mitigation measures that would be adopted as part of the CEMP, the overall effect of the demolition and construction works would be temporary, indirect, **Negligible Adverse**.

Completed Development Effects

2.57 The application site has no heritage significance. While the application site is not derelict and is still in use as a retail park, the application site has a neutral effect on its surroundings.

2.58 The proposed development would be of considerable scale and density and would change the setting of heritage assets by virtue of its visibility and presence. That visibility is not, by itself, harmful. The heritage significance of each of the heritage assets assessed does not inherently rely on no change occurring in their setting, nor is it necessarily harmed by the presence of new development in their setting that is highly visible. Quite the opposite; the visibility of new development is frequently a highly positive quality, signalling regeneration and assisting in place-making.

2.59 The proposed development would enhance the application site by providing commercial and residential accommodation, as well as public spaces and new access routes. The design at ground level would provide an active street frontage which would be of benefit to Vastern Road. Interpretation of the Design Code provides commitments to deliver high quality design at the reserved matters stage.

2.60 Table 2.6 summarises the sensitivity of the identified heritage assets, assessed in line with the methodology described earlier (specifically assessed in terms of the relationship of the asset to the proposed development), the magnitude of impact arising from the completed development, and the resulting scale of the effect on heritage significance.

Table 2.6: Sensitivity of Heritage Assets, Magnitude of Impact and Likely Effects			
Heritage Asset	**Sensitivity**	**Magnitude of Impact**	**Scale of Effect**
Main building of Reading General Station	Medium	Medium	Moderate
Regent Place	Medium	Negligible	Negligible
29 and 31 Caversham Road	Medium	Negligible	Negligible
Great Western House	Medium	Low	Minor
13 and 15 Station Road	Medium	Negligible	Negligible
Statue of King Edward VII	Medium	Negligible	Negligible
Reading Museum	Medium	Negligible	Negligible
No 55 Vastern Road	Low	High	Minor

Listed Buildings

2.61 The completed development effects would vary between each heritage asset due to the immediate setting of each heritage asset and the degree of visibility of the proposed development from each heritage asset. The main building of Reading General Station and Great Western House would have direct views of the proposed development. While there are other modern buildings around each, none of them are as tall as those proposed for the completed development.

2.62 The architectural importance of the glazed tower of the main building of Reading General Station would be diminished by the height of the buildings of the proposed development behind it. As such the effects would be permanent, indirect, **Moderate Adverse**. The effect would be significant.

2.63 The setting of Great Western House has been changed by virtue of its neighbouring modern buildings. The further change that would be introduced by the proposed development would be in keeping with the existing urban fabric and would only slightly affect the ability to appreciate the significance of the heritage assets. Accordingly, the effect is concluded as permanent, indirect, **Minor Adverse** and not significant.

[8] https://historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/

2.64 The other identified heritage assets in Table 2.5 are further away and would not have a direct view of the proposed development and/or the proposed development would not be visible in views of these assets, so the scale of the effect would be permanent, indirect**, Negligible Adverse.**

Locally Listed Buildings

2.65 The locally listed No55 Vastern Road would have a direct view of the proposed development. The introduction of the proposed development would represent a high magnitude impact given the scale and massing of the newly introduced buildings. However, the setting of this heritage asset is semi-industrial in nature and it has already been altered by the presence of the dual carriageway Vastern Road. The proposed development would improve the character of the application site, introduce new high quality public realm and thereby improve the ability to appreciate the locally listed building. Considering these factors, as well as the low sensitivity of the receptor, the effect would be permanent, indirect **Minor Adverse** and not significant.

Assessment of Residual Effects

Additional Mitigation

2.66 At the detailed design stage, the commitments made within the Design Code in regard to high quality design, the delivery of a landmark development, locally distinctive built form, variety in massing and height, articulation of the facade, quality materiality, creation of a distinct sense of place, permeability and high quality public realm and landscape interventions, would be delivered.

2.67 This would help to reduce the scale of effects identified in this assessment. However, as the proposed development is currently at outline stage, this detailed design information is not currently available and therefore cannot be relied upon as additional mitigation.

Enhancement Measures

2.68 No enhancement measurements are proposed in respect of built heritage.

Demolition and Construction Residual Effects

2.69 The residual effects remain unchanged, namely temporary, indirect, **Negligible Adverse.**

Completed Development Residual Effects

2.70 The residual effects remain unchanged, namely permanent, indirect, **Negligible Adverse** to permanent, indirect, **Moderate Adverse**.

Summary of Residual Effects

Table 2.7: Summary of Residual Effects

Receptor	Residual Effect	Additional Mitigation	Nature of Residual Effect*					
			Scale of Effect **	+ -	D I	P T	R IR	St Mt Lt
Demolition and Construction								
No 55 Vastern Road	Introduction of demolition and construction features and activities and the resulting visual and aural disruption to the setting of the listed buildings and locally listed building affecting the ability to appreciate the heritage significance	n/a	Negligible	-	I	T	R	St
Main building of Reading General Station			n/a	Negligible	-	I	T	R	St
Regent Place			n/a	Negligible	-	I	T	R	St
29 and 31 Caversham Road			n/a	Negligible	-	I	T	R	St
Great Western House			n/a	Negligible	-	I	T	R	St
13 and 15 Station Road			n/a	Negligible	-	I	T	R	St
Statue of King Edward VII			n/a	Negligible	-	I	T	R	St
Reading Museum			n/a	Negligible	-	I	T	R	St
Completed Development								
55 Vastern Road	Introduction of new built form within views of heritage assets and the resulting visual alteration to the setting of the listed buildings and locally listed building affecting the ability to appreciate the heritage significance	n/a	Minor	-	I	T	R	P
Main building of Reading General Station			n/a	Moderate	-	I	T	R	P
Regent Place			n/a	Negligible	-	I	T	R	P
29 and 31 Caversham Road			n/a	Negligible	-	I	T	R	P
Great Western House			n/a	Minor	-	I	T	R	P
13 and 15 Station Road			n/a	Negligible	-	I	T	R	P
Statue of King Edward VII			n/a	Negligible	-	I	T	R	P
Reading Museum			n/a	Negligible	-	I	T	R	P

Notes:

* - = Adverse/ + = Beneficial/ +/- Neutral; D = Direct/ I = Indirect; P = Permanent/ T = Temporary; R=Reversible/ IR= Irreversible; St- Short term/ Mt –Medium term/ Lt –Long term.

**Negligible/Minor/Moderate/Major

2.71 The residual built heritage effects on the main building of Reading General Station would be significant.

Cumulative Effects

2.72 Table 2.8 provides a summary of the likelihood for inter-project cumulative effects to arise during demolition and construction and at the completed development stage for the proposed development taking into consideration the list of cumulative schemes presented in Chapter 2: EIA Process and Methodology of ES Volume 1.

Table 2.8: Inter-Project Cumulative Effects

	Demolition and Construction	Operation / Completed Development

Table 2.8: Inter-Project Cumulative Effects

Cumulative Development	Cumulative Effects Likely?	Reason	Cumulative Effects Likely?	Reason
Former BMW Site – Thames Quarter	No	Development considered to be too far away	No	Development considered to be too far away
Station Hill				
Toys R Us				
Land between Weldale Street and Chatham Street				
Network Rail Thames Valley Area site office/Former Royal Mail site	Yes	Demolition and construction phases may overlap and much of the area would be boarded up and there would be increase noise levels	Yes	Another tall development near the proposed development
Former Scottish and Southern Energy site				
29 Station Road				
Broad Street Mall, Broad Street	No	Development considered to be too far away	No	Development considered to be too far away

2.73 Accordingly, the cumulative effects assessment has focused on the following schemes by virtue of their proximity to the application site:

- Network Rail Thames Valley Area site office/Former Royal Mail site;
- Former Scottish and Southern Energy site; and
- 29 Station Road.

Demolition and Construction Cumulative Effects

2.74 Should the three cumulative schemes be constructed at the same time as the proposed development, the cumulative effect on heritage assets in the vicinity of the application site may be magnified from the adverse effect resulting the proposed development by itself.

2.75 The closest designated heritage asset is the main building of Reading General Station. Between it and the cumulative schemes of Network Rail Thames Valley Area site are the railway lines. The SSE site is too far away and 29 Station Road is closer but is still separated by roads and as such the cumulative effects through demolition and construction works would not change and remain as temporary, indirect**, Negligible Adverse.**

2.76 The same can be said of Great Western House. The SSE development is too far away to have any effect and the railway lines provide a buffer between it and the Network Rail Thames Valley Area site. 29 Station Road is separated by a road which further reduces the likelihood of any cumulative effect. The effects would therefore remain as temporary, indirect**, Negligible Adverse.**

2.77 Should the demolition and construction of the former Scottish and Sothern Energy site and the proposed development take place at the same time, then cumulative effects are likely to arise in respect of No 55 Vastern Road. This would be due to the proximity of these schemes. The cumulative effect would be temporary, indirect **Minor Adverse.**

2.78 The other identified heritage assets are too far away from the application site to suffer any cumulative demolition and construction effects.

Completed Development Cumulative Effects

2.79 The introduction of cumulative schemes would be in keeping with urban context and changing surrounding townscape. As these schemes would put the proposed development within context, the scale of the cumulative effects would remain unchanged from that reported for the proposed development in isolation.

2.80 The proposed redevelopment of the former Royal Mail site would result in the introduction of a 25 storey building and would have a cumulative effect with the proposed development on the main building of Reading General Station by virtue of its proximity and massing and height. The cumulative development effect would be permanent, indirect, **Moderate Adverse**. The effect would be significant.

2.81 The proposed redevelopment of 29 Station Road would result in the introduction of a 22-storey building and would result in cumulative effects on the main building of Reading General Station, Great Western House and 13 and 15 Station Road. All three heritage assets will now have views on to three tall developments which will be in close proximity to each other. The cumulative effects would result in a substantial change to the setting of these heritage assets, and a resulting permanent, indirect **Moderate Adverse** effect. The effect would be significant.

2.82 The development of the former Scottish and Southern Energy site would result in the introduction of a 11 storey building. This would have a cumulative effect on No 55 Vastern Road in combination with the proposed development. The effect would be permanent, indirect**, Minor Adverse.**

2.83 The other identified heritage assets are too far away from the application site to experience any cumulative demolition and construction effects.

2.84

Reading Station Park
Vastern Road
Reading
RG1 8AL

Heritage Statement

NGR 471426 174045

Sign-off history

issue no.	issue date	prepared by	reviewed by	approved by	reason for issue
1	02/01/2020	Rebecca Reynolds Heritage Consultant	Sam Abelman Lead Consultant Built Heritage	Sam Abelman Contract Manager	First issue
2	16/01/2020	Rebecca Reynolds Heritage Consultant	Sam Abelman Lead Consultant Built Heritage	Sam Abelman Contract Manager	Revisions
3	29/01/2020	Rebecca Reynolds Heritage Consultant	Sam Abelman Lead Consultant Built Heritage	Sam Abelman Contract Manager	Revisions
4	10/02/2020	Rebecca Reynolds Heritage Consultant	Sam Abelman Lead Consultant Built Heritage	Sam Abelman Contract Manager	Revisions

PO code: P19-142

www.mola.org.uk
© MOLA
Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED
tel 0207 410 2200 fax 0207 410 2201 email:enquiries@mola.org.uk
Museum of London Archaeology is a company limited by guarantee

Registered in England and Wales

Contents

Executive summary 1

1 Introduction 3
1.1 Origin and scope of the report 3
1.2 Heritage assets 3
1.3 Aims and objectives 3

2 Methodology and sources consulted 4
2.1 Baseline 5
2.2 Significance 5
2.3 General Planning Advice 3 (GPA3) *The Setting of Heritage Assets* (Historic England 2015) 5
2.4 Impact 8
2.5 Conclusions and Recommendations 8

3 Policy Baseline 9
3.1 Introduction 9
3.2 Statutory protection 9
3.3 National Planning Policy Framework (NPPF) 9
3.4 Local planning policy 12

4 Built Heritage Baseline 13
4.1 Site development 14
4.2 Site description 17
4.4 Nearby heritage assets 18

5 Statement of Significance 22
5.1 Introduction 21
5.2 Significance Criteria 21
5.3 Listed Buildings 22

6 Proposed development 25
6.1 Proposal 23

7 Impact of Proposed Development 27
7.1 Impact on site 25
7.2 Setting of nearby heritage assets 25

8 Conclusions and Recommendations 30
8.1 Conclusions 26
8.2 Recommendations 26

9 Bibliography 31
9.1 Published and documentary sources 31
9.2 Other Sources 31

Figures

Fig 1 *Location of subject site showing individually designated and non-designated heritage assets (indicated by red squares son the map) and those likely to be affected by the proposed development (indicated by blue triangles for designated heritage and assets and green triangles for locally listed buildings) (Source: MOLA ArcGIS)*

Fig 2 *Site location (Source: Google Satellite)*

Fig 3 *OS map of 1881*

Fig 4 *OS map of 1900*

Fig 5 *OS map of 1956-1957*

Fig 6 *OS map of 1969-1972*

Fig 7 *OS map of 1988*

Fig 8 *View of the site from the north side of Vastern Road*

Fig 9 *View from Caversham Bridge looking south-east towards the site*

Fig 10 *The main building to Reading Station (Grade II listed)*

Fig 11 *Regent's Place on Caversham Road (Grade II listed)*

Fig 12 *29 and 31 Caversham Road (Grade II listed)*

Fig 13 *Locally listed building on Vastern Road*

Fig 14 *Parameter plan 105 – Plot Heights Mixed Use (source: ColladoCollins Architects)*

Fig 15 *Approved view 10 looking north on Station Road with wireframe of proposed development*

Fig 16 *Approved view 25 looking north-west from the top of Station Road with wireframe of proposed development*

Note: site outlines may appear differently on some figures owing to distortions in historic maps. North is approximate on early maps.

Executive summary

Ramboll, on behalf of Aviva Life and Pensions UK Limited, has commissioned MOLA to carry out a heritage statement in advance of proposed development at Vastern Court Retail Park, Vastern Road, Reading RG1 8AL in the County of Berkshire. The proposed development is anticipated to comprise of:

- *Demolition of existing buildings on-site;*
- *Construction of a single level basement to allow for any necessary below ground surface water attenuation;*
- *Construction of approximately four new buildings, up to approximately 112.9 mAOD, indicatively up to 23 storeys;*
- *Delivery of a total maximum floorspace of up to 115,000 m2 gross external area (GEA), which could include:*
    - *up to a maximum of approximately 1,000 new residential units within a minimum of 69,160 m2 GEA and a maximum floorspace of up to 100,000 m2 GEA, provided within a range of apartment buildings of varying scale and a mix of unit sizes, including a proportion of affordable homes;*
    - *a minimum floorspace of 2,000 m2 GEA of flexible retail, leisure and community uses (Use Class A1-A5, D1-D2) and up to a maximum floorspace of approximately 6,000 m2 GEA;*
    - *up to a maximum floorspace of approximately 115,000 m2 GEA office use (Use Class B1a);*
    - *up to a maximum floorspace of approximately 7,000 m2 GEA hotel use (Use Class C1);*

In order to facilitate the proposed development, the existing two buildings on-site would be demolished.

New pedestrian and cycle routes would be provided within the proposed development creating permeability through the application site. New vehicular routes would also be provided within the application site.

The application site is currently a retail park with associated car parking and access routes off Vastern Road, a large dual carriageway. The surrounding area is characterised by urban development with a mixture of commercial, industrial and residential uses.

The application site does not lie within a Conservation Area. Opposite the application site there is a locally listed building and to the south there are a number of designated heritage assets.

Historically, the application site was located within marshy ground to the north of the settlement at Reading and there is no evidence of extensive use or settlement within close vicinity of the application site until the later post-medieval period.

This desk-based study assesses the possible impacts of the proposed development on built heritage assets in and around the application site.

This heritage statement is required to be submitted with the accompanying planning application.

This report has the following findings:

- *This assessment has found that the proposed development would have a moderate adverse effect in built heritage terms on the Grade II listed main building of Reading General Station and a minor adverse effect on the Grade II listed Great Western House. The main building to Reading General Station will have its architectural significance and visual prominence diminished by the height and massing of the proposed development visible immediately behind it. In both instances this would amount to less than substantial harm.*
- *Proposals would present a positive effect on the application site itself in terms of contemporary design and providing public benefits.*

The main recommendation is as follows:

- *Continued discussion with the local authority to ensure a sufficiently sympathetic materiality and landscaping design to the proposed development, chiefly at the Vastern Road frontage and planned pedestrian routes.*



Fig 1 Location of application site showing individually designated and non-designated heritage assets (indicated by red squares son the map) and those likely to be affected by the proposed development (indicated by blue triangles for designated heritage assets and green triangles for locally listed buildings) (Source: MOLA ArcGIS)



Fig 2 Application site location (Source: Google Satellite)

Introduction

1.1 Origin and scope of the report

1.1.1 Ramboll, on behalf of Aviva Life and Pensions UK Limited, has commissioned MOLA (Museum of London Archaeology) to carry out a heritage statement in advance of proposed development at Vastern Court Retail Park, Vastern Rd, Reading RG1 8AL; National Grid Reference (NGR) 471427 174045: Fig 1). The proposed development is anticipated to comprise of:

- *Demolition of existing buildings on-site;*
- *Construction of a single level basement to allow for any necessary below ground surface water attenuation;*
- *Construction of approximately four new buildings, up to approximately 112.9 mAOD, indicatively up to 23 storeys;*
- *Delivery of a total maximum floorspace of up to 115,000 m2 gross external area (GEA), which could include:*
  - *up to a maximum of approximately 1,000 new residential units within a minimum of 69,160 m2 GEA and a maximum floorspace of up to 100,000 m2 GEA, provided within a range of apartment buildings of varying scale and a mix of unit sizes, including a proportion of affordable homes;*
  - *a minimum floorspace of 2,000 m2 GEA of flexible retail, leisure and community uses (Use Class A1-A5, D1-D2) and up to a maximum floorspace of approximately 6,000 m2 GEA;*
  - *up to a maximum floorspace of approximately 115,000 m2 GEA office use (Use Class B1a);*
  - *up to a maximum floorspace of approximately 7,000 m2 GEA hotel use (Use Class C1);*

1.1.2 In order to facilitate the proposed development, the existing two buildings on-site would be demolished.

1.1.3 New pedestrian and cycle routes would be provided within the proposed development creating permeability through the application site. New vehicular routes would also be provided within the application site.

1.1.4 This desk-based study assesses the impact of the scheme on built heritage assets (standing buildings). It forms an initial stage of investigation of the area of proposed development (hereafter referred to as the 'site') and may be required in relation to the planning process in order that the local planning authority (LPA) can formulate an appropriate response in the light of the impact upon any known or possible heritage assets. These are parts of the historic environment which are considered to be significant because of their historic, evidential, aesthetic and/or communal interest.

1.1.5 The assessment has been carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) (DCLG 2012, 2014, 2018, 2019) and to standards specified by the Chartered Institute for Archaeologists (CIfA Dec 2014a, 2014b), Historic England (EH 2008, 2017), and the Greater London Archaeological Advisory Service (GLAAS 2014). Under the 'Copyright, Designs and Patents Act' 1988 MOLA retains the copyright to this document.

1.1.6 Note: within the limitations imposed by dealing with historical material and maps, the information in this document is, to the best knowledge of the author and MOLA, correct at the time of writing. Further information about the nature of the present buildings, and/or more detailed proposals for redevelopment may require changes to all or parts of the document.

1.2 Heritage assets

1.2.1 The application site does not contain any nationally designated (protected) heritage assets; such as scheduled monuments, listed buildings or registered parks and gardens nor is the application site situated in a Conservation Area.

1.2.2 There are a number of Listed Buildings south and east of the application site, only those within a 500m radius from the centre of the application site are listed in Table 1 below.

NHL number	Grade	Name	Distance from site
1321892	II	Main building of Reading General Station	230m south-east
1113434	II	Regent Place	366m south-west
1113433	II	29 and 31 Caversham Road	464m south-west
1113589	II	Statue of King Edward VII	320m south-east
1113591	II	Great Western House	365m south-east
1113590	II	13 and 15 Station Road	401m south-east
1113486	II	15 Friar Street	458m south-east
1113485	II	14 Friar Street	466m south-east
1321950	II	13 Friar Street	468m south-east
1113484	II	12 Friar Street	469m south-east
1321949	II	11 Friar Street	468m south-east
1321990	II	Reading Museum	478m south-east
1113600	II	Former School of Art	484m south-east
1248738	II	Walter Parsons Corn Stores	420m south-east

1.2.3 The application site lies 360m north of the Market Place/London Street Conservation Area. The Conservation Area was designated in 1972 and extended in 1982. Its designation comes from the preservation of aspects of the medieval centre of Reading, groups of historic buildings around Market Place, fine examples of Georgian and Victorian architecture and examples of Reading's extensive brickworks.[1]

1.2.4 There is a locally listed building on the opposite side of Vastern Road (No 55), 35m north of the centre of the application site.

1.2.5 The Forbury Gardens, a registered park and garden lies just outside the study area to the south-east of the application area. The proposed development is unlikely to be seen from the Forbury Gardens due to the intervening built and landscape form and is therefore not considered in this report.

1.3 Aims and objectives

1.3.1 The aim of the assessment is to:

- identify the presence of any known built heritage assets that may be affected by the proposals;
- describe the significance of such assets, as required by national planning policy;
- assess the likely impacts upon the significance of the assets arising from the proposals; and
- provide recommendations for further assessment where necessary of the historic assets affected, and/or mitigation aimed at reducing or removing completely any adverse impacts upon buried heritage assets and/or their setting.

1 https://www.reading.gov.uk/media/8394/Market-Place-London-St-Original-CAA/pdf/Market-Place-London-St-Original-CAA.pdf

2 Methodology and sources consulted

2.1 Baseline

2.1.1 The baseline for this assessment has been determined primarily through desk-based research into designated and undesignated heritage assets on and near the application site of the proposed development. It has been confirmed and extended by a site visit by a MOLA Built Heritage Consultant.

2.1.2 The following are the principal sources consulted:

- MOLA - in-house Geographical Information System (GIS) with statutory designations GIS data, the locations of all key indicators of known prehistoric and Roman activity across Greater London, past investigation locations, projected Roman roads and burial grounds from the Holmes burial ground survey of 1896; georeferenced published historic maps; Defence of Britain survey data, in-house archaeological deposit survival archive; and archaeological publications.
- Historic England - information on statutory designations including scheduled monuments and listed buildings, along with identified Heritage at Risk
- Groundsure - historic Ordnance Survey maps from the first edition (1860-70s) to the present day, and Goad fire insurance maps;
- Ramboll - architectural drawings (ColladoCollins Architects)
- Internet - web-published material including LPA local plan, and information on conservation areas and locally listed buildings.

2.2 Significance

2.2.1 The assessment considers all structures on or near the site of a proposed development to have potential significance as heritage assets. From this start position, the values and significance of each asset will be determined using criteria set out in Historic England (formerly English Heritage)'s *Conservation Principles, Policies and Guidance* (EH 2008). All structures with a level of significance as heritage assets will be discussed in the report and included as material considerations in the assessment. Structures of negligible value and significance as heritage assets will not be assessed further and will generally be excluded from the report except where there is a need for explanation of their exclusion from the assessment, such as being part of the site.

2.2.2 For each built heritage asset to be considered, a description will be provided leading to a statement of significance for that asset. Section 10 sets out the criteria used to determine the significance of heritage assets. This is based on four values set out in Historic England's *Conservation Principles, Policies and Guidance* (EH 2008), and comprise evidential, historical, aesthetic and communal value. The report assesses the likely presence of such assets within (and beyond) the site, factors which may have compromised buried asset survival (i.e. present and previous land use), as well as possible significance.

2.2.3 The significance of the asset is derived from its historical, evidential, communal and aesthetic values, these in turn derived from the building's fabric, design, landscape and history.

2.2.4 In the case of Conservation Areas, the significance will be primarily found in their character assessments and those aspects of the historic built environment that make positive contributions to them.

2.2.5 The methodology for assessing the setting of designated heritage assets follows best practice as covered in Historic England's Good Practice Advice (GPA) document 3 (HE 2017). The basis for this methodology is set out below:

> All heritage assets have significance, some of which have particular significance and are designated. The contribution made by their setting to their significance also varies.

Although many settings may be enhanced by development, not all settings have the same capacity to accommodate change without harm to the significance of the heritage asset or the ability to appreciate it. This capacity may vary between designated assets of the same grade or of the same type or according to the nature of the change. It can also depend on the location of the asset: an elevated or overlooked location; a riverbank, coastal or island location; or a location within an extensive tract of flat land may increase the sensitivity of the setting (ie the capacity of the setting to accommodate change without harm to the heritage asset's significance) or of views of the asset. This requires the implications of development affecting the setting of heritage assets to be considered on a case-by-case basis.

2.2.6 GPA3 sets out this methodology in stages, or steps:

Step 1 - identify the asset(s) likely to be affected and the extent of setting

Step 2 - assess how and to what degree the setting makes a contribution to the significance of the assets

Step 3 - assess the effect of the proposed development on the significance of the asset;

Step 4 - seek to maximise enhancement and minimise harm; and

Step 5 - document and monitor outcomes

2.3 General Planning Advice 3 (GPA3) *The Setting of Heritage Assets* (Historic England 2015)

2.3.1 General Planning Advice 3 (GPA3) The Setting of Heritage Assets (Historic England 2015) sets out the broad methodology for assessing the impact of development on the significance of assets. This suggests a staged approach - Step 1 being the identification of assets potentially affected; Step 2 being to assess whether, how and to what degree the setting makes a contribution to the significance of the heritage asset(s); Step 3 is to assess the effects of the proposed development, whether beneficial or harmful, on that significance; Step 4 is to explore the ways to maximise enhancement and avoid or minimise harm; and Step 5, which is the preserve of the LPA, is to make and document the decision and monitor outcomes.

2.3.2 This report has identified 14 Grade II listed buildings, a Conservation Area and a locally listed building within the study area around the application site. Many of these heritage assets will not be affected by the development due to the intervening built landscape form which includes many reasonably tall modern buildings. The railway station which is south of the application site is a large structure which blocks much of the views to and from the application site. Further south of the station, where the other heritage assets are located, the streets are reasonably narrow and lined by 4-5 storey buildings, thus preventing any views to and from the application site to these heritage assets. The heritage assets likely to be affected are presented in the table below and shown as green triangles on Fig 1 (Step 1).

NHL number	Grade	Name	Distance from site
1321892	II	Main building of Reading General Station	230m south-east
1113434	II	Regent Place	366m south-west
1113433	II	29 and 31 Caversham Road	464m south-west
1113591	II	Great Western House	365m south-east
1113590	II	13 and 15 Station Road	401m south-east
1113589	II	Statue of King Edward VII	320m south-east
1321990	II	Reading Museum	478m south-east

2.3.3 In detail, Step 2 considers:

a) the physical surroundings of the asset, including its relationship with other heritage assets;

b) the way the asset is appreciated; and

c) the asset's associations and patterns of use.

2.3.4 Commentary of the various facets of these factors is as follows:

a) The asset's physical surroundings

- *Topography* – the area is generally flat.
- *Aspect* – the locally listed building faces onto Vastern Road, a large dual carriageway. Regent Place and 29 and 31 Caversham face onto Caversham Road, another large dual carriageway. The main building of Reading Station faces south away from the application site and behind it is the large modern building that forms the rest of the station building. The statue of King Edward VII is in front of Reading Station on a large open square. The corner of Great Western House faces the station while its main façade is on Station Road. 13 and 15 also face onto Station Road which is a narrow street with 4-5 storey buildings on each side. Reading Museum along with the Concert Hall, Town Council Chamber and Offices with Clock Tower (all designated heritage assets) face Blagrave Street, another street flanked by 4-5 storey buildings.
- *Other heritage assets (including buildings, structures, landscapes, areas or archaeological remains)* – there are several other heritage assets within the 500m study area around the application site but these are scattered and the intervening built and landscape form means that they will not be affected by the proposed development.
- *Definition, scale and 'grain' of surrounding streetscape, landscape and spaces* – all the considered heritage assets are isolated and most of them are surrounded by mid-rise modern buildings.
- *Formal design e.g. hierarchy, layout* – there is no formal design attributed to any of the heritage assets.
- *Orientation and aspect* – as above.
- *Historic materials and surfaces* – the Reading Museum is of Gothic style with dark blue and dark red brick while the Great Western House is in white stucco as is Regent Place. 13-15 Station Road is red brick as is 29-31 Caversham Road.
- *Green space, trees and vegetation* – there are some trees along Vastern Road but no open green spaces. Christchurch Meadow is north of the application site on the other side of the River Thames.
- *Openness, enclosure and boundaries* – all the heritage assets are enclosed by other buildings with the exception of the statue of King Edward VII.
- *Functional relationships and communications* – none in particular.
- *History and degree of change over time* – the station building and Great Western House date to 1840 when the Great Western Railway was finished. Both of these have changed significantly over time as have their surroundings. The other heritage assets date to the late 19th century. The application site and the surrounding area have been built up for over 100 years and have changed a little over time.

b) **Experience of the asset**

- *Surrounding landscape and townscape character* – all of the assets are situated within the centre of Reading and/or near the station. They are all on narrow streets surrounded by modern mid-rise buildings. Taller buildings are nearby such as near the station.
- *Views from, towards, though, across and including the asset* – none of the designated heritage assets have wide expansive views due to their location within the centre of Reading.
- *Visual dominance, prominence or role as focal point* – none in particular.
- *Noise, vibration and other nuisances* – none in particular.
- *Diurnal changes* – minor changes as a result of diurnal changes.
- *Sense of enclosure, seclusion, intimacy or privacy* – all of the designated heritage assets front onto busy roads and are not enclosed. Some of them are public buildings or have a commercial purpose.
- *Land use* – the main building of Reading Station is a public house within the station,

Great Western House is a hotel, Reading Museum is public building, 13 and 15 Station Road have commercial use, Regent Place ad 29 and 31 Caversham Road are private residences.

- *Accessibility, permeability and patterns of movement* – all of the heritage assets are on busy roads with high vehicular and pedestrian traffic.
- *Degree of interpretation or promotion to the public* – the area is characteristic of its time.

c) **Associations**

- *The assets associative attributes* – none in particular.
- *Associative relationships between heritage assets* – as above.

2.3.5 The proposed works are major in nature and will involve the demolition of the existing retail outlets to be replaced by four blocks up to 112.9 m AOD storeys high. This will likely have an effect on some of the nearby heritage assets and is further detailed in section 7 of this report (Step 3).

2.3.6 The proposed works are major in nature and any mitigation will have to be assessed (Step 4). Step 5 will be undertaken by LPA in due course.

2.4 Impact

2.4.1 Impacts are those actions associated with the proposed development with potential to alter the significance of a heritage asset through affecting the values that contribute to it.

2.4.2 For each built heritage asset, the potential impacts of demolition and construction will be assessed in terms of how they may alter these values and, by extension, significance of each.

2.4.3 For Conservation Areas, the assessment will focus on the preservation and/or enhancement of their historic character.

2.5 Conclusions and Recommendations

2.5.1 The built heritage assessment will conclude with a list of impacts, potentially ranging from major adverse to major positive, on built heritage assets in the baseline.

2.5.2 This list is primarily intended to inform mitigation, whether through design or ameliorative archaeological recording of assets in advance of their alteration.

3 Policy Baseline

3.1 Introduction

3.1.1 There is potential for the proposed development to impact on the significance of designated and undesignated built heritage assets and Conservation Areas. These impacts will likely take the form of demolition or other physical alteration to buildings, demolition and new construction that may alter the setting of designated heritage assets, and demolition and new construction that may affect the character and setting of Conservation Areas.

3.1.2 The following lays out the general criteria upon which the proposed development will be assessed.

3.2 Statutory protection

Listed Buildings and Conservation Areas

3.2.1 The *Planning (Listed Buildings and Conservation Areas) Act 1990* sets out the legal requirements for the control of development and alterations which affect buildings, including those which are listed or in conservation areas. Buildings which are listed or which lie within a Conservation Area are protected by law. Grade I are buildings of exceptional interest. Grade II* are particularly significant buildings of more than special interest. Grade II are buildings of special interest, which warrant every effort being made to preserve them.

3.3 National Planning Policy Framework

3.3.1 The Government issued the *National Planning Policy Framework* (NPPF) in March 2012 (DCLG 2012) and supporting *Planning Practice Guidance* in 2014 (DCLG 2014). The 2012 NPPF was revised and a new NPPF published in July 2018, with minor revisions in February 2019 (MHCLG 2019).

Conserving and enhancing the historic environment

3.3.2 The NPPF section concerning "Conserving and enhancing the historic environment" (section 12 of the NPPF 2012) has been replaced by NPPF 2018 Section 16 (unchanged in February 2019), reproduced in full below:

> **Para 184.** Heritage assets range from sites and buildings of local historic value to those of the highest significance, such as World Heritage Sites which are internationally recognised to be of Outstanding Universal Value. These assets are an irreplaceable resource, and should be conserved in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of existing and future generations.
>
> **Para 185.** Plans should set out a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats. This strategy should take into account:
>
> - a) the desirability of sustaining and enhancing the significance of heritage assets, and putting them to viable uses consistent with their conservation;
> - b) the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring;
> - c) the desirability of new development making a positive contribution to local character and distinctiveness; and
> - d) opportunities to draw on the contribution made by the historic environment to the character of a place.
>
> **Para 186.** When considering the designation of conservation areas, local planning authorities should ensure that an area justifies such status because of its special architectural or historic interest, and that the concept of conservation is not devalued through the designation of areas that lack special interest.

Para 187. Local planning authorities should maintain or have access to a historic environment record. This should contain up-to-date evidence about the historic environment in their area and be used to:

- a) assess the significance of heritage assets and the contribution they make to their environment; and
- b) predict the likelihood that currently unidentified heritage assets, particularly sites of historic and archaeological interest, will be discovered in the future.

Para 188. Local planning authorities should make information about the historic environment, gathered as part of policy-making or development management, publicly accessible.

Proposals affecting heritage assets

Para 189. In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes, or has the potential to include, heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.

Para 190. Local planning authorities should identify and assess the particular significance of any heritage asset that may be affected by a proposal (including by development affecting the setting of a heritage asset) taking account of the available evidence and any necessary expertise. They should take this into account when considering the impact of a proposal on a heritage asset, to avoid or minimise any conflict between the heritage asset's conservation and any aspect of the proposal.

Para 191. Where there is evidence of deliberate neglect of, or damage to, a heritage asset, the deteriorated state of the heritage asset should not be taken into account in any decision.

Para 192. In determining applications, local planning authorities should take account of:

- a) the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
- b) the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and
- c) the desirability of new development making a positive contribution to local character and distinctiveness.

Considering potential impacts

Para 193. When considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation (and the more important the asset, the greater the weight should be). This is irrespective of whether any potential harm amounts to substantial harm, total loss or less than substantial harm to its significance.

Para 194. Any harm to, or loss of, the significance of a designated heritage asset (from its alteration or destruction, or from development within its setting), should require clear and convincing justification. Substantial harm to or loss of:

- a) grade II listed buildings, or grade II registered parks or gardens, should be exceptional;
- b) assets of the highest significance, notably scheduled monuments, protected wreck sites, registered battlefields, grade I and II* listed buildings, grade I and II* registered parks and gardens, and World Heritage Sites, should be wholly exceptional.

Para 195. Where a proposed development will lead to substantial harm to (or total loss of significance of) a designated heritage asset, local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm or total loss is necessary to achieve substantial public benefits that outweigh that harm or loss, or all of the following apply:

- a) the nature of the heritage asset prevents all reasonable uses of the site; and
- b) no viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation; and

- c) conservation by grant-funding or some form of not for profit, charitable or public ownership is demonstrably not possible; and
- d) the harm or loss is outweighed by the benefit of bringing the site back into use.

Para 196. Where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal including, where appropriate, securing its optimum viable use.

Para 197. The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset.

Para 198. Local planning authorities should not permit the loss of the whole or part of a heritage asset without taking all reasonable steps to ensure the new development will proceed after the loss has occurred.

Para 199. Local planning authorities should require developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible. However, the ability to record evidence of our past should not be a factor in deciding whether such loss should be permitted.

Para 200. Local planning authorities should look for opportunities for new development within Conservation Areas and World Heritage Sites, and within the setting of heritage assets, to enhance or better reveal their significance. Proposals that preserve those elements of the setting that make a positive contribution to the asset (or which better reveal its significance) should be treated favourably.

Para 201. Not all elements of a Conservation Area or World Heritage Site will necessarily contribute to its significance. Loss of a building (or other element) which makes a positive contribution to the significance of the Conservation Area or World Heritage Site should be treated either as substantial harm under paragraph 195 or less than substantial harm under paragraph 196, as appropriate, taking into account the relative significance of the element affected and its contribution to the significance of the Conservation Area or World Heritage Site as a whole.

Para 202. Local planning authorities should assess whether the benefits of a proposal for enabling development, which would otherwise conflict with planning policies but which would secure the future conservation of a heritage asset, outweigh the disbenefits of departing from those policies.

3.4 Local planning policy

Local Plan

3.4.1 The Reading Borough Local Plan was adopted 4 November 2019. The Local Plan replaces the previous development plans - the Core Strategy, Reading Central Area Action Plan and Sites and Detailed Policies Document – and is the main consideration in planning decisions. The relevant policies are as follows:

EN1: Protection and Enhancement of the Historic Environment

Historic features, areas of historic importance and other elements of the historic environment, including their settings will be protected and where possible enhanced. This will include:

- Listed Buildings;
- Conservation Areas;
- Scheduled Monuments;
- Historic parks and gardens; and
- Other features with local or national significance, such as sites and features of archaeological importance, and assets on the Local List.

All proposals will be expected to protect and where possible enhance the significance of heritage assets and their settings, the historic character and local distinctiveness of the area in which they are located. Proposals should seek to avoid harm in the first instance. Any harm to or loss of a heritage asset should require clear and convincing justification, usually in the form of public benefits.

Applications which affect Listed Buildings will not have an adverse impact on those elements which contribute to their special architectural or historic interest including, where appropriate, their settings.

Applications which affect Historic Parks and Gardens will safeguard features which form an integral part of the special character or appearance of the park or garden. Development will not detract from the enjoyment, layout, design, character, appearance, features or setting of the park or garden, key views out from the park, or prejudice its future restoration.

Applications which affect, or have the potential to affect, the significant features of heritage assets should be justified by a Heritage Statement.

The Council will monitor buildings and other heritage assets at risk through neglect, decay or other threats, proactively seeking solutions for assets at risk including consideration of appropriate development schemes that will ensure the repair and maintenance of the asset, and, as a last resort, using its statutory powers.

Where there is evidence of deliberate neglect or of damage to a heritage asset, the deteriorated state of the heritage asset should not be taken into account in any decision.

EN4: Locally Important Heritage Assets

Development proposals that affect locally important heritage assets will demonstrate that development conserves architectural, archaeological or historical significance which may include the appearance, character and setting of the asset.

Planning permission may be granted in cases where a proposal could result in harm to or loss of a locally important heritage asset only where it can be demonstrated that the benefits of the development significantly outweigh the asset's significance. Where it is accepted by the Local Planning Authority that retention is not important, recording of the heritage asset should be undertaken and submitted alongside development proposals. Replacement buildings should draw upon heritage elements of the previous design, incorporating historical qualities that made the previous building significant. This may include appearance, scale and architectural quality.

Built Heritage Baseline

3.5 History of the application site

3.5.1 The application site was open land until the later half of the 19th century, known as "Vasterns" it was likely meadowland criss-crossed by drainage canals leading to the River Thames.

3.5.2 The Great Western Railway was created by an act of Parliament in 1835 in order to create a double tracked railway line connecting London and Bristol. Isambard Kingdom Brunel was the engineer retained by Great Western Railway to construct the line and as a result the line was first constructed using his broad-gauge tracks which required considerably more land within the railway cut. The work on the line began in 1836 at both ends with the intention of meeting in the middle (Great Western Archive 2013). The line to Reading was completed in 1840 with the full line's completion in 1841. Reading Station was originally designed by Isambard Kingdom Brunel and built in 1840. The main building of Reading General Station is Grade II listed and an enlargement and remodelling of the original design was undertaken by Mr Lane, the Chief Engineer of the Great Western Railway Company between 1865 and 1867. A railway works was constructed to the north of the station.

3.5.3 The Ordnance Survey 1st edition 25":mile map of 1881 (fig 3) shows the development of the railway to the south of the application site with a works building and railway tracks extending into the south-east corner of the application site. The application site is crossed by two drainage canals leading to a single canal from the north-east side of Vastern Road. Industrial buildings including a timber yard and malthouses have been constructed to the west of the application site. The land to the north of Vastern Road remains open to the Thames River.

3.5.4 The Ordnance Survey 2nd edition 25":mile map of 1900 (fig 4) shows the coal depot of the Great Western Railway Works has been constructed within the application site along with other railway lines. The land to the north of the application site has been fully developed with terraces housing and industrial works including a saw mill, electric works and iron works. The land to the west of the application site has been redeveloped as terraced housing. The railway works continued to expand and develop until it was at its largest extent as seen in the Ordnance Survey 1:1250 scale map of 1956–57 (fig 5.

3.5.5 The Ordnance Survey 1:1250 scale map of 1969–72 (fig 6) shows clearance of the railway work apparatus to the east of the application site and the construction of a small car park in the west of the application site suggesting that the works were no longer a priority.

3.5.6 The application site has been completely cleared and redeveloped by the Ordnance Survey 1:1250 scale map of 1988–93 (fig 7) and has not changed since. The buildings on the application site are various large pavilion style brick built retail units with metal roofs. The railway works to the south-west of the application site have been demolished and redeveloped as a sorting office.

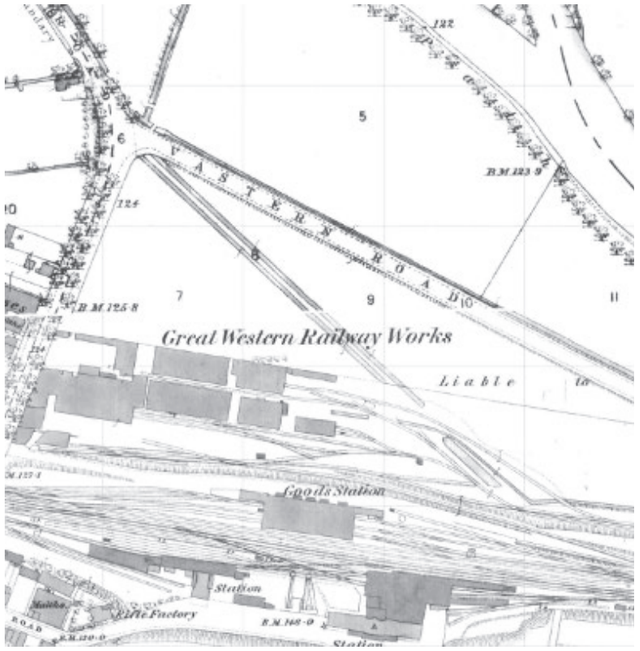


Fig 3 OS map of 1881

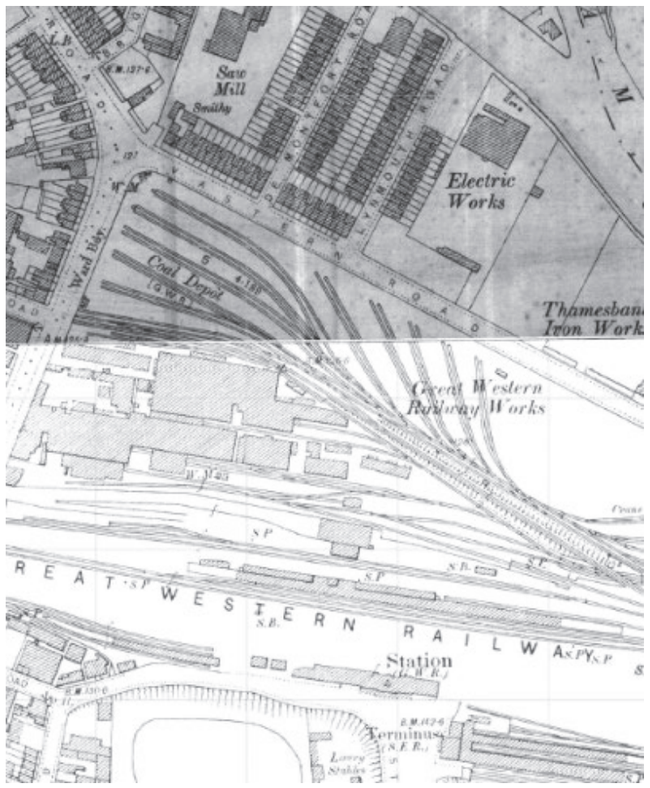


Fig 4 OS map of 1900

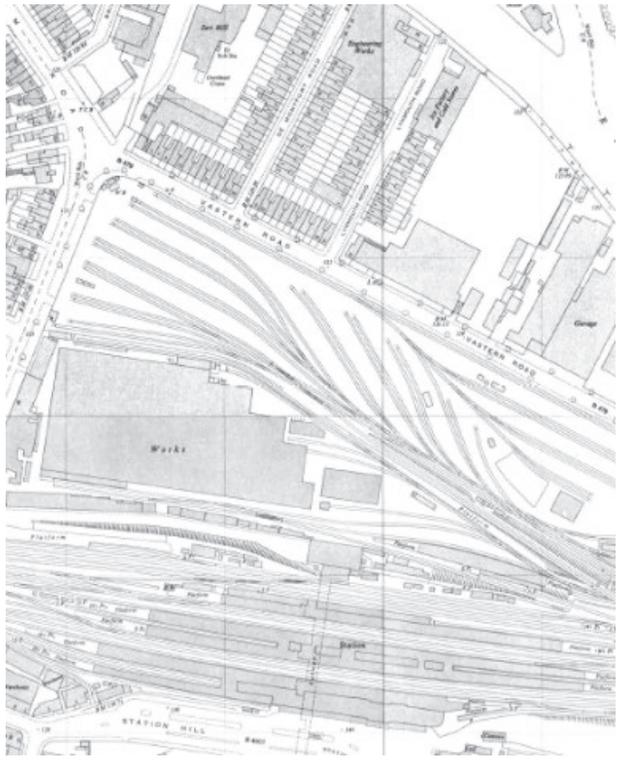


Fig 5 OS map of 1956-1957



Fig 6 OS map of 1969-1972

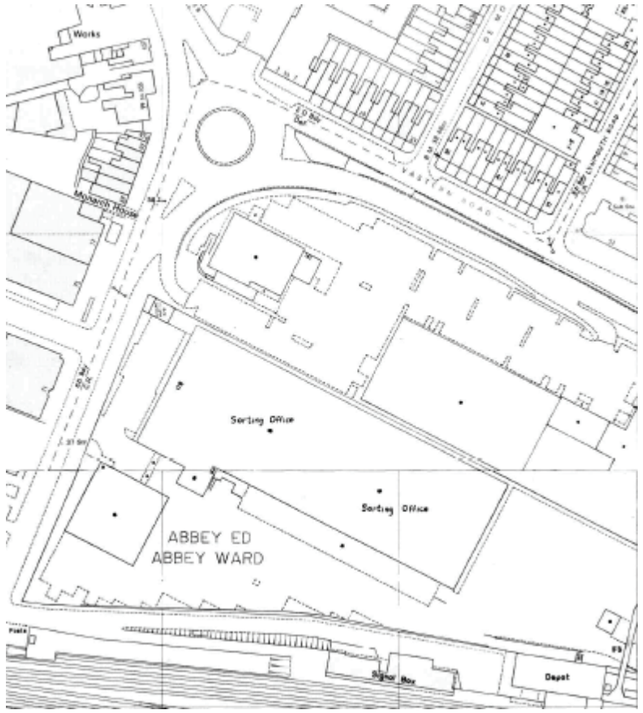


Fig 7 OS map of 1988

3.6 Application site description

3.6.1 The application site is a series of brick built pavilion style double storey commercial units. All of these buildings date to the 1980s.

3.6.2 The application site is bounded by Vastern Road to the north, beyond which are residential units and a Scottish and Southern Energy (SSE) office unit. To the east is Trooper Potts Way, Network Rail Thames Valley Area Site Office and Reading Railway Station are to the south and Caversham Road to the west on which there are commercial, residential and industrial units.

3.6.3 The area surrounding the application site can be characterised as urban development with a mix of commercial, industrial and residential uses.



Fig 8 View of the site from the north side of Vastern Road



Fig 9 View from Caversham Bridge looking south-east towards the site

3.7 Nearby heritage assets

3.7.1 The 14 designated heritage assets identified in section 2.3 are described below as is the locally listed building, No 55 Vastern Road.

3.7.2 The Reading Museum is:

> 1894 designed by a local architect (W.R Howell) to fill corner between concert hall and earlier school of art (qv). Asymmetric design in Gothic style closely echoing the style

of the concert hall. Two storeys attic and basement. Dark blue brick with dark red brick and terracotta dressings. Sandstone plinth. Terracotta band over ground floor, the carved reliefs depicting history of Reading; (incomplete but Saxon foundation, founding of Abbey and Magna Carta however can be seen). Arcaded cornice continued right across.

Projecting terracotta polygonal porch turret, heavy arcaded and decorated ground floor, gables over first floor windows. Three bay gable to right matches entrance to concert hall (coped gable, poppy head saddlestone, arcaded band and polygonal corner buttresses); two attic lancets flanking statue of Queen Victoria in canopied niche, C13 style. Two-light and oculus windows on first floor, segmental headed on ground floor. Corner block polygonal, basically a projecting chamfered turret with steep saddleback roof and three extremely rich gabled French Renaissance dormers with C13 geometrical tracery. First floor blind with three canopied niches on corners. On ground floor five foiled lancets and a basement of segmental headed windows. Commemorative marble tablet on corner. Return to Valpy Street repeats Waterhouse and Lainson use of triangular section buttresses capped with pinnacles between bays. Five bays. First floor blind, ground floor has two-light and oculus pointed windows with gables over. Tiled roofs. Octagonal belfry at east end, crenellated.

This composition is loosely said to be derived from Waterhouses Manchester Town Hall. Despite some similarities with other Gothic-style buildings in Manchester's Albert Square it is in fact much more closely related to the Waterhouse and Lainson blocks adjacent.

3.7.3 The main building at Reading Station is:

1865-67, architect Mr Lane (Chief Engineer of the GWR Co). Enlargement and remodelling of I K Brunel's original station of circa 1840. Italianate details. 2 storey symmetrical main building of buff brick from Coalbrookdale with Bath stone dressings, rusticated quoins. 10 bays wide, slight break to centre 4. Frieze, moulded cornice and blocking course, the projecting centre having console brackets to the cornice and the blocking course raised as solid pediment. The ground floor of the centre break has guilloche frieze and panelled pilasters with wreath caps flanking the windows and doorways. Cornices on console brackets over 1st floor windows, with triangular and segmental pediments over those in centre break. Canopy across ground floor. Hipped slate roof, chimneys removed. Pleasant central cupola, which has round headed lights and bracket eaves to pyramidal roof with finial. Canopy extends over ground floor extensions on both sides, about 12 bays to left and 7 to right.

3.7.4 The list entry for Regent Place describes it as:

Dated 1847. 3 storey and basement terrace block. Slight end breaks. Red brick on stucco basement. Stucco cornice, high parapet with panels to breaks. 1:5:1 bays, tripartite glazing bar sashes with brackets to cills and stucco architraves, plain stucco raised surrounds on 2nd floor. End bays have frieze and cornice to ground and 1st floor windows. No 47 altered to modern casements. Steps to 2 panel doors with moulded architraves and cornices. Nos 47-53 (odd) retain trefoil headed rails with heavier standards. Stucco date panel in centre inscribed "Regent Place MDCCCXLVII". Hidden slate roof.

3.7.5 29 and 31 Caversham Road are:

Circa 1847. 2 storey and basement pair. Red brick, with 1st floor cill band. Hipped slate roof with central chimney. 1 bay each, glazing bar sashes. 1 bay set back porch extensions to sides each with urn on coping.

3.7.6 Great Western House on Station Road is:

One of the 1st Railway Hotels in Britain. 1844 Italianate. 3 storeys and basement. Stucco with rusticated quoins. Ground floor channelled. 5x3 bays divided by pilasters supporting an entablature and boldly projecting modillion cornice. Glazing bar sash windows with architraves. Balustraded balcony, frieze and cornice to 1st floor windows, centre with pediment. 2nd floor windows with bracket cornice. Central

projecting portico with full Doric order and paired columns. 2 bay canted extension to right in matching style. North front has central bowed 3 light bay with cornice over on ground floor. High panelled parapet over cornice. Later 4 storey extension to left with carriage entry. Moulded coping to parapet. 2+1 bays. Modern extension to south. Similarities with Royal Station Hotel at Slough suggest I K Brunel as architect or one of his assistants. Balustraded area to street with heavy balusters. Curved to station approach corner.

3.7.7 13 and 15 Station Road are:

Probably circa 1903 and by Joseph Morris. Similar exuberant mixture of Baroque Art Nouveau and Flemish styles as Nos 17-27 (odd) qv. Very elaborate. 3 storeys and attic. Red and yellow glazed brick with terracotta enrichment to front only. Tiled roofs. 2 bays, tripartite sash windows. Bracketed oriel on 2nd floor to left. Enriched crows step gables of differing heights. Modern shop front.

3.7.8 The sculpture of King Edward VII is:

1902 to commemorate Coronation. Sculptor: George Edward Wade. Large bronze statue of the King in Coronation robes. High polished granite plinth with Ionic corner scroll balusters and re-entrant cornice.

3.7.9 The locally listed building is the entrance to Scottish and Southern Electric.

Date of building looks to be around 1900, possibly 1903. Building is now integrated within the wider (architecturally later) office and industrial depot SSE complex on Vastern Road, but is clearly architecturally separately identifiable and distinct, Building thought to be connected to the electric works. In 1903 the electric tramways also opened in Reading (Reading Corporation Tramways) and although this appears to be unconnected to this building, there was clearly an electric revolution in the town at that time, and it could mean that this may be the last original part of the original electric works. The street directory entry for Vastern Road in 1933 suggests that it might have been an individual building as a John Edwards is listed at 55 Vastern Road. The 1939 register lists him as the ‘electric works superintendent’, so there is the possibility that this was the caretaker’s lodge to the electric works. Main construction is orange brick in Flemish Bond with some grey/blue brick, which is characteristic of Reading. Liberal use of stone suggests a higher quality building. The style is an eclectic mix of a number of architectural styles, making use of polychromatic effects, including Neo-Gothic elements, appearing to be a Victorian building in a kind of Classical/Georgian revival, fashionable at the time. There is use of stone in the string work, porticos, headers and pillars which gives this small building grandeur beyond its size.



Fig 10 The main building to Reading Station (Grade II listed)



Fig 11 Regent's Place on Caversham Road (Grade II listed)



Fig 12 29 and 31 Caversham Road (Grade II listed)



Fig 13 Locally listed building – 55, Vastern Road

4 Statement of Significance

4.1 Introduction

4.1.1 The application site does not contain any nationally designated (protected) heritage assets; such as scheduled monuments, listed buildings or registered parks and gardens. There are several designated heritage assets that may be affected.

4.2 Significance Criteria

4.2.1 'Significance' lies in the value of a heritage asset to this and future generations because of its heritage interest, which may be archaeological, architectural, artistic or historic. Archaeological interest includes an interest in carrying out an expert investigation at some point in the future into the evidence a heritage asset may hold of past human activity, and may apply to standing buildings or structures as well as buried remains. Known and potential heritage assets within the site and its vicinity have been identified from national and local designations, HER data and expert opinion. The determination of the significance of these assets is based on statutory designation and/or professional judgement against four values (EH 2008):

Evidential value: the potential of the physical remains to yield evidence of past human activity. This might take into account date; rarity; state of preservation; diversity/complexity; contribution to published priorities; supporting documentation; collective value and comparative potential.

Aesthetic value: this derives from the ways in which people draw sensory and intellectual stimulation from the heritage asset, taking into account what other people have said or written;

Historical value: the ways in which past people, events and aspects of life can be connected through heritage asset to the present, such a connection often being illustrative or associative;

Communal value: this derives from the meanings of a heritage asset for the people who know about it, or for whom it figures in their collective experience or memory; communal values are closely bound up with historical, particularly associative, and aesthetic values, along with and educational, social or economic values.

4.2.2 Table 2 gives examples of the significance of designated and non-designated heritage assets.

Table 2: Significance of heritage assets

Heritage asset description	Significance
World heritage sites Scheduled monuments Grade I and II* listed buildings Historic England Grade I and II* registered parks and gardens Protected Wrecks Heritage assets of national importance	Very high (International/ national)
Historic England Grade II registered parks and gardens Conservation areas Designated historic battlefields Grade II listed buildings Burial grounds Protected heritage landscapes (e.g. ancient woodland or historic hedgerows) Heritage assets of regional or county importance	High (national/ regional/ county)
Locally listed buildings and heritage assets with a district value or interest for education or cultural appreciation and local (ie parish) value or interest for education or cultural appreciation	Low (Local)
Historic environment resource with no significant value or interest	Negligible
Heritage assets that have a clear potential, but for which current knowledge is insufficient to allow significance to be determined	Uncertain

4.3 Listed building

4.3.1 The following Grade II listed buildings have a high significance baseline;

Reading Museum

Evidential and Historic Value

4.3.2 Reading Museum forms a group with the Town Council and Clock Tower and Concert Hall. All three are architecturally similar and the museum was built to fit in with its neighbouring buildings. The evidential and historic value stems from their architectural style (Gothic) and their clustering together.

Aesthetic Value

4.3.3 The architecture of all three buildings is similar and dates to the end of the 19th century. The museum was built to sit alongside the other buildings and thus forms an aesthetic cluster of historically important buildings amongst modern mid-rise buildings. It therefore has a high aesthetic value.

Communal Value

4.3.4 All of these buildings are public buildings and thus have great communal value. The Museum has an education and entertainment value.

Summary of Significance

4.3.5 Based on the above Reading Museum has a high significance.

Station Building and Great Western Building

Evidential and Historic Value

4.3.6 Both of these buildings' historic value lies in their relationship with the construction of the Great Western Railway. The Great Western Building was the first railway hotel, and remains a hotel today. Both of these buildings have a strong historic association due to their connection with the railway.

Aesthetic Value

4.3.7 The aesthetic value of these buildings lies in their contribution of historic vernacular architecture. Furthermore their architectural style is unusual in the area due to the very modern station building and modern mid-rise buildings around the area.

Summary of Significance

4.3.8 Based on the above these three buildings have a high significance.

The statute of King Edward VII

Evidential and Historic Value

4.3.9 The historic and evidential value of the statue is the commemorative reason for why it has been erected; the coronation of Edward VII.

Aesthetic Value

4.3.10 The aesthetic value of the statue lies in its design and construction.

Communal Value

4.3.11 The communal value in the statue is the information and memory that can be appreciated by passers by.

Summary of Significance

4.3.12 Based on the above the statue has a medium significance.

13 and 15 Station Road

Evidential and Historic Value

4.3.13 The historic and evidential value in these buildings is their architectural style dating to early 20th century and that they are a pair.

Aesthetic Value

4.3.14 The aesthetic value rests in their contribution of historic vernacular architecture which can be appreciated by all as they are commercial buildings. Additionally, their architectural style is unusual in the immediate neighbouring locale.

Communal Value

4.3.15 The communal value in these buildings lie in their position on a busy road with plenty of pedestrian traffic and that the ground floors are commercial premises.

Summary of Significance

4.3.16 Based on the above these two buildings have a high significance.

Regents Place and 39 and 41 Caversham Road

Evidential and Historic Value

4.3.17 Both of these properties have a low evidential and historic value as they are private residences. Any interest lies in their architectural style.

Aesthetic Value

4.3.18 The aesthetic value of these buildings lies in their architectural style as examples of vernacular architecture and that they are unusual given the surrounding architecture which is mainly modern.

Communal Value

4.3.19 These buildings have very little communal value as they are private dwellings.

Summary of Significance

4.3.20 Based on the above these three buildings have a high significance.

Market Place Conservation Area

4.3.21 Conservation Areas have a high baseline significance. The Market Place Conservation Area is situated to the south-east of the application site. The high built landscape form means it is unlikely the development will be seen from within the Conservation Area or its peripheries

55, Vastern Road

4.3.22 Locally listed buildings have a medium significance baseline. It is only the front of this building as the entrance to Scottish and Southern Energy (SSE). The evidential and historic value of the building lies in its association with SSE. Its aesthetic value lies in its architectural form which is different to the surrounding buildings. The building has little communal value as it belongs to a private company and has no public access. Therefore the significance of this building is low to medium.

5 Proposed development

5.1 Proposal

5.1.1 Due to the outline nature of the application, the height and massing of the proposed development has been assessed based on a worst case interpretation of the development parameters, as described in ES Chapter 4: Proposed Development Description. The Built Heritage Assessment has been undertaken on the worst-case massing proposals, represented by Parameter Plan 105 (fig 14). All reference hereafter to the proposed development is based on the development proposals as permitted by Parameter Plan 105.

5.1.2 The proposed development would deliver four new builds that will be up to 112.9 m ADO storeys high in parts. The four blocks will be in a linear formation the length of the application site. All buildings will be divided into two blocks and each will be of differing height. The north-west corner of the application site will have a square block and be surrounded by a curved building which follows the shape of the application site boundary. The other buildings are square or rectangular in shape. There are passages between each of the buildings and an open space at the back of the buildings along the southern boundary. The buildings will be taller along the southern boundary. The heights will be as follows:

- Plot A – max. 71.1m AOD in the northern portion and max. 94.4m AOD in the southern portion
- Plot B - max. 61.8m AOD in the northern portion and max. 92.8m AOD in the southern portion
- Plot C - max. 79.1m AOD in the northern portion and max. 94.4m AOD in the southern portion
- Plot D - max. 87.9m AOD in the northern portion and max. 112.9m AOD in the southern portion

5.1.3 The Design Code has given some indication of the materiality and finishes likely to be incorporated. Floor to ceiling glazing will be used on the ground floor to provide an active street frontage. Large glazed windows will be present on the floors above, though dominance of glazing will depend on whether the buildings are residential or office use.

5.1.4 Podium gardens may be included and these would assist in breaking up the massing as well as having a high public benefit.

5.1.5 The roof design will respond to the scale of the local character and pitched roofs are suggested for lower height roofs and these would contribute to Reading's character and aesthetics.

5.1.6 The materials for the façades will be consistent with the local character of Reading. Historically Reading has had many brickworks and blue/grey bricks combined with red bricks are characteristic of some historic buildings. All buildings will use the same materials so as to create uniformity.

5.1.7 Clear delineations between the bottom, medium and top of the buildings will be incorporated to create visual divisions and assist in breaking up the height and massing.

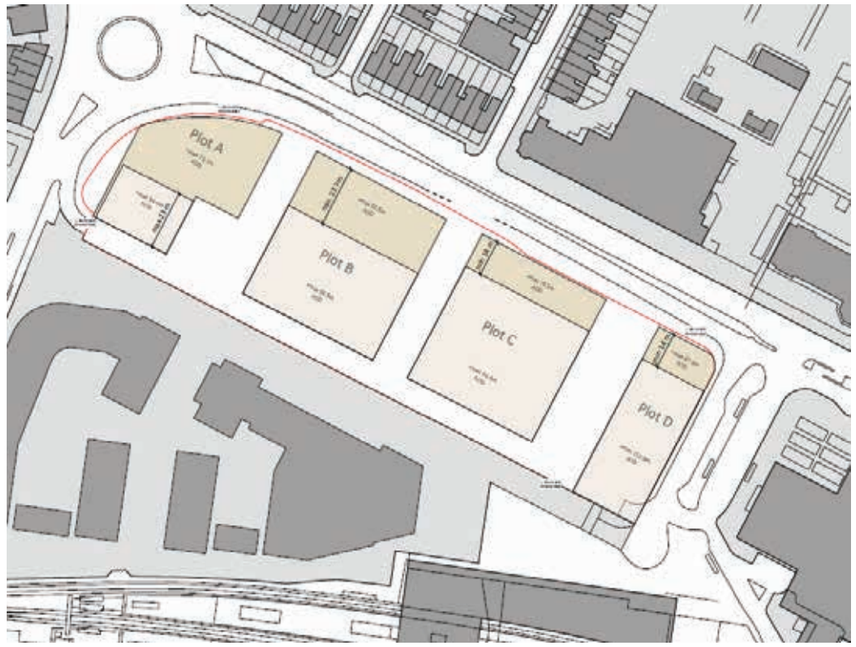


Fig 14 Parameter plan 105 – Plot Heights Mixed Use (source: ColladoCollins Architects)

6 Impact of Proposed Development

6.1 Impact on application site

6.1.1 There are no designated heritage assets on the application site. The only impact on the application site will be the demolition of the existing buildings to be replaced by the new builds.

6.1.2 The application site has a neutral impact on the surrounding area and its redevelopment will bring a more active street frontage on Vastern Road as well as domestic accommodation and public amenity space. Final designs, materiality and finishes have not been received yet and these will have to be taken into account but it is assumed that the scheme will be delivered to a high architectural quality. As such the scheme will have a positive effect on the application site and the surrounding area.

6.2 Impact on nearby heritage assets

6.2.1 There are a number of designated heritage assets as well as a locally listed building around the application site. There will be no physical impacts to any of these assets due to their distance from the application site.

6.2.2 The height of the proposed buildings means they will be seen from several of the surrounding heritage assets. The setting of most of these has changed considerably over time. Regent Place is a row of 5 terrace houses and the surrounding buildings and opposite are all modern, the same can be said of 29 and 31 Caversham Road though these two are part of a row of similar looking houses though those opposite are also modern.

6.2.3 The immediate setting of the main building of Reading Station has changed considerably as the station has been expanded and altered significantly. The historic station building is now a public house and the rest of the station is a modern building.

6.2.4 Verified view 10 (Fig 15) and 25 (Fig 16) from the supplied Town and Visual Assessment (TVIA) illustrates the impact the proposed development will have on the setting and views of the historic main building. While the proposed development will be behind the station building the height and scale of the proposed development is unprecedented in the area. The height and massing of the proposed development will detract from its architectural significance and prominence. As such the proposed development will have some harm on this heritage asset but this will be outweighed by any public benefit and can be mitigated by high quality architectural design and finishing.

6.2.5 Great Western House opposite the station still has some association with the station building as both date to the opening of the Great Western Railway. However, this value is now primarily historical association as the surrounding buildings are all of contemporary development which has had the result of reducing the historical and architectural links. This harm is less than that on the main building of Reading General Station and will not be significant.

6.2.6 The Town Council Chamber and Offices with Clock Tower as well as the Reading Museum and Concert Hall have a strong architectural and historic association and form a group. The buildings opposite and to the north are modern but to the south and east there are older buildings that help contribute to the setting of these heritage assets. The buildings of the proposed development are unlikely to be seen from the Reading Museum and so will not have an impact on these heritage assets.

6.2.7 The setting of the statue of Edward VII is immediate and is meant to be enjoyed at close proximity. The proposed development will therefore not have any impact on this heritage asset.

6.2.8 The locally listed building, No 55 Vastern Road will face the proposed development. While it is still the entrance to the offices of SSE, the surrounding buildings have changed and are no longer contemporary with the building in question. Its setting can be described as semi-industrial. It is also surrounded by modern buildings so the importance of its setting has reduced. It will benefit from the new active street frontage and the high quality architectural design of the proposed development. As a locally listed building it also does not benefit from any statutory protection.

6.2.9 There are cumulative schemes nearby that have planned tall buildings, these are at the Former Royal Mail site just south of the application site, the former SSE site north-east of the application site and at 29 Station Road. The main building of Reading General Station will suffer a cumulative effect if the Former Royal Mail site is developed. This will be a major adverse effect. The development at 29 Station Road will also have a cumulative effect on the main building of Reading General Station, as well as the Great Western House and 13 and 15 Station Road. This will only be a moderate adverse effect as the views will not be direct and parts of the surrounding area have already been subject to modern redevelopment. The development of the former SSE site will not effect any of the designated heritage assets as the application site is in between them. It will have a cumulative effect on the locally listed No 55 Vastern Road, this will be minor adverse. As a locally listed building, No 55 Vastern Road does not benefit from any statutory protection.



Fig 16 Approved view 10 looking north on Station Road with wireframe of proposed development (Source: AVR London)



Fig 17 Approved view 25 looking north-west from the top of Station Road with wireframe of proposed development (Source: AVR London)

7 Conclusions and Recommendations

7.1 Conclusions

7.1.1 This assessment has found that the proposed development would have a moderate adverse effect in built heritage terms on the main building to Reading General Station and a minor adverse effect on Great Western House and the other designated heritage assets. In both instances this would amount to less than substantial harm.

7.1.2 The views towards these assets will be impacted by the visual prominence of the proposed development, views north from Station Road have previously been uninterrupted leaving the clock tower of the Grade II listed station building as a focal point. However, this can be mitigated by careful design and finishing.

7.1.3 No 55 Vastern Road, the locally listed building, will have direct views on the proposed development and will benefit from the more active street frontage on Vastern Road. The proposed development will involve tall buildings but the beneficial public benefit will outweigh any adverse effects and so the overall effect can be summarised as minor beneficial. As a locally listed building, No 55 Vastern Road does not benefit from any statutory protection.

7.1.4 Proposals would present a positive effect on the site itself in terms of contemporary design and providing public benefits.

7.2 Recommendations

7.2.1 Continued discussion with the local authority to ensure a sufficiently sympathetic materiality, landscaping design to the proposed development, chiefly at the Vastern Road frontage, Vastern Road and planned pedestrian routes.

8 Bibliography

8.1 Published and documentary sources

CIfA [Chartered Institute for Archaeologists] Dec 2014a, *Standards and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment*, Reading.

CIfA [Chartered Institute for Archaeologists] Dec 2014b, *Standards and guidance for historic environment desk-based assessment*, Reading

DCLG [Department of Communities and Local Government], March 2012 *National Planning Policy Framework*

DCLG [Department of Communities and Local Government], March 2014 *Conserving and Enhancing the Historic Environment: Planning Practice Guide*

EH [English Heritage], 2008 *Conservation principles, policies and guidance.* Swindon

HE [Historic England] 2015a, *The Setting of Heritage Assets – Historic Environment Good Practice Advice in Planning: 3*. Historic England in collaboration with the Historic Environment Forum, second edition, Historic England July 2015.

HE [Historic England] 2015b *Managing Significance in Decision-Taking in the Historic Environment – Historic Environment Good Practice Advice in Planning: 2*. Historic England in collaboration with the Historic Environment Forum, second edition, Historic England July 2015.

8.2 Other Sources

Historic England designation data

Internet – web-published sources

Groundsure historic Ordnance Survey mapping

Technical Appendix 2.4: Flood Risk Assessment

8 Friday Street
Henley-on-Thames
Oxfordshire
RG9 1AH
Tel: +44 (0)1491 576 221
Email: mail@simpsoneng.com
www.simpsoneng.com

FLOOD RISK ASSESSMENT

READING STATION SHOPPING PARK

READING

RG1 8AJ

PREPARED FOR:

AVIVA

JOB NO: P19-418

DATE: 24th January 2020

REVISION: -

DOCUMENT HISTORY

Revision	Description	Date
-	First Issue	18.12.19
1	Issued for Planning	24.01.20

CONTENTS

1. INTRODUCTION 3
2. SITE LOCATION AND TOPOGRAPHY 3
3. EXISTING GROUND CONDITIONS 4
4. EXISTING DRAINAGE CHARACTERISTICS 4
5. PROPOSED SCHEME 5
6. SOURCES OF FLOODING 5
7. THE SEQUENTIAL & EXCEPTION TEST 11
8. MANAGING THE RISK OF FLOODING 12
9. SURFACE WATER MANAGEMENT & DRAINAGE STRATEGY 14
10. FOUL WATER DRAINAGE STRATEGY 20
11. CONCLUSIONS 20

APPENDICES

APPENDIX A: TOPOGRAPHICAL SURVEY
APPENDIX B: THAMES WATER SEWER RECORDS
APPENDIX C: SITE PARAMETER PLANS
APPENDIX D: SFRA FLOOD MAPS & SITE ASSESSMENT
APPENDIX E: EA FLOOD DATA
APPENDIX F: FLOOD OUTLINE & STORAGE LAYOUTS
APPENDIX G: RUNOFF CALCULATIONS
APPENDIX H: PROPOSED DRAINAGE STRATEGY
APPENDIX J: MICRODRAINAGE CALCULATIONS
APPENDIX K: SUDS IMPLEMENTATION & MAINTENANCE PLANS

1. INTRODUCTION

1.1 This report has been prepared by Simpson Associates on behalf of Aviva Life and Pensions UK Limited to accompany an outline planning application for a mixed-use development comprising residential and commercial uses together with associated parking, access arrangements and landscaping.

1.2 The report considers the flood risk associated with the development proposals and details a strategy for the disposal of foul and surface water runoff from the development.

1.3 The report has been prepared in accordance with the Department for Communities and Local Government's National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG), which provides advice on development and flood risk.

2. SITE LOCATION AND TOPOGRAPHY

2.1 The development is proposed in an existing retail park known as Reading Station Shopping Park and is shown in *Figure 1* below. The site is centred on Ordnance Survey grid reference SU 71403 74068 and co-ordinates: X: 471403, Y: 174068. The nearest post code is RG1 8AJ.

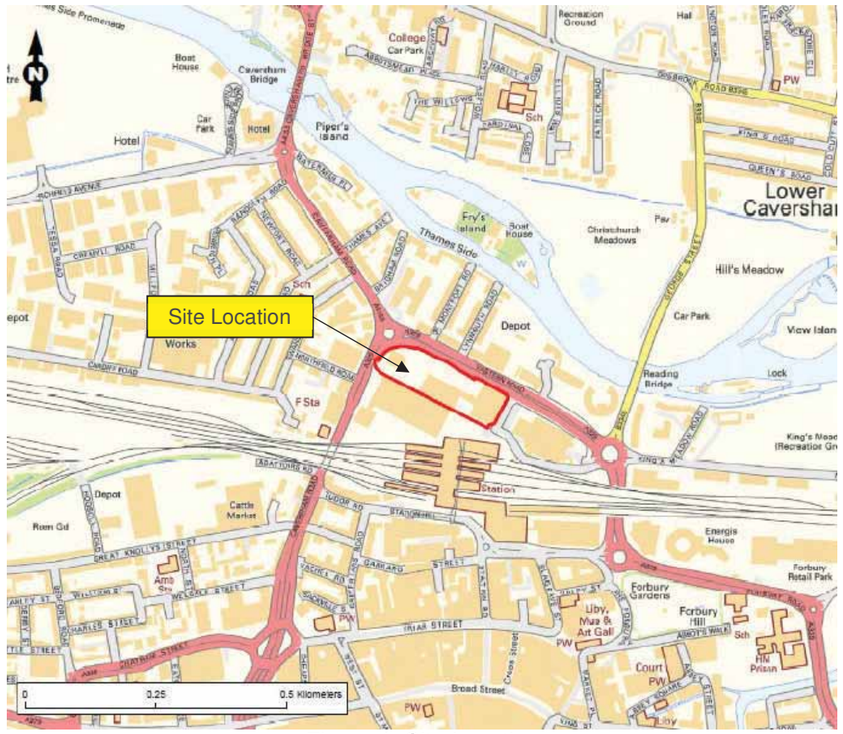


Figure 1: Site Location

2.2 To the north of the site is Vastern Road (A329), beyond which are residential units, a Scottish and Southern Energy (SSE) office unit and the River Thames. Trooper Potts Way and Reading Railway Station Car park are to the east of the site. To the south is Network Rail Thames Valley Area Site Office, beyond which is Reading Station and railway lines. Caversham Road / Inner Distribution Road (IDR) is to the west, with a range of commercial, residential and industrial units beyond.

2.3 The application site is approximately 1.77Ha and comprises pavilion style commercial units (Aldi, The Range, TGI Fridays, Mothercare, Majestic Wine) and associated parking. Vehicular access to the application site is off Caversham Road, with egress onto Vastern Road (A329).

2.4 A topographical survey of the site is included in *Appendix A*. The survey shows the existing site layout with levels across the site ranging between 38.10mAOD – 38.82mAOD demonstrating the site to be largely flat with a median level across the site of 38.46mAOD. The site is shown to be at an elevated level above its immediate boundaries, with the greatest level difference along the northern boundary up to circa 1m.

3. EXISTING GROUND CONDITIONS

3.1 At the current time a site investigation has not been carried out for the application site, however an interpretive report on Phase 2 Geo-Environmental Ground Investigations undertaken for the adjacent site (Network Rail Thames Valley Area Site Office) has been reviewed and provides an indication of the application site's ground conditions. Further information accessible on the British Geology Survey (BGS) website provides details of ground conditions and allows access to borehole log records. Records have been reviewed in conjunction with the site investigation for the adjacent site and provide a close representation of the site's ground conditions.

3.2 The site investigation for the adjacent site indicates ground conditions to comprise of variable thicknesses of made ground and Alluvium (Langley Silt) comprising of greenish grey and brown silt and clay with some peat, over River Terrace Deposits (RTD) consisting of fine to coarse sand and gravel, overlying a bedrock of chalk. The results are consistent with the BGS mapping which details superficial deposits of Langley silt overlying a bedrock geology of Seaford Chalk Formation and Newhaven Chalk Formation.

3.3 Groundwater was encountered in all boreholes and ranged from 1.95mbgl to 2.5mbgl within the BGS borehole records in the application site. This is consistent with the adjacent site investigation, which encountered groundwater at the top of the RTD layer in all boreholes, at an average level of 2mbgl. The adjacent site investigation measured water depths indicated the direction of groundwater flow in the gravels is from west to east, which corresponds with falls in site ground levels.

4. EXISTING DRAINAGE CHARACTERISTICS

4.1 The topographical survey included in *Appendix A* shows the existing site to be served by separate foul and surface water gravity drained networks comprising of traditional underground pipework.

4.2 Surface water runoff from the buildings is shown to be drained via rainwater downpipes, whilst the car park runoff is drained by a series of linear channel drains. Surface water runoff generated from the car park passes through a petrol interceptor

prior to discharging to a culverted watercourse located in the south east of the site via a 450mm diameter pipe.

4.3 Foul flows are shown to be drained via a traditional system of below ground pipework prior to discharging into the existing sewer infrastructure operated and maintained by Thames Water located within the site. A copy of Thames Water sewer records is included in *Appendix B*.

5. PROPOSED SCHEME

5.1 The proposed development is anticipated to comprise of:

- Construction of approximately four new buildings, up to approximately 112.9mAOD
- Delivery of a total maximum floorspace of up to 115,000 m^2 gross external area (GEA), which could include;
- Residential, retail, leisure and community, office and hotel use
- Demolition of existing buildings;
- New vehicular, pedestrian and cycle routes;
- The proposed development would deliver below ground surface water attenuation. The parameter plans would allow for excavation up to 1.5mbgl for this within the areas shown in Parameter Plan 105.

5.2 A set of parameter plans are included in *Appendix C* which outline the development proposals.

6. SOURCES OF FLOODING

6.1 The Evidence Base on Reading Borough Council's (RBC) website includes a list of documents which have been used to inform the different plans and policies of the Local Development Plan. The list of documents includes Strategic Flood Risk Assessment's (SFRA), which provide details of sources of flood risk within the local area. The following reports are available on the Council's Website:

- Reading Borough Council Level 1 SFRA 2009
- Reading Borough Council Local Flood Risk Management Strategy 2015
- Reading Borough Council Level 1 SFRA 2017 Update
- Reading Borough Council Level 2 SFRA 2017

6.2 The flood risk associated with sources of flooding identified within these reports has been reviewed under the headings below.

<u>Fluvial Flooding</u>

6.3 The Environment Agency (EA) has derived flood maps of England, from which it is possible to initially identify whether a site is located within an area that is at risk of fluvial / tidal flooding. The maps, which are available on the EA's website, categorise land as being within Flood Zone 1, Flood Zone 2 or Flood Zone 3, with Flood Zone 1 being all land falling outside of the floodplain and Flood Zone 2 and 3 being all land within the floodplain. Flood Zone 3 is split into two further categories, namely Flood Zone 3a and Flood Zone 3b with Flood Zone 3b considered to be the functional floodplain.

6.4 The definitions of the Flood Zones extracted from the National Planning Policy Framework (NPPF) are described below:

- Flood Zone 1 – Low probability. This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

- Flood Zone 2 – Medium probability. This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% - 0.1%) in any year.

- Flood Zone 3a – High probability. This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

- Flood Zone 3b – The functional floodplain. This zone comprises land where water has to flow or be stored in times of flood. Typically land which would flood with an annual probability of 1 in 20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood.

6.5 The flood zone map in *Figure 2* below has been taken from EA's website and shows the site to lie largely in Flood Zone 2 associated with the River Thames.

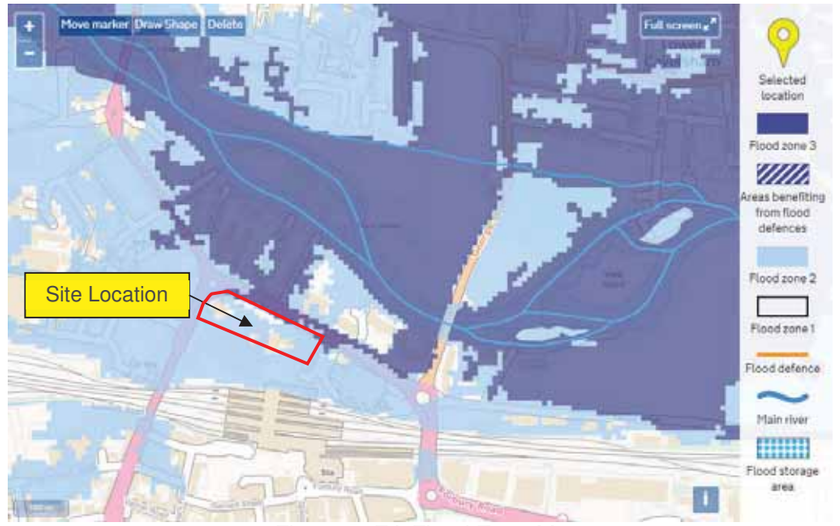


Figure 2: EA Flood Zone Map

6.6 The EA's Flood Zone Map typically corresponds with the Flood Zone Map extracted from the RBC Level 2 SFRA and is included in *Appendix D.*

6.7 On a similar basis to the flood zone map, the associated level of risk from river (fluvial) flooding taken from the EA's website is shown in *Figure 3*. The map demonstrates the location of the proposed development to be in an area mainly considered to be at very low to low risk of fluvial flooding, with a small proportion shown to be at medium risk.

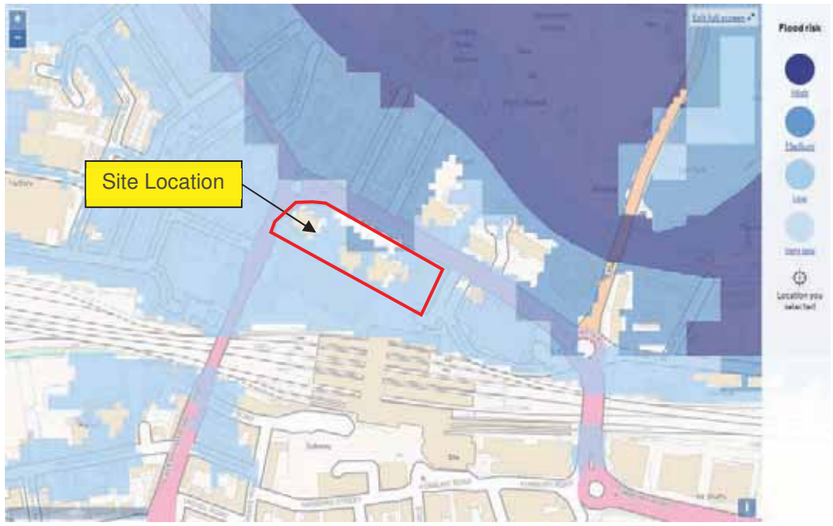


Figure 3: EA Risk of Fluvial Flooding Map

6.8 The maps available on the EA's website are produced from a combination of a national generalised computer model, detailed modelling and some historic flood event outlines and are intended as a guide only. Further detailed flood risk information from the EA has been obtained and is included in *Appendix E*.

6.9 The information received from the EA includes a map of historic fluvial flood events, which shows the site was not affected as a result of a fluvial flooding events which occurred between 1947 – 2007.

6.10 Whilst there is no formal flood defence for the River Thames at the location relevant to the site, the EA asset register details bank protection which has a design standard of 1 in 5 years. The condition of this is 4 on a scale of 1 being very good and 5 being very poor. In light of this, a flood alleviation scheme proposed by the EA to reduce flooding from the River Thames in north Reading and Lower Caversham is currently in consultation stage. If carried through it would see the addition of more significant embankments / walls along with other methods of alleviation which would aim to reduce the risk of fluvial flooding to north Reading and Lower Caversham area.

6.11 The flood mapping information received from the EA includes a set of modelled fluvial flood levels for a range of flood events and climate change allowance at various nodes along the River Thames and at a select number of Flood Points relative to the application site. *Table 1* below shows EA modelled flood levels for selected flood events and climate change (CC) allowances for Flood Points 2 & 4 shown on the EA mapping in *Appendix E*. The information from the EA did not include data for select events at flood point 4 which is located within the site, however, flood levels for Flood Point 2 are considered to have a direct relationship with the flood levels for Flood Point 4 and have been deemed appropriate to represent predicted flood levels of the application site.

Table 1: EA Modelled Flood Levels

Flood Event	Flood Level (mAOD)	
	Flood point 2	Flood point 4
1 in 100 (1%) AEP	38.05	N/A
1 in 100 (1%) AEP (+25% increase in flows)	38.29	N/A
1 in 100 (1%) AEP (+35% increase in flows)	38.34	N/A
1 in 100 (1%) AEP (+70% increase in flows)	38.52	38.52
1 in 1000 (0.1%) AEP	38.469	38.467

6.12 The NPPF suggests a range of percentile allowances for climate change, which should take into consideration the flood risk vulnerability classification for the type of development and Flood Zone. The flood risk vulnerability classification of the proposed development would be considered 'more vulnerable' for residential / hotel and 'less vulnerable' for retail / office use. The NPPF advises that "more vulnerable" development in Flood Zone 2 use the higher central and central percentile allowances to assess the impact of climate change. The site is in the Thames region, with the higher central and central percentile allowances listed in *Table 2*.

Table 2: Thames Region – Central and Higher Central percentile allowances

Allowance Category	Period		
	2020's (2015 – 2039)	2050's 2040 - 2069	2080's 2070 – 2115
Higher Central	+15%	+25%	+35%
Central	+10%	+15%	+25%

6.13 The land north of the railway station which includes the application site, adjacent site (Network Rail Thames Valley Area Site Office) and Reading station railway carpark, are included in the RBC Local Plan for development and have been assessed together in RBC's Level 2 SFRA ref: AB004 – North of the Station. The RBC Level 2 SFRA document which provides an assessment and associated recommendations can be found in *Appendix D*. Providing allowance for a 100 year design life, it is considered appropriate to use the central allowance of 25% for the 1% annual exceedance probability (AEP) to represent the benchmark design level that the development's ground floor level and flood storage should be assessed against in accordance with the recommendations of the RBC Level 2 SFRA assessment ref:AB004.

6.14 The predicted flood level of 38.29mAOD associated with the 1% AEP + 25% CC has been plotted onto the site plan using 3D level information extracted from the topographical survey. The results of this exercise are shown on drawing P19-418 SK01 included in *Appendix F* which indicates that there are areas of the site which would be situated within the flood extents associated with the 1% AEP + 25% CC. The exercise has also been carried out for the predicted flood level of 38.34 for the 1% AEP + 35% CC and is shown on the plan.

Surface Water Flooding

6.15 The EA have modelled locations along critical flow paths and areas situated in topographic depressions, which could flood following an extreme rainfall event. *Figure 4* below, shows a surface water flood risk map taken from the EA's website with the location of the site identified.

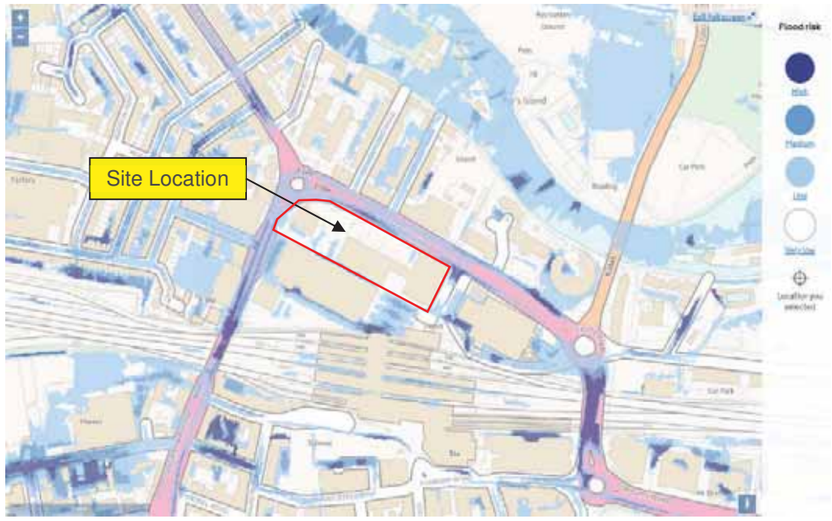


Figure 4: EA Surface Water Flood Risk Map

6.16 *Figure 4* identifies the site to be at a low to very low risk from surface water flooding. The areas at low risk within the site are consistent with low points identified on the topographical survey which are drained via linear drainage channels and in turn discharge to the culverted watercourse south east of the site. The off-site areas adjacent to the northern boundary are shown to be at high risk of surface water flooding however are not considered to be a potential flood risk to the site, as the site is at an elevated level above surrounding areas and will continue to be situated above following development. Therefore, the risk of surface water flooding is assessed to be low to very low.

Groundwater Flooding

6.17 RBC's level 1 SFRA provides a map of areas susceptible to groundwater flooding and is included in *Appendix D*. The map shows the site is situated on the band of areas considered to be at risk of between 25% and 50% susceptible to groundwater flooding and at a risk greater than 75%.

6.18 The RBC level 1 SFRA states that the risk of groundwater flooding across the Reading area is typically considered to be low and provides a map of historic flood records, in which groundwater flooding is considered. The map shows there is no recorded incidents of groundwater flooding in the application site. A copy of the map is included in *Appendix D*.

6.19 Given the close proximity of the River Thames which runs approximately 150m north of the site, it is considered that groundwater levels would closely match base flow river levels and given the site is raised substantially above the rivers normal water level. It is therefore considered unlikely that the site would be affected by groundwater flooding.

Sewer Flooding

6.20 A sewer flood map extracted from the RBC's Level 2 SFRA is included in *Appendix D*. The map has been produced from internal / external flood incidents recorded in Thames Water's DG5 register and shows the site to be in the postcode RG1 8, which details 21-50 recorded incidents of sewer flooding.

6.21 The RBC Level 1 SFRA also provides a map of historic flood records, in which sewer flooding is considered. The map shows there has been no recorded incidents of sewer flooding in the application site or its vicinity. A copy of the map is included in *Appendix D*.

6.22 The area associated with the postcode RG1 8 is generally on the lower scale of recorded sewer flooding incidents across the Reading Borough and as there are no recorded incidents shown on the historic flood maps, the development is not considered to be at risk of sewer flooding.

6.23 As it was determined in section 4 of this report, there is an existing foul sewer located within the site owned and operated by Thames Water. This length of sewer disposes of foul water flows from on-site existing buildings only, which will be demolished as part of the site proposals. Where the sewer is affected by the proposed development it will be diverted via agreement with Thames Water.

Flooding from Artificial Sources

6.24 Flooding from artificial sources, is most likely to result from burst water mains or from infrastructure failure in an artificial watercourse or water body, i.e. canals or other water features such as reservoirs. These systems are maintained, improved and regularly inspected by the Canal and River Trust (canals), Thames Water (water mains) and EA (water bodies). Therefore, flood risk from these sources is generally considered to be low.

6.25 Flood maps associated with large reservoirs that hold over 25,000 cubic meters of water are available on the EA website. The maps help to identify areas that could potentially be affected by reservoir flooding and display a realistic worst case scenario of the largest area that may be flooded if a reservoir were to fail and release the water it holds.

6.26 *Figure 5* below shows a Reservoir Flood Map taken from the EA's website. The map shows the site to be unaffected by reservoir flooding, therefore, the development is assessed to not be at risk of flooding from this source.

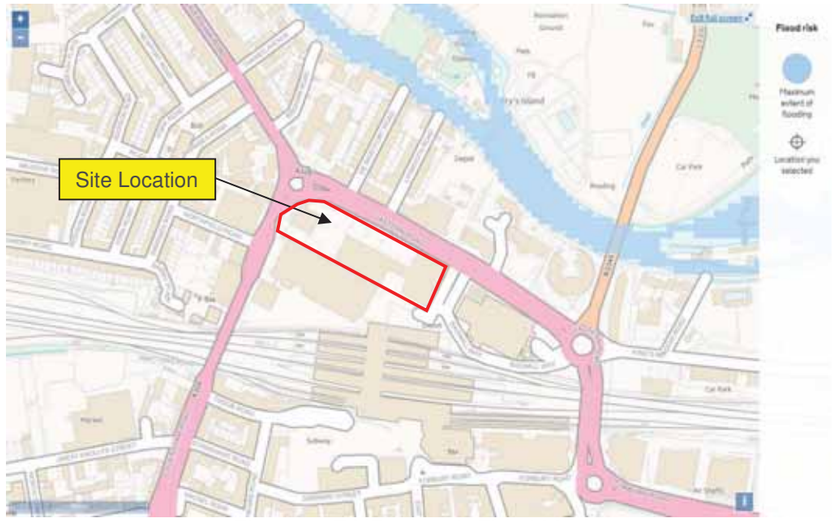


Figure 5: EA Reservoir Flood Map

6.27 There are no canals in the immediate surrounding area, therefore, the development is assessed to not be at risk of flooding from this source.

6.28 Flood patterns associated with burst water mains would be similar to surface water flood patterns, which have been assessed to be low to very low.

7. THE SEQUENTIAL & EXCEPTION TEST

7.1 The National Planning Policy Framework (NPPF) encourages a sequential risk-based approach to determine the suitability of land for development in flood risk areas. It advises local planning authorities to demonstrate that there are no reasonably available sites in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.

7.2 In areas at risk of flooding, the NPPF advises that preference be given to new development in Flood Zone 1. If there are no reasonably available sites in Flood Zone 1 the flood vulnerability of the development can be considered in locating development in Flood Zone 2 and then Flood Zone 3. Within each flood zone new development should be directed to sites at the lowest probability of flooding from all sources.

7.3 The application site along with neighbouring sites Network Rail Thames Valley Area Site and Reading station railway carpark have been considered in the Local Plan by Reading Borough Council for mixed-use development, ref. *CR11e, North of Station*. The sequential test was applied in consideration to steer new development away from high flood risk areas. The conducted sequential test confirmed the application site and surrounding sites are suitable for development by Reading Borough Council.

7.4 On this basis, paragraph 162 of the NPPF states that "*Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan making stage, or if more recent information about existing or potential flood risk should be taken into account."* It is therefore not considered necessary to carry out any further assessment, as the application of the sequential test has been applied and has been considered to meet the requirements of the NPPF.

7.5 In connection with the Exception Test paragraph 159 of the NPPF which states that *"If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives), the exception test may have to be applied. The need for the exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in national planning guidance."*

7.6 The exception test was applied in the Local Plan and it was determined that the sustainability benefits would outweigh the flood risk and would be suitable for development on the basis that design recommendations set out in the RBC Level 2 SFRA are considered throughout the design.

8. MANAGING THE RISK OF FLOODING

8.1 Section 6 of this report has established the site to be in Flood Zone 2 in present day circumstances, however through applying the Thames basin climate change allowances, it was determined that areas of the site would fall within Flood Zone 3a. The associated predicted flood level of 38.29mAOD 1% AEP +25% was assessed to be the benchmark flood level to which the development should be protected from fluvial flooding and in which flood storage should be assessed against, in line with the RBC Level 2 SFRA recommendations. Furthermore, it was determined that residual risk to the development required assessing for the 1% AEP + 35% CC.

8.2 It has been established in this report that the application site is determined to be at low to very low risk of flooding from all other sources of flooding.

8.3 The measures summarised under the headings below are proposed to ensure that the development can be occupied and operated safely with there being no increase in the level of flood risk to the site or neighbouring sites.

Finished Floor Level

8.4 In line with the design recommendations from the assessment in the RBC's Level 2 SFRA Ref. AB004 and section 5.5.2 of BS 8533-2017 '*Assessing and Managing Flood Risk in New Development – Code of practice'*, floor levels will be set a minimum of 300mm above the predicted design flood level.

8.5 On this basis it is proposed to set building floor levels at a minimum level of 38.59mAOD which would ensure the ground floor is raised 300mm above the maximum predicted flood level of 38.29mAOD for the 1% AEP + 25% climate change allowance. Setting building ground floor levels to 38.59mAOD would also provide a freeboard of 250mm for the predicted 1% AEP + 35% climate change allowance and 123mm for the 0.1% AEP.

Floodplain Compensation

8.6 Areas at which flooding could occur within the site are demonstrated on drawing P19-418 SK01 in *Appendix F*. Floodwater depths and volumes within the existing site have been analysed and calculated at 100mm increments, with results shown on Existing Flood Storage drawing P19-418 SK02 in *Appendix F*.

8.7 The proposed building plots shown on the Parameter Plans drawing ref PP-102 in *Appendix C* indicate proposed building footprints and have been used to assess the impact the proposed development would have on flood water storage. As demonstrated on the flood outline plan P19-418 SK01 there would be potential for flood water to be displaced as a result of buildings encroaching the extents of the floodplain for the 1% AEP + 25% CC.

8.8 To compensate the flood water that would be displaced by the development and to ensure there is no detriment to the floodplain, it is proposed to provide the necessary levels of compensation on a "level for level" & "volume for volume" basis. This would be achieved at the proposed access and egress, along with the southeast corner of the site, which would ensure hydraulic connectivity is maintained with the floodplain.

8.9 The proposed volumes of compensatory storage have been analysed and the results of the modelling exercise are demonstrated on drawing P19-418 SK04 in *Appendix F*. The results demonstrate that predevelopment flood storage levels would not be reduced as a result of the proposed development and that there would not be an increase in the risk of flooding elsewhere. A comparison of existing and proposed storage volumes is shown in *Table 3* below.

Table 3: Floodwater Storage Volumes

		Existing Volumes		Proposed Volumes	
Elevation (mAOD)	**Depth (m)**	**Volume (m^3)**	**Cumulative Volume (m^3)**	**Volume (m^3)**	**Cumulative Volume (m^3)**
38.29	0.0 – 0.1	120	163	107	170
38.19	0.1 – 0.2	37	43	42	63
38.09	0.2 – 0.3	5	7	14	21
37.99	0.3 – 0.4	1	2	6	7
37.89	0.4 – 0.5	1	1	1	1

Access/Egress

8.10 The RBC Level 2 SFRA assessment states that safe access is available in the current 1% AEP flood event and would therefore meet the requirements of Section 3.4 of the Level 2 SFRA provided a Flood Management and Evacuation Plan is prepared to consider the impacts for climate change scenarios.

8.11 The 1% AEP + 35% CC flood level of 38.34mAOD has been used to assess the access routes to land outside the Floodplain. A flood hazard map has been produced using the predicted flood level of 38.34mAOD for the 1% AEP + 35% CC, with results of the exercise included on drawing P19-418 SK04 included in *Appendix F.* The drawing demonstrates the associated risk with the modelled flood depth and safe routes of access / egress to land outside the floodplain.

8.12 The flood depth to hazard rating has been established in line with the DEFRA Technical Report documents "FD2320/TR2" and "FD2321/TR1" and considers the velocity of flood waters. When flooding does occur the rate of rise and fall in water level is slow and velocities will correspondingly be slow due to the distance from the River Thames and the application site located in urbanised area as given in the RBC Level 2 SFRA assessment.

8.13 Flood depths in the landscaping of the development would generally be less than 200mm in depth for the 1% AEP + 35% CC flood level of 38.34mAOD and would be relatively still and a "Very Low Hazard" in line with the documents "FD2320/TR2" and "FD2321/TR1".

8.14 Whilst depths in the site are considered to be a very low hazard, access routes to land outside the floodplain could be affected by the 1% AEP + 35% CC and flood events exceeding this. Therefore, a flood risk management plan / evacuation plan should be prepared to inform future tenants / residents of the potential flood risk and the appropriate response in the event of a flood warning.

9. SURFACE WATER MANAGEMENT & DRAINAGE STRATEGY

Surface Water Disposal

9.1 The NPPF Planning Practice Guidance advises that Sustainable Urban Drainage Systems (SUDS) should be used to control surface water runoff close to where it falls as well as to mimic natural drainage as closely as possible with surface runoff discharged as high up the following hierarchy of drainage options as reasonably practicable.

- into the ground (infiltration);
- to a surface water body;
- to a surface water sewer, highway drain, or another drainage system;
- to a combined sewer.

9.2 The methods of disposal are summarised in *Table 4* below with an assessment of each methods suitability also provided.

Table 4: Surface Water Runoff Destination Assessment

Surface Water Runoff Destination	Assessment
Into the ground (infiltration)	*Section 3* of this report determined that groundwater was typically encountered at 2mbgl in borehole records within the application site. Furthermore, the ground conditions comprise of The Langley Silt Member which are deemed to possess negligible infiltration qualities.
To a surface water body	The topographical survey in *Appendix A* identifies an existing culverted watercourse which the existing surface water runoff from the site is drained to. It is therefore proposed that the outfall is retained and re-used for the discharge of surface water runoff subject to a CCTV survey being undertaken to confirm the outfall`s condition.

9.3 Based on the assessment in *Table 4*, it is assessed to be appropriate to discharge surface water runoff from the development to the existing culverted watercourse southeast of the site.

Runoff Management

9.4 Surface water runoff from new development should be managed in accordance with the suggested procedures set out in March 2015 DEFRA report "Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems".

9.5 The site is considered to be brownfield in nature. For developments on previously developed land, Policy S3 of the DEFRA report advises that the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event. Policy S5 of the DEFRA report advises that where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

9.6 Greenfield runoff rates and volumes for a variety of storm events up to the 1 in 100-year return period for a 6-hour duration are shown in *Table 5* , which are based on the site area of 1.77ha. The greenfield runoff rates and volumes have been calculated using the ReFH2 method within the Source Control Facility of the MicroDrainage Software Package, with design results included in *Appendix G*.

Table 5: Greenfield Runoff Rates & Volumes

Return Period (Year)	Greenfield	
	Peak Runoff Rate (l/s)	6hr Runoff Volume (m^3)
1	1.8	18.4
30	4.8	80.4
100	6.4	107.0

9.7 Existing runoff rates and volumes for a variety of storm events up to the 1 in 100 year return period for a 6 hour duration are shown in *Table 6* below which have been established using the Modified Rational Method Formula based on rainfall profiles generated using the FSR rainfall model within MicroDrainage. The Modified Rational Method calculations and rainfall profiles are included in *Appendix G*.

Table 6: Existing Runoff Rates & Volumes

Return Period (Year)	Pre-Development	
	Peak Runoff Rate (l/s)	6hr Runoff Volume (m^3)
1	64.0	271.4
30	142.6	604.7
100	185.5	786.6

Sustainable Urban Drainage Systems (SUDS)

9.8 Within the drainage strategy it is necessary to consider the use of SUDS, which encompass a wide range of drainage techniques intended to minimise the rate of discharge, volume and environmental impact of runoff and include; green roofs / rainwater harvesting; soakaways / infiltration systems; infiltration trenches and filter drains; permeable paving; swales and basins; ponds and wetlands. *Table 7* below provides an assessment of each methods suitability.

Table 7: SUDS Assessment

System	Assessment
Green / Blue Roofs	Where the roof structure of the building comprises of flat roofs the use of green / blue roofs is considered appropriate for the management of surface water runoff, which would intercept and retain precipitation and help reduce runoff rates & volumes discharged from the site. Green roofs typically comprise of vegetation and substrate, overlaying a filter fabric, drainage board, root barrier and waterproof membrane components. Blue roofs comprise of a similar build up however utilise an additional 'attenuation' layer, which allows surface water flows to be stored and discharged at a restricted rate through a restrictor chamber and outlet.
Rainwater Harvesting	Rainwater harvesting has not been considered as part of the drainage strategy for this development as it will not contribute to significant reduction in surface water volumes offsite. However, it could be considered as a means of reducing water consumption

	on site but would need to be evaluated against final development plans.
Soakaway / Infiltration Systems / Infiltration Trenches	Part H of the Building Regulations advises that soakaways should not be built within 5m of a building or road, or up to 20m where underlying ground consists of chalk. Taking into account the proposed building footprints and areas which would form access roads, together with the ground conditions reported in Section 3, infiltration drainage techniques are assessed to be inappropriate. Further to this, high groundwater levels would generally mean it would not be feasible to achieve the necessary 1m freeboard from the base of the soakage facility to the groundwater level. Infiltration is therefore considered to be unsuitable.
Permeable Pavements	Areas of parking could benefit from the use of permeable paving which is proven to remove pollutants such as hydrocarbons as surface water runoff is percolated through the gaps in the permeable blocks and filtered through the voids of the porous sub-base beneath.
Swales, basins, ponds, wetlands and below ground attenuation tanks.	Areas of soft landscaping are limited and will be required for areas of accessible open space. Therefore, areas available for swales, basins, ponds and wetlands are not considered suitable for this scheme. On this basis, the use of below ground storage tanks is considered the most appropriate technique for providing the attenuation and storage of surface water runoff. Furthermore, it would be possible to strategically locate the below ground attenuation tanks to facilitate the construction phasing proposed.

9.9 Based on the assessment in *Table 7,* a surface water drainage strategy has been developed for the site and is shown on drawing P19-418-SK05 included in *Appendix H*. A description of the proposals is provided below;

- Roof water runoff would be managed at source and incorporate SuDS in the form of a combination of green / blue roofs providing a level of treatment, with resultant runoff drained via rainwater outlets and downpipes to a system of underground pipework

- Runoff generated from the access road where possible would be managed by SuDS in the form of bioretention systems and or filter drains / strips or drained onto areas of adjacent permeable paving parking bays.

- Areas of parking will incorporate SuDS in the form of permeable paving. The permeable paving would allow surface water runoff to filter through a block paved surface into a filter zone of sub-base beneath the bedding layer where it will be collected by a perforated pipe discharging to the surface water drainage network

- 3No. below ground geocellular storage tanks are proposed to attenuate surface water flows with catchpit type manholes shown at the inlet and outlet to the geocellular storage tank to protect from silt and debris. The storage tanks would be wrapped in an impermeable geomembrane and comprise 95% voids to store and attenuate excess runoff associated with an extreme rainfall events

- The network of below ground pipework would drain to a catchpit chamber fitted with a hydrobrake flow control device which would restrict flows to as close as practically possible to greenfield runoff rates from the 1 in 1 year up to the 1 in 100 year including a 40% allowance for increase in peak rainfall intensity over the lifetime of the development

Hydraulic Analysis

9.10 The source control facility in the MicroDrainage software package has been used to design the green / blue roofs and geocellular storage tanks components. The design results for a variety of storm events up to and including the 1 in 100 year storm return period with 40% allowance for increase in peak rainfall intensity over the lifetime of the development are included in *Appendix J.* The design results confirm that the surface water drainage network would store and attenuate surface water flows for all analysed storm events with no surface water flooding identified.

9.11 A drained area of 15,900m^2 has been used in the calculations based on the minimum open space equalling 10% of the 17,700m^2 application site.

9.12 *Table 8* below compares the maximum rate of discharge / volume analysed for each storm event to the greenfield / brownfield runoff rates / volumes identified in *Tables 5 & 6*.

Table 8: Comparison of Discharge Rates & Volumes

Return Period (Year)	Greenfield		Brownfield			
			Pre-Development		Post Development	
	Peak Runoff Rate (l/s)	6hr Runoff Volume (m^3)	Peak Runoff Rate (l/s)	6hr Runoff Volume (m^3)	Peak Runoff Rate (l/s)	6hr Runoff Volume (m^3)
1	1.8	18.4	64.0	271.4	3.5	174.7
30	4.8	80.4	142.6	604.7	3.8	429.6
100	6.4	107.0	185.5	786.6	4.0	553.3
100+40	N/A	N/A	N/A	N/A	4.2	671.2

9.13 The above table confirms that surface water flows would be discharged at rates corresponding to greenfield runoff rate for all analysed storm return periods, with exception to the 1 in 1 year greenfield rate. It is deemed inappropriate to restrict flows to the 1 in 1 year greenfield runoff rate for the site and in line with CIRIA report C753 "The SUDS Manual" it would be proposed to restrict rates for the 1 in 1 year rate to 2 l/s/ha for the site which would be equal to 3.5l/s, which would be a significant reduction in comparison to the established pre-development runoff rates.

9.14 Table 8 confirms that surface water runoff volumes would be reduced in comparison to the pre-development volumes however would discharge at a volume greater than greenfield volumes for the corresponding event. Policy S6 of the DEFRA report provides where it is not reasonably practicable to constrain the volume of runoff to any drain, sewer or surface water body in accordance with Policy S5, the runoff volume must be discharged at a rate that does not adversely affect flood risk. Surface water runoff from the proposed development has been limited to be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event and would be considerably reduced in comparison to pre-development rates. On this basis, it is considered that the runoff volume would be discharged at a rate which does not adversely affect flood risk.

Exceedance

9.15 If the capacity of the surface water drainage network was exceeded, site levels would be designed to allow surface water to be channelled off-site in a south easterly direction as illustrated on the drainage layout drawing included in *Appendix H*. Further to this the buildings finished floor level would be raised above surrounding levels so there would be no risk of buildings being affected by overland flows.

Water Quality

9.16 CIRIA report C753 "The SUDS Manual" sets out requirements for delivering appropriate levels of treatment to surface water runoff using SuDS. *Table 9* below identifies that the proposed SUDS components would have a total pollution mitigation index equal to or exceeding the recommended pollution hazard index thus confirming the SUDS components would provide suitable treatment to surface water runoff.

Table 9: SuDS Treatment Chart

Use	Pollution Hazard Index			SUDS Component	Mitigation Index		
	TSS	Metals	TPH		TSS	Metals	TPH
Residential Roofs	0.2	0.2	0.05	Green / blue roof	0.4	0.3	0.3
Commercial Roofs	0.3	0.2	0.05				
Non-residential parking / Access roads	0.7	0.6	0.7	Permeable Pavement	0.7	0.6	0.7
				Bioretention systems	0.8	0.8	0.8

Amenity / Biodiversity

9.17 The drainage proposals include the use of a combination of green / blue roofs. These systems can be used to provide valuable amenity if the roof is intended to be accessible or is overlooked. Further to this, they can be designed to provide high ecological value, and help provide valuable habitat and biodiversity in urbanised areas. Bioretention systems can also provide high quality conditions for wildlife and contribute positively to biodiversity enhancement in urban areas.

9.18 The layout drawing included in *Appendix H* shows the majority of the proposed surface water storage to be located beneath landscaped areas and at roof level with no unnecessary loss of amenity space therefore required to enable the development. The proposals also maximise the opportunity for biodiversity benefits to be implemented within the introduction of new areas of soft landscaping.

Implementation

9.19 It is recommended that the surface water drainage system is implemented in accordance with the SuDS Implementation Plan included in *Appendix K* with the Contractors Construction Health and Safety Plan to incorporate the measures proposed in plan.

Management & Maintenance Plan

9.20 It is recommended that the surface water drainage system is maintained in accordance with the SuDS Maintenance Plan included in *Appendix K*. The Plan should be incorporated into the site Operation and Maintenance Manual.

10. FOUL WATER DRAINAGE STRATEGY

10.1 It is proposed to discharge foul water flows from the development to the 225mm Thames Water Foul sewer which serves the existing site.

10.2 The Thames Water foul sewer within the site would be affected by the development proposals and will require diverting via agreement with Thames Water.

10.3 The foul drainage proposals are shown on the drawing ref P19-418 SK05 in *Appendix H.*

10.4 A predevelopment sewer capacity enquiry has been submitted to Thames Water to confirm if the existing foul sewer has capacity to accommodate the additional flows from the proposed development. Due to the increase in foul flows, the response concluded the sewerage network is unable to meet the needs of the development currently and upgrades may be needed, through modelling by Thames Water to confirm the scale if upgrade works are determined to be required.

11. CONCLUSIONS

11.1 Flood Zone maps show the site to be located in Flood Zone 2 in present day circumstances with areas Flood 3a when applying climate change allowances up to 2070 and 2115.

11.2 The site has been assessed to be at low to very low risk of flooding from all other sources of flooding identified in the RBC SFRA.

11.3 It was determined that the sequential and exception test does not need to be reapplied, as the application site is included in the RBC Local Plan for development and in which the sequential and exception test were applied and passed.

11.4 It has been determined that the proposed development could be affected by the 1% AEP + 25% CC and the associated predicted flood level of 38.29mAOD has been assessed to be the design level to which the development should be protected from fluvial flooding. The following measures are proposed to ensure that the development can be occupied and operated safely with there being no increase in the level of flood risk to the site or neighbouring sites.

- Building ground floor levels will be set at a minimum level of 38.59mAOD which would ensure 300mm above the predicted design flood level for protection from fluvial flooding.

- The proposed development would displace flood water associated with the 1% AEP + 25% flood event. To compensate for the flood water that would be displaced, it is proposed to reduce the ground levels at the proposed access and egress, along with the southeast corner of the site. It has been demonstrated that the compensated flood volume would be provided on a volume for volume / level for level basis.

- Flood depths in parking / circulation areas within the application site would be generally less than 0.2m in depth for the 1% AEP + 35% CC flood level of 38.34mAOD. Given the area is located some distance from the River Thames and is in an urbanised area, it is anticipated that floodwaters would be relatively still and as such the anticipated flood depth of 0.3m would be a “Very Low Hazard”. It was determined that routes to land outside the Floodplain could be affected and therefore is proposed a flood risk management plan / evacuation plan should be prepared to inform future tenants / residents of the potential flood risk and the appropriate response in the event of a flood warning.

- It is considered that the mitigation measures set out to protect against fluvial flooding for the 1% AEP + 25% CC would also ensure suitable protection from the 1% AEP + 35% CC

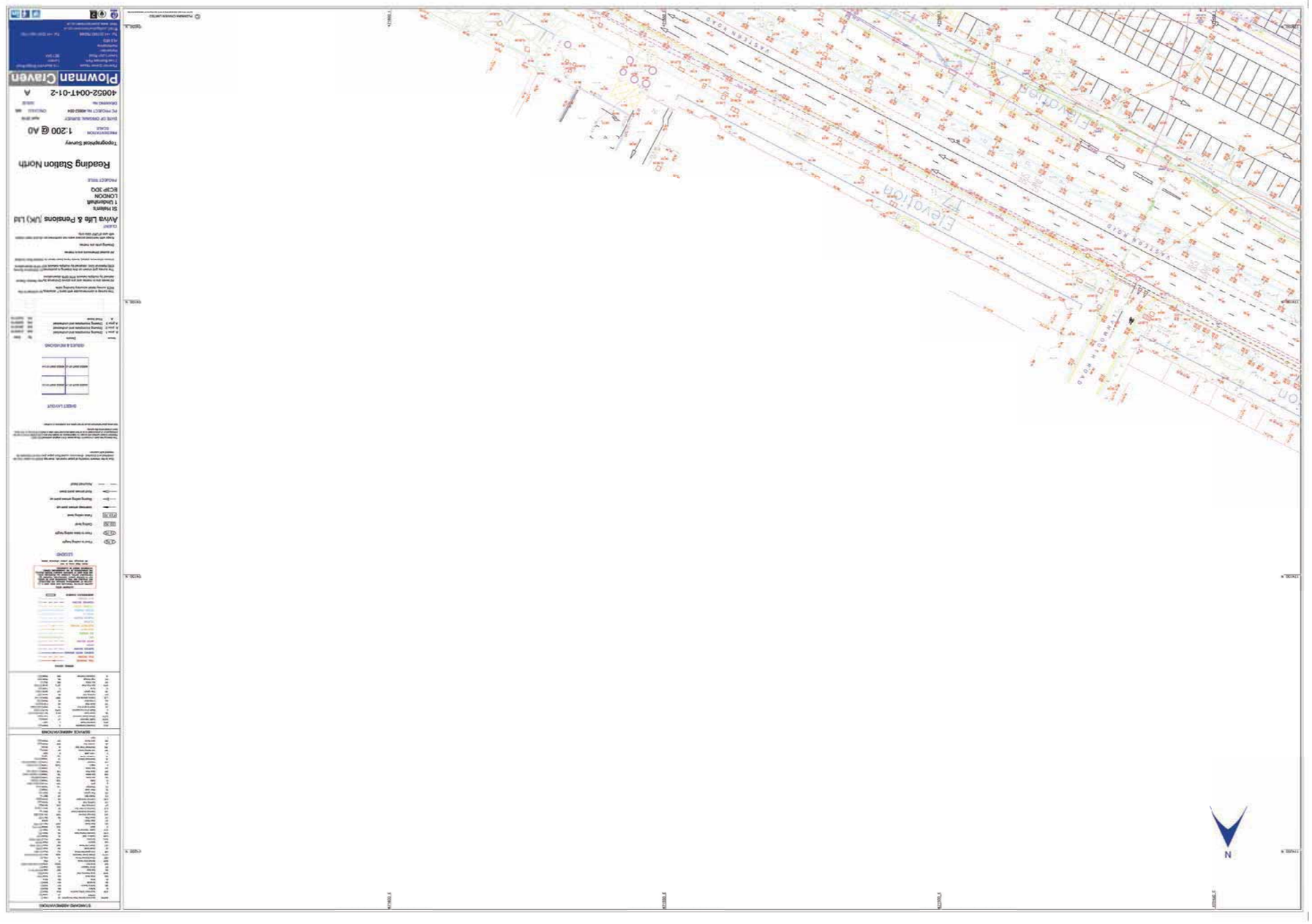
11.5 The RBC Level 2 SFRA assessment recommended that greenfield runoff rates should be aimed to be achieved. A surface water drainage strategy has been developed for the site on this basis that incorporates SuDS in the form of a green / blue roofs, below ground geocellular storage tanks, permeable paving and filter strips / tree pit bio-retention systems. The surface water drainage strategy would ensure that surface water runoff is limited back nearer to the corresponding greenfield runoff rate, whilst also providing sufficient capacity for excess runoff to be stored and attenuated on site up to and including the 1 in 100 year storm return period with 40% allowance for increase in peak rainfall intensity over the lifetime of the development.

11.6 It is proposed to discharge foul water flows to the Thames Water foul sewer which currently serves the site and is located along Trooper Potts Way. Thames Water have confirmed that modelling and potential upgrade works would be required to ensure the receiving sewer would have capacity to accommodate the increased foul flows.

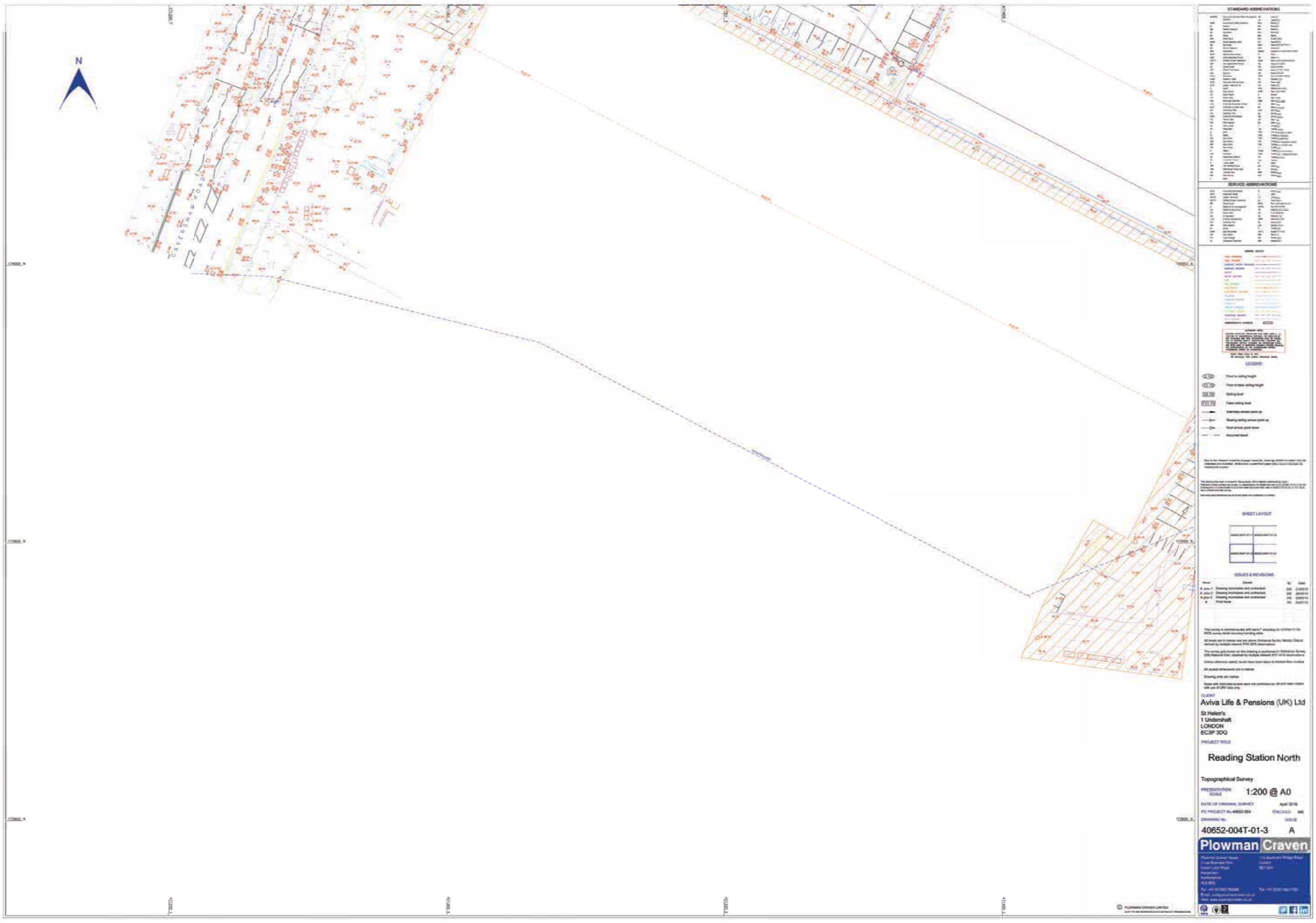
11.7 It is considered the design recommendations set out in the RBC Level 2 SFRA assessment ref:AB004 have been consider throughout this report and are incorporated in the design.

11.8 In terms of flood risk, it is concluded that the development can be occupied and operated safely and that there will be no increase in the level of flood risk to the site or neighbouring sites as a result of the development.

APPENDIX A
TOPOGRAPHICAL SURVEY


Elevation 1
Elevation 2
Elevation 3
Elevation 4
Elevation 5
Elevation 6
Elevation 7
Elevation 8
Elevation 9
EASTERN ROAD
CAVERSHAM ROAD
Reading Station North
Topographical Survey
1:200 @ A0
40652-0041-01-1
A
Plowman Craven
Aviva Life & Pensions (UK) Ltd
St Helens
1 Undershaft
LONDON
EC3P 3DQ
N


Elevation 1
Elevation 2
Elevation 3
Elevation 4
Elevation 5
Elevation 6
Elevation 7
Elevation 8
Elevation 9
EASTERN ROAD
CAVERSHAM ROAD
Reading Station North
Topographical Survey
1:200 @ A0
40652-0041-01-2
A
Plowman Craven
Aviva Life & Pensions (UK) Ltd
St Helens
1 Undershaft
LONDON
EC3P 3DQ
N


STANDARD ABBREVIATIONS
SERVICE ABBREVIATIONS
LEGEND
SHEET LAYOUT
ISSUES & REVISIONS
CAVERSHAM ROAD
CLIENT
Aviva Life & Pensions (UK) Ltd
St Helen's
1 Undershaft
LONDON
EC3P 3DQ
PROJECT TITLE
Reading Station North
Topographical Survey
PRESENTATION SCALE
1:200 @ A0
DATE OF ORIGINAL SURVEY
PC PROJECT No. 40652-004
DRAWING No.
40652-004T-01-3
A
Plowman Craven


STANDARD ABBREVIATIONS
SERVICE ABBREVIATIONS
LEGEND
SHEET LAYOUT
ISSUES & REVISIONS
Elevation 18
Elevation 19
Elevation 21
Elevation 22
Elevation
NORMAN PLACE
VASTERN ROAD
TROOPER POTTS WAY
BUS GATE
TURN LEFT
TURN RIGHT
CLIENT
Aviva Life & Pensions (UK) Ltd
St Helen's
1 Undershaft
LONDON
EC3P 3DQ
PROJECT TITLE
Reading Station North
Topographical Survey
PRESENTATION SCALE
1:200 @ A0
DATE OF ORIGINAL SURVEY
PC PROJECT No. 40652-004
DRAWING No.
40652-004T-01-4
A
Plowman Craven

APPENDIX B
THAMES WATER SEWER RECORDS

Asset Location Search Sewer Map - ALS/ALS Standard/2019_4029565

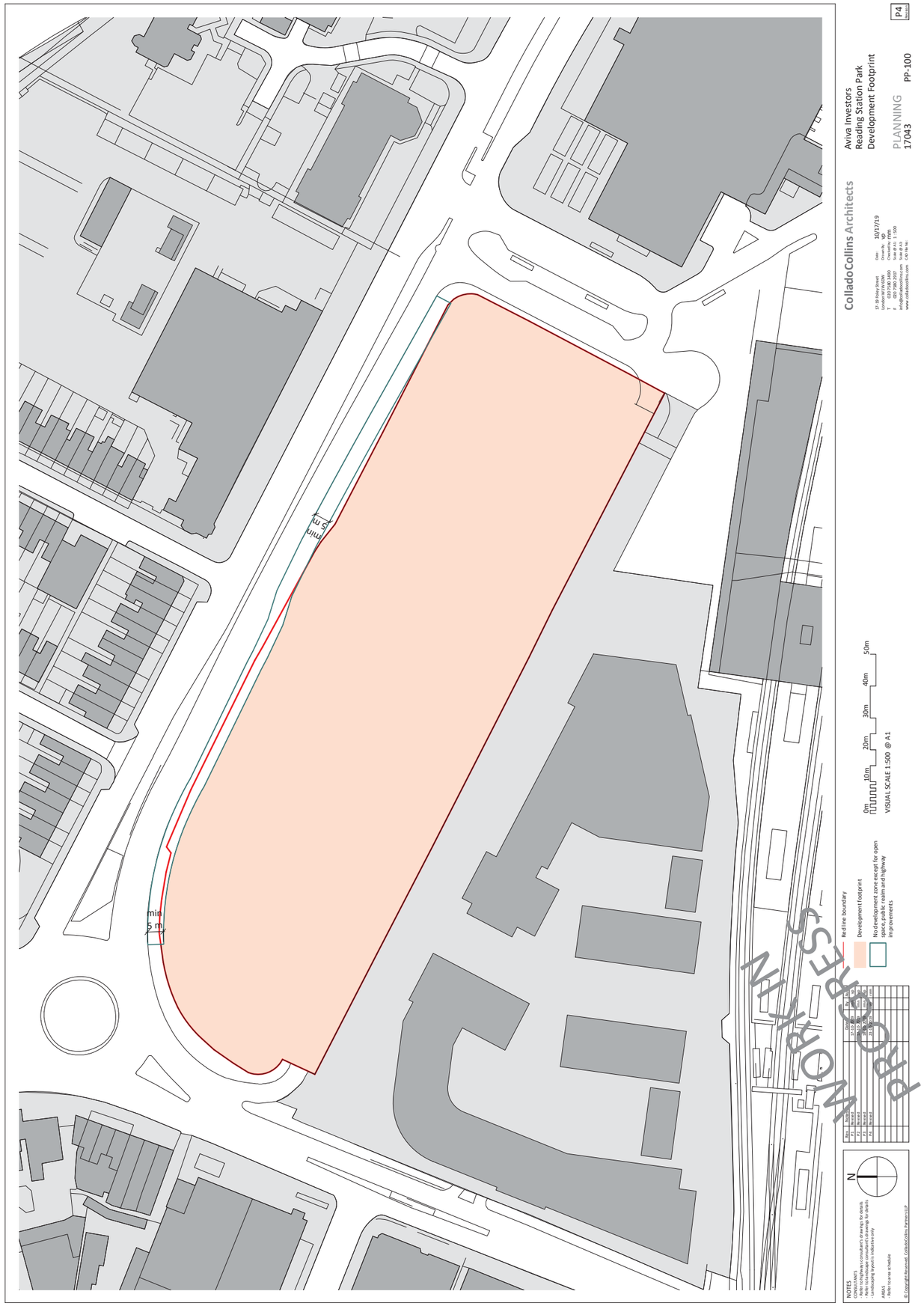


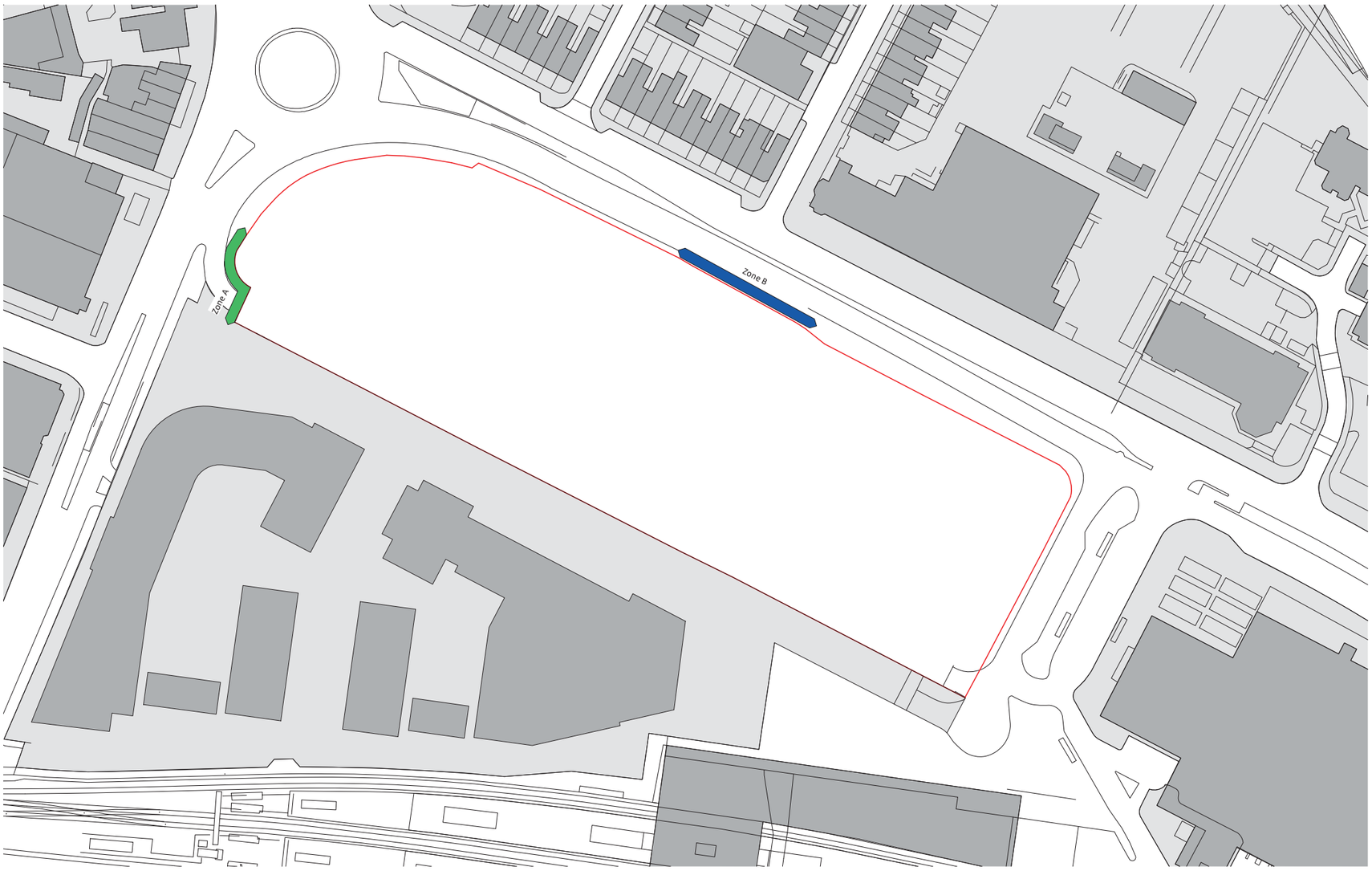
The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 471423,174052

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

APPENDIX C
SITE PARAMETER PLANS





NOTES
CONSULTANTS
- Refer to highways consultant's drawings for details
- Refer to landscape consultant's drawings for details
- Landscaping layout is indicative only

AREAS
- Refer to area schedule

N

© Copyright Reserved. ColladoCollins Partners LLP

Rev.	Notes	Date	By	Auth.
P1	Issued for comment	10-06-2019	vp	vp
P2	Revised with EIA comments	12-06-2019	mm	vp
P3	Revised with Highways comments	09-07-2019	mm	vp
P4	Revised with Planning Officers comments	16-09-2019	mm	vp
P5	Revised	02-10-2019	mm	vp
P6	Revised	14-10-2019	mm	vp
P7	Revised	16-10-2019	mm	vp
P8	Revised	17-10-2019	mm	vp
P9	Revised	18-10-2019	mm	vp
P10	Revised	23-10-2019	vp	mm

Red line boundary

zone within which site access to be provided

zone within which site egress to be provided

0m 10m 20m 30m 40m 50m

VISUAL SCALE 1:500 @ A1

ColladoCollins Architects

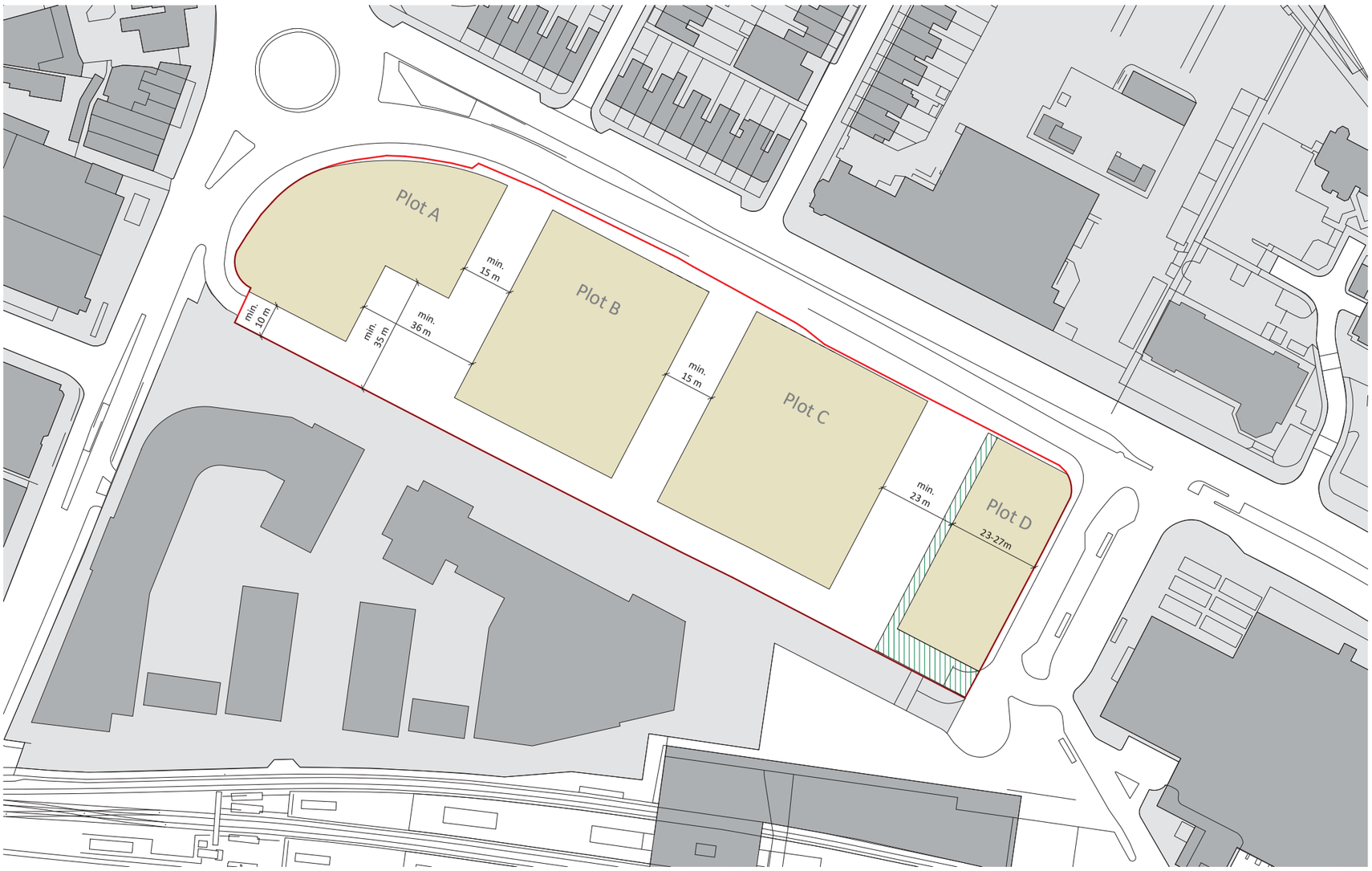
17-19 Foley Street
London W1W 6DW
T 020 7580 3490
F 020 7580 2937
info@colladocollins.com
www.colladocollins.com

Date: 23/05/2019
Drawn by: mm
Checked by: VP
Scale @ A3: 1 : 500
Scale @ A1: 1 : 1000
CAD File No:

Aviva Investors
Reading Station Park
Parameter Plan - Site Access & Egress

PLANNING
17043 PP-101

P9
Revision



NOTES
CONSULTANTS
- Refer to highways consultant's drawings for details
- Refer to landscape consultant's drawings for details
- Landscaping layout is indicative only

AREAS
- Refer to area schedule

N

© Copyright Reserved. ColladoCollins Partners LLP

Rev.	Notes	Date	By	Auth.
P1	Issued for comment	10-06-2019	vp	vp
P2	Revised with EIA comments	12-06-2019	mm	vp
P3	Revised	02-10-2019	mm	vp
P4	Revised	14-10-2019	mm	vp
P5	Revised	16-10-2019	mm	vp
P6	Revised	17-10-2019	mm	vp
P7	Revised	17-10-2019	mm	vp
P8	Revised	17-10-2019	mm	vp
P9	Revised	18-10-2019	mm	vp
P10	Revised	23-10-2019	vp	mm

Red line boundary

Area within which buildings to be located

No building footprint at ground and first floor. Floorspace acceptable above first floor.

0m 10m 20m 30m 40m 50m

VISUAL SCALE 1:500 @ A1

ColladoCollins Architects

17-19 Foley Street
London W1W 6DW
T 020 7580 3490
F 020 7580 2937
info@colladocollins.com
www.colladocollins.com

Date: 23/05/2019
Drawn by: mm
Checked by: VP
Scale @ A3: 1 : 500
Scale @ A1: 1 : 1000
CAD File No:

Aviva Investors
Reading Station Park
Parameter Plan - Building Plots

PLANNING
17043 PP-102

P10
Revision



NOTES
CONSULTANTS
- Refer to highways consultant's drawings for details
- Refer to landscape consultant's drawings for details
- Landscaping layout is indicative only

AREAS
- Refer to area schedule

© Copyright Reserved. ColladoCollins Partners LLP

Rev.	Notes	Date	By	Auth.
P1	Revised	16-10-2019	mm	vp
P2	Revised	17-10-2019	mm	vp
P3	Revised	17-10-2019	mm	vp
P4	Revised	18-10-2019	mm	vp
P5	Revised	18-10-2019	mm	vp
P6	Revised	23-10-2019	vp	mm

Red line boundary

0m 10m 20m 30m 40m 50m

VISUAL SCALE 1:500 @ A1

ColladoCollins Architects
17- 19 Foley Street
London W1W 6DW
T 020 7580 3490
F 020 7580 2937
info@colladocollins.com
www.colladocollins.com

Date: 10/16/19
Drawn by: vp
Checked by: mm
Scale @ A1: 1 : 500
Scale @ A3:
CAD File No:

Aviva Investors
Reading Station Park
Parameter Plan - Plot Heights
Non-residential Use
PLANNING
17043 PP-103
P6 Revision



NOTES
CONSULTANTS
- Refer to highways consultant's drawings for details
- Refer to landscape consultant's drawings for details
- Landscaping layout is indicative only

AREAS
- Refer to area schedule

© Copyright Reserved. ColladoCollins Partners LLP

Rev.	Notes	Date	By	Auth.
P6	Revised	02-10-2019	mm	vp
P7	Revised	14-10-2019	mm	vp
P8	Revised	16-10-2019	mm	vp
P9	Revised	17-10-2019	mm	vp
P10	Revised	17-10-2019	mm	vp
P11	Revised	18-10-2019	mm	vp
P12	Revised	18-10-2019	mm	vp
P13	Revised	18-10-2019	mm	vp
P14	Revised	21-10-2019	mm	vp
P15	Revised	23-10-2019	vp	mm

Red line boundary

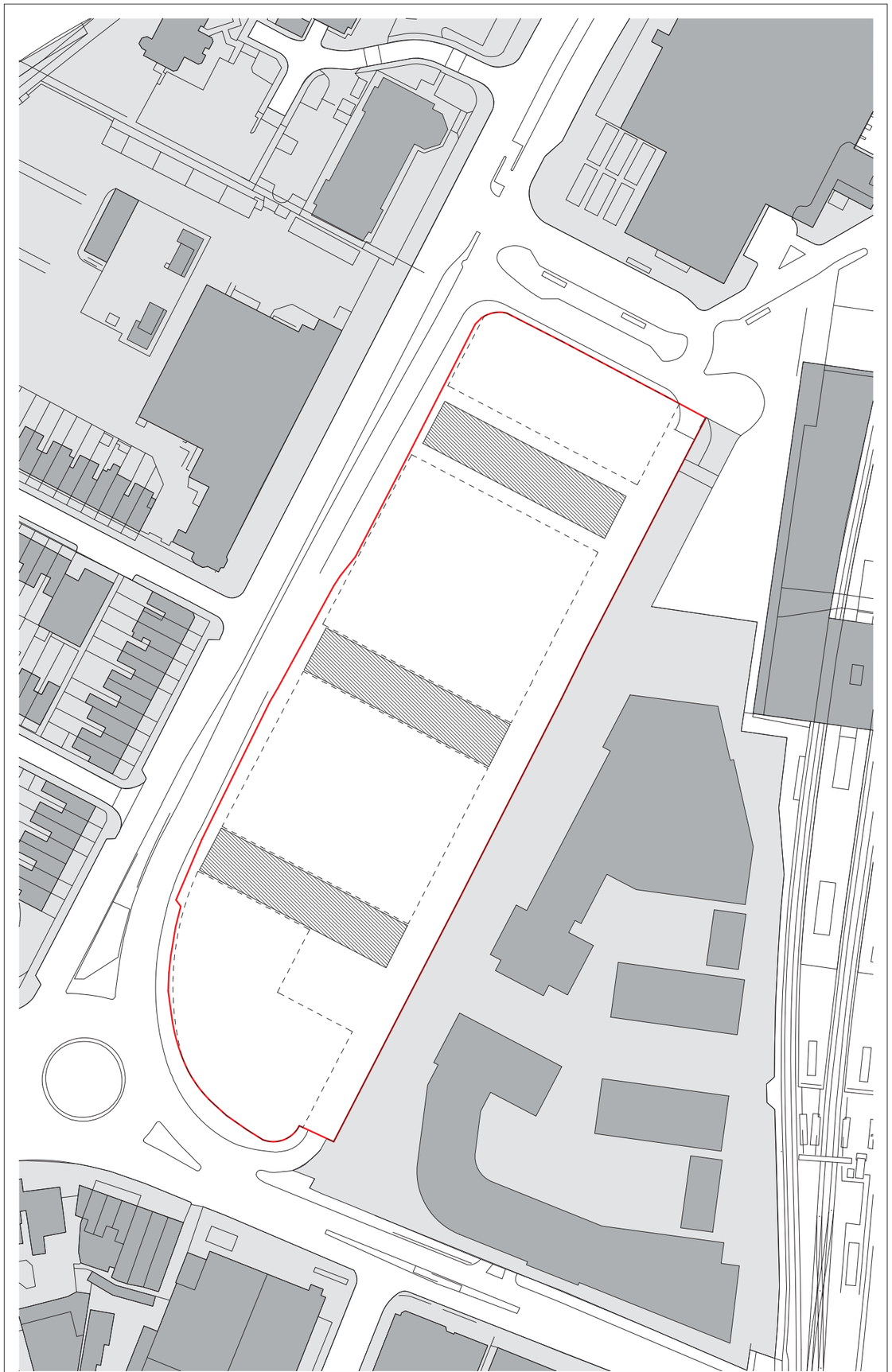
0m 10m 20m 30m 40m 50m

VISUAL SCALE 1:500 @ A1

ColladoCollins Architects
17- 19 Foley Street
London W1W 6DW
T 020 7580 3490
F 020 7580 2937
info@colladocollins.com
www.colladocollins.com

Date: 23/05/2019
Drawn by: mm
Checked by: VP
Scale @ A1: 1 : 500
Scale @ A3: 1 : 1000
CAD File No:

Aviva Investors
Reading Station Park
Parameter Plan - Plot Heights
Residential Use
PLANNING
17043 PP-104
P15 Revision



ColladoCollins Architects

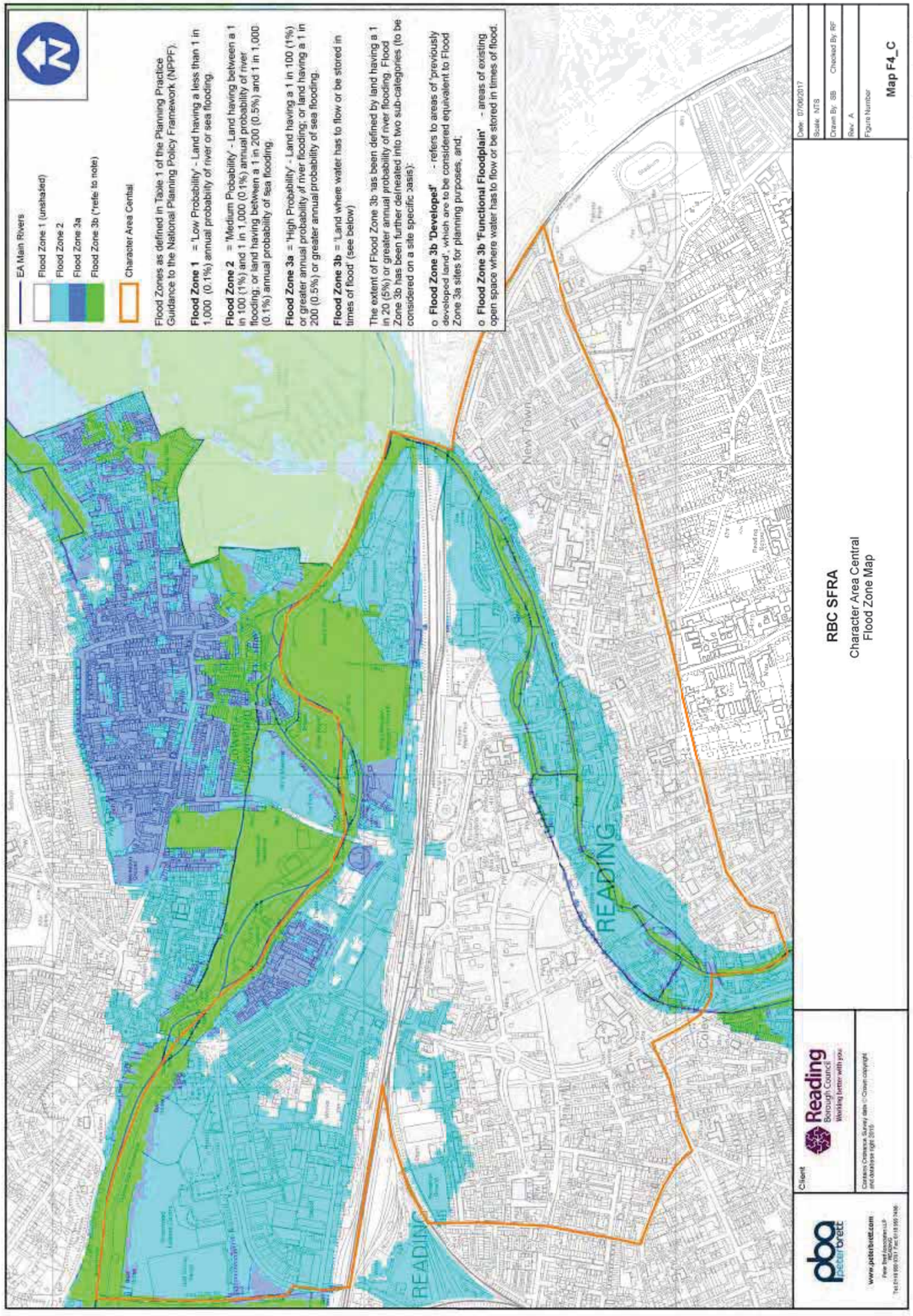
17-18 Hanway Street
London W1T 1UD
T 020 7580 3490
F 020 7580 3491
info@colladocollins.com
www.colladocollins.com

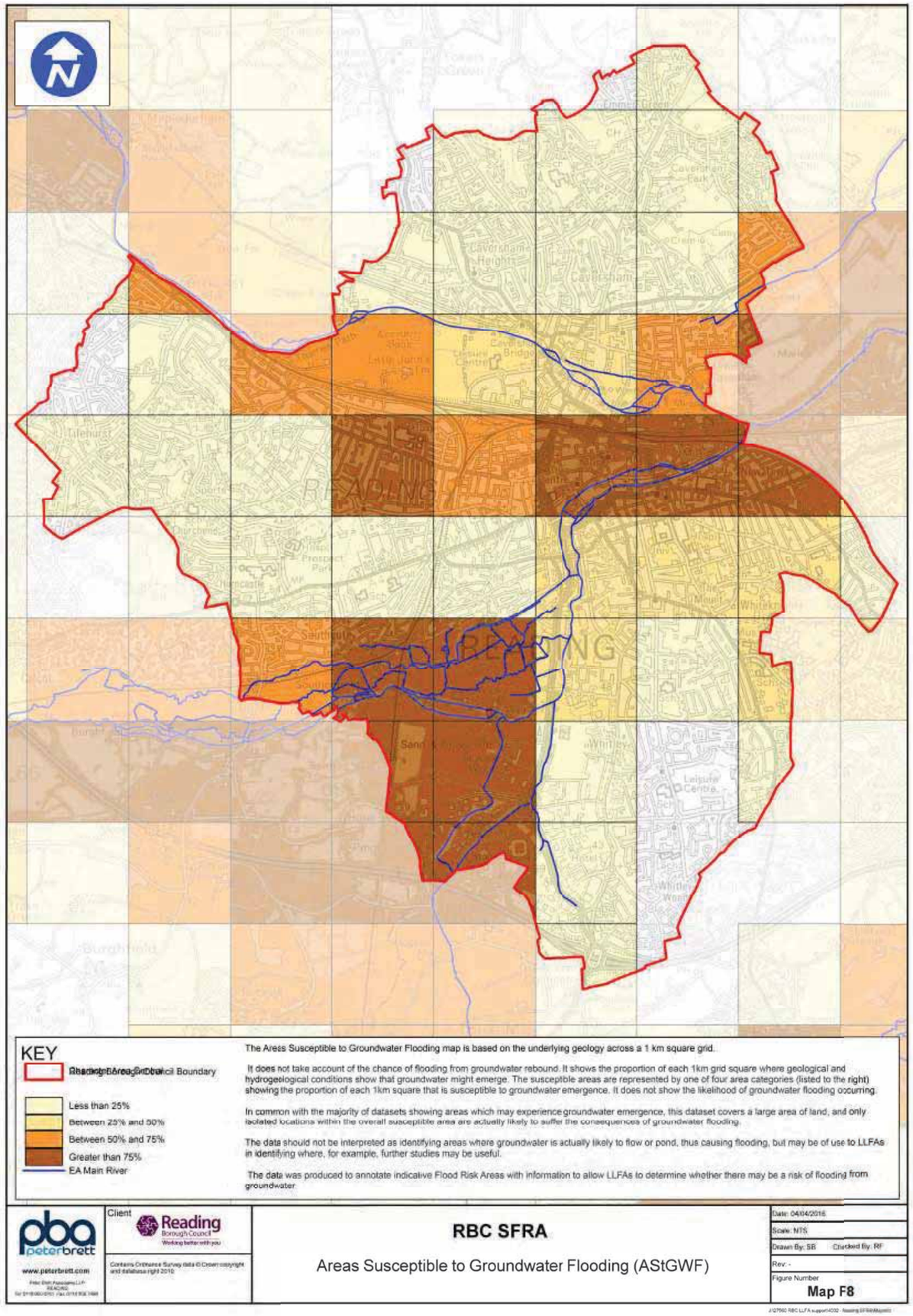
Date 23/10/19
Drawn By JTT/PS
Checked By VP
Paper Size A1
Scale @ A1 1 : 500
CAD File No:

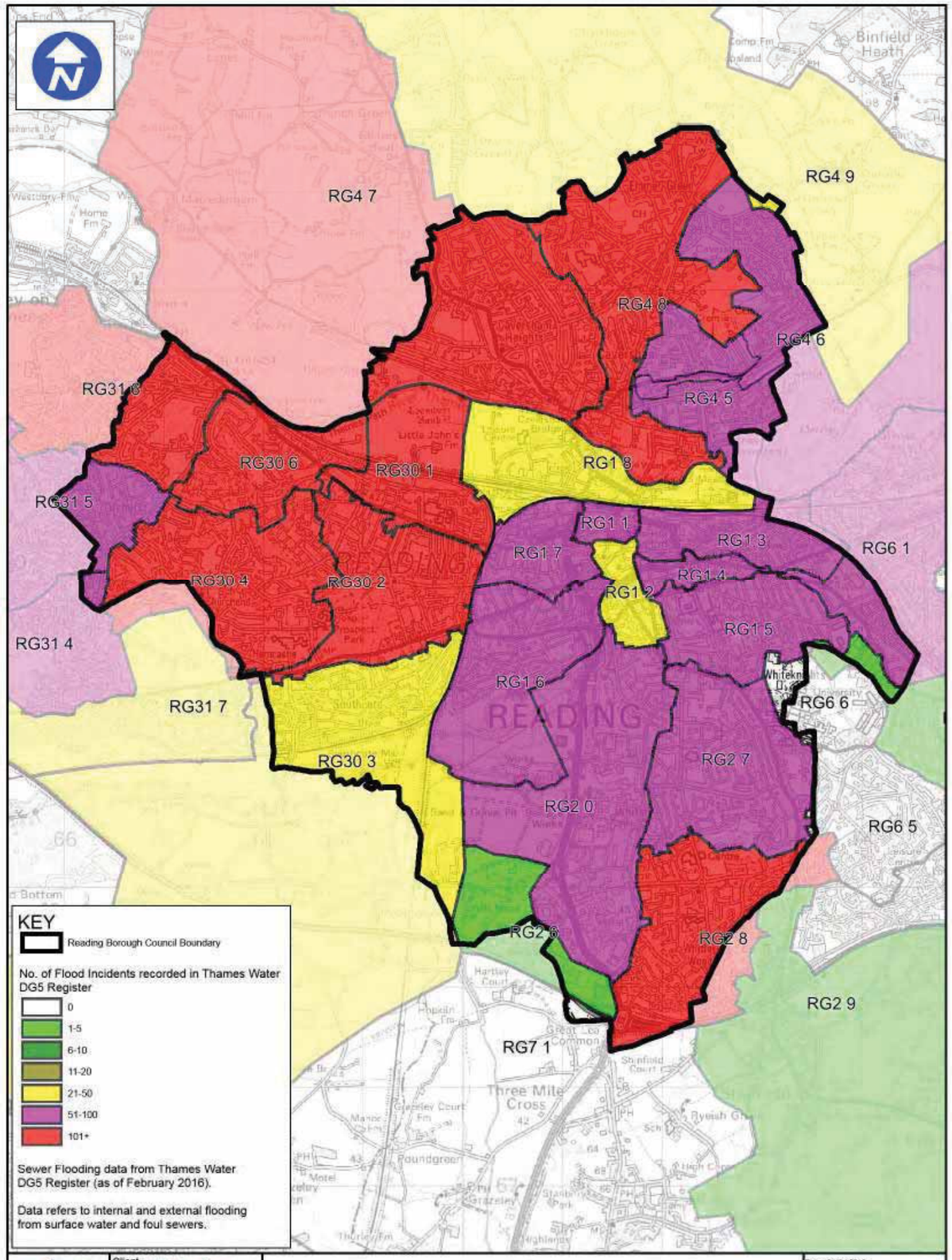
Aviva Investors
Reading Station Park
Parameter Plan - Basement
Footprint
PLANNING
17043 PP-105

P1
Issued

APPENDIX D
SFRA FLOOD MAPS & SITE ASSESSMENT


EA Main Rivers
Flood Zone 1 (unshaded)
Flood Zone 2
Flood Zone 3a
Flood Zone 3b (*refs: to note)
Character Area Central
Flood Zones as defined in Table 1 of the Planning Practice Guidance to the National Planning Policy Framework (NPPF).
Flood Zone 1 = 'Low Probability' - Land having a less than 1 in 1,000 (0.1%) annual probability of river or sea flooding.
Flood Zone 2 = 'Medium Probability' - Land having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding; or land having between a 1 in 200 (0.5%) and 1 in 1,000 (0.1%) annual probability of sea flooding.
Flood Zone 3a = 'High Probability' - Land having a 1 in 100 (1%) or greater annual probability of river flooding; or land having a 1 in 200 (0.5%) or greater annual probability of sea flooding.
Flood Zone 3b = 'Land where water has to flow or be stored in times of flood' (see below)
The extent of Flood Zone 3b has been defined by land having a 1 in 20 (5%) or greater annual probability of river flooding. Flood Zone 3b has been further delineated into two sub-categories (to be considered on a site specific basis):
o Flood Zone 3b 'Developed' - refers to areas of 'previously developed land', which are to be considered equivalent to Flood Zone 3a sites for planning purposes, and;
o Flood Zone 3b 'Functional Floodplain' - areas of existing open space where water has to flow or be stored in times of flood.
READING
New Town
RBC SFRA
Character Area Central
Flood Zone Map
Date: 07/06/2017
Scale: NTS
Drawn By: SB
Checked By: RF
Rev: A
Figure Number
Map F4_C
Client
Reading Borough Council
Working better with you
Contains Ordnance Survey data © Crown copyright and database right 2010
www.peterbrett.com


KEY
Reading Borough Council Boundary
Less than 25%
Between 25% and 50%
Between 50% and 75%
Greater than 75%
EA Main River
The Areas Susceptible to Groundwater Flooding map is based on the underlying geology across a 1 km square grid.
It does not take account of the chance of flooding from groundwater rebound. It shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. The susceptible areas are represented by one of four area categories (listed to the right) showing the proportion of each 1km square that is susceptible to groundwater emergence. It does not show the likelihood of groundwater flooding occurring.
In common with the majority of datasets showing areas which may experience groundwater emergence, this dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.
The data should not be interpreted as identifying areas where groundwater is actually likely to flow or pond, thus causing flooding, but may be of use to LLFAs in identifying where, for example, further studies may be useful.
The data was produced to annotate indicative Flood Risk Areas with information to allow LLFAs to determine whether there may be a risk of flooding from groundwater.
READING
Client
Reading Borough Council
Working better with you
Contains Ordnance Survey data © Crown copyright and database right 2010
www.peterbrett.com
RBC SFRA
Areas Susceptible to Groundwater Flooding (AStGWF)
Date: 04/04/2016
Scale: NTS
Drawn By: SB
Checked By: RF
Rev: -
Figure Number
Map F8

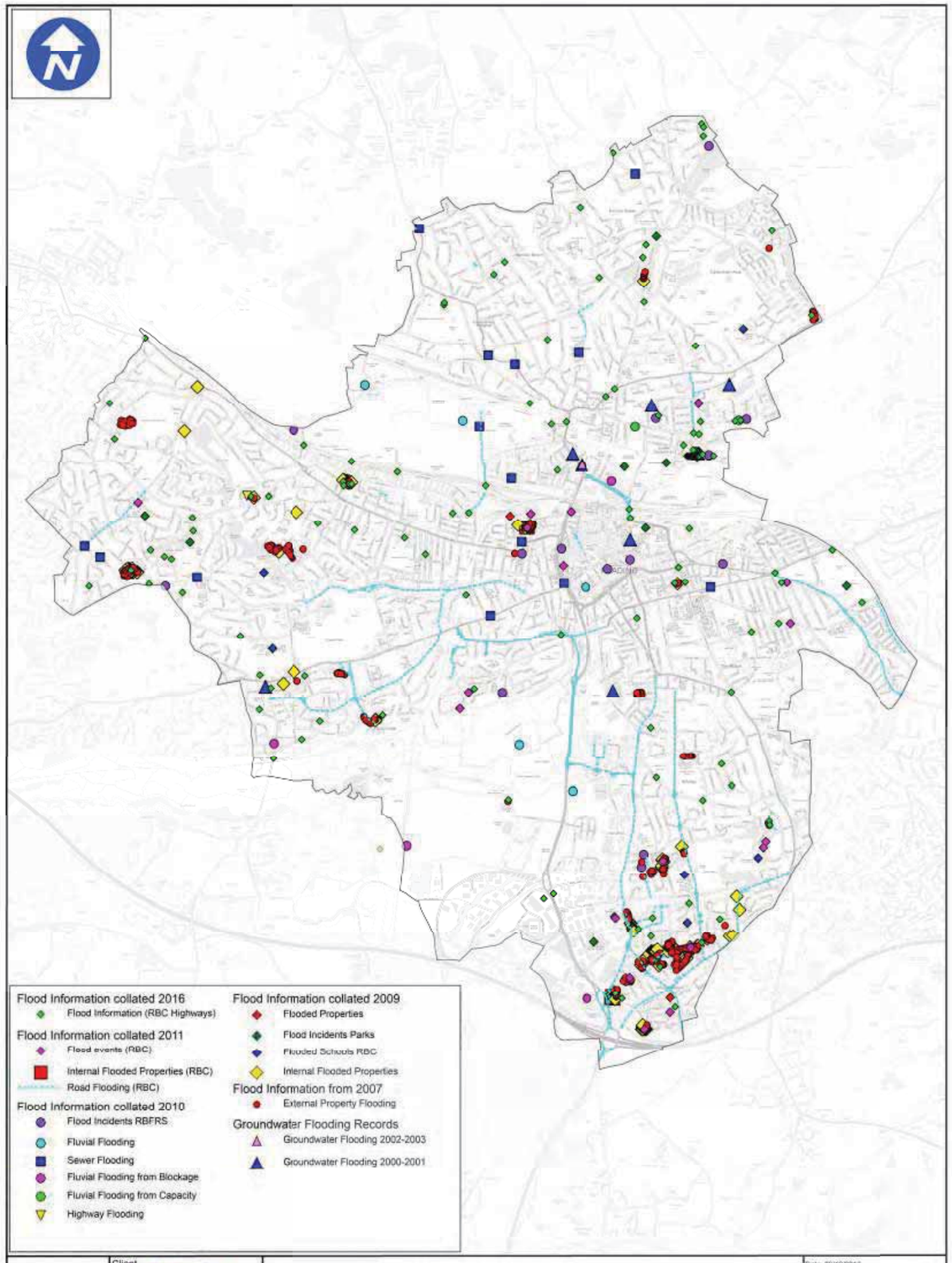


pba peterbrett
www.peterbrett.com
Client: Reading Borough Council
Contains Ordnance Survey data © Crown copyright and database right 2010

RBC SFRA

Thames Water Sewer Flooding Incidents

Date: 04/04/2016
Scale: NTS
Drawn By: SB Checked By: RF
Rev: -
Figure Number: **Map F9**



pba peterbrett
www.peterbrett.com
Client: Reading Borough Council

RBC SFRA

RBC Historic Flood Records

Date: 06/12/2016
Scale: NTS
Drawn By: SB Checked By: RF
Rev: -
Figure Number: **Figure F3**

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

AB004 - North of the Station (Local Plan ref: CR11e)			
Grid Reference	SU 71490 471490	**Post Code**	RG1 8AL

Topography



Elevation
- < 35 mAOD
- 35 - 36 mAOD
- 36 - 37 mAOD
- 37 - 38 mAOD
- 38 - 39 mAOD
- 39 - 40mAOD
- 40 - 41 mAOD
- 41 - 42 mAOD
- 42 - 43 mAOD
- 43 - 44 mAOD
- 44 - 45 mAOD
- > 45 mAOD

The topography of the site is largely flat, ranging between approximately 37.5m AOD and 39.4m AOD.

Flood Zone Map



Legend
- River
- Site Boundary
- Flood Zone 2
- Flood Zone 3
- Flood Zone 3b

Flood Zone 1	10%	**Flood Zone 2**	90%	**Flood Zone 3a**	0%	**Flood Zone 3b**	0%

Surface Water



Risk of Surface Water Flooding
- River
- Site Boundary
- High - 1 in 30 annual probability
- Medium - 1 in 100 annual probability
- Low - 1 in 1000 annual Probability
- Very Low - > 1 in 1000 annual probability

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Development Proposal	640-960 dwellings, 50,000m^2 of offices, 3,000 - 6,000m^2 net gain of retail, leisure, potential hotel.	**Vulnerability Classification**	Less Vulnerable (offices/retail), More Vulnerable (residential)
Applicable Climate Change Allowances	The +25% and +35% peak river flow climate change allowances should therefore be used to assess a range of climate change scenarios. The +25% allowance should be used to provide a benchmark flood level against which mitigation measures should be set, and the +35% allowance used to assess residual risk to the development.		

Climate Change Extents



Legend
- River
- Site Boundary
- 1 in 100 annual probability +25% Climate Change
- 1 in 100 annual probability +35% Climate Change

1 in 100 annual probability +25%	60%	**1 in 100 annual probability +35%**	70%	**1 in 100 annual probability +70%**	N/A

Description of Flood Risk

Flood Depth
No flooding occurs in the present day 1 in 100 annual probability event. In the 1 in 1000 annual probability flood event, the site experiences maximum flood depths of typically 400mm.

Flood depths in the climate change scenarios are typically 100mm in the +25% scenario, and 200mm in the +35% scenario.

Flood Warning and Period of Inundation
The River Thames is a large catchment with flooding typically the result of sustained regional-scale rainfall events. The response time – i.e. the period between the rainfall over the catchment and the rising river levels downstream – can be significant, and this ensures there is typically a significant period of advance warning (i.e. a period of days) before flooding occurs in the area.

The EA issue flood warnings for the area via their 'Flood Information Service' and considerable advance warning of a flood event can typically be provided to allow the Council, emergency services residents and businesses to take appropriate action.

Velocity of Flood Waters
The site is occupied by buildings in an urbanised area, a relatively significant distance from the main river, and is impacted in the climate change allowance scenarios. When flooding does occur, the rate of rise and fall in water level is slow and velocities will correspondingly be slow, with the direction of flow from west to east (subject to further interrogation of the EA modelling).

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Description of Flood Risk

Flood Defences
While not a 'formal' flood defence, the EA asset register does identify that the River Thames, located approximately 0.2km north of the site, includes bank protection on its right bank with a design standard of 1 in 5 years. The condition is currently at 4 (poor), on a scale of 1 (very good) to 5 (very poor).

Other Sources of Flooding
The Level 1 SFRA indicates that the site has not been subject to historic river flooding, and is not noted to have been impacted by flood events from other sources. Vastern Road, located north of the site, has previously been impacted by flooding. External areas are noted to be impacted by surface water flooding, which, if surface water drainage strategy is not sufficiently incorporated into proposed development design, could result in ponding of water following heavy rainfall events. Site drainage must therefore be considered with respect to future development, and must be assessed in accordance with Sections 13.4 and 13.5 of the Level 1 SFRA.

The susceptibility to groundwater flooding varies between '25% to 50%' and '>75%'. The Thames Water DG5 information indicates that the site is within a postcode (RG1 8) that has 21-50 recorded sewer flood incidents, both internal and external.

The site is not located within a maximum modelled breach extent of reservoir flooding and is therefore at negligible risk of flooding in the event of a reservoir breach.

Overview of Flood Risk
A summary of the flood risk to the site is provided below:

- The site is classified as Flood Zone 2 'Medium Probability' (between 1 in 100 and 1 in 1000 annual probability of river flooding);
- The maximum flood depth during the 1 in 1000 annual probability event is typically 400mm;
- Approximately half of the site is impacted by the 1 in 100 annual probability +25% allowance for climate change flood event with general depths of 100mm, rising to 200mm in the 1 in 100 annual probability +35% climate change allowance scenario;
- The site is largely classified as at Very Low risk of surface water flooding, with localised areas between Low and High risk;
- The site is at negligible risk of flooding in the event of a reservoir breach;
- The pedestrian access route via Vastern Road is impacted by the 1 in 100 annual probability +35% climate change allowance flood event. Further analysis of flood depths/flood hazard is required and development may be reliant on advance warning measures and provision of a Flood Risk Management/Evacuation Plan. For the commercial elements an evacuation plan should be sufficient and the building could be vacated and secured in advance of flooding.

The site is shown to be at 'Medium' probability of fluvial flooding, at a range of very low to high risk of surface water flooding and may be susceptible to groundwater and sewer flooding. The site is therefore potentially at risk of flooding from a number of sources but it is considered feasible that the site can be developed safely and in accordance with the requirements of the NPPF, to mitigate the potential risks of these sources of flooding.

It is important that the design process considers the risk of flooding at the earliest conceptual stage, encompassing measures that will ensure the safety of future tenants/residents during a flood event.

A number of important design recommendations are set out below.

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

Planning Recommendations

Spatial Planning
The site lies within Flood Zone 2 'Medium Probability', affected by flooding from the River Thames in the 1 in 1000 annual probability flood event. The majority of the site is shown to be impacted by the 1 in 100 annual probability +25% and +35% allowances for climate change flood events.

A review of flood risk within the site has been carried out, and it is considered feasible to design the site in such a way that it remains safe throughout the lifetime of the development.

It is essential that the following design recommendations are incorporated into the design process from the conceptual stage. A detailed site-based Flood Risk Assessment will be required as an integral part of the planning application stage, which should be carried out in accordance with Section 10.4 of the Level 1 SFRA.

Design Recommendations

1. Floor levels within the site should be situated a minimum of 300mm above the 1 in 100 annual probability plus allowance for climate change, in this instance +25%, assuming a 100 year lifetime for residential development;

2. Flood storage should be analysed to show that the proposed building footprint of the development will not cause a detriment to the available storage during the 1 in 100 annual probability +25% climate change allowance flood event. The presence of a significant existing building footprint suggest that floodplain storage capacity could be improved through effective design measures;

3. Where appropriate, buildings should adopt resilient design techniques to minimise the damage and disruption sustained by businesses and/or residents following a flooding event. Further guidance can be found in BRE Digest DG523 'Flood Resilient Building', the Department for Communities and Local Government document 'Improving the Flood Performance of New Buildings – Flood Resilient Construction', and Section 12.4 of the Level 1 SFRA';

4. Sustainable Drainage Systems (SuDS) should be incorporated into the site design, aiming to achieve greenfield runoff rates, if feasible, in accordance with Section 13.4 of the Level 1 SFRA. It is important that SUDS are designed with due consideration to soil and groundwater conditions. Infiltration techniques should be sought wherever possible, however are likely to be unsuitable in areas of shallow groundwater and/or impermeable soils. Further guidance on designing for groundwater is provided in Section 6.5 of the Level 1 SFRA. Buildings and landscaping should be designed within the site to avoid locking overland flow routes;

5. Safe access is available in the current 1 in 100 annual probability flood event and would therefore meet the requirements of Section 3.4 of the L2 SFRA provided a 'Flood Management and Evacuation Plan' is prepared to consider the impacts in the climate change scenarios. Future tenants/residents within the site should be made aware of the potential risks of flooding, and should be actively encouraged to sign up to the Environment Agency's Flood Information Service to receive flood alerts, flood warnings and severe flood warnings well in advance of an event;

6. It is essential to ensure that all basement areas within flood affected areas of the site are watertight, and the entrance point is situated above the 1 in 100 annual probability +25% allowance for climate change flood level. Basements should not be used to provide habitable areas in locations classified at Flood Zone 2 'Medium Probability';

Reading Borough Council
Level 2 Strategic Flood Risk Assessment

	7. Residual risk to the development should be investigated against the 1 in 100 annual probability +35% allowance for climate change flood event.

APPENDIX E
EA FLOOD DATA

Product 4 (Detailed Flood Risk) for Caversham Road, RG1 8AJ, Reading
Our Ref: THM133268

Product 4 is designed for developers where Flood Risk Standing Advice FRA (Flood Risk Assessment) Guidance Note 3 Applies. This is:

i) "all applications in Flood Zone 3, other than non-domestic extensions less than 250 sq metres; and all domestic extensions", and
ii) "all applications with a site area greater than 1 ha" in Flood Zone 2.

Product 4 includes the following information:

Ordnance Survey 1:25k colour raster base mapping;
Flood Zone 2 and Flood Zone 3;
Relevant model node locations and unique identifiers (for cross referencing to the water levels, depths and flows table);
Model extents showing *defended* scenarios;
FRA site boundary (where a suitable GIS layer is supplied);
Flood defence locations (where available/relevant) and unique identifiers; (supplied separately)
Flood Map areas benefiting from defences (where available/relevant);
Flood Map flood storage areas (where available/relevant);
Historic flood events outlines (where available/relevant, not the Historic Flood Map) and unique identifiers;
Statutory (Sealed) Main River (where available within map extents);

A table showing:

i) Model node X/Y coordinate locations, unique identifiers, and levels and flows for *defended* scenarios.
ii) Flood defence locations unique identifiers and attributes; (supplied seperately)
iii) Historic flood events outlines unique identifiers and attributes; and
iv) Local flood history data (where available/relevant).

Please note:

If you will be carrying out computer modelling as part of your Flood Risk Assessment, please request our guidance which sets out the requirements and best practice for computer river modelling.

This information is based on that currently available as of the date of this letter. You may feel it is appropriate to contact our office at regular intervals, to check whether any amendments/ improvements have been made. Should you re-contact us after a period of time, please quote the above reference in order to help us deal with your query.

This information is provided subject to the enclosed notice which you should read.

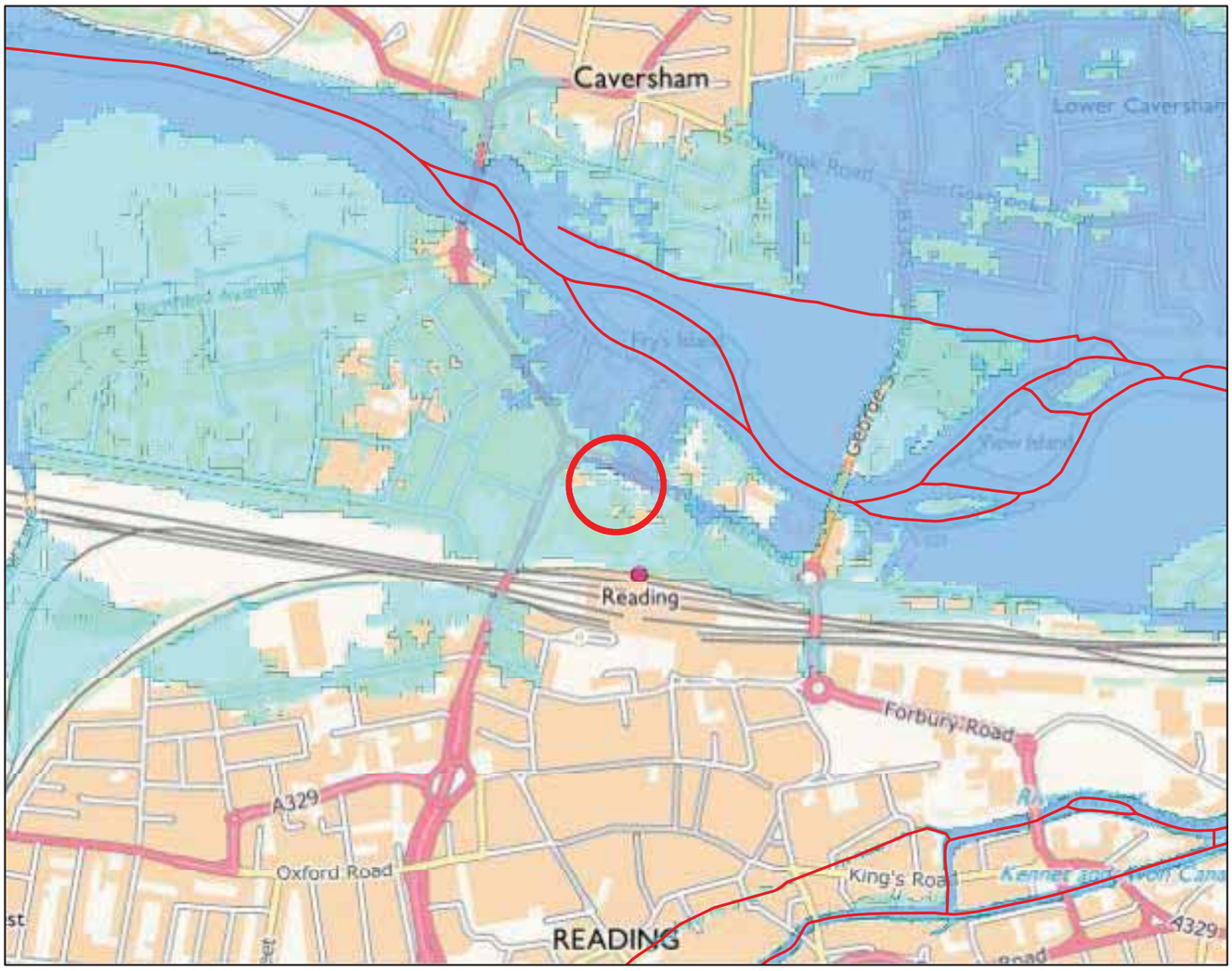
This letter is not a Flood Risk Assessment. The information supplied can be used to form part of your Flood Risk Assessment. Further advice and guidance regarding Flood Risk Assessments can be found on our website at:

https://www.gov.uk/guidance/flood-risk-assessment-local-planning-authorities

If you would like advice from us regarding your development proposals you can complete our pre application enquiry form which can be found at:

https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Flood Map for Planning centred on Caversham Road, RG1 8AJ, Reading
Created on 10/07/2019 REF:THM133268



Environment Agency

Kilometres

0 0.25 0.5

Legend

- Main River
- Flood defences
- Areas benefiting from flood defences
- Flooding from rivers or sea (FZ3)
- Extent of extreme flood (FZ2)
- Flood Map - flood storage areas

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

© Environment Agency copyright and / or database rights 2019. All rights reserved. © Crown Copyright and database right. All rights reserved. Environment Agency, 100024198, 2019.
Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Environment Agency

Defence information

THM133268

Defence Location:	No defences on Main River
Description:	This location is not currently protected by any formal defences and we do not currently have any flood alleviation works planned for the area. However we continue to maintain certain watercourses and the schedule of these can be found on our internet pages.

© Environment Agency 2013

Model information

THM133268

Model: Thames (Sandford to Mapledurham) 2018

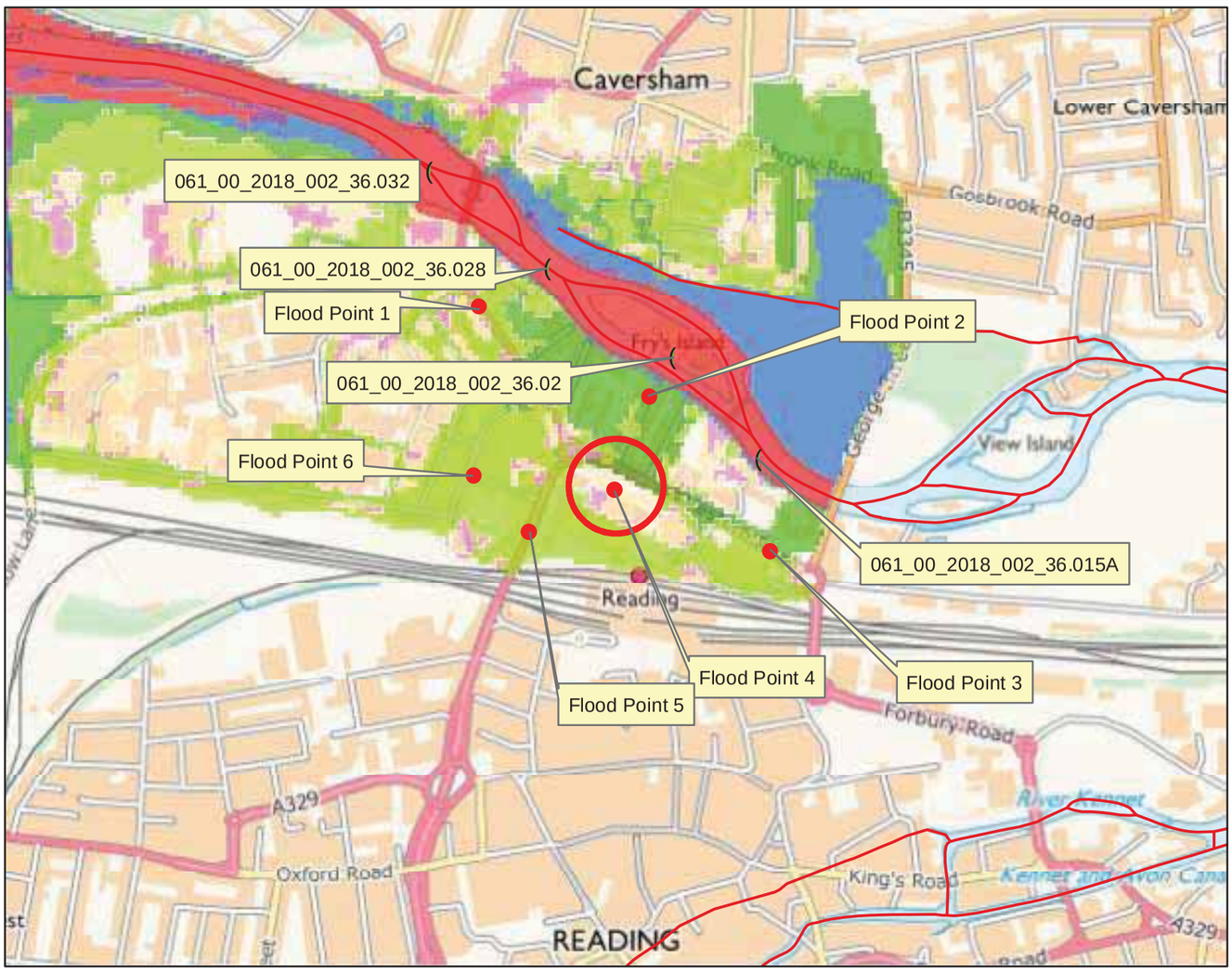
Description: The information provided is from the Abingdon Flood Schemes mapping completed in June 2017. The previous model 1D model was updated to a 1D-2D model (Flood modeller-Tuflow). The updated model will also be used to assess downstream effects due to flood alleviation options in Oxford and Abingdon.

Model design runs:
1 in 2/ 50% AEP; 1 in 5 / 20% AEP; 1 in 10/ 10% AEP; 1 in 20 / 5% AEP; 1 in 50/ 2% AEP; 1 in 75 / 1.3% AEP; 1 in 100 / 1% AEP, 1 in 100+25% / 1% + 25% AEP with climate change; 1 in 100+35% / 1% + 35% AEP with climate change; 1 in 100+70% / 1% + 70% AEP with climate change; 1 in 200/ 0.5% AEP and 1 in 1000 / 0.1% AEP.

Mapped outputs:
1 in 2/ 50% AEP; 1 in 5 / 20% AEP; 1 in 10/ 10% AEP; 1 in 20 / 5% AEP; 1 in 50/ 2% AEP; 1 in 75 / 1.3% AEP; 1 in 100 / 1% AEP, 1 in 100+25% / 1% + 25% AEP with climate change; 1 in 100+35% / 1% + 35% AEP with climate change; 1 in 100+70% / 1% + 70% AEP with climate change; 1 in 200/ 0.5% AEP and 1 in 1000 / 0.1% AEP.

© Environment Agency 2013

Detailed FRA Map (S - M) centred on Caversham Road, RG1 8AJ, Reading Created on 10/07/2019 REF:THM133268



Environment Agency

Kilometres
0 0.25 0.5

Legend

- THM Model Node Data selection
- Main River
- 50% AEP Flood Outline
- 20% AEP Flood Outline
- 5% AEP Flood Outline
- 1% AEP Flood Outline
- 1%+25% CC AEP Flood Outline
- 1%+35% CC AEP Flood Outline
- 1%+70% AEP Flood Outline
- 0.1% AEP Flood Outline

AEP = Annual Exceedance Probability
The probability of a flood of a particular magnitude, or greater, occuring in any given year

Where available climate change extents have been calculated with an additional flow added to an AEP event. An example of how this is written is 1%+20% AEP.

© Environment Agency copyright and / or database rights 2019. All rights reserved. © Crown Copyright and database right. All rights reserved. Environment Agency, 100024198, 2019.
Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Modelled in-channel flood flows and levels

THM133268

The modelled flood levels and flows for the closest most appropriate model node points for your site that are within the river channel are provided below:

				Flood Levels (mAOD)							
Node label	Model	Easting	Northing	20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	1% AEP (+25% increase in flows)	1% AEP (+35% increase in flows)	1% AEP (+70% increase in flows)	0.1% AEP
061_00_2018_002_36.032	Thames (Sandford to Mapledurham) 2018	471075	174646	37.23	37.65	38.19	0.00	38.49	38.57	38.81	38.74
061_00_2018_002_36.028	Thames (Sandford to Mapledurham) 2018	471287	174474	37.18	37.59	38.09	0.00	38.33	38.39	38.57	38.51
061_00_2018_002_36.02	Thames (Sandford to Mapledurham) 2018	471511	174314	37.12	37.54	38.05	0.00	38.30	38.35	38.53	38.48
061_00_2018_002_36.015A	Thames (Sandford to Mapledurham) 2018	471664	174132	37.05	37.47	38.00	0.00	38.25	38.31	38.49	38.44

				Flood Flows (m3/s)							
Node label	Model	Easting	Northing	20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	1% AEP (+25% increase in flows)	1% AEP (+35% increase in flows)	1% AEP (+70% increase in flows)	0.1% AEP
061_00_2018_002_36.032	Thames (Sandford to Mapledurham) 2018	471075	174646	218.79	283.66	382.28	0.00	484.80	512.15	624.31	585.50
061_00_2018_002_36.028	Thames (Sandford to Mapledurham) 2018	471287	174474	218.79	282.17	376.75	0.00	474.55	501.04	609.06	571.28
061_00_2018_002_36.02	Thames (Sandford to Mapledurham) 2018	471511	174314	218.70	278.51	367.56	0.00	459.69	484.02	588.64	551.59
061_00_2018_002_36.015A	Thames (Sandford to Mapledurham) 2018	471664	174132	218.78	271.54	318.67	0.00	375.76	391.67	464.79	437.45

Note:

Due to changes in guidance on the allowances for climate change, the 20% increase in river flows should no longer to be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit
https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

© Environment Agency 2013

Modelled floodplain flood levels

THM133268

The modelled flood levels for the closest most appropriate model grid cells for your site are provided below:

				flood levels (mAOD)							
2D grid cell reference	Model	Easting	Northing	50% AEP	20% AEP	5% AEP	1% AEP	1% AEP (+25% increase in flows)	1% AEP (+35% increase in flows)	1% AEP (+70% increase in flows)	0.1% AEP
Flood Point 1	Thames (Sandford to Mapledurham) 2018	471,168	174,398	No Data	No Data	No Data	No Data	38.31	38.36	38.56	38.5
Flood Point 2	Thames (Sandford to Mapledurham) 2018	471,468	174,239	No Data	No Data	No Data	38.05	38.29	38.34	38.52	38.469
Flood Point 3	Thames (Sandford to Mapledurham) 2018	471,685	173,968	No Data	No Data	No Data	No Data	38.15	38.20	38.33	38.3
Flood Point 4	Thames (Sandford to Mapledurham) 2018	471,407	174,074	No Data	No Data	No Data	No Data	No Data	No Data	38.52	38.467
Flood Point 5	Thames (Sandford to Mapledurham) 2018	471,250	173,999	No Data	No Data	No Data	No Data	38.28	38.34	38.53	38.474
Flood Point 6	Thames (Sandford to Mapledurham) 2018	471,154	174,101	No Data	No Data	No Data	No Data	38.29	38.36	38.56	38.5

This flood model has represented the floodplain as a grid.
The flood water levels have been calculated for each grid cell.

Note:

Due to changes in guidance on the allowances for climate change, the 20% increase in river flows should no longer to be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit
https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

© Environment Agency 2013

Model information

THM133268

Model: Thames (Mapledurham to Sonning) 2011

Description: The information provided is taken from the Thames (Reading Complex Change) Flood Alleviation Study completed in June 2011. The study was carried out using 2D modelling software (ISIS-Tuflow).

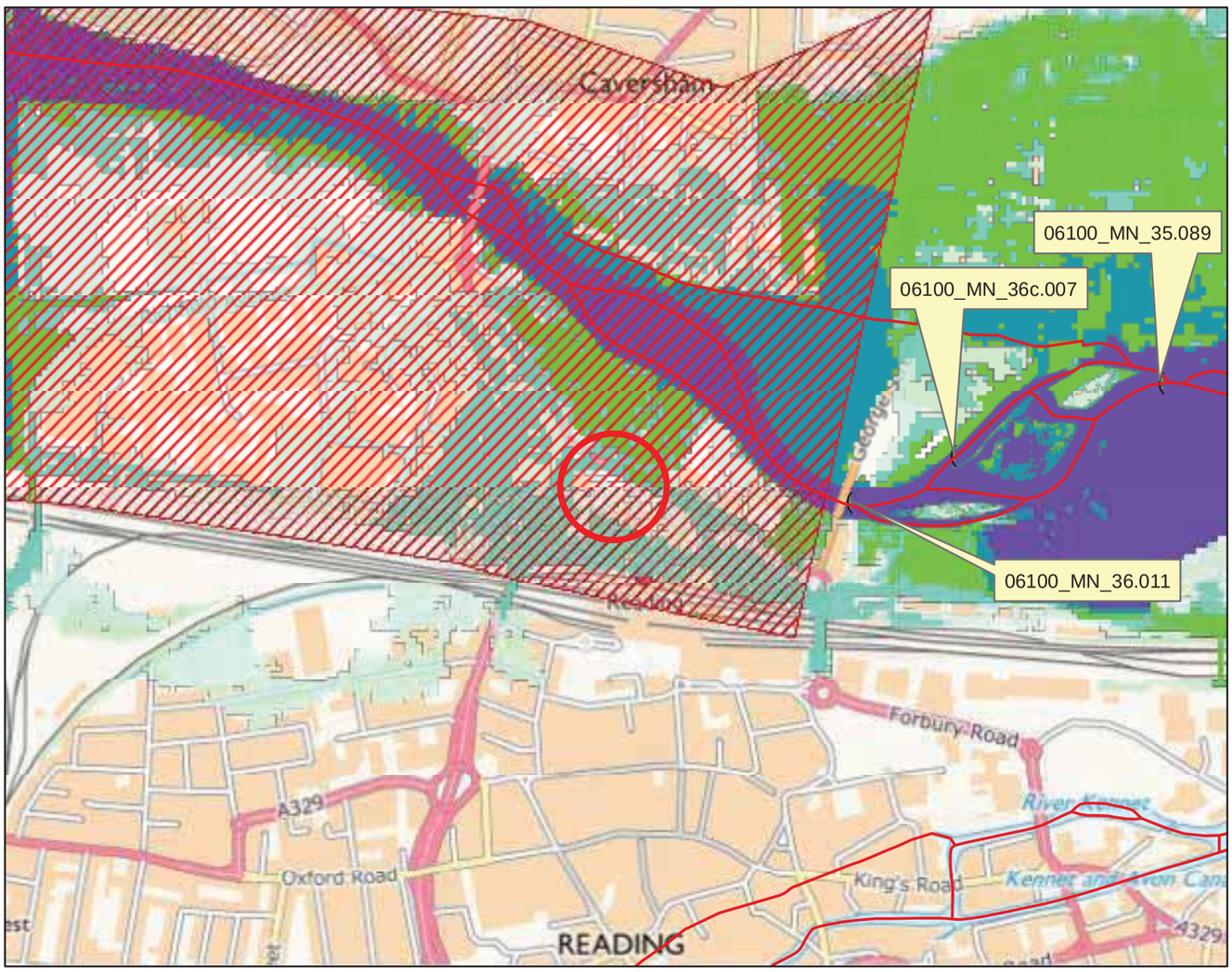
Model design runs:
1 in 5 / 20% Annual Exceedance Probabilty (AEP); 1 in 20 / 5% AEP; 1 in 50 / 2% AEP; 1 in 100 / 1% AEP; 1 in 1000 / 0.1% AEP and 1 in 100+20% / 1% AEP plus 20% increase in flows

Mapped Outputs:
1 in 5 / 20% AEP; 1 in 20 / 5% AEP; 1 in 50 / 2% AEP; 1 in 100 / 1% AEP and 1 in 1000 / 0.1% AEP

Model accuracy:
Levels ± 250mm

© Environment Agency 2013

Detailed FRA Map (M - S) centred on Caversham Road, RG1 8AJ, Reading Created on 16/07/2019 REF:THM133268



Kilometres
0 0.25 0.5

Legend

- Main River
- Model Nodes
- Outlines/Height Grids at this location not supplied
- 20% AEP Flood Outline
- 5% AEP Flood Outline
- 1% AEP Flood Outline
- 1%+20% AEP Flood Outline
- 0.1% AEP Flood Outline

AEP = Annual Exceedance Probability
The probability of a flood of a particular magnitude, or greater, occuring in any given year

Where available climate change extents have been calculated with an additional flow added to an AEP event. An example of how this is written is 1%+20% AEP.

© Environment Agency copyright and / or database rights 2019. All rights reserved. © Crown Copyright and database right. All rights reserved. Environment Agency, 100024198, 2019.
Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Modelled in-channel flood flows and levels

THM133268

The modelled flood levels and flows for the closest most appropriate model node points for your site that are within the river channel are provided below:

				Flood Levels (mAOD)							
Node label	Model	Easting	Northing	20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	1% AEP (+25% increase in flows)	1% AEP (+35% increase in flows)	1% AEP (+70% increase in flows)	0.1% AEP
06100_MN_36.011	Thames (Mapledurham to Sonning) 2011	471817	174063	36.96	37.30	37.72	37.86	0.00	0.00	0.00	38.04
06100_MN_36c.007	Thames (Mapledurham to Sonning) 2011	472004	174146	36.93	37.29	37.75	37.91	0.00	0.00	0.00	38.10
06100_MN_35.089	Thames (Mapledurham to Sonning) 2011	472375	174276	36.58	36.86	37.17	37.36	0.00	0.00	0.00	37.61

				Flood Flows (m3/s)							
Node label	Model	Easting	Northing	20% AEP	5% AEP	1% AEP	1% AEP (+20% increase in flows)	1% AEP (+25% increase in flows)	1% AEP (+35% increase in flows)	1% AEP (+70% increase in flows)	0.1% AEP
06100_MN_36.011	Thames (Mapledurham to Sonning) 2011	471817	174063	223.08	281.34	353.30	405.25	0.00	0.00	0.00	476.08
06100_MN_36c.007	Thames (Mapledurham to Sonning) 2011	472004	174146	14.29	18.33	56.07	87.02	0.00	0.00	0.00	136.00
06100_MN_35.089	Thames (Mapledurham to Sonning) 2011	472375	174276	219.81	255.44	287.00	301.74	0.00	0.00	0.00	324.74

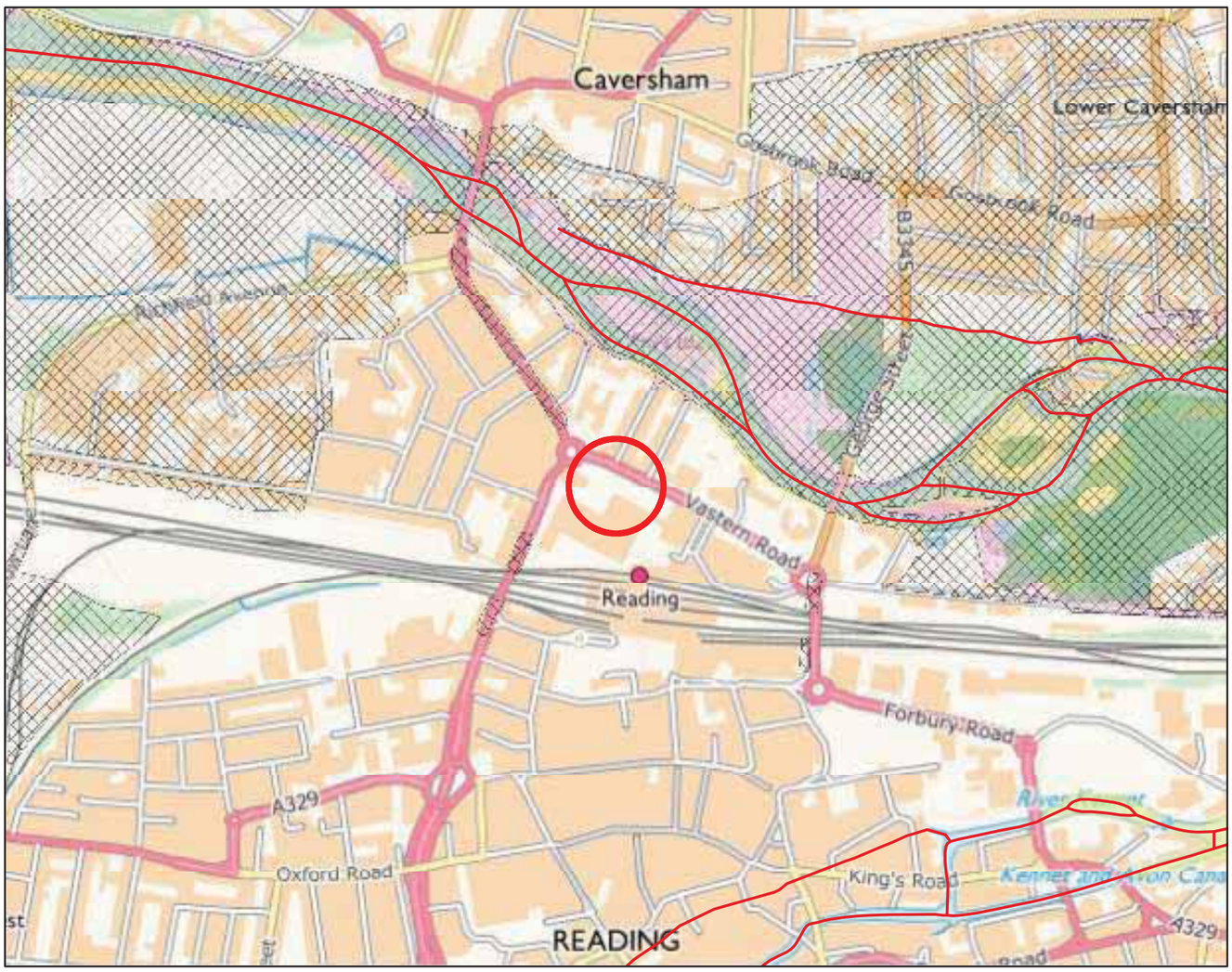
Note:

Due to changes in guidance on the allowances for climate change, the 20% increase in river flows should no longer to be used for development design purposes. The data included in this Product can be used for interpolation of levels as part of an intermediate level assessment.

For further advice on the new allowances please visit
https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

© Environment Agency 2013

Historic Floop Map centred on Caversham Road, RG1 8AJ, Reading
Created on 10/07/2019 REF:THM133268



Environment Agency

Kilometres
0 0.25 0.5

Legend

Main River

year

1947
1974
1977
2000
2002
2007

Flooding from rivers or sea without defences (Flood Zone 3) shows the area that could be affected by flooding:
- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

The Extent of an extreme flood (Flood Zone 2) shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

© Environment Agency copyright and / or database rights 2019. All rights reserved. © Crown Copyright and database right. All rights reserved. Environment Agency, 100024198, 2019.
Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Historic flood data

THM133268

Our records show that the area of your site has been affected by flooding.
Information on the floods that have affected your site is provided in the table below:

Flood Event Code	Flood Event Name	Start Date	End Date	Source of Flooding	Cause of Flooding
EA0619470300429	06MarchSpring1947	01/01/1947	12/12/1947	main river	channel capacity exceeded (no raised defences)
EA0619741100405	06NovemberAutumn1974	01/01/1974	12/12/1974	main river	channel capacity exceeded (no raised defences)
EA0619770800427	06AugustSummer1977	01/01/1977	12/12/1977	main river	channel capacity exceeded (no raised defences)
EA0620001200994	06DecemberWinter2000	01/01/2000	12/12/2000	main river	channel capacity exceeded (no raised defences)
EA0620030101899	06JanuaryNewYear2003	23/12/2002	12/01/2003	main river	channel capacity exceeded (no raised defences)
ea061231477	Shiplake CP_Fluvial Wate	19/07/2007	29/07/2007	main river	channel capacity exceeded (no raised defences)
ea061231504	Reading_Fluvial Water	19/07/2007	29/07/2007	main river	channel capacity exceeded (no raised defences)

Please note the Environment Agency maps flooding to land not individual properties. Floodplain extents are an indication of the geographical extent of a historic flood. They do not provide information regarding levels of individual properties, nor do they imply that a property has flooded internally.

Start and End Dates shown above may represent a wider range where the exact dates are not available.

© Environment Agency 2013

APPENDIX F
FLOOD OUTLINE & STORAGE LAYOUTS

A1



LEGEND

FLOODPLAIN BASED ON 1 IN 100 LEVEL OF 36.29mAOD + 35% CC REDUCED FLOOD LEVEL OF 36.34mAOD

FLOODPLAIN BASED ON 1 IN 100 + 35% CC REDUCED FLOOD LEVEL OF 36.34mAOD

SITE BOUNDARY

DO NOT SCALE

No.	REVISION	BY	DATE
A	Site plan updated	JHH	24.01.20

DRAWING STATUS: PRELIMINARY

DRAWING TITLE: FLOOD OUTLINE PLAN

PROJECT: READING STATION SHOPPING PARK

Project Number: P19-418

simpson | tws

8 Friday Street
Henley on Thames
Oxfordshire RG9 1AH
T:01491 572221

London, Henley-on-Thames, Gloucester and Exeter

Drawn	Chkd	Status	Date
JHH	MC	1:500@A1	DEC'19

Purpose of Issue: FOR INFORMATION

Drawing Number: P19-418-SK01 | Revision: A

A1



EXISTING FLOOD STORAGE VOLUMES			
ELEVATION (mAOD)	DEPTH (m)	VOLUME (m³)	TOTAL VOLUME (m³)
38.29	0.0 – 0.1	120	163
38.19	0.1 – 0.2	37	43
38.09	0.2 – 0.3	5	7
37.99	0.3 – 0.4	1	2
37.89	0.4 – 0.5	1	1

FLOOD KEY

FLOOD DEPTH (m)

0.00	0.10
0.10	0.20
0.20	0.30
0.30	0.40
0.40	0.50

SITE BOUNDARY

DO NOT SCALE

No.	REVISION	BY	DATE
—	—	—	—

DRAWING STATUS: PRELIMINARY

DRAWING TITLE: EXISTING FLOOD STORAGE 1 % AEP + 25%

PROJECT: READING STATION SHOPPING PARK

Project Number: P19-418

simpson | tws

8 Friday Street
Henley on Thames
Oxfordshire RG9 1AH
T:01491 572221

London, Henley-on-Thames, Gloucester and Exeter

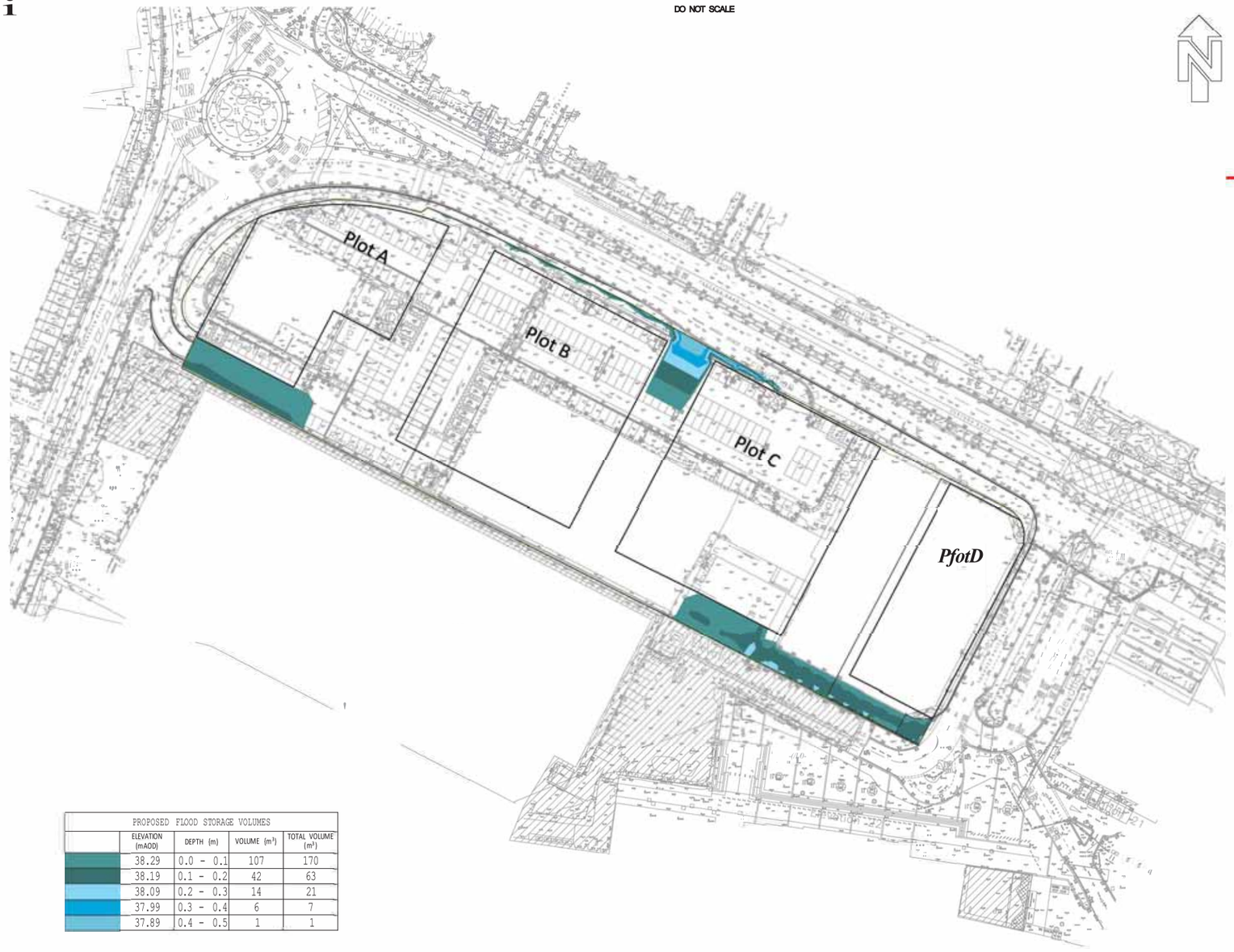
Drawn	Chkd	Status	Date
JHH	MC	1:500@A1	DEC'19

Purpose of Issue: INFORMATION

Drawing Number: P19-418-SK02 | Revision: -

DO NOT SCALE

7



FLOOD KEY

FLOOD DEPTH (m)	
0.00	0.10
0.10	0.20
0.20	0.30
0.30	0.40
0.40	0.50

SITE BOUNDARY

PROPOSED FLOOD STORAGE VOLUMES

	ELEVATION (mAOD)	DEPTH (m)	VOLUME (m^3)	TOTAL VOLUME (m^3)
	38.29	0.0 - 0.1	107	170
	38.19	0.1 - 0.2	42	63
	38.09	0.2 - 0.3	14	21
	37.99	0.3 - 0.4	6	7
	37.89	0.4 - 0.5	1	1

No	REVISION	BY	DATE
A	Site plan updated	JPH	24.01.20

DRAWING STATUS
PRELIMINARY

DRAWING TITLE
PROPOSED FLOOD STORAGE 1% AEP + 25% cc

PROJECT — Project Number P19-418
READING STATION SHOPPING PARK

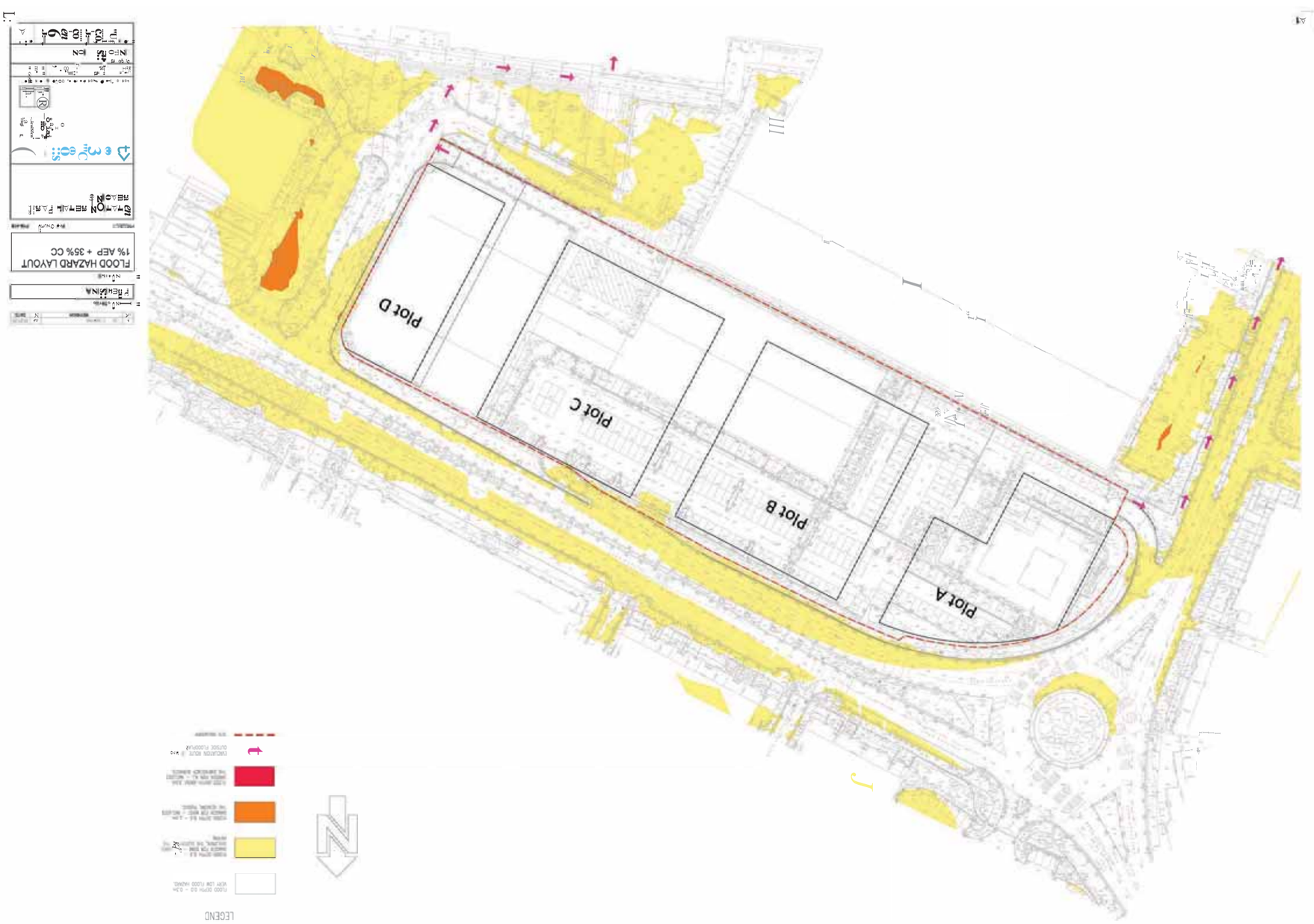
simpson ltws
6 Friday Street
Henley on Thames
Oxfordshire RG9 1AH
T.01491 578221
London, Henley-on Thames, Gloucester and Exeter

Drawn	Checked	Scale	Date
JPH	BD	1:600@A1	DEC'19

Purpose of Issue
INFORMATION

Drawing Number P19-418-SK03 — Revision A

♦1



APPENDIX G
RUNOFF CALCULATIONS

ReFH2 Rural Runoff Peak Flows

Input

Return Period (Years)	100
FEH Rainfall Version	2013
Site Location	GB 471402 174068 SU 71402 74068
Data Type	Point
Season	Summer
Country	England/Wales/Northern Ireland
Area (ha)	1.770
SAAR (mm)	639
BFIHOST	0.817
FARL	0.000
SPRHOST	0.000
URBEXT (2000)	0.0000

Results

Return Period (Years)	Rural (l/s)	Urban (l/s)
User	6.4	6.4
Q1	1.8	1.8
Q2	2.1	2.1
Q5	3.0	3.0
Q10	3.7	3.7
Q30	4.8	4.8
Q50	5.4	5.4
Q75	6.0	6.0
Q100	6.4	6.4
Q200	7.5	7.5
Q1000	11.7	11.7

©1982-2017 XP Solutions

SIMPSON ASSOCIATES		Page 1
4TH FLOOR 43 EAGLE STREET LONDON WC1R 4AT		
Date 16/12/2019 11:20 File	Designed by jackhadley Checked by	
XP Solutions	Source Control 2018.1	

Greenfield Runoff Volume

FSR Data

Return Period (years)	1
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.100
Ratio R	0.400
Areal Reduction Factor	1.00
Area (ha)	1.770
SAAR (mm)	700
CWI	105.000
Urban	0.000
SPR	10.000

Results

Percentage Runoff (%)	5.00
Greenfield Runoff Volume (m³)	18.412

©1982-2018 Innovyze

Simpson Associates		Page 1
1 Market Place Mews Henley-on-Thames RG9 2AH		
Date 09/12/2019 11:26 File	Designed by Bryn.Tawton Checked by	
Micro Drainage	Source Control 2017.1.2	

ReFH2 Greenfield Runoff Volume

Input

Return Period (Years)	2
Storm Duration (min)	360
FEH Rainfall Version	2013
Site Location	GB 471402 174068 SU 71402 74068
Data Type	Point
Season	Summer
Country	England/Wales/Northern Ireland
Area (ha)	1.770
SAAR (mm)	639
BFIHOST	0.817
FARL	0.000
SPRHOST	0.000
URBEXT (2000)	0.0000

Results

Percentage Runoff (%)	8.16
Greenfield Runoff Volume (m³)	33.619

©1982-2017 XP Solutions

ReFH2 Greenfield Runoff Volume

Input

Return Period (Years)	30
Storm Duration (min)	360
FEH Rainfall Version	2013
Site Location	GB 471402 174068 SU 71402 74068
Data Type	Point
Season	Summer
Country	England/Wales/Northern Ireland
Area (ha)	1.770
SAAR (mm)	639
BFIHOST	0.817
FARL	0.000
SPRHOST	0.000
URBEXT (2000)	0.0000

Results

Percentage Runoff (%)	9.45
Greenfield Runoff Volume (m³)	80.410

©1982-2017 XP Solutions

ReFH2 Greenfield Runoff Volume

Input

Return Period (Years)	100
Storm Duration (min)	360
FEH Rainfall Version	2013
Site Location	GB 471402 174068 SU 71402 74068
Data Type	Point
Season	Summer
Country	England/Wales/Northern Ireland
Area (ha)	1.770
SAAR (mm)	639
BFIHOST	0.817
FARL	0.000
SPRHOST	0.000
URBEXT (2000)	0.0000

Results

Percentage Runoff (%)	10.07
Greenfield Runoff Volume (m³)	106.986

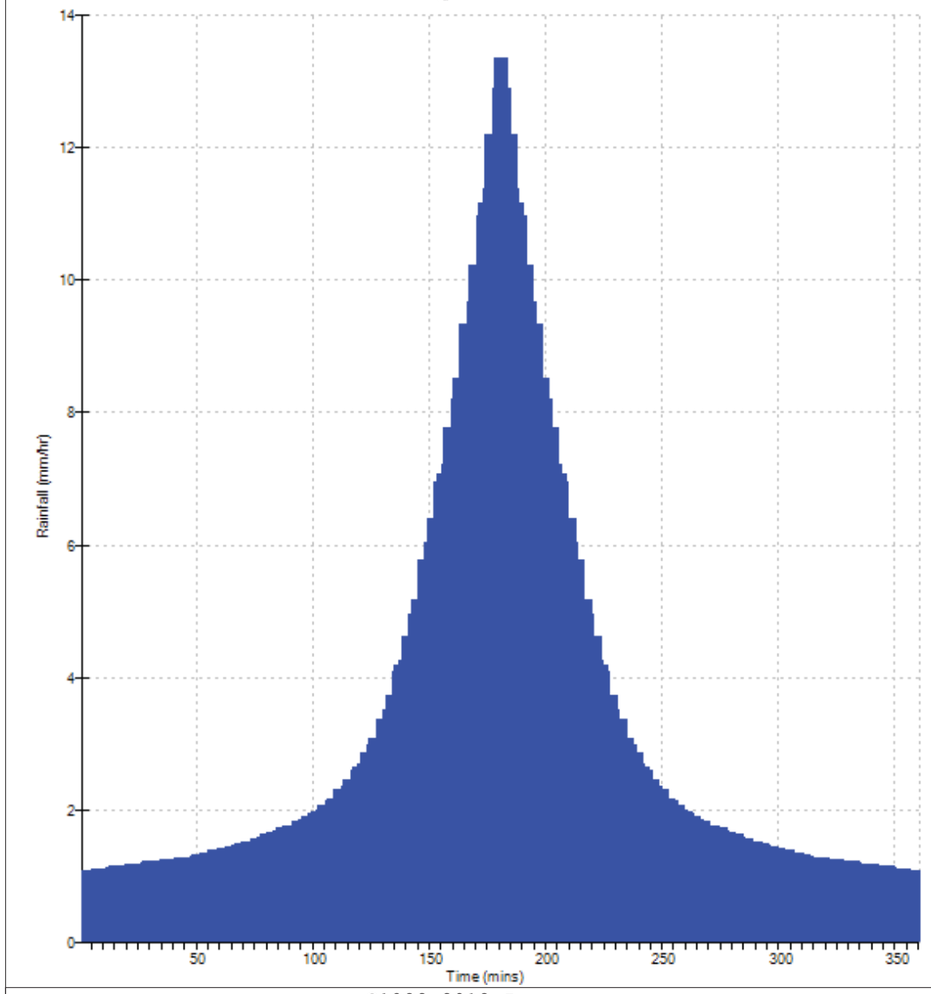
©1982-2017 XP Solutions

SIMPSON ASSOCIATES		Page 1
4TH FLOOR 43 EAGLE STREET LONDON WC1R 4AT	Reading Station Park Reading Rainfall Profile 1-1 Summer	
Date 22/07/2019 09:43 File	Designed by Jack Hadley Checked by	
XP Solutions	Network 2018.1	

Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.800
Ratio R	0.400
Peak Intensity (mm/hr)	13.360
Ave. Intensity (mm/hr)	3.408
Return Period (years)	1.0



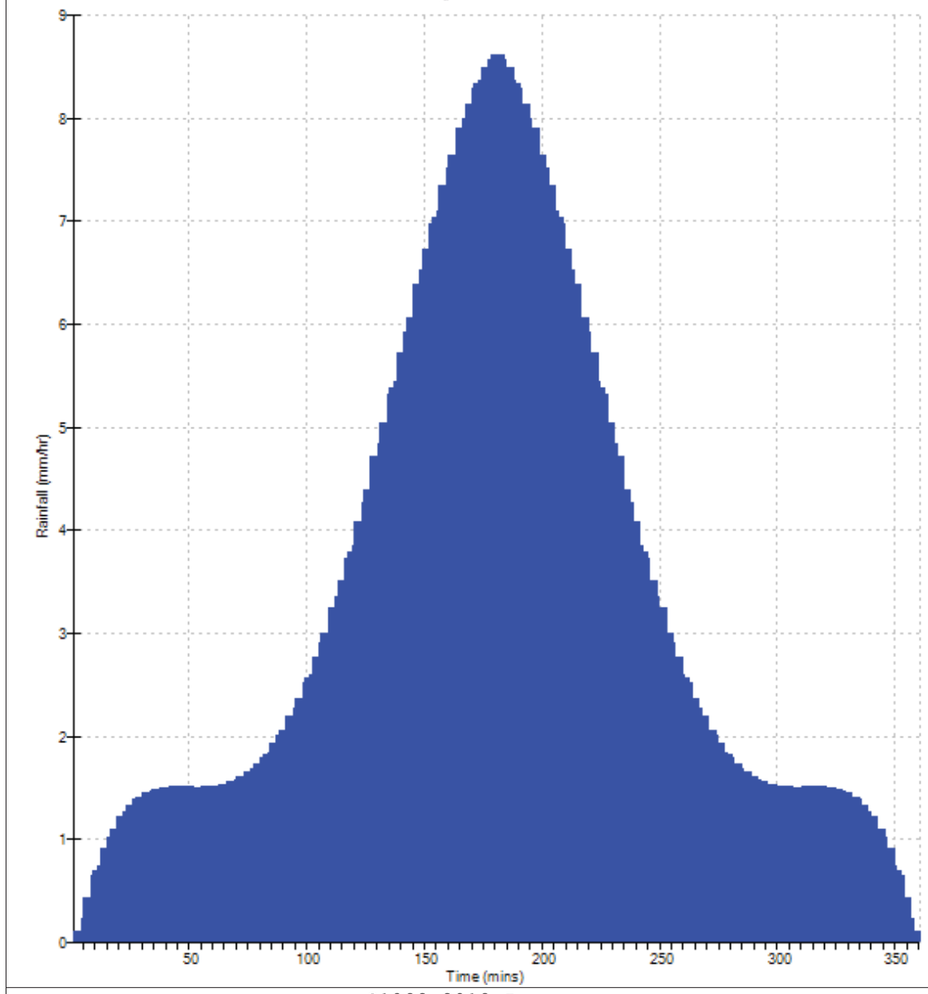
©1982-2018 Innovyze

SIMPSON ASSOCIATES		Page 1
4TH FLOOR 43 EAGLE STREET LONDON WC1R 4AT	Reading Station Park Reading Rainfall Profile 1-1 Winter	
Date 22/07/2019 09:46 File	Designed by Jack Hadley Checked by	
XP Solutions	Network 2018.1	

Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.800
Ratio R	0.400
Peak Intensity (mm/hr)	8.620
Ave. Intensity (mm/hr)	3.408
Return Period (years)	1.0



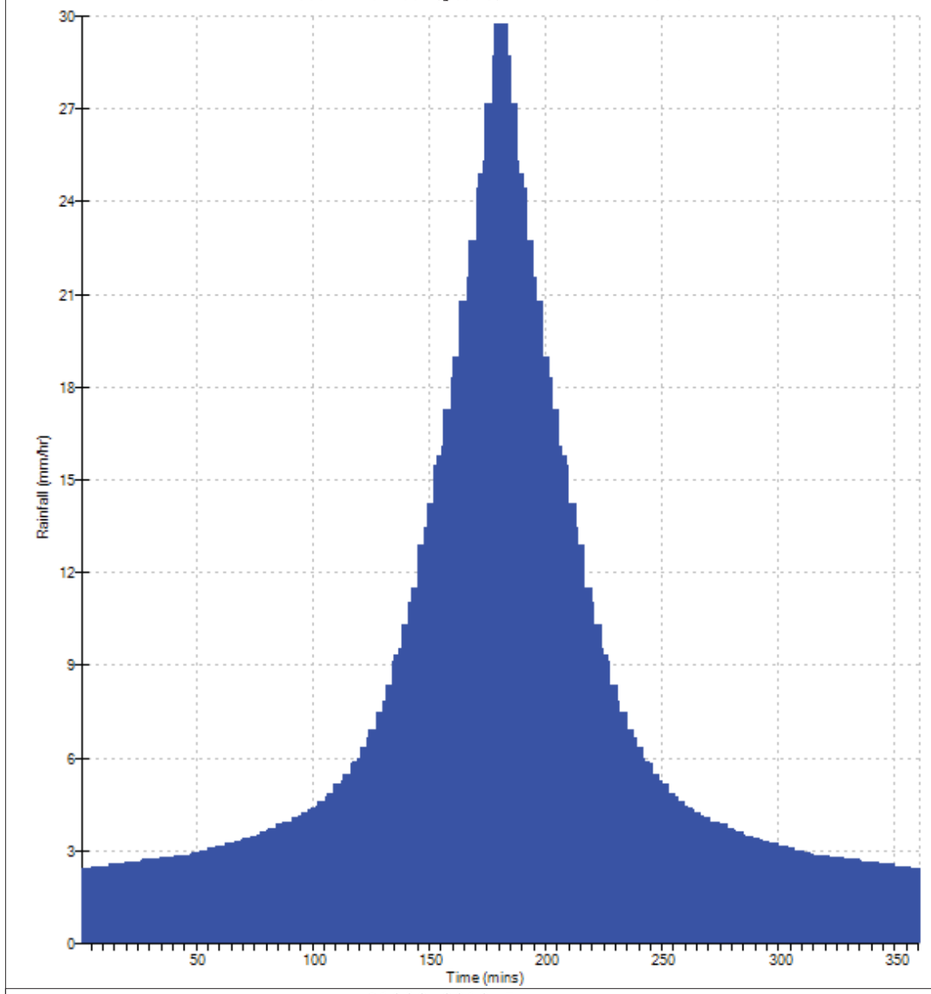
©1982-2018 Innovyze

SIMPSON ASSOCIATES		Page 1
4TH FLOOR 43 EAGLE STREET LONDON WC1R 4AT	Reading Station Park Reading Rainfall Profile 1-30 Summer	
Date 22/07/2019 09:47 File	Designed by Jack Hadley Checked by	
XP Solutions	Network 2018.1	

Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.800
Ratio R	0.400
Peak Intensity (mm/hr)	29.759
Ave. Intensity (mm/hr)	7.592
Return Period (years)	30.0



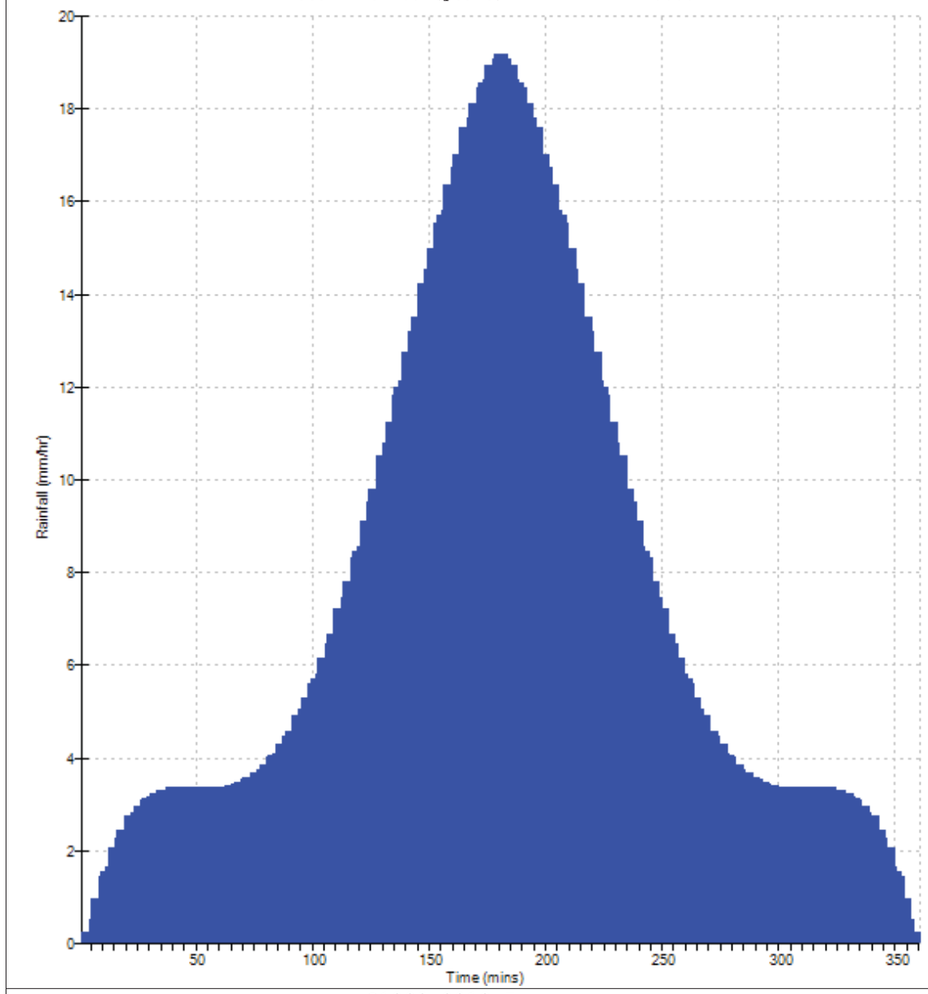
©1982-2018 Innovyze

SIMPSON ASSOCIATES		Page 1
4TH FLOOR 43 EAGLE STREET LONDON WC1R 4AT	Reading Station Park Reading Rainfall Profile 1-30 Winter	
Date 22/07/2019 09:48 File	Designed by Jack Hadley Checked by	
XP Solutions	Network 2018.1	

Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.800
Ratio R	0.400
Peak Intensity (mm/hr)	19.200
Ave. Intensity (mm/hr)	7.592
Return Period (years)	30.0



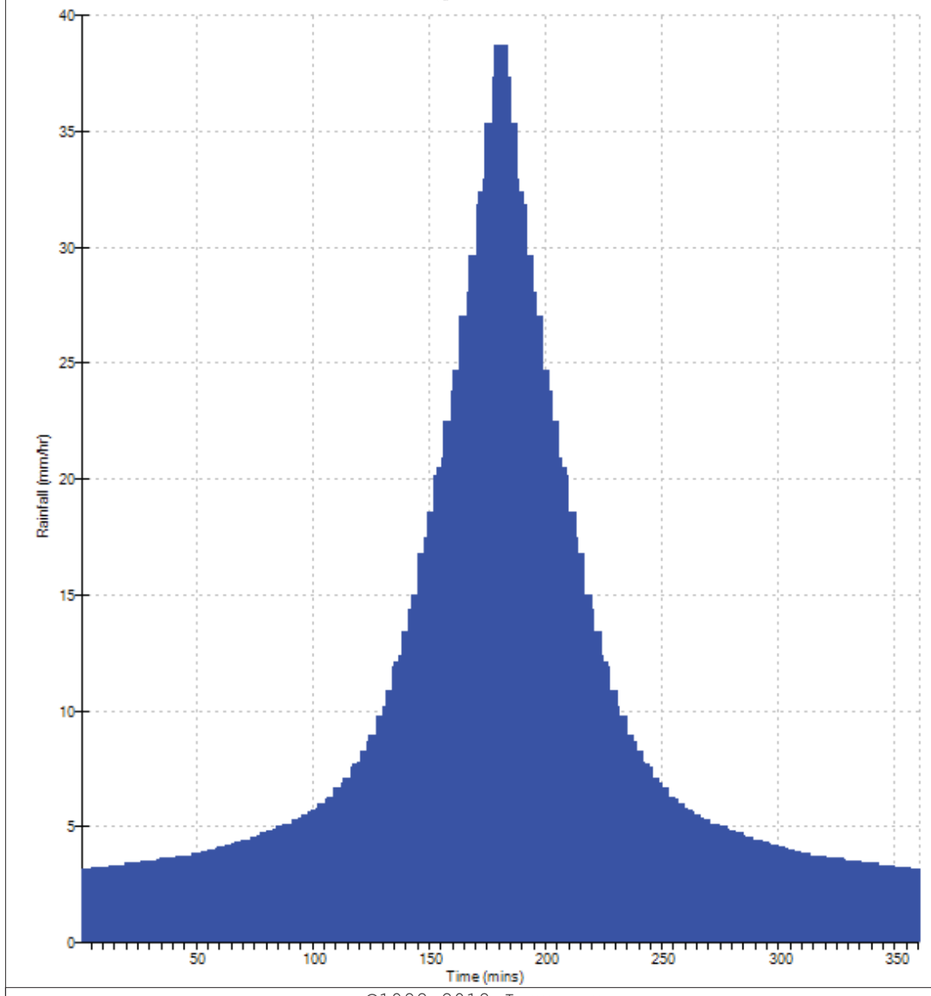
©1982-2018 Innovyze

SIMPSON ASSOCIATES		Page 1
4TH FLOOR 43 EAGLE STREET LONDON WC1R 4AT	Reading Station Park Reading Rainfall Profile 1-100 Summer	
Date 22/07/2019 09:50 File	Designed by Jack Hadley Checked by	
XP Solutions	Network 2018.1	

Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.800
Ratio R	0.400
Peak Intensity (mm/hr)	38.715
Ave. Intensity (mm/hr)	9.876
Return Period (years)	100.0



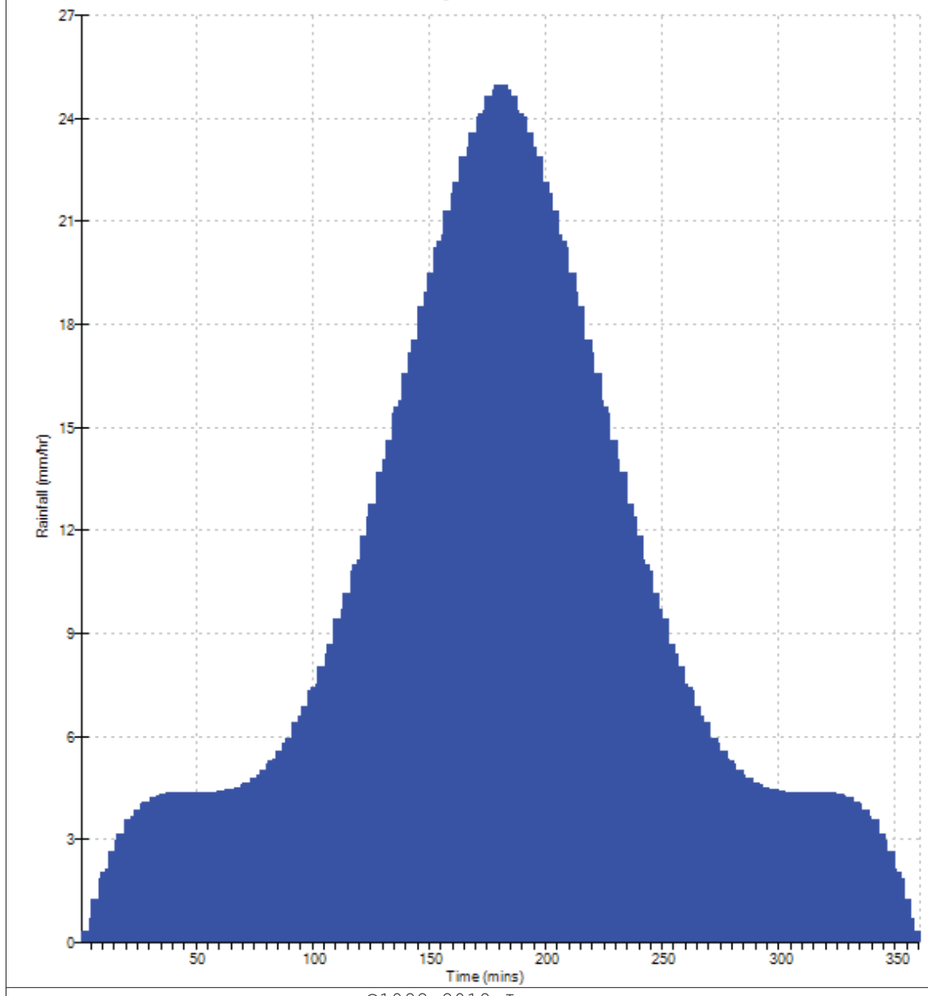
©1982-2018 Innovyze

SIMPSON ASSOCIATES		Page 1
4TH FLOOR 43 EAGLE STREET LONDON WC1R 4AT	Reading Station Park Reading Rainfall Profile 1-100 Winter	
Date 22/07/2019 09:51 File	Designed by Jack Hadley Checked by	
XP Solutions	Network 2018.1	

Rainfall profile

Storm duration (mins) 360

FSR Data	
Region	England and Wales
M5-60(mm)	18.800
Ratio R	0.400
Peak Intensity (mm/hr)	24.978
Ave. Intensity (mm/hr)	9.876
Return Period (years)	100.0



©1982-2018 Innovyze

P19-418, Reading Station Park, Reading - Modified Rational Method Runoff Calculations (Pre-Development)

Peak Runoff Rate = 3.61 x Runoff Volume Coefficient (Cv) x Area (A) x Peak Rainfall Intensity (I_{peak})

Runoff Volume = Runoff Coefficient (C) x Area (A) x Average Rainfall intensity (I_{ave}) x Storm Duration

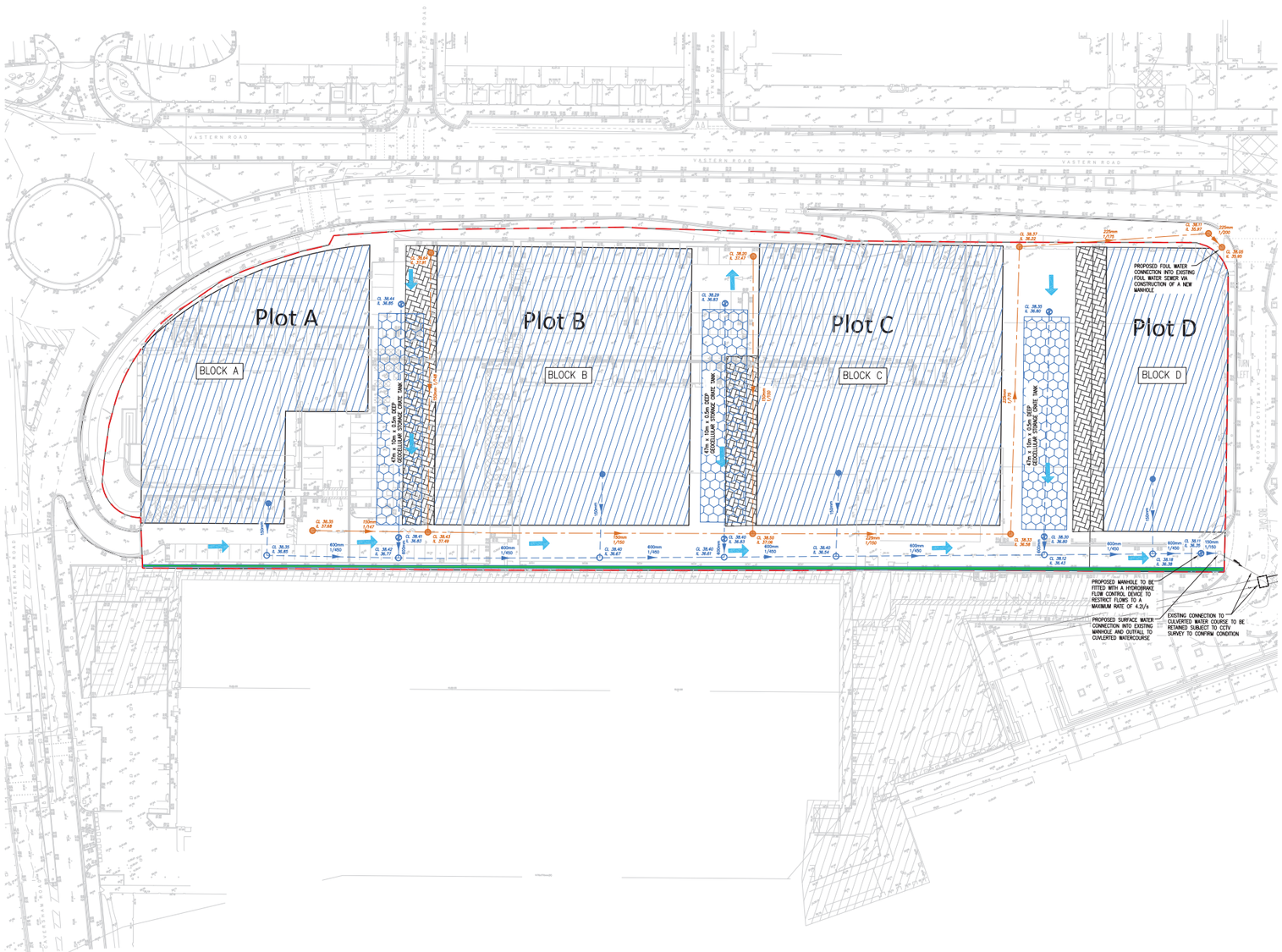
Pre-development Runoff

Return Period	Cv	$I_{(peak)}$ (mm)	$I_{(ave)}$ (mm)	A (Ha)	Peak Runoff Rate (l/s)	Runoff Volume (m^3)
1	0.75	13.360	3.408	1.7700	64.0	271.4
30	0.75	29.759	7.592	1.7700	142.6	604.7
100	0.75	38.715	9.876	1.7700	185.5	786.6

Notes

1. Rainfall intensities generated from the FSR rainfall model facility in MicroDrainage.
2. Peak rainfall intensities are based on the following FSR data:
   Storm Duration: 360 min (6hrs)
   M5-60 (mm): 18.900
   Ratio R 0.400
3. Average rainfall intensities are based on the following FSR data:
   Storm Duration: 360 min (6hrs)
   M5-60 (mm): 18.900
   Ratio R 0.400

DO NOT SCALE



LEGEND

- INDICATIVE GREEN / BLUE ROOF CATCHMENT
- BELOW GROUND ATTENUATION
- OVERLAND FLOW DIRECTION
- SUDS FEATURE TO SERVE ACCESS ROAD
- PROVISION FOR PERMEABLE PAVING TO SERVE PARKING AREAS
- SURFACE WATER OUTFALL FROM GREEN / BLUE ROOF
- SURFACE WATER MANHOLE
- SURFACE WATER CATCHPIT MANHOLE
- FOUL WATER MANHOLE
- FOUL WATER DRAIN
- SURFACE WATER DRAIN
- SITE BOUNDARY

A	Site plan updated.	JPH	24.01.20
MC	REVISION	BY	DATE

DRAWING STATUS

FOR OUTLINE PLANNING

DRAWING TITLE

SURFACE WATER MANAGEMENT & FOUL WATER DISPOSAL PLAN

PROJECT — Project Number P19s418

READING STATION SHOPPING PARK

simpson | tws
8 Fridley Street
Henley on Thames
Oxfordshire RG9 1AH
T.01491 576221
London, Henley-on-Thames, Gloucester and Exeter

Drawn	Ch'kd	Scales	Date
JPH	MC	1:400@A1	Dec 19

Purpose of Issue: PRELIMINARY

Drawing Number: P19-418 - SK05 — Revision: A

A1

APPENDIX H
PROPOSED DRAINAGE STRATEGY

APPENDIX J
MICRODRAINAGE CALCULATIONS

SIMPSON ASSOCIATES		Page 1
4TH FLOOR 43 EAGLE STREET LONDON WC1R 4AT	Block A Blue Roof Design	Micro Drainage
Date 17/12/2019 15:46 File Cascade 1 in 1yr.casx	Designed by jackhadley Checked by	
XP Solutions	Source Control 2018.1	

Cascade Summary of Results for Block A Blue Roof 1 in 1yr.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 1yr.srcx	(None)

Half Drain Time : 1235 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.501	0.001	0.0	0.0	0.0	0.5	O K
30 min Summer	59.505	0.005	0.0	0.0	0.0	3.0	O K
60 min Summer	59.510	0.010	0.0	0.0	0.0	5.8	O K
120 min Summer	59.515	0.015	0.0	0.1	0.1	8.9	O K
180 min Summer	59.518	0.018	0.0	0.1	0.1	10.9	O K
240 min Summer	59.521	0.021	0.0	0.1	0.1	12.2	O K
360 min Summer	59.524	0.024	0.0	0.1	0.1	14.1	O K
480 min Summer	59.526	0.026	0.0	0.1	0.1	15.2	O K
600 min Summer	59.527	0.027	0.0	0.1	0.1	15.9	O K
720 min Summer	59.528	0.028	0.0	0.1	0.1	16.4	O K
960 min Summer	59.528	0.028	0.0	0.2	0.2	16.8	O K
1440 min Summer	59.529	0.029	0.0	0.2	0.2	17.5	O K
2160 min Summer	59.530	0.030	0.0	0.2	0.2	17.9	O K
2880 min Summer	59.530	0.030	0.0	0.2	0.2	17.9	O K
4320 min Summer	59.529	0.029	0.0	0.2	0.2	17.3	O K
5760 min Summer	59.528	0.028	0.0	0.1	0.1	16.5	O K
7200 min Summer	59.527	0.027	0.0	0.1	0.1	15.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	29.542	0.0	0.0	106
30 min Summer	19.215	0.0	0.5	117
60 min Summer	12.155	0.0	2.4	134
120 min Summer	7.534	0.0	4.7	170
180 min Summer	5.668	0.0	6.3	216
240 min Summer	4.627	0.0	7.5	266
360 min Summer	3.467	0.0	9.2	376
480 min Summer	2.810	0.0	10.4	490
600 min Summer	2.387	0.0	11.3	606
720 min Summer	2.089	0.0	12.0	722
960 min Summer	1.693	0.0	13.0	874
1440 min Summer	1.259	0.0	13.9	1104
2160 min Summer	0.937	0.0	19.7	1496
2880 min Summer	0.760	0.0	20.1	1908
4320 min Summer	0.565	0.0	19.2	2736
5760 min Summer	0.458	0.0	22.3	3568
7200 min Summer	0.389	0.0	21.6	4368

©1982-2018 Innovyze

Cascade Summary of Results for Block A Blue Roof 1 in 1yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.525	0.025	0.0	0.1	0.1	15.1	O K
10080 min Summer	59.524	0.024	0.0	0.1	0.1	14.5	O K
15 min Winter	59.502	0.002	0.0	0.0	0.0	1.5	O K
30 min Winter	59.507	0.007	0.0	0.0	0.0	4.3	O K
60 min Winter	59.513	0.013	0.0	0.0	0.0	7.4	O K
120 min Winter	59.518	0.018	0.0	0.1	0.1	10.9	O K
180 min Winter	59.522	0.022	0.0	0.1	0.1	13.1	O K
240 min Winter	59.525	0.025	0.0	0.1	0.1	14.7	O K
360 min Winter	59.528	0.028	0.0	0.2	0.2	16.8	O K
480 min Winter	59.530	0.030	0.0	0.2	0.2	18.0	O K
600 min Winter	59.532	0.032	0.0	0.2	0.2	18.8	O K
720 min Winter	59.533	0.033	0.0	0.2	0.2	19.4	O K
960 min Winter	59.534	0.034	0.0	0.2	0.2	19.9	O K
1440 min Winter	59.535	0.035	0.0	0.2	0.2	20.5	O K
2160 min Winter	59.535	0.035	0.0	0.2	0.2	20.8	O K
2880 min Winter	59.535	0.035	0.0	0.2	0.2	20.5	O K
4320 min Winter	59.533	0.033	0.0	0.2	0.2	19.4	O K
5760 min Winter	59.531	0.031	0.0	0.2	0.2	18.2	O K
7200 min Winter	59.529	0.029	0.0	0.2	0.2	17.1	O K
8640 min Winter	59.527	0.027	0.0	0.1	0.1	16.1	O K
10080 min Winter	59.526	0.026	0.0	0.1	0.1	15.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.341	0.0	20.8	5192
10080 min Summer	0.305	0.0	20.0	5968
15 min Winter	29.542	0.0	0.1	107
30 min Winter	19.215	0.0	0.9	117
60 min Winter	12.155	0.0	3.6	132
120 min Winter	7.534	0.0	6.3	170
180 min Winter	5.668	0.0	8.2	214
240 min Winter	4.627	0.0	9.6	264
360 min Winter	3.467	0.0	11.7	370
480 min Winter	2.810	0.0	13.1	482
600 min Winter	2.387	0.0	14.1	594
720 min Winter	2.089	0.0	15.0	702
960 min Winter	1.693	0.0	16.2	902
1440 min Winter	1.259	0.0	17.3	1120
2160 min Winter	0.937	0.0	24.3	1580
2880 min Winter	0.760	0.0	25.1	2024
4320 min Winter	0.565	0.0	24.6	2896
5760 min Winter	0.458	0.0	28.8	3752
7200 min Winter	0.389	0.0	27.8	4576
8640 min Winter	0.341	0.0	26.5	5384
10080 min Winter	0.305	0.0	25.4	6248

©1982-2018 Innovyze

Cascade Rainfall Details for Block A Blue Roof 1 in 1yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³) 1550 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.028167	32	36	0.005687	64	68	0.001148	96	100	0.000232
4	8	0.023061	36	40	0.004656	68	72	0.000940	100	104	0.000190
8	12	0.018881	40	44	0.003812	72	76	0.000770	104	108	0.000155
12	16	0.015458	44	48	0.003121	76	80	0.000630	108	112	0.000127
16	20	0.012656	48	52	0.002555	80	84	0.000516	112	116	0.000104
20	24	0.010362	52	56	0.002092	84	88	0.000422	116	120	0.000085
24	28	0.008484	56	60	0.001713	88	92	0.000346			
28	32	0.006946	60	64	0.001402	92	96	0.000283			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block A Blue Roof 1 in 1yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	625.0	625.0	0.201	0.0	645.0
0.200	625.0	645.0			

Orifice Outflow Control

Diameter (m) 0.027 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block B Blue Roof 1 in 1yr.srcx

Upstream Structures | **Outflow To** | **Overflow To**

(None) Geocellular storage crate tanks 1 in 1yr.srcx (None)

Half Drain Time : 2613 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ Outflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.501	0.001	0.0	0.0	0.0	0.6	O K
30 min Summer	59.504	0.004	0.0	0.0	0.0	4.2	O K
60 min Summer	59.509	0.009	0.0	0.0	0.0	8.3	O K
120 min Summer	59.513	0.013	0.0	0.0	0.0	12.8	O K
180 min Summer	59.516	0.016	0.0	0.1	0.1	15.7	O K
240 min Summer	59.519	0.019	0.0	0.1	0.1	17.8	O K
360 min Summer	59.522	0.022	0.0	0.1	0.1	20.7	O K
480 min Summer	59.524	0.024	0.0	0.1	0.1	22.6	O K
600 min Summer	59.525	0.025	0.0	0.1	0.1	23.9	O K
720 min Summer	59.526	0.026	0.0	0.1	0.1	25.0	O K
960 min Summer	59.528	0.028	0.0	0.1	0.1	26.3	O K
1440 min Summer	59.529	0.029	0.0	0.1	0.1	27.4	O K
2160 min Summer	59.530	0.030	0.0	0.1	0.1	28.1	O K
2880 min Summer	59.530	0.030	0.0	0.1	0.1	28.4	O K
4320 min Summer	59.529	0.029	0.0	0.1	0.1	28.0	O K
5760 min Summer	59.528	0.028	0.0	0.1	0.1	27.1	O K
7200 min Summer	59.528	0.028	0.0	0.1	0.1	26.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	29.542	0.0	0.0	106
30 min Summer	19.215	0.0	0.3	118
60 min Summer	12.155	0.0	2.2	136
120 min Summer	7.534	0.0	4.4	176
180 min Summer	5.668	0.0	6.1	222
240 min Summer	4.627	0.0	7.4	274
360 min Summer	3.467	0.0	9.1	384
480 min Summer	2.810	0.0	10.2	498
600 min Summer	2.387	0.0	11.0	614
720 min Summer	2.089	0.0	11.7	730
960 min Summer	1.693	0.0	12.5	966
1440 min Summer	1.259	0.0	13.1	1366
2160 min Summer	0.937	0.0	22.5	1700
2880 min Summer	0.760	0.0	22.5	2084
4320 min Summer	0.565	0.0	20.5	2920
5760 min Summer	0.458	0.0	28.1	3760
7200 min Summer	0.389	0.0	26.8	4592

©1982-2018 Innovyze

Cascade Summary of Results for Block B Blue Roof 1 in 1yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.527	0.027	0.0	0.1	0.1	25.4	O K
10080 min Summer	59.526	0.026	0.0	0.1	0.1	24.6	O K
15 min Winter	59.502	0.002	0.0	0.0	0.0	2.1	O K
30 min Winter	59.506	0.006	0.0	0.0	0.0	6.1	O K
60 min Winter	59.511	0.011	0.0	0.0	0.0	10.7	O K
120 min Winter	59.517	0.017	0.0	0.1	0.1	15.7	O K
180 min Winter	59.520	0.020	0.0	0.1	0.1	18.9	O K
240 min Winter	59.522	0.022	0.0	0.1	0.1	21.3	O K
360 min Winter	59.526	0.026	0.0	0.1	0.1	24.7	O K
480 min Winter	59.528	0.028	0.0	0.1	0.1	26.8	O K
600 min Winter	59.530	0.030	0.0	0.1	0.1	28.4	O K
720 min Winter	59.531	0.031	0.0	0.1	0.1	29.6	O K
960 min Winter	59.533	0.033	0.0	0.1	0.1	31.2	O K
1440 min Winter	59.535	0.035	0.0	0.2	0.2	32.8	O K
2160 min Winter	59.535	0.035	0.0	0.2	0.2	33.5	O K
2880 min Winter	59.536	0.036	0.0	0.2	0.2	33.8	O K
4320 min Winter	59.535	0.035	0.0	0.2	0.2	33.1	O K
5760 min Winter	59.533	0.033	0.0	0.2	0.2	31.7	O K
7200 min Winter	59.532	0.032	0.0	0.1	0.1	30.1	O K
8640 min Winter	59.530	0.030	0.0	0.1	0.1	28.6	O K
10080 min Winter	59.529	0.029	0.0	0.1	0.1	27.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.341	0.0	25.5	5440
10080 min Summer	0.305	0.0	24.1	6256
15 min Winter	29.542	0.0	0.1	108
30 min Winter	19.215	0.0	0.7	119
60 min Winter	12.155	0.0	3.3	136
120 min Winter	7.534	0.0	6.2	176
180 min Winter	5.668	0.0	8.1	222
240 min Winter	4.627	0.0	9.5	272
360 min Winter	3.467	0.0	11.5	380
480 min Winter	2.810	0.0	12.9	490
600 min Winter	2.387	0.0	13.9	604
720 min Winter	2.089	0.0	14.7	718
960 min Winter	1.693	0.0	15.8	944
1440 min Winter	1.259	0.0	16.4	1378
2160 min Winter	0.937	0.0	28.0	1740
2880 min Winter	0.760	0.0	28.2	2196
4320 min Winter	0.565	0.0	26.4	3120
5760 min Winter	0.458	0.0	36.9	4016
7200 min Winter	0.389	0.0	35.2	4896
8640 min Winter	0.341	0.0	33.0	5736
10080 min Winter	0.305	0.0	31.0	6592

©1982-2018 Innovyze

Cascade Rainfall Details for Block B Blue Roof 1 in 1yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³)	2200	Evaporation (mm/day)	3
Depression Storage (mm)	5	Decay Coefficient	0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.039978	32	36	0.008071	64	68	0.001630	96	100	0.000329
4	8	0.032731	36	40	0.006608	68	72	0.001334	100	104	0.000269
8	12	0.026798	40	44	0.005410	72	76	0.001092	104	108	0.000221
12	16	0.021941	44	48	0.004430	76	80	0.000894	108	112	0.000181
16	20	0.017963	48	52	0.003627	80	84	0.000732	112	116	0.000148
20	24	0.014707	52	56	0.002969	84	88	0.000599	116	120	0.000121
24	28	0.012041	56	60	0.002431	88	92	0.000491			
28	32	0.009859	60	64	0.001990	92	96	0.000402			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block B Blue Roof 1 in 1yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1000.0	1000.0	0.201	0.0	1028.0
0.200	1000.0	1028.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block C Blue Roof 1 in 1yr.srcx

Upstream Structures | **Outflow To** | **Overflow To**

(None) Geocellular storage crate tanks 1 in 1yr.srcx (None)

Half Drain Time : 4134 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.501	0.001	0.0	0.0	0.9	O K
30 min Summer	59.504	0.004	0.0	0.0	5.8	O K
60 min Summer	59.507	0.007	0.0	0.0	11.4	O K
120 min Summer	59.512	0.012	0.0	0.0	17.6	O K
180 min Summer	59.514	0.014	0.0	0.0	21.5	O K
240 min Summer	59.516	0.016	0.0	0.1	24.4	O K
360 min Summer	59.519	0.019	0.0	0.1	28.7	O K
480 min Summer	59.521	0.021	0.0	0.1	31.4	O K
600 min Summer	59.522	0.022	0.0	0.1	33.5	O K
720 min Summer	59.523	0.023	0.0	0.1	35.1	O K
960 min Summer	59.525	0.025	0.0	0.1	37.4	O K
1440 min Summer	59.526	0.026	0.0	0.1	39.9	O K
2160 min Summer	59.527	0.027	0.0	0.1	41.0	O K
2880 min Summer	59.527	0.027	0.0	0.1	41.4	O K
4320 min Summer	59.527	0.027	0.0	0.1	41.0	O K
5760 min Summer	59.526	0.026	0.0	0.1	40.0	O K
7200 min Summer	59.526	0.026	0.0	0.1	39.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	29.542	0.0	0.0	106
30 min Summer	19.215	0.0	0.3	118
60 min Summer	12.155	0.0	1.8	138
120 min Summer	7.534	0.0	3.8	178
180 min Summer	5.668	0.0	5.5	226
240 min Summer	4.627	0.0	6.8	278
360 min Summer	3.467	0.0	8.3	390
480 min Summer	2.810	0.0	9.4	504
600 min Summer	2.387	0.0	10.1	620
720 min Summer	2.089	0.0	10.8	736
960 min Summer	1.693	0.0	11.6	970
1440 min Summer	1.259	0.0	12.0	1444
2160 min Summer	0.937	0.0	23.1	1944
2880 min Summer	0.760	0.0	22.9	2296
4320 min Summer	0.565	0.0	20.2	3092
5760 min Summer	0.458	0.0	32.3	3928
7200 min Summer	0.389	0.0	30.3	4768

©1982-2018 Innovyze

Cascade Summary of Results for Block C Blue Roof 1 in 1yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.525	0.025	0.0	0.1	0.1	38.0	O K
10080 min Summer	59.524	0.024	0.0	0.1	0.1	37.1	O K
15 min Winter	59.502	0.002	0.0	0.0	0.0	2.9	O K
30 min Winter	59.506	0.006	0.0	0.0	0.0	8.4	O K
60 min Winter	59.510	0.010	0.0	0.0	0.0	14.6	O K
120 min Winter	59.514	0.014	0.0	0.0	0.0	21.6	O K
180 min Winter	59.517	0.017	0.0	0.1	0.1	26.0	O K
240 min Winter	59.519	0.019	0.0	0.1	0.1	29.4	O K
360 min Winter	59.522	0.022	0.0	0.1	0.1	34.2	O K
480 min Winter	59.525	0.025	0.0	0.1	0.1	37.3	O K
600 min Winter	59.526	0.026	0.0	0.1	0.1	39.7	O K
720 min Winter	59.527	0.027	0.0	0.1	0.1	41.6	O K
960 min Winter	59.529	0.029	0.0	0.1	0.1	44.4	O K
1440 min Winter	59.531	0.031	0.0	0.1	0.1	47.4	O K
2160 min Winter	59.532	0.032	0.0	0.1	0.1	49.1	O K
2880 min Winter	59.533	0.033	0.0	0.1	0.1	49.5	O K
4320 min Winter	59.532	0.032	0.0	0.1	0.1	49.3	O K
5760 min Winter	59.532	0.032	0.0	0.1	0.1	48.0	O K
7200 min Winter	59.530	0.030	0.0	0.1	0.1	46.2	O K
8640 min Winter	59.529	0.029	0.0	0.1	0.1	44.3	O K
10080 min Winter	59.528	0.028	0.0	0.1	0.1	42.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.341	0.0	28.3	5616
10080 min Summer	0.305	0.0	26.1	6456
15 min Winter	29.542	0.0	0.1	108
30 min Winter	19.215	0.0	0.5	120
60 min Winter	12.155	0.0	2.8	138
120 min Winter	7.534	0.0	5.6	178
180 min Winter	5.668	0.0	7.4	226
240 min Winter	4.627	0.0	8.7	276
360 min Winter	3.467	0.0	10.7	384
480 min Winter	2.810	0.0	12.0	496
600 min Winter	2.387	0.0	13.1	610
720 min Winter	2.089	0.0	13.8	724
960 min Winter	1.693	0.0	14.8	954
1440 min Winter	1.259	0.0	15.3	1404
2160 min Winter	0.937	0.0	29.3	2044
2880 min Winter	0.760	0.0	29.3	2336
4320 min Winter	0.565	0.0	26.5	3248
5760 min Winter	0.458	0.0	43.0	4168
7200 min Winter	0.389	0.0	40.2	5104
8640 min Winter	0.341	0.0	36.8	5984
10080 min Winter	0.305	0.0	33.8	6872

©1982-2018 Innovyze

Cascade Rainfall Details for Block C Blue Roof 1 in 1yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³)	3000	Evaporation (mm/day)	3
Depression Storage (mm)	5	Decay Coefficient	0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.054516	32	36	0.011007	64	68	0.002222	96	100	0.000449
4	8	0.044634	36	40	0.009011	68	72	0.001819	100	104	0.000367
8	12	0.036543	40	44	0.007378	72	76	0.001490	104	108	0.000301
12	16	0.029919	44	48	0.006041	76	80	0.001220	108	112	0.000246
16	20	0.024496	48	52	0.004946	80	84	0.000998	112	116	0.000202
20	24	0.020055	52	56	0.004049	84	88	0.000817	116	120	0.000165
24	28	0.016420	56	60	0.003315	88	92	0.000669			
28	32	0.013443	60	64	0.002714	92	96	0.000548			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block C Blue Roof 1 in 1yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1600.0	1600.0	0.201	0.0	1632.0
0.200	1600.0	1632.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block D Blue Roof 1 in 1yr.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 1yr.srcx	(None)

Half Drain Time : 1830 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.501	0.001	0.0	0.0	0.0	0.5	O K
30 min Summer	59.505	0.005	0.0	0.0	0.0	3.3	O K
60 min Summer	59.510	0.010	0.0	0.0	0.0	6.4	O K
120 min Summer	59.515	0.015	0.0	0.0	0.0	9.8	O K
180 min Summer	59.518	0.018	0.0	0.1	0.1	12.0	O K
240 min Summer	59.520	0.020	0.0	0.1	0.1	13.6	O K
360 min Summer	59.524	0.024	0.0	0.1	0.1	15.7	O K
480 min Summer	59.526	0.026	0.0	0.1	0.1	17.1	O K
600 min Summer	59.527	0.027	0.0	0.1	0.1	18.0	O K
720 min Summer	59.528	0.028	0.0	0.1	0.1	18.6	O K
960 min Summer	59.529	0.029	0.0	0.1	0.1	19.4	O K
1440 min Summer	59.530	0.030	0.0	0.1	0.1	20.1	O K
2160 min Summer	59.531	0.031	0.0	0.1	0.1	20.6	O K
2880 min Summer	59.531	0.031	0.0	0.1	0.1	20.7	O K
4320 min Summer	59.530	0.030	0.0	0.1	0.1	20.2	O K
5760 min Summer	59.529	0.029	0.0	0.1	0.1	19.4	O K
7200 min Summer	59.528	0.028	0.0	0.1	0.1	18.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	29.542	0.0	0.0	106
30 min Summer	19.215	0.0	0.4	117
60 min Summer	12.155	0.0	2.3	134
120 min Summer	7.534	0.0	4.5	172
180 min Summer	5.668	0.0	6.1	218
240 min Summer	4.627	0.0	7.2	270
360 min Summer	3.467	0.0	9.0	380
480 min Summer	2.810	0.0	10.1	494
600 min Summer	2.387	0.0	10.9	610
720 min Summer	2.089	0.0	11.5	726
960 min Summer	1.693	0.0	12.3	960
1440 min Summer	1.259	0.0	13.0	1196
2160 min Summer	0.937	0.0	20.2	1572
2880 min Summer	0.760	0.0	20.4	1976
4320 min Summer	0.565	0.0	19.1	2816
5760 min Summer	0.458	0.0	23.6	3640
7200 min Summer	0.389	0.0	22.7	4472

©1982-2018 Innovyze

Cascade Summary of Results for Block D Blue Roof 1 in 1yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.527	0.027	0.0	0.1	0.1	18.0	O K
10080 min Summer	59.526	0.026	0.0	0.1	0.1	17.3	O K
15 min Winter	59.502	0.002	0.0	0.0	0.0	1.6	O K
30 min Winter	59.507	0.007	0.0	0.0	0.0	4.7	O K
60 min Winter	59.512	0.012	0.0	0.0	0.0	8.2	O K
120 min Winter	59.518	0.018	0.0	0.1	0.1	12.1	O K
180 min Winter	59.522	0.022	0.0	0.1	0.1	14.5	O K
240 min Winter	59.524	0.024	0.0	0.1	0.1	16.3	O K
360 min Winter	59.528	0.028	0.0	0.1	0.1	18.7	O K
480 min Winter	59.530	0.030	0.0	0.1	0.1	20.3	O K
600 min Winter	59.532	0.032	0.0	0.1	0.1	21.3	O K
720 min Winter	59.533	0.033	0.0	0.2	0.2	22.1	O K
960 min Winter	59.535	0.035	0.0	0.2	0.2	23.1	O K
1440 min Winter	59.536	0.036	0.0	0.2	0.2	23.9	O K
2160 min Winter	59.537	0.037	0.0	0.2	0.2	24.5	O K
2880 min Winter	59.537	0.037	0.0	0.2	0.2	24.4	O K
4320 min Winter	59.535	0.035	0.0	0.2	0.2	23.5	O K
5760 min Winter	59.533	0.033	0.0	0.2	0.2	22.1	O K
7200 min Winter	59.531	0.031	0.0	0.1	0.1	20.8	O K
8640 min Winter	59.530	0.030	0.0	0.1	0.1	19.6	O K
10080 min Winter	59.528	0.028	0.0	0.1	0.1	18.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.341	0.0	21.8	5288
10080 min Summer	0.305	0.0	20.9	6072
15 min Winter	29.542	0.0	0.1	107
30 min Winter	19.215	0.0	0.8	118
60 min Winter	12.155	0.0	3.4	134
120 min Winter	7.534	0.0	6.1	172
180 min Winter	5.668	0.0	7.9	218
240 min Winter	4.627	0.0	9.3	268
360 min Winter	3.467	0.0	11.3	374
480 min Winter	2.810	0.0	12.6	486
600 min Winter	2.387	0.0	13.5	598
720 min Winter	2.089	0.0	14.3	712
960 min Winter	1.693	0.0	15.3	934
1440 min Winter	1.259	0.0	16.0	1322
2160 min Winter	0.937	0.0	24.9	1656
2880 min Winter	0.760	0.0	25.4	2116
4320 min Winter	0.565	0.0	24.3	3020
5760 min Winter	0.458	0.0	30.6	3880
7200 min Winter	0.389	0.0	29.5	4712
8640 min Winter	0.341	0.0	27.9	5544
10080 min Winter	0.305	0.0	26.6	6376

©1982-2018 Innovyze

Cascade Rainfall Details for Block D Blue Roof 1 in 1yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³) 1700 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.030892	32	36	0.006237	64	68	0.001259	96	100	0.000254
4	8	0.025293	36	40	0.005106	68	72	0.001031	100	104	0.000208
8	12	0.020708	40	44	0.004181	72	76	0.000844	104	108	0.000170
12	16	0.016954	44	48	0.003423	76	80	0.000691	108	112	0.000140
16	20	0.013881	48	52	0.002802	80	84	0.000566	112	116	0.000114
20	24	0.011365	52	56	0.002294	84	88	0.000463	116	120	0.000094
24	28	0.009305	56	60	0.001879	88	92	0.000379			
28	32	0.007618	60	64	0.001538	92	96	0.000311			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block D Blue Roof 1 in 1yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	700.0	700.0	0.201	0.0	722.0
0.200	700.0	722.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 1yr.srcx

Upstream Structures	Outflow To	Overflow To
Block A Blue Roof 1 in 1yr.srcx	(None)	(None)
Block B Blue Roof 1 in 1yr.srcx		
Block C Blue Roof 1 in 1yr.srcx		
Block D Blue Roof 1 in 1yr.srcx		

Half Drain Time : 170 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	37.178	0.028	0.0	3.5	3.5	37.5	O K
30 min Summer	37.185	0.035	0.0	3.5	3.5	46.9	O K
60 min Summer	37.191	0.041	0.0	3.5	3.5	55.1	O K
120 min Summer	37.194	0.044	0.0	3.5	3.5	59.3	O K
180 min Summer	37.194	0.044	0.0	3.5	3.5	58.8	O K
240 min Summer	37.194	0.044	0.0	3.5	3.5	58.3	O K
360 min Summer	37.192	0.042	0.0	3.5	3.5	56.8	O K
480 min Summer	37.191	0.041	0.0	3.5	3.5	54.4	O K
600 min Summer	37.189	0.039	0.0	3.5	3.5	51.9	O K
720 min Summer	37.187	0.037	0.0	3.5	3.5	49.3	O K
960 min Summer	37.183	0.033	0.0	3.5	3.5	44.0	O K
1440 min Summer	37.175	0.025	0.0	3.5	3.5	33.7	O K
2160 min Summer	37.165	0.015	0.0	3.5	3.5	20.5	O K
2880 min Summer	37.158	0.008	0.0	3.4	3.4	10.8	O K
4320 min Summer	37.151	0.001	0.0	3.4	3.4	0.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	29.542	0.0	41.3	18
30 min Summer	19.215	0.0	54.4	33
60 min Summer	12.155	0.0	75.8	62
120 min Summer	7.534	0.0	101.0	120
180 min Summer	5.668	0.0	118.4	160
240 min Summer	4.627	0.0	131.6	194
360 min Summer	3.467	0.0	151.0	260
480 min Summer	2.810	0.0	165.2	330
600 min Summer	2.387	0.0	176.2	398
720 min Summer	2.089	0.0	185.4	468
960 min Summer	1.693	0.0	200.1	606
1440 min Summer	1.259	0.0	220.3	866
2160 min Summer	0.937	0.0	273.6	1236
2880 min Summer	0.760	0.0	289.1	1584
4320 min Summer	0.565	0.0	306.3	2208

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 1yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
5760 min Summer	37.150	0.000	0.0	3.0	3.0	0.0	O K
7200 min Summer	37.150	0.000	0.0	2.6	2.6	0.0	O K
8640 min Summer	37.150	0.000	0.0	2.3	2.3	0.0	O K
10080 min Summer	37.150	0.000	0.0	2.0	2.0	0.0	O K
15 min Winter	37.182	0.032	0.0	3.5	3.5	42.5	O K
30 min Winter	37.190	0.040	0.0	3.5	3.5	53.5	O K
60 min Winter	37.197	0.047	0.0	3.5	3.5	63.4	O K
120 min Winter	37.202	0.052	0.0	3.5	3.5	70.2	O K
180 min Winter	37.203	0.053	0.0	3.5	3.5	71.1	O K
240 min Winter	37.202	0.052	0.0	3.5	3.5	69.9	O K
360 min Winter	37.200	0.050	0.0	3.5	3.5	67.2	O K
480 min Winter	37.198	0.048	0.0	3.5	3.5	63.7	O K
600 min Winter	37.195	0.045	0.0	3.5	3.5	59.8	O K
720 min Winter	37.192	0.042	0.0	3.5	3.5	55.6	O K
960 min Winter	37.185	0.035	0.0	3.5	3.5	47.1	O K
1440 min Winter	37.173	0.023	0.0	3.5	3.5	31.2	O K
2160 min Winter	37.159	0.009	0.0	3.4	3.4	12.2	O K
2880 min Winter	37.151	0.001	0.0	3.4	3.4	1.0	O K
4320 min Winter	37.150	0.000	0.0	2.8	2.8	0.0	O K
5760 min Winter	37.150	0.000	0.0	2.3	2.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Summer	0.458	0.0	352.0	0
7200 min Summer	0.389	0.0	362.5	0
8640 min Summer	0.341	0.0	370.8	0
10080 min Summer	0.305	0.0	377.3	0
15 min Winter	29.542	0.0	46.1	18
30 min Winter	19.215	0.0	62.4	32
60 min Winter	12.155	0.0	88.4	60
120 min Winter	7.534	0.0	117.7	118
180 min Winter	5.668	0.0	137.5	174
240 min Winter	4.627	0.0	152.1	226
360 min Winter	3.467	0.0	174.7	282
480 min Winter	2.810	0.0	190.5	362
600 min Winter	2.387	0.0	203.2	440
720 min Winter	2.089	0.0	214.0	514
960 min Winter	1.693	0.0	231.0	664
1440 min Winter	1.259	0.0	253.5	938
2160 min Winter	0.937	0.0	317.1	1300
2880 min Winter	0.760	0.0	336.4	1584
4320 min Winter	0.565	0.0	356.5	0
5760 min Winter	0.458	0.0	414.5	0

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 1yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200 min Winter	37.150	0.000	0.0	2.0	2.0	0.0	O K
8640 min Winter	37.150	0.000	0.0	1.8	1.8	0.0	O K
10080 min Winter	37.150	0.000	0.0	1.6	1.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	0.389	0.0	425.2	0
8640 min Winter	0.341	0.0	431.6	0
10080 min Winter	0.305	0.0	437.4	0

©1982-2018 Innovyze

Cascade Rainfall Details for Geocellular storage crate tanks 1 in 1yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.745

Time (mins) From:	To:	Area (ha)
0	4	0.745

©1982-2018 Innovyze

Cascade Model Details for Geocellular storage crate tanks 1 in 1yr.srcx

Storage is Online Cover Level (m) 38.400

Complex Structure

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0060-4300-1300-4300
Design Head (m)	1.300
Design Flow (l/s)	4.3
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	60
Invert Level (m)	36.350
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

©1982-2018 Innovyze

Hydro-Brake® Optimum Outflow Control

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	4.3
Flush-Flo™	0.085	1.3
Kick-Flo®	0.090	1.3
Mean Flow over Head Range	-	2.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.3	1.200	4.1	3.000	6.4	7.000	9.5
0.200	1.8	1.400	4.5	3.500	6.9	7.500	9.9
0.300	2.2	1.600	4.7	4.000	7.3	8.000	10.2
0.400	2.5	1.800	5.0	4.500	7.7	8.500	10.5
0.500	2.8	2.000	5.3	5.000	8.1	9.000	10.8
0.600	3.0	2.200	5.5	5.500	8.5	9.500	11.0
0.800	3.4	2.400	5.7	6.000	8.9		
1.000	3.8	2.600	6.0	6.500	9.2		

©1982-2018 Innovyze

Cascade Summary of Results for Block A Blue Roof 1 in 30yr.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 30yr.srcx	(None)

Half Drain Time : 1289 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.521	0.021	0.0	0.1	0.1	12.5	O K
30 min Summer	59.531	0.031	0.0	0.2	0.2	18.4	O K
60 min Summer	59.542	0.042	0.0	0.3	0.3	24.7	O K
120 min Summer	59.553	0.053	0.0	0.3	0.3	31.3	O K
180 min Summer	59.559	0.059	0.0	0.3	0.3	35.1	O K
240 min Summer	59.563	0.063	0.0	0.3	0.3	37.6	O K
360 min Summer	59.569	0.069	0.0	0.4	0.4	40.7	O K
480 min Summer	59.572	0.072	0.0	0.4	0.4	42.6	O K
600 min Summer	59.574	0.074	0.0	0.4	0.4	43.7	O K
720 min Summer	59.575	0.075	0.0	0.4	0.4	44.4	O K
960 min Summer	59.576	0.076	0.0	0.4	0.4	45.0	O K
1440 min Summer	59.577	0.077	0.0	0.4	0.4	45.5	O K
2160 min Summer	59.576	0.076	0.0	0.4	0.4	45.4	O K
2880 min Summer	59.575	0.075	0.0	0.4	0.4	44.7	O K
4320 min Summer	59.572	0.072	0.0	0.4	0.4	42.5	O K
5760 min Summer	59.567	0.067	0.0	0.4	0.4	39.9	O K
7200 min Summer	59.563	0.063	0.0	0.3	0.3	37.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	72.416	0.0	5.4	103
30 min Summer	47.168	0.0	9.4	108
60 min Summer	29.395	0.0	18.8	124
120 min Summer	17.796	0.0	24.8	164
180 min Summer	13.135	0.0	28.3	212
240 min Summer	10.546	0.0	30.8	264
360 min Summer	7.703	0.0	34.0	374
480 min Summer	6.164	0.0	36.3	490
600 min Summer	5.183	0.0	37.9	606
720 min Summer	4.497	0.0	39.1	722
960 min Summer	3.592	0.0	40.7	878
1440 min Summer	2.614	0.0	41.4	1114
2160 min Summer	1.900	0.0	57.6	1508
2880 min Summer	1.514	0.0	59.2	1916
4320 min Summer	1.099	0.0	58.8	2732
5760 min Summer	0.875	0.0	67.8	3528
7200 min Summer	0.733	0.0	67.3	4328

©1982-2018 Innovyze

Cascade Summary of Results for Block A Blue Roof 1 in 30yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.559	0.059	0.0	0.3	0.3	35.0	O K
10080 min Summer	59.555	0.055	0.0	0.3	0.3	32.7	O K
15 min Winter	59.525	0.025	0.0	0.1	0.1	14.9	O K
30 min Winter	59.536	0.036	0.0	0.2	0.2	21.5	O K
60 min Winter	59.548	0.048	0.0	0.3	0.3	28.6	O K
120 min Winter	59.561	0.061	0.0	0.3	0.3	36.1	O K
180 min Winter	59.568	0.068	0.0	0.4	0.4	40.4	O K
240 min Winter	59.573	0.073	0.0	0.4	0.4	43.3	O K
360 min Winter	59.579	0.079	0.0	0.4	0.4	46.8	O K
480 min Winter	59.583	0.083	0.0	0.4	0.4	49.1	O K
600 min Winter	59.585	0.085	0.0	0.4	0.4	50.5	O K
720 min Winter	59.587	0.087	0.0	0.4	0.4	51.4	O K
960 min Winter	59.588	0.088	0.0	0.4	0.4	52.2	O K
1440 min Winter	59.588	0.088	0.0	0.4	0.4	52.2	O K
2160 min Winter	59.587	0.087	0.0	0.4	0.4	51.5	O K
2880 min Winter	59.584	0.084	0.0	0.4	0.4	49.9	O K
4320 min Winter	59.577	0.077	0.0	0.4	0.4	46.0	O K
5760 min Winter	59.571	0.071	0.0	0.4	0.4	42.0	O K
7200 min Winter	59.564	0.064	0.0	0.3	0.3	38.3	O K
8640 min Winter	59.559	0.059	0.0	0.3	0.3	35.0	O K
10080 min Winter	59.554	0.054	0.0	0.3	0.3	32.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.634	0.0	65.9	5104
10080 min Summer	0.560	0.0	63.9	5856
15 min Winter	72.416	0.0	7.0	102
30 min Winter	47.168	0.0	11.6	107
60 min Winter	29.395	0.0	22.4	124
120 min Winter	17.796	0.0	29.0	166
180 min Winter	13.135	0.0	32.9	212
240 min Winter	10.546	0.0	35.6	262
360 min Winter	7.703	0.0	39.2	370
480 min Winter	6.164	0.0	41.7	482
600 min Winter	5.183	0.0	43.4	596
720 min Winter	4.497	0.0	44.7	708
960 min Winter	3.592	0.0	46.3	924
1440 min Winter	2.614	0.0	46.5	1162
2160 min Winter	1.900	0.0	66.7	1616
2880 min Winter	1.514	0.0	68.6	2072
4320 min Winter	1.099	0.0	68.4	2944
5760 min Winter	0.875	0.0	79.8	3768
7200 min Winter	0.733	0.0	79.9	4576
8640 min Winter	0.634	0.0	79.1	5368
10080 min Winter	0.560	0.0	77.5	6152

©1982-2018 Innovyze

Cascade Rainfall Details for Block A Blue Roof 1 in 30yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³)	1550	Evaporation (mm/day)	3
Depression Storage (mm)	5	Decay Coefficient	0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.028167	32	36	0.005687	64	68	0.001148	96	100	0.000232
4	8	0.023061	36	40	0.004656	68	72	0.000940	100	104	0.000190
8	12	0.018881	40	44	0.003812	72	76	0.000770	104	108	0.000155
12	16	0.015458	44	48	0.003121	76	80	0.000630	108	112	0.000127
16	20	0.012656	48	52	0.002555	80	84	0.000516	112	116	0.000104
20	24	0.010362	52	56	0.002092	84	88	0.000422	116	120	0.000085
24	28	0.008484	56	60	0.001713	88	92	0.000346			
28	32	0.006946	60	64	0.001402	92	96	0.000283			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block A Blue Roof 1 in 30yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	625.0	625.0	0.201	0.0	645.0
0.200	625.0	645.0			

Orifice Outflow Control

Diameter (m) 0.027 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block B Blue Roof 1 in 30yr.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 30yr.srcx	(None)

Half Drain Time : 3094 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.519	0.019	0.0	0.1	0.1	18.0	O K
30 min Summer	59.528	0.028	0.0	0.1	0.1	26.7	O K
60 min Summer	59.538	0.038	0.0	0.2	0.2	35.9	O K
120 min Summer	59.548	0.048	0.0	0.2	0.2	45.7	O K
180 min Summer	59.554	0.054	0.0	0.2	0.2	51.4	O K
240 min Summer	59.558	0.058	0.0	0.2	0.2	55.3	O K
360 min Summer	59.564	0.064	0.0	0.2	0.2	60.6	O K
480 min Summer	59.568	0.068	0.0	0.2	0.2	64.3	O K
600 min Summer	59.571	0.071	0.0	0.2	0.2	67.0	O K
720 min Summer	59.573	0.073	0.0	0.3	0.3	69.1	O K
960 min Summer	59.576	0.076	0.0	0.3	0.3	71.8	O K
1440 min Summer	59.578	0.078	0.0	0.3	0.3	74.3	O K
2160 min Summer	59.579	0.079	0.0	0.3	0.3	74.8	O K
2880 min Summer	59.579	0.079	0.0	0.3	0.3	74.7	O K
4320 min Summer	59.577	0.077	0.0	0.3	0.3	73.4	O K
5760 min Summer	59.575	0.075	0.0	0.3	0.3	71.4	O K
7200 min Summer	59.573	0.073	0.0	0.3	0.3	68.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	72.416	0.0	4.6	111
30 min Summer	47.168	0.0	8.2	118
60 min Summer	29.395	0.0	19.2	136
120 min Summer	17.796	0.0	24.9	176
180 min Summer	13.135	0.0	27.8	222
240 min Summer	10.546	0.0	29.5	276
360 min Summer	7.703	0.0	31.3	388
480 min Summer	6.164	0.0	32.3	502
600 min Summer	5.183	0.0	32.9	618
720 min Summer	4.497	0.0	33.1	734
960 min Summer	3.592	0.0	33.1	970
1440 min Summer	2.614	0.0	31.8	1442
2160 min Summer	1.900	0.0	61.5	1888
2880 min Summer	1.514	0.0	59.9	2256
4320 min Summer	1.099	0.0	53.6	3032
5760 min Summer	0.875	0.0	87.5	3864
7200 min Summer	0.733	0.0	85.3	4688

©1982-2018 Innovyze

Cascade Summary of Results for Block B Blue Roof 1 in 30yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.570	0.070	0.0	0.2	0.2	66.2	O K
10080 min Summer	59.567	0.067	0.0	0.2	0.2	63.4	O K
15 min Winter	59.523	0.023	0.0	0.1	0.1	21.5	O K
30 min Winter	59.533	0.033	0.0	0.1	0.1	31.2	O K
60 min Winter	59.544	0.044	0.0	0.2	0.2	41.6	O K
120 min Winter	59.555	0.055	0.0	0.2	0.2	52.6	O K
180 min Winter	59.562	0.062	0.0	0.2	0.2	59.0	O K
240 min Winter	59.567	0.067	0.0	0.2	0.2	63.5	O K
360 min Winter	59.573	0.073	0.0	0.3	0.3	69.6	O K
480 min Winter	59.578	0.078	0.0	0.3	0.3	73.9	O K
600 min Winter	59.581	0.081	0.0	0.3	0.3	77.0	O K
720 min Winter	59.584	0.084	0.0	0.3	0.3	79.4	O K
960 min Winter	59.587	0.087	0.0	0.3	0.3	82.7	O K
1440 min Winter	59.591	0.091	0.0	0.3	0.3	86.0	O K
2160 min Winter	59.592	0.092	0.0	0.3	0.3	87.0	O K
2880 min Winter	59.591	0.091	0.0	0.3	0.3	86.1	O K
4320 min Winter	59.589	0.089	0.0	0.3	0.3	84.1	O K
5760 min Winter	59.585	0.085	0.0	0.3	0.3	80.9	O K
7200 min Winter	59.581	0.081	0.0	0.3	0.3	77.2	O K
8640 min Winter	59.577	0.077	0.0	0.3	0.3	73.4	O K
10080 min Winter	59.573	0.073	0.0	0.3	0.3	69.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.634	0.0	81.8	5504
10080 min Summer	0.560	0.0	77.1	6352
15 min Winter	72.416	0.0	5.9	110
30 min Winter	47.168	0.0	10.1	118
60 min Winter	29.395	0.0	22.7	136
120 min Winter	17.796	0.0	28.4	176
180 min Winter	13.135	0.0	31.1	224
240 min Winter	10.546	0.0	32.7	274
360 min Winter	7.703	0.0	34.5	384
480 min Winter	6.164	0.0	35.6	496
600 min Winter	5.183	0.0	36.1	610
720 min Winter	4.497	0.0	36.4	724
960 min Winter	3.592	0.0	36.4	954
1440 min Winter	2.614	0.0	35.0	1406
2160 min Winter	1.900	0.0	68.5	2052
2880 min Winter	1.514	0.0	66.8	2356
4320 min Winter	1.099	0.0	60.1	3252
5760 min Winter	0.875	0.0	102.4	4160
7200 min Winter	0.733	0.0	100.5	5056
8640 min Winter	0.634	0.0	96.7	5944
10080 min Winter	0.560	0.0	91.2	6776

©1982-2018 Innovyze

Cascade Rainfall Details for Block B Blue Roof 1 in 30yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³)	2200	Evaporation (mm/day)	3
Depression Storage (mm)	5	Decay Coefficient	0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.039978	32	36	0.008071	64	68	0.001630	96	100	0.000329
4	8	0.032731	36	40	0.006608	68	72	0.001334	100	104	0.000269
8	12	0.026798	40	44	0.005410	72	76	0.001092	104	108	0.000221
12	16	0.021941	44	48	0.004430	76	80	0.000894	108	112	0.000181
16	20	0.017963	48	52	0.003627	80	84	0.000732	112	116	0.000148
20	24	0.014707	52	56	0.002969	84	88	0.000599	116	120	0.000121
24	28	0.012041	56	60	0.002431	88	92	0.000491			
28	32	0.009859	60	64	0.001990	92	96	0.000402			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block B Blue Roof 1 in 30yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1000.0	1000.0	0.201	0.0	1028.0
0.200	1000.0	1028.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block C Blue Roof 1 in 30yr.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 30yr.srcx	(None)

Half Drain Time : 4725 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.516	0.016	0.0	0.1	0.1	24.7	O K
30 min Summer	59.524	0.024	0.0	0.1	0.1	36.7	O K
60 min Summer	59.533	0.033	0.0	0.1	0.1	49.4	O K
120 min Summer	59.541	0.041	0.0	0.2	0.2	62.8	O K
180 min Summer	59.547	0.047	0.0	0.2	0.2	70.7	O K
240 min Summer	59.550	0.050	0.0	0.2	0.2	76.3	O K
360 min Summer	59.555	0.055	0.0	0.2	0.2	83.9	O K
480 min Summer	59.559	0.059	0.0	0.2	0.2	89.3	O K
600 min Summer	59.561	0.061	0.0	0.2	0.2	93.4	O K
720 min Summer	59.564	0.064	0.0	0.2	0.2	96.6	O K
960 min Summer	59.567	0.067	0.0	0.2	0.2	101.2	O K
1440 min Summer	59.570	0.070	0.0	0.2	0.2	106.4	O K
2160 min Summer	59.572	0.072	0.0	0.2	0.2	109.0	O K
2880 min Summer	59.572	0.072	0.0	0.2	0.2	108.9	O K
4320 min Summer	59.571	0.071	0.0	0.2	0.2	107.7	O K
5760 min Summer	59.570	0.070	0.0	0.2	0.2	105.7	O K
7200 min Summer	59.568	0.068	0.0	0.2	0.2	103.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	72.416	0.0	3.9	115
30 min Summer	47.168	0.0	7.1	123
60 min Summer	29.395	0.0	18.7	140
120 min Summer	17.796	0.0	24.6	180
180 min Summer	13.135	0.0	27.3	228
240 min Summer	10.546	0.0	28.7	282
360 min Summer	7.703	0.0	30.3	394
480 min Summer	6.164	0.0	31.2	508
600 min Summer	5.183	0.0	31.6	624
720 min Summer	4.497	0.0	31.8	740
960 min Summer	3.592	0.0	31.7	976
1440 min Summer	2.614	0.0	30.2	1448
2160 min Summer	1.900	0.0	62.0	2160
2880 min Summer	1.514	0.0	59.7	2588
4320 min Summer	1.099	0.0	52.4	3324
5760 min Summer	0.875	0.0	101.3	4088
7200 min Summer	0.733	0.0	96.5	4912

©1982-2018 Innovyze

Cascade Summary of Results for Block C Blue Roof 1 in 30yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.566	0.066	0.0	0.2	0.2	100.0	O K
10080 min Summer	59.564	0.064	0.0	0.2	0.2	96.7	O K
15 min Winter	59.519	0.019	0.0	0.1	0.1	29.5	O K
30 min Winter	59.528	0.028	0.0	0.1	0.1	43.0	O K
60 min Winter	59.538	0.038	0.0	0.2	0.2	57.2	O K
120 min Winter	59.548	0.048	0.0	0.2	0.2	72.2	O K
180 min Winter	59.553	0.053	0.0	0.2	0.2	81.2	O K
240 min Winter	59.558	0.058	0.0	0.2	0.2	87.5	O K
360 min Winter	59.563	0.063	0.0	0.2	0.2	96.2	O K
480 min Winter	59.567	0.067	0.0	0.2	0.2	102.4	O K
600 min Winter	59.570	0.070	0.0	0.2	0.2	107.1	O K
720 min Winter	59.573	0.073	0.0	0.3	0.3	110.9	O K
960 min Winter	59.577	0.077	0.0	0.3	0.3	116.3	O K
1440 min Winter	59.581	0.081	0.0	0.3	0.3	122.7	O K
2160 min Winter	59.583	0.083	0.0	0.3	0.3	126.5	O K
2880 min Winter	59.584	0.084	0.0	0.3	0.3	127.1	O K
4320 min Winter	59.582	0.082	0.0	0.3	0.3	124.8	O K
5760 min Winter	59.580	0.080	0.0	0.3	0.3	122.1	O K
7200 min Winter	59.578	0.078	0.0	0.3	0.3	118.4	O K
8640 min Winter	59.575	0.075	0.0	0.3	0.3	114.3	O K
10080 min Winter	59.572	0.072	0.0	0.3	0.3	109.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.634	0.0	90.1	5728
10080 min Summer	0.560	0.0	82.4	6560
15 min Winter	72.416	0.0	5.1	116
30 min Winter	47.168	0.0	9.0	123
60 min Winter	29.395	0.0	22.4	140
120 min Winter	17.796	0.0	28.0	182
180 min Winter	13.135	0.0	30.3	228
240 min Winter	10.546	0.0	31.7	280
360 min Winter	7.703	0.0	33.3	390
480 min Winter	6.164	0.0	34.2	502
600 min Winter	5.183	0.0	34.7	616
720 min Winter	4.497	0.0	34.9	730
960 min Winter	3.592	0.0	34.7	960
1440 min Winter	2.614	0.0	33.2	1422
2160 min Winter	1.900	0.0	68.6	2100
2880 min Winter	1.514	0.0	66.2	2744
4320 min Winter	1.099	0.0	58.5	3460
5760 min Winter	0.875	0.0	116.3	4376
7200 min Winter	0.733	0.0	110.7	5280
8640 min Winter	0.634	0.0	103.6	6216
10080 min Winter	0.560	0.0	95.3	7080

©1982-2018 Innovyze

Cascade Rainfall Details for Block C Blue Roof 1 in 30yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³)	3000	Evaporation (mm/day)	3
Depression Storage (mm)	5	Decay Coefficient	0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.054516	32	36	0.011007	64	68	0.002222	96	100	0.000449
4	8	0.044634	36	40	0.009011	68	72	0.001819	100	104	0.000367
8	12	0.036543	40	44	0.007378	72	76	0.001490	104	108	0.000301
12	16	0.029919	44	48	0.006041	76	80	0.001220	108	112	0.000246
16	20	0.024496	48	52	0.004946	80	84	0.000998	112	116	0.000202
20	24	0.020055	52	56	0.004049	84	88	0.000817	116	120	0.000165
24	28	0.016420	56	60	0.003315	88	92	0.000669			
28	32	0.013443	60	64	0.002714	92	96	0.000548			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block C Blue Roof 1 in 30yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1600.0	1600.0	0.201	0.0	1632.0
0.200	1600.0	1632.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block D Blue Roof 1 in 30yr.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 30yr.srcx	(None)

Half Drain Time : 2185 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.521	0.021	0.0	0.1	0.1	13.8	O K
30 min Summer	59.531	0.031	0.0	0.1	0.1	20.4	O K
60 min Summer	59.541	0.041	0.0	0.2	0.2	27.5	O K
120 min Summer	59.553	0.053	0.0	0.2	0.2	35.0	O K
180 min Summer	59.559	0.059	0.0	0.2	0.2	39.3	O K
240 min Summer	59.564	0.064	0.0	0.2	0.2	42.3	O K
360 min Summer	59.569	0.069	0.0	0.2	0.2	46.1	O K
480 min Summer	59.573	0.073	0.0	0.3	0.3	48.8	O K
600 min Summer	59.576	0.076	0.0	0.3	0.3	50.6	O K
720 min Summer	59.578	0.078	0.0	0.3	0.3	51.9	O K
960 min Summer	59.580	0.080	0.0	0.3	0.3	53.5	O K
1440 min Summer	59.582	0.082	0.0	0.3	0.3	54.4	O K
2160 min Summer	59.582	0.082	0.0	0.3	0.3	54.6	O K
2880 min Summer	59.582	0.082	0.0	0.3	0.3	54.4	O K
4320 min Summer	59.580	0.080	0.0	0.3	0.3	52.9	O K
5760 min Summer	59.576	0.076	0.0	0.3	0.3	50.9	O K
7200 min Summer	59.573	0.073	0.0	0.3	0.3	48.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	72.416	0.0	4.9	107
30 min Summer	47.168	0.0	8.5	113
60 min Summer	29.395	0.0	18.1	130
120 min Summer	17.796	0.0	23.5	172
180 min Summer	13.135	0.0	26.4	218
240 min Summer	10.546	0.0	28.3	272
360 min Summer	7.703	0.0	30.5	382
480 min Summer	6.164	0.0	31.8	498
600 min Summer	5.183	0.0	32.5	614
720 min Summer	4.497	0.0	32.9	730
960 min Summer	3.592	0.0	33.1	966
1440 min Summer	2.614	0.0	32.1	1362
2160 min Summer	1.900	0.0	56.6	1700
2880 min Summer	1.514	0.0	56.5	2080
4320 min Summer	1.099	0.0	52.1	2900
5760 min Summer	0.875	0.0	72.2	3712
7200 min Summer	0.733	0.0	71.3	4544

©1982-2018 Innovyze

Cascade Summary of Results for Block D Blue Roof 1 in 30yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.569	0.069	0.0	0.2	0.2	46.1	O K
10080 min Summer	59.566	0.066	0.0	0.2	0.2	43.8	O K
15 min Winter	59.525	0.025	0.0	0.1	0.1	16.4	O K
30 min Winter	59.536	0.036	0.0	0.2	0.2	23.9	O K
60 min Winter	59.548	0.048	0.0	0.2	0.2	31.9	O K
120 min Winter	59.561	0.061	0.0	0.2	0.2	40.3	O K
180 min Winter	59.568	0.068	0.0	0.2	0.2	45.2	O K
240 min Winter	59.573	0.073	0.0	0.3	0.3	48.5	O K
360 min Winter	59.580	0.080	0.0	0.3	0.3	53.0	O K
480 min Winter	59.584	0.084	0.0	0.3	0.3	56.0	O K
600 min Winter	59.587	0.087	0.0	0.3	0.3	58.2	O K
720 min Winter	59.590	0.090	0.0	0.3	0.3	59.7	O K
960 min Winter	59.593	0.093	0.0	0.3	0.3	61.8	O K
1440 min Winter	59.595	0.095	0.0	0.3	0.3	63.2	O K
2160 min Winter	59.595	0.095	0.0	0.3	0.3	62.9	O K
2880 min Winter	59.594	0.094	0.0	0.3	0.3	62.3	O K
4320 min Winter	59.590	0.090	0.0	0.3	0.3	59.7	O K
5760 min Winter	59.585	0.085	0.0	0.3	0.3	56.4	O K
7200 min Winter	59.580	0.080	0.0	0.3	0.3	52.9	O K
8640 min Winter	59.574	0.074	0.0	0.3	0.3	49.5	O K
10080 min Winter	59.570	0.070	0.0	0.2	0.2	46.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.634	0.0	69.4	5360
10080 min Summer	0.560	0.0	66.4	6152
15 min Winter	72.416	0.0	6.2	106
30 min Winter	47.168	0.0	10.3	113
60 min Winter	29.395	0.0	21.3	132
120 min Winter	17.796	0.0	27.1	172
180 min Winter	13.135	0.0	30.1	218
240 min Winter	10.546	0.0	31.9	270
360 min Winter	7.703	0.0	34.0	378
480 min Winter	6.164	0.0	35.2	490
600 min Winter	5.183	0.0	35.9	604
720 min Winter	4.497	0.0	36.3	720
960 min Winter	3.592	0.0	36.5	946
1440 min Winter	2.614	0.0	35.4	1386
2160 min Winter	1.900	0.0	64.3	1772
2880 min Winter	1.514	0.0	63.8	2212
4320 min Winter	1.099	0.0	58.7	3124
5760 min Winter	0.875	0.0	84.9	4024
7200 min Winter	0.733	0.0	84.5	4896
8640 min Winter	0.634	0.0	82.8	5720
10080 min Winter	0.560	0.0	79.9	6560

©1982-2018 Innovyze

Cascade Rainfall Details for Block D Blue Roof 1 in 30yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³)	1700	Evaporation (mm/day)	3
Depression Storage (mm)	5	Decay Coefficient	0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.030892	32	36	0.006237	64	68	0.001259	96	100	0.000254
4	8	0.025293	36	40	0.005106	68	72	0.001031	100	104	0.000208
8	12	0.020708	40	44	0.004181	72	76	0.000844	104	108	0.000170
12	16	0.016954	44	48	0.003423	76	80	0.000691	108	112	0.000140
16	20	0.013881	48	52	0.002802	80	84	0.000566	112	116	0.000114
20	24	0.011365	52	56	0.002294	84	88	0.000463	116	120	0.000094
24	28	0.009305	56	60	0.001879	88	92	0.000379			
28	32	0.007618	60	64	0.001538	92	96	0.000311			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block D Blue Roof 1 in 30yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	700.0	700.0	0.201	0.0	722.0
0.200	700.0	722.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 30yr.srcx

	Upstream Structures	Outflow To	Overflow To
	Block A Blue Roof 1 in 30yr.srcx Block B Blue Roof 1 in 30yr.srcx Block C Blue Roof 1 in 30yr.srcx Block D Blue Roof 1 in 30yr.srcx	(None)	(None)

Half Drain Time : 510 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control Σ (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	37.223	0.073	0.0	3.7	3.7	97.2	O K
30 min Summer	37.243	0.093	0.0	3.7	3.7	124.5	O K
60 min Summer	37.263	0.113	0.0	3.7	3.7	151.0	O K
120 min Summer	37.280	0.130	0.0	3.8	3.8	174.1	O K
180 min Summer	37.287	0.137	0.0	3.8	3.8	184.2	O K
240 min Summer	37.291	0.141	0.0	3.8	3.8	188.6	O K
360 min Summer	37.291	0.141	0.0	3.8	3.8	189.0	O K
480 min Summer	37.288	0.138	0.0	3.8	3.8	185.1	O K
600 min Summer	37.285	0.135	0.0	3.8	3.8	180.4	O K
720 min Summer	37.281	0.131	0.0	3.8	3.8	176.1	O K
960 min Summer	37.276	0.126	0.0	3.8	3.8	169.0	O K
1440 min Summer	37.267	0.117	0.0	3.7	3.7	156.5	O K
2160 min Summer	37.254	0.104	0.0	3.7	3.7	139.0	O K
2880 min Summer	37.241	0.091	0.0	3.7	3.7	122.1	O K
4320 min Summer	37.218	0.068	0.0	3.6	3.6	91.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	72.416	0.0	119.2	19
30 min Summer	47.168	0.0	164.2	33
60 min Summer	29.395	0.0	238.5	64
120 min Summer	17.796	0.0	296.0	122
180 min Summer	13.135	0.0	329.2	182
240 min Summer	10.546	0.0	352.1	242
360 min Summer	7.703	0.0	383.5	362
480 min Summer	6.164	0.0	406.3	480
600 min Summer	5.183	0.0	423.7	586
720 min Summer	4.497	0.0	437.8	630
960 min Summer	3.592	0.0	458.9	760
1440 min Summer	2.614	0.0	485.3	1012
2160 min Summer	1.900	0.0	619.4	1428
2880 min Summer	1.514	0.0	640.7	1844
4320 min Summer	1.099	0.0	658.3	2636

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 30yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
5760 min Summer	37.198	0.048	0.0	3.6	3.6	64.8	O K
7200 min Summer	37.182	0.032	0.0	3.6	3.6	43.0	O K
8640 min Summer	37.169	0.019	0.0	3.5	3.5	25.9	O K
10080 min Summer	37.160	0.010	0.0	3.5	3.5	13.0	O K
15 min Winter	37.232	0.082	0.0	3.7	3.7	109.3	O K
30 min Winter	37.255	0.105	0.0	3.7	3.7	140.6	O K
60 min Winter	37.278	0.128	0.0	3.8	3.8	171.0	O K
120 min Winter	37.298	0.148	0.0	3.8	3.8	198.6	O K
180 min Winter	37.308	0.158	0.0	3.8	3.8	211.6	O K
240 min Winter	37.313	0.163	0.0	3.8	3.8	218.3	O K
360 min Winter	37.316	0.166	0.0	3.8	3.8	222.6	O K
480 min Winter	37.315	0.165	0.0	3.8	3.8	221.7	O K
600 min Winter	37.313	0.163	0.0	3.8	3.8	217.7	O K
720 min Winter	37.309	0.159	0.0	3.8	3.8	212.3	O K
960 min Winter	37.301	0.151	0.0	3.8	3.8	202.6	O K
1440 min Winter	37.288	0.138	0.0	3.8	3.8	184.9	O K
2160 min Winter	37.269	0.119	0.0	3.7	3.7	159.0	O K
2880 min Winter	37.250	0.100	0.0	3.7	3.7	133.8	O K
4320 min Winter	37.216	0.066	0.0	3.6	3.6	88.3	O K
5760 min Winter	37.188	0.038	0.0	3.6	3.6	50.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Summer	0.875	0.0	797.7	3392
7200 min Summer	0.733	0.0	810.7	4104
8640 min Summer	0.634	0.0	816.4	4760
10080 min Summer	0.560	0.0	815.1	5352
15 min Winter	72.416	0.0	137.0	19
30 min Winter	47.168	0.0	187.9	33
60 min Winter	29.395	0.0	272.0	62
120 min Winter	17.796	0.0	334.5	120
180 min Winter	13.135	0.0	370.4	180
240 min Winter	10.546	0.0	395.3	238
360 min Winter	7.703	0.0	429.6	354
480 min Winter	6.164	0.0	454.6	468
600 min Winter	5.183	0.0	473.8	578
720 min Winter	4.497	0.0	489.3	686
960 min Winter	3.592	0.0	512.9	892
1440 min Winter	2.614	0.0	542.0	1110
2160 min Winter	1.900	0.0	695.3	1560
2880 min Winter	1.514	0.0	719.8	2016
4320 min Winter	1.099	0.0	740.1	2852
5760 min Winter	0.875	0.0	908.0	3576

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 30yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200 min Winter	37.166	0.016	0.0	3.5	3.5	21.5	O K
8640 min Winter	37.152	0.002	0.0	3.5	3.5	2.7	O K
10080 min Winter	37.150	0.000	0.0	3.3	3.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	0.733	0.0	925.2	4248
8640 min Winter	0.634	0.0	933.2	4752
10080 min Winter	0.560	0.0	933.0	0

©1982-2018 Innovyze

Cascade Rainfall Details for Geocellular storage crate tanks 1 in 30yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.745

Time (mins) From:	To:	Area (ha)
0	4	0.745

©1982-2018 Innovyze

Cascade Model Details for Geocellular storage crate tanks 1 in 30yr.srcx

Storage is Online Cover Level (m) 38.400

Complex Structure

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0061-4400-1300-4400
Design Head (m)	1.300
Design Flow (l/s)	4.4
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	61
Invert Level (m)	36.350
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

©1982-2018 Innovyze

Hydro-Brake® Optimum Outflow Control

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	4.4
Flush-Flo™	0.092	1.3
Kick-Flo®	0.092	1.3
Mean Flow over Head Range	-	3.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	4.2	3.000	6.5	7.000	9.8
0.200	1.9	1.400	4.6	3.500	7.0	7.500	10.1
0.300	2.2	1.600	4.8	4.000	7.5	8.000	10.4
0.400	2.6	1.800	5.1	4.500	7.9	8.500	10.7
0.500	2.8	2.000	5.4	5.000	8.3	9.000	11.0
0.600	3.1	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.5	2.400	5.9	6.000	9.1		
1.000	3.9	2.600	6.1	6.500	9.4		

©1982-2018 Innovyze

Cascade Summary of Results for Block A Blue Roof 1 in 100yr.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 100yr.srcx	(None)

Half Drain Time : 1444 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.531	0.031	0.0	0.2	0.2	18.3	O K
30 min Summer	59.544	0.044	0.0	0.3	0.3	26.4	O K
60 min Summer	59.559	0.059	0.0	0.3	0.3	35.0	O K
120 min Summer	59.574	0.074	0.0	0.4	0.4	43.8	O K
180 min Summer	59.582	0.082	0.0	0.4	0.4	48.8	O K
240 min Summer	59.587	0.087	0.0	0.4	0.4	51.9	O K
360 min Summer	59.594	0.094	0.0	0.4	0.4	55.7	O K
480 min Summer	59.598	0.098	0.0	0.4	0.4	58.1	O K
600 min Summer	59.600	0.100	0.0	0.4	0.4	59.6	O K
720 min Summer	59.602	0.102	0.0	0.5	0.5	60.4	O K
960 min Summer	59.603	0.103	0.0	0.5	0.5	61.0	O K
1440 min Summer	59.603	0.103	0.0	0.5	0.5	61.2	O K
2160 min Summer	59.602	0.102	0.0	0.5	0.5	60.7	O K
2880 min Summer	59.600	0.100	0.0	0.4	0.4	59.5	O K
4320 min Summer	59.595	0.095	0.0	0.4	0.4	56.3	O K
5760 min Summer	59.589	0.089	0.0	0.4	0.4	52.8	O K
7200 min Summer	59.583	0.083	0.0	0.4	0.4	49.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	93.822	0.0	9.4	100
30 min Summer	61.653	0.0	15.0	107
60 min Summer	38.624	0.0	28.1	126
120 min Summer	23.402	0.0	35.7	166
180 min Summer	17.234	0.0	40.0	214
240 min Summer	13.794	0.0	42.9	266
360 min Summer	10.013	0.0	46.6	376
480 min Summer	7.982	0.0	49.0	492
600 min Summer	6.690	0.0	50.7	608
720 min Summer	5.789	0.0	51.8	724
960 min Summer	4.604	0.0	52.8	938
1440 min Summer	3.329	0.0	52.0	1154
2160 min Summer	2.403	0.0	77.1	1536
2880 min Summer	1.905	0.0	78.7	1944
4320 min Summer	1.371	0.0	77.5	2768
5760 min Summer	1.085	0.0	90.9	3576
7200 min Summer	0.904	0.0	90.8	4352

©1982-2018 Innovyze

Cascade Summary of Results for Block A Blue Roof 1 in 100yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.578	0.078	0.0	0.4	0.4	46.2	O K
10080 min Summer	59.573	0.073	0.0	0.4	0.4	43.2	O K
15 min Winter	59.536	0.036	0.0	0.2	0.2	21.4	O K
30 min Winter	59.551	0.051	0.0	0.3	0.3	30.5	O K
60 min Winter	59.568	0.068	0.0	0.4	0.4	40.2	O K
120 min Winter	59.584	0.084	0.0	0.4	0.4	50.1	O K
180 min Winter	59.594	0.094	0.0	0.4	0.4	55.7	O K
240 min Winter	59.600	0.100	0.0	0.4	0.4	59.3	O K
360 min Winter	59.607	0.107	0.0	0.5	0.5	63.7	O K
480 min Winter	59.612	0.112	0.0	0.5	0.5	66.5	O K
600 min Winter	59.615	0.115	0.0	0.5	0.5	68.3	O K
720 min Winter	59.617	0.117	0.0	0.5	0.5	69.4	O K
960 min Winter	59.619	0.119	0.0	0.5	0.5	70.4	O K
1440 min Winter	59.618	0.118	0.0	0.5	0.5	69.9	O K
2160 min Winter	59.616	0.116	0.0	0.5	0.5	68.7	O K
2880 min Winter	59.612	0.112	0.0	0.5	0.5	66.5	O K
4320 min Winter	59.603	0.103	0.0	0.5	0.5	61.2	O K
5760 min Winter	59.594	0.094	0.0	0.4	0.4	55.8	O K
7200 min Winter	59.586	0.086	0.0	0.4	0.4	50.8	O K
8640 min Winter	59.578	0.078	0.0	0.4	0.4	46.3	O K
10080 min Winter	59.571	0.071	0.0	0.4	0.4	42.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.779	0.0	89.6	5128
10080 min Summer	0.686	0.0	87.5	5880
15 min Winter	93.822	0.0	11.5	98
30 min Winter	61.653	0.0	17.7	107
60 min Winter	38.624	0.0	32.6	126
120 min Winter	23.402	0.0	41.0	166
180 min Winter	17.234	0.0	45.7	214
240 min Winter	13.794	0.0	48.8	264
360 min Winter	10.013	0.0	52.7	372
480 min Winter	7.982	0.0	55.2	484
600 min Winter	6.690	0.0	56.8	598
720 min Winter	5.789	0.0	57.7	712
960 min Winter	4.604	0.0	58.5	932
1440 min Winter	3.329	0.0	57.5	1214
2160 min Winter	2.403	0.0	88.1	1644
2880 min Winter	1.905	0.0	90.0	2100
4320 min Winter	1.371	0.0	88.4	2984
5760 min Winter	1.085	0.0	105.6	3824
7200 min Winter	0.904	0.0	106.1	4632
8640 min Winter	0.779	0.0	105.5	5448
10080 min Winter	0.686	0.0	103.8	6192

©1982-2018 Innovyze

Cascade Rainfall Details for Block A Blue Roof 1 in 100yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³) 1550 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.028167	32	36	0.005687	64	68	0.001148	96	100	0.000232
4	8	0.023061	36	40	0.004656	68	72	0.000940	100	104	0.000190
8	12	0.018881	40	44	0.003812	72	76	0.000770	104	108	0.000155
12	16	0.015458	44	48	0.003121	76	80	0.000630	108	112	0.000127
16	20	0.012656	48	52	0.002555	80	84	0.000516	112	116	0.000104
20	24	0.010362	52	56	0.002092	84	88	0.000422	116	120	0.000085
24	28	0.008484	56	60	0.001713	88	92	0.000346			
28	32	0.006946	60	64	0.001402	92	96	0.000283			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block A Blue Roof 1 in 100yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	625.0	625.0	0.201	0.0	645.0
0.200	625.0	645.0			

Orifice Outflow Control

Diameter (m) 0.027 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block B Blue Roof 1 in 100yr.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 100yr.srcx	(None)

Half Drain Time : 3444 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.528	0.028	0.0	0.1	0.1	26.5	O K
30 min Summer	59.540	0.040	0.0	0.2	0.2	38.3	O K
60 min Summer	59.554	0.054	0.0	0.2	0.2	50.8	O K
120 min Summer	59.567	0.067	0.0	0.2	0.2	63.8	O K
180 min Summer	59.575	0.075	0.0	0.3	0.3	71.2	O K
240 min Summer	59.580	0.080	0.0	0.3	0.3	76.2	O K
360 min Summer	59.587	0.087	0.0	0.3	0.3	82.8	O K
480 min Summer	59.592	0.092	0.0	0.3	0.3	87.4	O K
600 min Summer	59.596	0.096	0.0	0.3	0.3	90.8	O K
720 min Summer	59.598	0.098	0.0	0.3	0.3	93.3	O K
960 min Summer	59.602	0.102	0.0	0.3	0.3	96.8	O K
1440 min Summer	59.605	0.105	0.0	0.3	0.3	100.0	O K
2160 min Summer	59.606	0.106	0.0	0.3	0.3	100.4	O K
2880 min Summer	59.605	0.105	0.0	0.3	0.3	99.8	O K
4320 min Summer	59.603	0.103	0.0	0.3	0.3	97.7	O K
5760 min Summer	59.600	0.100	0.0	0.3	0.3	95.0	O K
7200 min Summer	59.597	0.097	0.0	0.3	0.3	91.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	93.822	0.0	8.1	110
30 min Summer	61.653	0.0	12.8	119
60 min Summer	38.624	0.0	27.8	138
120 min Summer	23.402	0.0	33.2	178
180 min Summer	17.234	0.0	35.7	224
240 min Summer	13.794	0.0	37.2	278
360 min Summer	10.013	0.0	38.9	390
480 min Summer	7.982	0.0	39.8	504
600 min Summer	6.690	0.0	40.3	620
720 min Summer	5.789	0.0	40.5	738
960 min Summer	4.604	0.0	40.3	972
1440 min Summer	3.329	0.0	38.5	1446
2160 min Summer	2.403	0.0	75.8	2044
2880 min Summer	1.905	0.0	73.4	2360
4320 min Summer	1.371	0.0	65.5	3112
5760 min Summer	1.085	0.0	115.6	3928
7200 min Summer	0.904	0.0	112.5	4760

©1982-2018 Innovyze

Cascade Summary of Results for Block B Blue Roof 1 in 100yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.593	0.093	0.0	0.3	0.3	88.3	O K
10080 min Summer	59.589	0.089	0.0	0.3	0.3	84.9	O K
15 min Winter	59.533	0.033	0.0	0.1	0.1	31.0	O K
30 min Winter	59.547	0.047	0.0	0.2	0.2	44.3	O K
60 min Winter	59.561	0.061	0.0	0.2	0.2	58.4	O K
120 min Winter	59.577	0.077	0.0	0.3	0.3	72.9	O K
180 min Winter	59.586	0.086	0.0	0.3	0.3	81.3	O K
240 min Winter	59.592	0.092	0.0	0.3	0.3	86.9	O K
360 min Winter	59.599	0.099	0.0	0.3	0.3	94.4	O K
480 min Winter	59.605	0.105	0.0	0.3	0.3	99.7	O K
600 min Winter	59.609	0.109	0.0	0.3	0.3	103.7	O K
720 min Winter	59.612	0.112	0.0	0.3	0.3	106.6	O K
960 min Winter	59.617	0.117	0.0	0.3	0.3	110.8	O K
1440 min Winter	59.621	0.121	0.0	0.3	0.3	115.0	O K
2160 min Winter	59.622	0.122	0.0	0.3	0.3	116.3	O K
2880 min Winter	59.621	0.121	0.0	0.3	0.3	114.9	O K
4320 min Winter	59.618	0.118	0.0	0.3	0.3	111.6	O K
5760 min Winter	59.613	0.113	0.0	0.3	0.3	107.5	O K
7200 min Winter	59.608	0.108	0.0	0.3	0.3	102.7	O K
8640 min Winter	59.603	0.103	0.0	0.3	0.3	97.8	O K
10080 min Winter	59.598	0.098	0.0	0.3	0.3	93.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.779	0.0	107.2	5552
10080 min Summer	0.686	0.0	100.0	6376
15 min Winter	93.822	0.0	10.1	109
30 min Winter	61.653	0.0	14.4	120
60 min Winter	38.624	0.0	31.3	138
120 min Winter	23.402	0.0	36.5	178
180 min Winter	17.234	0.0	39.1	226
240 min Winter	13.794	0.0	40.7	278
360 min Winter	10.013	0.0	42.4	386
480 min Winter	7.982	0.0	43.4	498
600 min Winter	6.690	0.0	43.9	612
720 min Winter	5.789	0.0	44.1	726
960 min Winter	4.604	0.0	43.9	956
1440 min Winter	3.329	0.0	42.0	1414
2160 min Winter	2.403	0.0	83.5	2076
2880 min Winter	1.905	0.0	81.0	2672
4320 min Winter	1.371	0.0	72.7	3312
5760 min Winter	1.085	0.0	132.5	4224
7200 min Winter	0.904	0.0	128.7	5128
8640 min Winter	0.779	0.0	122.4	6024
10080 min Winter	0.686	0.0	114.5	6872

©1982-2018 Innovyze

Cascade Rainfall Details for Block B Blue Roof 1 in 100yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³) 2200 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.039978	32	36	0.008071	64	68	0.001630	96	100	0.000329
4	8	0.032731	36	40	0.006608	68	72	0.001334	100	104	0.000269
8	12	0.026798	40	44	0.005410	72	76	0.001092	104	108	0.000221
12	16	0.021941	44	48	0.004430	76	80	0.000894	108	112	0.000181
16	20	0.017963	48	52	0.003627	80	84	0.000732	112	116	0.000148
20	24	0.014707	52	56	0.002969	84	88	0.000599	116	120	0.000121
24	28	0.012041	56	60	0.002431	88	92	0.000491			
28	32	0.009859	60	64	0.001990	92	96	0.000402			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block B Blue Roof 1 in 100yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1000.0	1000.0	0.201	0.0	1028.0
0.200	1000.0	1028.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block C Blue Roof 1 in 100yr.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 100yr.srcx	(None)

Half Drain Time : 5288 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.524	0.024	0.0	0.1	0.1	36.5	O K
30 min Summer	59.535	0.035	0.0	0.2	0.2	52.7	O K
60 min Summer	59.546	0.046	0.0	0.2	0.2	69.9	O K
120 min Summer	59.558	0.058	0.0	0.2	0.2	87.6	O K
180 min Summer	59.564	0.064	0.0	0.2	0.2	97.9	O K
240 min Summer	59.569	0.069	0.0	0.2	0.2	105.0	O K
360 min Summer	59.575	0.075	0.0	0.3	0.3	114.4	O K
480 min Summer	59.580	0.080	0.0	0.3	0.3	121.2	O K
600 min Summer	59.583	0.083	0.0	0.3	0.3	126.3	O K
720 min Summer	59.586	0.086	0.0	0.3	0.3	130.2	O K
960 min Summer	59.589	0.089	0.0	0.3	0.3	136.0	O K
1440 min Summer	59.594	0.094	0.0	0.3	0.3	142.6	O K
2160 min Summer	59.596	0.096	0.0	0.3	0.3	146.1	O K
2880 min Summer	59.596	0.096	0.0	0.3	0.3	145.9	O K
4320 min Summer	59.594	0.094	0.0	0.3	0.3	143.5	O K
5760 min Summer	59.592	0.092	0.0	0.3	0.3	140.6	O K
7200 min Summer	59.590	0.090	0.0	0.3	0.3	137.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	93.822	0.0	7.1	115
30 min Summer	61.653	0.0	11.8	124
60 min Summer	38.624	0.0	27.4	142
120 min Summer	23.402	0.0	32.2	182
180 min Summer	17.234	0.0	34.6	230
240 min Summer	13.794	0.0	35.9	284
360 min Summer	10.013	0.0	37.4	396
480 min Summer	7.982	0.0	38.2	510
600 min Summer	6.690	0.0	38.6	626
720 min Summer	5.789	0.0	38.7	744
960 min Summer	4.604	0.0	38.3	978
1440 min Summer	3.329	0.0	36.4	1450
2160 min Summer	2.403	0.0	75.4	2164
2880 min Summer	1.905	0.0	72.4	2812
4320 min Summer	1.371	0.0	63.6	3456
5760 min Summer	1.085	0.0	128.2	4208
7200 min Summer	0.904	0.0	121.3	5000

©1982-2018 Innovyze

Cascade Summary of Results for Block C Blue Roof 1 in 100yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.588	0.088	0.0	0.3	0.3	133.3	O K
10080 min Summer	59.585	0.085	0.0	0.3	0.3	129.3	O K
15 min Winter	59.528	0.028	0.0	0.1	0.1	42.7	O K
30 min Winter	59.540	0.040	0.0	0.2	0.2	60.9	O K
60 min Winter	59.553	0.053	0.0	0.2	0.2	80.1	O K
120 min Winter	59.566	0.066	0.0	0.2	0.2	100.1	O K
180 min Winter	59.573	0.073	0.0	0.3	0.3	111.7	O K
240 min Winter	59.579	0.079	0.0	0.3	0.3	119.7	O K
360 min Winter	59.586	0.086	0.0	0.3	0.3	130.4	O K
480 min Winter	59.591	0.091	0.0	0.3	0.3	138.1	O K
600 min Winter	59.595	0.095	0.0	0.3	0.3	144.0	O K
720 min Winter	59.598	0.098	0.0	0.3	0.3	148.6	O K
960 min Winter	59.602	0.102	0.0	0.3	0.3	155.4	O K
1440 min Winter	59.607	0.107	0.0	0.3	0.3	163.3	O K
2160 min Winter	59.611	0.111	0.0	0.3	0.3	168.2	O K
2880 min Winter	59.611	0.111	0.0	0.3	0.3	169.1	O K
4320 min Winter	59.609	0.109	0.0	0.3	0.3	165.4	O K
5760 min Winter	59.606	0.106	0.0	0.3	0.3	161.6	O K
7200 min Winter	59.603	0.103	0.0	0.3	0.3	156.9	O K
8640 min Winter	59.600	0.100	0.0	0.3	0.3	151.7	O K
10080 min Winter	59.596	0.096	0.0	0.3	0.3	146.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.779	0.0	112.9	5824
10080 min Summer	0.686	0.0	103.5	6664
15 min Winter	93.822	0.0	8.9	115
30 min Winter	61.653	0.0	13.4	125
60 min Winter	38.624	0.0	30.5	142
120 min Winter	23.402	0.0	35.4	184
180 min Winter	17.234	0.0	37.8	230
240 min Winter	13.794	0.0	39.2	282
360 min Winter	10.013	0.0	40.7	392
480 min Winter	7.982	0.0	41.6	504
600 min Winter	6.690	0.0	42.0	618
720 min Winter	5.789	0.0	42.1	732
960 min Winter	4.604	0.0	41.7	964
1440 min Winter	3.329	0.0	39.7	1428
2160 min Winter	2.403	0.0	82.7	2108
2880 min Winter	1.905	0.0	79.5	2772
4320 min Winter	1.371	0.0	70.4	3936
5760 min Winter	1.085	0.0	143.5	4456
7200 min Winter	0.904	0.0	136.3	5400
8640 min Winter	0.779	0.0	127.5	6312
10080 min Winter	0.686	0.0	117.6	7184

©1982-2018 Innovyze

Cascade Rainfall Details for Block C Blue Roof 1 in 100yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³) 3000 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.054516	32	36	0.011007	64	68	0.002222	96	100	0.000449
4	8	0.044634	36	40	0.009011	68	72	0.001819	100	104	0.000367
8	12	0.036543	40	44	0.007378	72	76	0.001490	104	108	0.000301
12	16	0.029919	44	48	0.006041	76	80	0.001220	108	112	0.000246
16	20	0.024496	48	52	0.004946	80	84	0.000998	112	116	0.000202
20	24	0.020055	52	56	0.004049	84	88	0.000817	116	120	0.000165
24	28	0.016420	56	60	0.003315	88	92	0.000669			
28	32	0.013443	60	64	0.002714	92	96	0.000548			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block C Blue Roof 1 in 100yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1600.0	1600.0	0.201	0.0	1632.0
0.200	1600.0	1632.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block D Blue Roof 1 in 100yr.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 100yr.srcx	(None)

Half Drain Time : 2458 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.531	0.031	0.0	0.1	0.1	20.3	O K
30 min Summer	59.544	0.044	0.0	0.2	0.2	29.4	O K
60 min Summer	59.559	0.059	0.0	0.2	0.2	39.0	O K
120 min Summer	59.574	0.074	0.0	0.3	0.3	48.9	O K
180 min Summer	59.582	0.082	0.0	0.3	0.3	54.5	O K
240 min Summer	59.588	0.088	0.0	0.3	0.3	58.3	O K
360 min Summer	59.595	0.095	0.0	0.3	0.3	63.1	O K
480 min Summer	59.600	0.100	0.0	0.3	0.3	66.4	O K
600 min Summer	59.603	0.103	0.0	0.3	0.3	68.6	O K
720 min Summer	59.606	0.106	0.0	0.3	0.3	70.3	O K
960 min Summer	59.609	0.109	0.0	0.3	0.3	72.3	O K
1440 min Summer	59.611	0.111	0.0	0.3	0.3	73.6	O K
2160 min Summer	59.610	0.110	0.0	0.3	0.3	73.3	O K
2880 min Summer	59.609	0.109	0.0	0.3	0.3	72.6	O K
4320 min Summer	59.606	0.106	0.0	0.3	0.3	70.5	O K
5760 min Summer	59.602	0.102	0.0	0.3	0.3	67.7	O K
7200 min Summer	59.597	0.097	0.0	0.3	0.3	64.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	93.822	0.0	8.4	104
30 min Summer	61.653	0.0	12.9	114
60 min Summer	38.624	0.0	26.3	132
120 min Summer	23.402	0.0	32.3	174
180 min Summer	17.234	0.0	35.1	220
240 min Summer	13.794	0.0	36.7	274
360 min Summer	10.013	0.0	38.6	386
480 min Summer	7.982	0.0	39.6	500
600 min Summer	6.690	0.0	40.3	616
720 min Summer	5.789	0.0	40.5	732
960 min Summer	4.604	0.0	40.5	968
1440 min Summer	3.329	0.0	39.0	1440
2160 min Summer	2.403	0.0	72.1	1776
2880 min Summer	1.905	0.0	70.8	2140
4320 min Summer	1.371	0.0	64.4	2948
5760 min Summer	1.085	0.0	96.5	3760
7200 min Summer	0.904	0.0	95.5	4584

©1982-2018 Innovyze

Cascade Summary of Results for Block D Blue Roof 1 in 100yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.593	0.093	0.0	0.3	0.3	61.6	O K
10080 min Summer	59.588	0.088	0.0	0.3	0.3	58.6	O K
15 min Winter	59.536	0.036	0.0	0.2	0.2	23.8	O K
30 min Winter	59.551	0.051	0.0	0.2	0.2	34.0	O K
60 min Winter	59.567	0.067	0.0	0.2	0.2	44.8	O K
120 min Winter	59.584	0.084	0.0	0.3	0.3	55.9	O K
180 min Winter	59.594	0.094	0.0	0.3	0.3	62.2	O K
240 min Winter	59.600	0.100	0.0	0.3	0.3	66.5	O K
360 min Winter	59.608	0.108	0.0	0.3	0.3	72.0	O K
480 min Winter	59.614	0.114	0.0	0.3	0.3	75.8	O K
600 min Winter	59.618	0.118	0.0	0.3	0.3	78.5	O K
720 min Winter	59.621	0.121	0.0	0.3	0.3	80.4	O K
960 min Winter	59.625	0.125	0.0	0.3	0.3	83.0	O K
1440 min Winter	59.628	0.128	0.0	0.3	0.3	84.9	O K
2160 min Winter	59.627	0.127	0.0	0.3	0.3	84.2	O K
2880 min Winter	59.625	0.125	0.0	0.3	0.3	82.9	O K
4320 min Winter	59.619	0.119	0.0	0.3	0.3	79.5	O K
5760 min Winter	59.613	0.113	0.0	0.3	0.3	75.1	O K
7200 min Winter	59.606	0.106	0.0	0.3	0.3	70.6	O K
8640 min Winter	59.600	0.100	0.0	0.3	0.3	66.2	O K
10080 min Winter	59.593	0.093	0.0	0.3	0.3	62.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.779	0.0	93.1	5384
10080 min Summer	0.686	0.0	89.4	6176
15 min Winter	93.822	0.0	10.3	105
30 min Winter	61.653	0.0	14.6	115
60 min Winter	38.624	0.0	30.0	134
120 min Winter	23.402	0.0	35.8	174
180 min Winter	17.234	0.0	38.6	222
240 min Winter	13.794	0.0	40.3	272
360 min Winter	10.013	0.0	42.3	382
480 min Winter	7.982	0.0	43.4	494
600 min Winter	6.690	0.0	44.0	606
720 min Winter	5.789	0.0	44.3	722
960 min Winter	4.604	0.0	44.3	950
1440 min Winter	3.329	0.0	42.7	1398
2160 min Winter	2.403	0.0	80.1	2004
2880 min Winter	1.905	0.0	78.6	2260
4320 min Winter	1.371	0.0	71.8	3176
5760 min Winter	1.085	0.0	111.8	4088
7200 min Winter	0.904	0.0	111.1	4968
8640 min Winter	0.779	0.0	108.7	5800
10080 min Winter	0.686	0.0	104.5	6656

©1982-2018 Innovyze

Cascade Rainfall Details for Block D Blue Roof 1 in 100yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Green Roof

Area (m³) 1700 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.030892	32	36	0.006237	64	68	0.001259	96	100	0.000254
4	8	0.025293	36	40	0.005106	68	72	0.001031	100	104	0.000208
8	12	0.020708	40	44	0.004181	72	76	0.000844	104	108	0.000170
12	16	0.016954	44	48	0.003423	76	80	0.000691	108	112	0.000140
16	20	0.013881	48	52	0.002802	80	84	0.000566	112	116	0.000114
20	24	0.011365	52	56	0.002294	84	88	0.000463	116	120	0.000094
24	28	0.009305	56	60	0.001879	88	92	0.000379			
28	32	0.007618	60	64	0.001538	92	96	0.000311			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block D Blue Roof 1 in 100yr.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	700.0	700.0	0.201	0.0	722.0
0.200	700.0	722.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 100yr.srcx

Upstream Structures	Outflow To	Overflow To
Block A Blue Roof 1 in 100yr.srcx Block B Blue Roof 1 in 100yr.srcx Block C Blue Roof 1 in 100yr.srcx Block D Blue Roof 1 in 100yr.srcx	(None)	(None)

Half Drain Time : 686 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	37.245	0.095	0.0	3.7	3.7	127.1	O K
30 min Summer	37.273	0.123	0.0	3.8	3.8	165.1	O K
60 min Summer	37.301	0.151	0.0	3.8	3.8	202.8	O K
120 min Summer	37.327	0.177	0.0	3.9	3.9	237.0	O K
180 min Summer	37.339	0.189	0.0	3.9	3.9	253.4	O K
240 min Summer	37.346	0.196	0.0	3.9	3.9	261.9	O K
360 min Summer	37.350	0.200	0.0	3.9	3.9	267.7	O K
480 min Summer	37.350	0.200	0.0	3.9	3.9	267.5	O K
600 min Summer	37.347	0.197	0.0	3.9	3.9	263.5	O K
720 min Summer	37.343	0.193	0.0	3.9	3.9	258.7	O K
960 min Summer	37.335	0.185	0.0	3.9	3.9	248.4	O K
1440 min Summer	37.324	0.174	0.0	3.8	3.8	232.5	O K
2160 min Summer	37.309	0.159	0.0	3.8	3.8	212.9	O K
2880 min Summer	37.295	0.145	0.0	3.8	3.8	194.6	O K
4320 min Summer	37.269	0.119	0.0	3.7	3.7	160.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	93.822	0.0	163.4	19
30 min Summer	61.653	0.0	223.9	34
60 min Summer	38.624	0.0	324.5	64
120 min Summer	23.402	0.0	394.0	124
180 min Summer	17.234	0.0	433.4	182
240 min Summer	13.794	0.0	460.4	242
360 min Summer	10.013	0.0	496.5	362
480 min Summer	7.982	0.0	522.9	482
600 min Summer	6.690	0.0	543.0	600
720 min Summer	5.789	0.0	558.9	720
960 min Summer	4.604	0.0	582.9	896
1440 min Summer	3.329	0.0	601.9	1126
2160 min Summer	2.403	0.0	783.3	1512
2880 min Summer	1.905	0.0	805.5	1928
4320 min Summer	1.371	0.0	821.8	2724

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 100yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
5760 min Summer	37.246	0.096	0.0	3.7	3.7	128.5	O K
7200 min Summer	37.225	0.075	0.0	3.7	3.7	100.3	O K
8640 min Summer	37.206	0.056	0.0	3.6	3.6	75.5	O K
10080 min Summer	37.190	0.040	0.0	3.6	3.6	54.1	O K
15 min Winter	37.257	0.107	0.0	3.7	3.7	142.8	O K
30 min Winter	37.289	0.139	0.0	3.8	3.8	185.8	O K
60 min Winter	37.321	0.171	0.0	3.8	3.8	228.8	O K
120 min Winter	37.351	0.201	0.0	3.9	3.9	269.2	O K
180 min Winter	37.366	0.216	0.0	3.9	3.9	289.2	O K
240 min Winter	37.374	0.224	0.0	3.9	3.9	300.3	O K
360 min Winter	37.382	0.232	0.0	3.9	3.9	310.3	O K
480 min Winter	37.384	0.234	0.0	4.0	4.0	313.8	O K
600 min Winter	37.384	0.234	0.0	4.0	4.0	313.1	O K
720 min Winter	37.381	0.231	0.0	3.9	3.9	309.9	O K
960 min Winter	37.373	0.223	0.0	3.9	3.9	299.2	O K
1440 min Winter	37.358	0.208	0.0	3.9	3.9	278.4	O K
2160 min Winter	37.337	0.187	0.0	3.9	3.9	250.9	O K
2880 min Winter	37.317	0.167	0.0	3.8	3.8	224.4	O K
4320 min Winter	37.280	0.130	0.0	3.8	3.8	173.5	O K
5760 min Winter	37.245	0.095	0.0	3.7	3.7	127.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Summer	1.085	0.0	1012.1	3520
7200 min Summer	0.904	0.0	1025.5	4256
8640 min Summer	0.779	0.0	1029.0	5016
10080 min Summer	0.686	0.0	1024.1	5744
15 min Winter	93.822	0.0	186.9	19
30 min Winter	61.653	0.0	252.5	33
60 min Winter	38.624	0.0	365.4	62
120 min Winter	23.402	0.0	441.0	122
180 min Winter	17.234	0.0	484.1	180
240 min Winter	13.794	0.0	513.6	238
360 min Winter	10.013	0.0	553.3	356
480 min Winter	7.982	0.0	582.4	472
600 min Winter	6.690	0.0	604.7	586
720 min Winter	5.789	0.0	622.4	700
960 min Winter	4.604	0.0	637.5	922
1440 min Winter	3.329	0.0	619.3	1328
2160 min Winter	2.403	0.0	875.2	1644
2880 min Winter	1.905	0.0	900.5	2104
4320 min Winter	1.371	0.0	920.4	2984
5760 min Winter	1.085	0.0	1144.1	3808

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 100yr.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200 min Winter	37.215	0.065	0.0	3.6	3.6	86.9	O K
8640 min Winter	37.189	0.039	0.0	3.6	3.6	52.4	O K
10080 min Winter	37.168	0.018	0.0	3.5	3.5	24.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	0.904	0.0	1160.4	4608
8640 min Winter	0.779	0.0	1165.4	5272
10080 min Winter	0.686	0.0	1161.2	5856

©1982-2018 Innovyze

Cascade Rainfall Details for Geocellular storage crate tanks 1 in 100yr.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.745

Time From:	(mins) To:	Area (ha)
0	4	0.745

©1982-2018 Innovyze

Cascade Model Details for Geocellular storage crate tanks 1 in 100yr.srcx

Storage is Online Cover Level (m) 38.400

Complex Structure

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0061-4400-1300-4400
Design Head (m)	1.300
Design Flow (l/s)	4.4
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	61
Invert Level (m)	36.350
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

©1982-2018 Innovyze

Hydro-Brake® Optimum Outflow Control

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	4.4
Flush-Flo™	0.092	1.3
Kick-Flo®	0.092	1.3
Mean Flow over Head Range	-	3.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	4.2	3.000	6.5	7.000	9.8
0.200	1.9	1.400	4.6	3.500	7.0	7.500	10.1
0.300	2.2	1.600	4.8	4.000	7.5	8.000	10.4
0.400	2.6	1.800	5.1	4.500	7.9	8.500	10.7
0.500	2.8	2.000	5.4	5.000	8.3	9.000	11.0
0.600	3.1	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.5	2.400	5.9	6.000	9.1		
1.000	3.9	2.600	6.1	6.500	9.4		

©1982-2018 Innovyze

Cascade Summary of Results for Block A Blue Roof 1 in 100yr +40%.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 100yr +40%.srcx	(None)

Half Drain Time : 1704 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.548	0.048	0.0	0.3	0.3	28.6	O K
30 min Summer	59.568	0.068	0.0	0.4	0.4	40.1	O K
60 min Summer	59.588	0.088	0.0	0.4	0.4	52.3	O K
120 min Summer	59.609	0.109	0.0	0.5	0.5	64.8	O K
180 min Summer	59.621	0.121	0.0	0.5	0.5	71.9	O K
240 min Summer	59.629	0.129	0.0	0.5	0.5	76.4	O K
360 min Summer	59.638	0.138	0.0	0.5	0.5	82.1	O K
480 min Summer	59.644	0.144	0.0	0.6	0.6	85.7	O K
600 min Summer	59.648	0.148	0.0	0.6	0.6	88.1	O K
720 min Summer	59.651	0.151	0.0	0.6	0.6	89.6	O K
960 min Summer	59.653	0.153	0.0	0.6	0.6	91.1	O K
1440 min Summer	59.654	0.154	0.0	0.6	0.6	91.3	O K
2160 min Summer	59.653	0.153	0.0	0.6	0.6	90.7	O K
2880 min Summer	59.650	0.150	0.0	0.6	0.6	89.3	O K
4320 min Summer	59.644	0.144	0.0	0.5	0.5	85.2	O K
5760 min Summer	59.636	0.136	0.0	0.5	0.5	80.6	O K
7200 min Summer	59.628	0.128	0.0	0.5	0.5	75.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.351	0.0	16.6	99
30 min Summer	86.314	0.0	23.5	109
60 min Summer	54.074	0.0	42.8	128
120 min Summer	32.762	0.0	52.7	168
180 min Summer	24.128	0.0	58.0	216
240 min Summer	19.312	0.0	61.3	268
360 min Summer	14.018	0.0	65.0	380
480 min Summer	11.175	0.0	67.3	494
600 min Summer	9.366	0.0	68.6	610
720 min Summer	8.105	0.0	69.5	726
960 min Summer	6.446	0.0	70.0	962
1440 min Summer	4.660	0.0	68.5	1230
2160 min Summer	3.364	0.0	112.5	1596
2880 min Summer	2.667	0.0	114.4	1996
4320 min Summer	1.920	0.0	109.4	2816
5760 min Summer	1.519	0.0	138.5	3640
7200 min Summer	1.266	0.0	140.1	4424

©1982-2018 Innovyze

Cascade Summary of Results for Block A Blue Roof 1 in 100yr +40%.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.620	0.120	0.0	0.5	0.5	71.5	O K
10080 min Summer	59.613	0.113	0.0	0.5	0.5	67.3	O K
15 min Winter	59.556	0.056	0.0	0.3	0.3	33.0	O K
30 min Winter	59.577	0.077	0.0	0.4	0.4	46.0	O K
60 min Winter	59.600	0.100	0.0	0.4	0.4	59.6	O K
120 min Winter	59.624	0.124	0.0	0.5	0.5	73.7	O K
180 min Winter	59.637	0.137	0.0	0.5	0.5	81.6	O K
240 min Winter	59.646	0.146	0.0	0.6	0.6	86.8	O K
360 min Winter	59.657	0.157	0.0	0.6	0.6	93.3	O K
480 min Winter	59.664	0.164	0.0	0.6	0.6	97.6	O K
600 min Winter	59.669	0.169	0.0	0.6	0.6	100.4	O K
720 min Winter	59.672	0.172	0.0	0.6	0.6	102.3	O K
960 min Winter	59.676	0.176	0.0	0.6	0.6	104.3	O K
1440 min Winter	59.676	0.176	0.0	0.6	0.6	104.6	O K
2160 min Winter	59.673	0.173	0.0	0.6	0.6	102.8	O K
2880 min Winter	59.669	0.169	0.0	0.6	0.6	100.3	O K
4320 min Winter	59.658	0.158	0.0	0.6	0.6	93.6	O K
5760 min Winter	59.646	0.146	0.0	0.6	0.6	86.5	O K
7200 min Winter	59.634	0.134	0.0	0.5	0.5	79.6	O K
8640 min Winter	59.623	0.123	0.0	0.5	0.5	73.2	O K
10080 min Winter	59.613	0.113	0.0	0.5	0.5	67.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.090	0.0	140.2	5216
10080 min Summer	0.961	0.0	138.7	5992
15 min Winter	131.351	0.0	19.4	99
30 min Winter	86.314	0.0	26.3	109
60 min Winter	54.074	0.0	48.7	128
120 min Winter	32.762	0.0	59.2	170
180 min Winter	24.128	0.0	64.5	216
240 min Winter	19.312	0.0	67.7	266
360 min Winter	14.018	0.0	71.5	376
480 min Winter	11.175	0.0	73.8	488
600 min Winter	9.366	0.0	75.2	602
720 min Winter	8.105	0.0	76.1	716
960 min Winter	6.446	0.0	76.6	940
1440 min Winter	4.660	0.0	74.9	1360
2160 min Winter	3.364	0.0	126.7	1688
2880 min Winter	2.667	0.0	128.1	2148
4320 min Winter	1.920	0.0	121.8	3044
5760 min Winter	1.519	0.0	158.8	3920
7200 min Winter	1.266	0.0	161.2	4760
8640 min Winter	1.090	0.0	161.8	5552
10080 min Winter	0.961	0.0	160.6	6360

©1982-2018 Innovyze

Cascade Rainfall Details for Block A Blue Roof 1 in 100yr +40%.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Green Roof

Area (m³)	1550	Evaporation (mm/day)	3
Depression Storage (mm)	5	Decay Coefficient	0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.028167	32	36	0.005687	64	68	0.001148	96	100	0.000232
4	8	0.023061	36	40	0.004656	68	72	0.000940	100	104	0.000190
8	12	0.018881	40	44	0.003812	72	76	0.000770	104	108	0.000155
12	16	0.015458	44	48	0.003121	76	80	0.000630	108	112	0.000127
16	20	0.012656	48	52	0.002555	80	84	0.000516	112	116	0.000104
20	24	0.010362	52	56	0.002092	84	88	0.000422	116	120	0.000085
24	28	0.008484	56	60	0.001713	88	92	0.000346			
28	32	0.006946	60	64	0.001402	92	96	0.000283			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block A Blue Roof 1 in 100yr +40%.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	625.0	625.0	0.201	0.0	645.0
0.200	625.0	645.0			

Orifice Outflow Control

Diameter (m) 0.027 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block B Blue Roof 1 in 100yr +40%.srcx

Upstream Structures	Outflow To	Overflow To
(None)	Geocellular storage crate tanks 1 in 100yr +40%.srcx	(None)

Half Drain Time : 4135 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.544	0.044	0.0	0.2	0.2	41.6	O K
30 min Summer	59.561	0.061	0.0	0.2	0.2	58.3	O K
60 min Summer	59.580	0.080	0.0	0.3	0.3	75.9	O K
120 min Summer	59.599	0.099	0.0	0.3	0.3	94.1	O K
180 min Summer	59.610	0.110	0.0	0.3	0.3	104.7	O K
240 min Summer	59.618	0.118	0.0	0.3	0.3	111.9	O K
360 min Summer	59.628	0.128	0.0	0.3	0.3	121.4	O K
480 min Summer	59.635	0.135	0.0	0.4	0.4	128.2	O K
600 min Summer	59.640	0.140	0.0	0.4	0.4	133.2	O K
720 min Summer	59.644	0.144	0.0	0.4	0.4	137.1	O K
960 min Summer	59.650	0.150	0.0	0.4	0.4	142.7	O K
1440 min Summer	59.656	0.156	0.0	0.4	0.4	148.6	O K
2160 min Summer	59.659	0.159	0.0	0.4	0.4	151.0	O K
2880 min Summer	59.658	0.158	0.0	0.4	0.4	150.2	O K
4320 min Summer	59.656	0.156	0.0	0.4	0.4	147.9	O K
5760 min Summer	59.653	0.153	0.0	0.4	0.4	144.9	O K
7200 min Summer	59.649	0.149	0.0	0.4	0.4	141.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.351	0.0	13.8	111
30 min Summer	86.314	0.0	17.5	121
60 min Summer	54.074	0.0	37.8	140
120 min Summer	32.762	0.0	43.4	180
180 min Summer	24.128	0.0	46.2	228
240 min Summer	19.312	0.0	47.9	282
360 min Summer	14.018	0.0	49.8	394
480 min Summer	11.175	0.0	50.8	508
600 min Summer	9.366	0.0	51.3	624
720 min Summer	8.105	0.0	51.5	740
960 min Summer	6.446	0.0	51.1	976
1440 min Summer	4.660	0.0	48.9	1448
2160 min Summer	3.364	0.0	98.9	2160
2880 min Summer	2.667	0.0	95.9	2564
4320 min Summer	1.920	0.0	86.1	3276
5760 min Summer	1.519	0.0	164.9	4048
7200 min Summer	1.266	0.0	159.1	4896

©1982-2018 Innovyze

Cascade Summary of Results for Block B Blue Roof 1 in 100yr +40%.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.644	0.144	0.0	0.4	0.4	137.2	O K
10080 min Summer	59.640	0.140	0.0	0.4	0.4	133.1	O K
15 min Winter	59.551	0.051	0.0	0.2	0.2	48.0	O K
30 min Winter	59.570	0.070	0.0	0.2	0.2	66.7	O K
60 min Winter	59.591	0.091	0.0	0.3	0.3	86.5	O K
120 min Winter	59.613	0.113	0.0	0.3	0.3	106.9	O K
180 min Winter	59.625	0.125	0.0	0.3	0.3	118.8	O K
240 min Winter	59.634	0.134	0.0	0.4	0.4	126.9	O K
360 min Winter	59.645	0.145	0.0	0.4	0.4	137.7	O K
480 min Winter	59.653	0.153	0.0	0.4	0.4	145.5	O K
600 min Winter	59.659	0.159	0.0	0.4	0.4	151.3	O K
720 min Winter	59.664	0.164	0.0	0.4	0.4	155.8	O K
960 min Winter	59.671	0.171	0.0	0.4	0.4	162.4	O K
1440 min Winter	59.679	0.179	0.0	0.4	0.4	169.6	O K
2160 min Winter	59.683	0.183	0.0	0.4	0.4	173.4	O K
2880 min Winter	59.682	0.182	0.0	0.4	0.4	173.1	O K
4320 min Winter	59.678	0.178	0.0	0.4	0.4	168.8	O K
5760 min Winter	59.673	0.173	0.0	0.4	0.4	164.4	O K
7200 min Winter	59.667	0.167	0.0	0.4	0.4	158.9	O K
8640 min Winter	59.661	0.161	0.0	0.4	0.4	153.0	O K
10080 min Winter	59.655	0.155	0.0	0.4	0.4	146.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.090	0.0	151.1	5712
10080 min Summer	0.961	0.0	141.2	6504
15 min Winter	131.351	0.0	15.3	112
30 min Winter	86.314	0.0	19.1	122
60 min Winter	54.074	0.0	41.4	140
120 min Winter	32.762	0.0	47.2	182
180 min Winter	24.128	0.0	50.1	228
240 min Winter	19.312	0.0	51.9	280
360 min Winter	14.018	0.0	53.8	390
480 min Winter	11.175	0.0	54.9	502
600 min Winter	9.366	0.0	55.4	616
720 min Winter	8.105	0.0	55.6	730
960 min Winter	6.446	0.0	55.3	960
1440 min Winter	4.660	0.0	53.1	1422
2160 min Winter	3.364	0.0	107.8	2096
2880 min Winter	2.667	0.0	104.7	2740
4320 min Winter	1.920	0.0	94.5	3436
5760 min Winter	1.519	0.0	183.5	4344
7200 min Winter	1.266	0.0	177.2	5264
8640 min Winter	1.090	0.0	168.6	6160
10080 min Winter	0.961	0.0	158.1	7064

©1982-2018 Innovyze

Cascade Rainfall Details for Block B Blue Roof 1 in 100yr +40%.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Green Roof

Area (m³)	2200	Evaporation (mm/day)	3
Depression Storage (mm)	5	Decay Coefficient	0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.039978	32	36	0.008071	64	68	0.001630	96	100	0.000329
4	8	0.032731	36	40	0.006608	68	72	0.001334	100	104	0.000269
8	12	0.026798	40	44	0.005410	72	76	0.001092	104	108	0.000221
12	16	0.021941	44	48	0.004430	76	80	0.000894	108	112	0.000181
16	20	0.017963	48	52	0.003627	80	84	0.000732	112	116	0.000148
20	24	0.014707	52	56	0.002969	84	88	0.000599	116	120	0.000121
24	28	0.012041	56	60	0.002431	88	92	0.000491			
28	32	0.009859	60	64	0.001990	92	96	0.000402			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block B Blue Roof 1 in 100yr +40%.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1000.0	1000.0	0.201	0.0	1028.0
0.200	1000.0	1028.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block C Blue Roof 1 in 100yr +40%.srcx

Upstream Structures | **Outflow To** | **Overflow To**

(None) Geocellular storage crate tanks 1 in 100yr +40%.srcx (None)

Half Drain Time : 6314 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.538	0.038	0.0	0.2	0.2	57.2	O K
30 min Summer	59.553	0.053	0.0	0.2	0.2	80.1	O K
60 min Summer	59.569	0.069	0.0	0.2	0.2	104.2	O K
120 min Summer	59.585	0.085	0.0	0.3	0.3	129.2	O K
180 min Summer	59.595	0.095	0.0	0.3	0.3	143.8	O K
240 min Summer	59.601	0.101	0.0	0.3	0.3	153.9	O K
360 min Summer	59.610	0.110	0.0	0.3	0.3	167.4	O K
480 min Summer	59.617	0.117	0.0	0.3	0.3	177.3	O K
600 min Summer	59.622	0.122	0.0	0.3	0.3	184.8	O K
720 min Summer	59.626	0.126	0.0	0.3	0.3	190.8	O K
960 min Summer	59.631	0.131	0.0	0.4	0.4	199.7	O K
1440 min Summer	59.639	0.139	0.0	0.4	0.4	210.6	O K
2160 min Summer	59.643	0.143	0.0	0.4	0.4	218.0	O K
2880 min Summer	59.645	0.145	0.0	0.4	0.4	220.0	O K
4320 min Summer	59.643	0.143	0.0	0.4	0.4	217.7	O K
5760 min Summer	59.641	0.141	0.0	0.4	0.4	214.5	O K
7200 min Summer	59.639	0.139	0.0	0.4	0.4	210.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.351	0.0	12.8	116
30 min Summer	86.314	0.0	16.3	126
60 min Summer	54.074	0.0	36.7	144
120 min Summer	32.762	0.0	41.8	184
180 min Summer	24.128	0.0	44.4	234
240 min Summer	19.312	0.0	45.9	288
360 min Summer	14.018	0.0	47.6	400
480 min Summer	11.175	0.0	48.4	514
600 min Summer	9.366	0.0	48.8	630
720 min Summer	8.105	0.0	48.9	746
960 min Summer	6.446	0.0	48.5	982
1440 min Summer	4.660	0.0	46.2	1454
2160 min Summer	3.364	0.0	97.0	2168
2880 min Summer	2.667	0.0	93.3	2884
4320 min Summer	1.920	0.0	82.8	3740
5760 min Summer	1.519	0.0	173.3	4472
7200 min Summer	1.266	0.0	164.7	5208

©1982-2018 Innovyze

Cascade Summary of Results for Block C Blue Roof 1 in 100yr +40%.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.636	0.136	0.0	0.4	0.4	206.8	O K
10080 min Summer	59.633	0.133	0.0	0.4	0.4	202.5	O K
15 min Winter	59.543	0.043	0.0	0.2	0.2	65.9	O K
30 min Winter	59.560	0.060	0.0	0.2	0.2	91.6	O K
60 min Winter	59.578	0.078	0.0	0.3	0.3	118.7	O K
120 min Winter	59.597	0.097	0.0	0.3	0.3	146.7	O K
180 min Winter	59.607	0.107	0.0	0.3	0.3	163.2	O K
240 min Winter	59.615	0.115	0.0	0.3	0.3	174.5	O K
360 min Winter	59.625	0.125	0.0	0.3	0.3	189.8	O K
480 min Winter	59.632	0.132	0.0	0.4	0.4	201.1	O K
600 min Winter	59.638	0.138	0.0	0.4	0.4	209.7	O K
720 min Winter	59.642	0.142	0.0	0.4	0.4	216.6	O K
960 min Winter	59.649	0.149	0.0	0.4	0.4	226.9	O K
1440 min Winter	59.658	0.158	0.0	0.4	0.4	239.7	O K
2160 min Winter	59.664	0.164	0.0	0.4	0.4	249.1	O K
2880 min Winter	59.666	0.166	0.0	0.4	0.4	252.5	O K
4320 min Winter	59.665	0.165	0.0	0.4	0.4	251.1	O K
5760 min Winter	59.662	0.162	0.0	0.4	0.4	245.6	O K
7200 min Winter	59.658	0.158	0.0	0.4	0.4	240.8	O K
8640 min Winter	59.655	0.155	0.0	0.4	0.4	235.2	O K
10080 min Winter	59.651	0.151	0.0	0.4	0.4	229.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.090	0.0	154.3	6048
10080 min Summer	0.961	0.0	142.6	6864
15 min Winter	131.351	0.0	14.3	118
30 min Winter	86.314	0.0	17.9	127
60 min Winter	54.074	0.0	40.0	146
120 min Winter	32.762	0.0	45.3	186
180 min Winter	24.128	0.0	48.0	234
240 min Winter	19.312	0.0	49.6	286
360 min Winter	14.018	0.0	51.4	396
480 min Winter	11.175	0.0	52.3	508
600 min Winter	9.366	0.0	52.7	622
720 min Winter	8.105	0.0	52.8	736
960 min Winter	6.446	0.0	52.4	968
1440 min Winter	4.660	0.0	50.0	1432
2160 min Winter	3.364	0.0	105.3	2124
2880 min Winter	2.667	0.0	101.6	2800
4320 min Winter	1.920	0.0	90.8	4084
5760 min Winter	1.519	0.0	191.0	4680
7200 min Winter	1.266	0.0	182.1	5552
8640 min Winter	1.090	0.0	171.3	6488
10080 min Winter	0.961	0.0	159.0	7384

©1982-2018 Innovyze

Cascade Rainfall Details for Block C Blue Roof 1 in 100yr +40%.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Green Roof

Area (m³) 3000 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.054516	32	36	0.011007	64	68	0.002222	96	100	0.000449
4	8	0.044634	36	40	0.009011	68	72	0.001819	100	104	0.000367
8	12	0.036543	40	44	0.007378	72	76	0.001490	104	108	0.000301
12	16	0.029919	44	48	0.006041	76	80	0.001220	108	112	0.000246
16	20	0.024496	48	52	0.004946	80	84	0.000998	112	116	0.000202
20	24	0.020055	52	56	0.004049	84	88	0.000817	116	120	0.000165
24	28	0.016420	56	60	0.003315	88	92	0.000669			
28	32	0.013443	60	64	0.002714	92	96	0.000548			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block C Blue Roof 1 in 100yr +40%.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1600.0	1600.0	0.201	0.0	1632.0
0.200	1600.0	1632.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Block D Blue Roof 1 in 100yr +40%.srcx

Upstream Structures | **Outflow To** | **Overflow To**

(None) Geocellular storage crate tanks 1 in 100yr +40%.srcx (None)

Half Drain Time : 2943 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	59.548	0.048	0.0	0.2	0.2	31.9	O K
30 min Summer	59.567	0.067	0.0	0.2	0.2	44.7	O K
60 min Summer	59.588	0.088	0.0	0.3	0.3	58.3	O K
120 min Summer	59.609	0.109	0.0	0.3	0.3	72.2	O K
180 min Summer	59.621	0.121	0.0	0.3	0.3	80.2	O K
240 min Summer	59.629	0.129	0.0	0.3	0.3	85.6	O K
360 min Summer	59.639	0.139	0.0	0.4	0.4	92.6	O K
480 min Summer	59.647	0.147	0.0	0.4	0.4	97.5	O K
600 min Summer	59.652	0.152	0.0	0.4	0.4	101.0	O K
720 min Summer	59.656	0.156	0.0	0.4	0.4	103.6	O K
960 min Summer	59.661	0.161	0.0	0.4	0.4	107.1	O K
1440 min Summer	59.665	0.165	0.0	0.4	0.4	110.0	O K
2160 min Summer	59.665	0.165	0.0	0.4	0.4	109.9	O K
2880 min Summer	59.664	0.164	0.0	0.4	0.4	109.2	O K
4320 min Summer	59.660	0.160	0.0	0.4	0.4	106.7	O K
5760 min Summer	59.656	0.156	0.0	0.4	0.4	103.4	O K
7200 min Summer	59.650	0.150	0.0	0.4	0.4	99.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.351	0.0	14.0	106
30 min Summer	86.314	0.0	17.8	117
60 min Summer	54.074	0.0	37.2	136
120 min Summer	32.762	0.0	43.1	176
180 min Summer	24.128	0.0	46.0	224
240 min Summer	19.312	0.0	47.9	276
360 min Summer	14.018	0.0	49.9	388
480 min Summer	11.175	0.0	51.1	502
600 min Summer	9.366	0.0	51.7	618
720 min Summer	8.105	0.0	52.0	736
960 min Summer	6.446	0.0	51.9	970
1440 min Summer	4.660	0.0	49.9	1444
2160 min Summer	3.364	0.0	96.1	1912
2880 min Summer	2.667	0.0	94.1	2276
4320 min Summer	1.920	0.0	85.7	3040
5760 min Summer	1.519	0.0	144.7	3864
7200 min Summer	1.266	0.0	143.5	4688

©1982-2018 Innovyze

Cascade Summary of Results for Block D Blue Roof 1 in 100yr +40%.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	59.644	0.144	0.0	0.4	0.4	95.9	O K
10080 min Summer	59.638	0.138	0.0	0.4	0.4	92.1	O K
15 min Winter	59.555	0.055	0.0	0.2	0.2	36.8	O K
30 min Winter	59.577	0.077	0.0	0.3	0.3	51.2	O K
60 min Winter	59.600	0.100	0.0	0.3	0.3	66.4	O K
120 min Winter	59.623	0.123	0.0	0.3	0.3	82.0	O K
180 min Winter	59.637	0.137	0.0	0.4	0.4	91.1	O K
240 min Winter	59.646	0.146	0.0	0.4	0.4	97.2	O K
360 min Winter	59.658	0.158	0.0	0.4	0.4	105.1	O K
480 min Winter	59.667	0.167	0.0	0.4	0.4	110.8	O K
600 min Winter	59.673	0.173	0.0	0.4	0.4	114.8	O K
720 min Winter	59.677	0.177	0.0	0.4	0.4	117.9	O K
960 min Winter	59.684	0.184	0.0	0.4	0.4	122.1	O K
1440 min Winter	59.689	0.189	0.0	0.4	0.4	125.9	O K
2160 min Winter	59.690	0.190	0.0	0.4	0.4	126.5	O K
2880 min Winter	59.687	0.187	0.0	0.4	0.4	124.5	O K
4320 min Winter	59.682	0.182	0.0	0.4	0.4	120.8	O K
5760 min Winter	59.674	0.174	0.0	0.4	0.4	115.7	O K
7200 min Winter	59.665	0.165	0.0	0.4	0.4	110.0	O K
8640 min Winter	59.657	0.157	0.0	0.4	0.4	104.3	O K
10080 min Winter	59.649	0.149	0.0	0.4	0.4	98.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.090	0.0	139.2	5496
10080 min Summer	0.961	0.0	132.2	6328
15 min Winter	131.351	0.0	15.6	107
30 min Winter	86.314	0.0	19.5	118
60 min Winter	54.074	0.0	40.9	136
120 min Winter	32.762	0.0	47.0	178
180 min Winter	24.128	0.0	50.1	224
240 min Winter	19.312	0.0	52.0	276
360 min Winter	14.018	0.0	54.1	384
480 min Winter	11.175	0.0	55.4	496
600 min Winter	9.366	0.0	56.1	610
720 min Winter	8.105	0.0	56.4	724
960 min Winter	6.446	0.0	56.2	954
1440 min Winter	4.660	0.0	54.2	1410
2160 min Winter	3.364	0.0	105.4	2056
2880 min Winter	2.667	0.0	103.1	2380
4320 min Winter	1.920	0.0	94.3	3256
5760 min Winter	1.519	0.0	164.2	4168
7200 min Winter	1.266	0.0	162.2	5064
8640 min Winter	1.090	0.0	156.8	5960
10080 min Winter	0.961	0.0	149.0	6776

©1982-2018 Innovyze

Cascade Rainfall Details for Block D Blue Roof 1 in 100yr +40%.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Green Roof

Area (m³) 1700 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.030892	32	36	0.006237	64	68	0.001259	96	100	0.000254
4	8	0.025293	36	40	0.005106	68	72	0.001031	100	104	0.000208
8	12	0.020708	40	44	0.004181	72	76	0.000844	104	108	0.000170
12	16	0.016954	44	48	0.003423	76	80	0.000691	108	112	0.000140
16	20	0.013881	48	52	0.002802	80	84	0.000566	112	116	0.000114
20	24	0.011365	52	56	0.002294	84	88	0.000463	116	120	0.000094
24	28	0.009305	56	60	0.001879	88	92	0.000379			
28	32	0.007618	60	64	0.001538	92	96	0.000311			

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

©1982-2018 Innovyze

Cascade Model Details for Block D Blue Roof 1 in 100yr +40%.srcx

Storage is Online Cover Level (m) 60.000

Cellular Storage Structure

Invert Level (m) 59.500 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	700.0	700.0	0.201	0.0	722.0
0.200	700.0	722.0			

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 59.500

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 100yr +40%.srcx

Upstream Structures	Outflow To	Overflow To
Block A Blue Roof 1 in 100yr +40%.srcx	(None)	(None)
Block B Blue Roof 1 in 100yr +40%.srcx		
Block C Blue Roof 1 in 100yr +40%.srcx		
Block D Blue Roof 1 in 100yr +40%.srcx		

Half Drain Time : 1012 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	37.284	0.134	0.0	3.8	3.8	179.5	O K
30 min Summer	37.325	0.175	0.0	3.8	3.8	234.0	O K
60 min Summer	37.366	0.216	0.0	3.9	3.9	289.4	O K
120 min Summer	37.405	0.255	0.0	4.0	4.0	342.2	O K
180 min Summer	37.426	0.276	0.0	4.0	4.0	369.6	O K
240 min Summer	37.438	0.288	0.0	4.0	4.0	386.2	O K
360 min Summer	37.451	0.301	0.0	4.1	4.1	403.6	O K
480 min Summer	37.458	0.308	0.0	4.1	4.1	412.5	O K
600 min Summer	37.460	0.310	0.0	4.1	4.1	415.8	O K
720 min Summer	37.460	0.310	0.0	4.1	4.1	415.7	O K
960 min Summer	37.455	0.305	0.0	4.1	4.1	409.0	O K
1440 min Summer	37.442	0.292	0.0	4.1	4.1	391.5	O K
2160 min Summer	37.425	0.275	0.0	4.0	4.0	368.4	O K
2880 min Summer	37.411	0.261	0.0	4.0	4.0	349.2	O K
4320 min Summer	37.384	0.234	0.0	4.0	4.0	314.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	131.351	0.0	240.0	19
30 min Summer	86.314	0.0	315.5	34
60 min Summer	54.074	0.0	455.9	64
120 min Summer	32.762	0.0	546.6	124
180 min Summer	24.128	0.0	598.3	184
240 min Summer	19.312	0.0	633.8	242
360 min Summer	14.018	0.0	658.7	362
480 min Summer	11.175	0.0	662.6	482
600 min Summer	9.366	0.0	664.9	602
720 min Summer	8.105	0.0	666.1	722
960 min Summer	6.446	0.0	666.0	962
1440 min Summer	4.660	0.0	651.0	1428
2160 min Summer	3.364	0.0	1080.5	1752
2880 min Summer	2.667	0.0	1112.1	2132
4320 min Summer	1.920	0.0	1099.0	2936

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 100yr +40%.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
5760 min Summer	37.359	0.209	0.0	3.9	3.9	280.3	O K
7200 min Summer	37.335	0.185	0.0	3.9	3.9	247.9	O K
8640 min Summer	37.312	0.162	0.0	3.8	3.8	217.0	O K
10080 min Summer	37.290	0.140	0.0	3.8	3.8	188.1	O K
15 min Winter	37.300	0.150	0.0	3.8	3.8	201.5	O K
30 min Winter	37.346	0.196	0.0	3.9	3.9	263.0	O K
60 min Winter	37.393	0.243	0.0	4.0	4.0	325.5	O K
120 min Winter	37.439	0.289	0.0	4.0	4.0	386.7	O K
180 min Winter	37.463	0.313	0.0	4.1	4.1	419.2	O K
240 min Winter	37.478	0.328	0.0	4.1	4.1	439.4	O K
360 min Winter	37.495	0.345	0.0	4.1	4.1	462.1	O K
480 min Winter	37.505	0.355	0.0	4.2	4.2	475.4	O K
600 min Winter	37.510	0.360	0.0	4.2	4.2	482.7	O K
720 min Winter	37.513	0.363	0.0	4.2	4.2	486.0	O K
960 min Winter	37.512	0.362	0.0	4.2	4.2	485.5	O K
1440 min Winter	37.500	0.350	0.0	4.2	4.2	469.4	O K
2160 min Winter	37.480	0.330	0.0	4.1	4.1	442.2	O K
2880 min Winter	37.459	0.309	0.0	4.1	4.1	414.4	O K
4320 min Winter	37.423	0.273	0.0	4.0	4.0	365.1	O K
5760 min Winter	37.386	0.236	0.0	4.0	4.0	316.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
5760 min Summer	1.519	0.0	1435.0	3744
7200 min Summer	1.266	0.0	1455.0	4544
8640 min Summer	1.090	0.0	1461.3	5360
10080 min Summer	0.961	0.0	1455.9	6144
15 min Winter	131.351	0.0	269.6	19
30 min Winter	86.314	0.0	321.7	33
60 min Winter	54.074	0.0	508.5	64
120 min Winter	32.762	0.0	608.0	122
180 min Winter	24.128	0.0	658.6	180
240 min Winter	19.312	0.0	664.4	240
360 min Winter	14.018	0.0	671.2	358
480 min Winter	11.175	0.0	675.2	474
600 min Winter	9.366	0.0	677.3	590
720 min Winter	8.105	0.0	678.2	708
960 min Winter	6.446	0.0	677.2	936
1440 min Winter	4.660	0.0	668.2	1386
2160 min Winter	3.364	0.0	1202.1	2028
2880 min Winter	2.667	0.0	1238.2	2304
4320 min Winter	1.920	0.0	1153.8	3200
5760 min Winter	1.519	0.0	1609.7	4096

©1982-2018 Innovyze

Cascade Summary of Results for Geocellular storage crate tanks 1 in 100yr +40%.srcx

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
7200 min Winter	37.351	0.201	0.0	3.9	3.9	268.6	O K
8640 min Winter	37.317	0.167	0.0	3.8	3.8	223.6	O K
10080 min Winter	37.286	0.136	0.0	3.8	3.8	181.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
7200 min Winter	1.266	0.0	1632.8	4968
8640 min Winter	1.090	0.0	1640.8	5792
10080 min Winter	0.961	0.0	1636.4	6560

©1982-2018 Innovyze

Cascade Rainfall Details for Geocellular storage crate tanks 1 in 100yr +40%.srcx

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.100	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.745

Time From:	(mins) To:	Area (ha)
0	4	0.745

©1982-2018 Innovyze

Cascade Model Details for Geocellular storage crate tanks 1 in 100yr +40%.srcx

Storage is Online Cover Level (m) 38.400

Complex Structure

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Cellular Storage

Invert Level (m) 37.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	470.0	470.0	0.501	0.0	527.0
0.500	470.0	527.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SCU-0061-4400-1300-4400
Design Head (m)	1.300
Design Flow (l/s)	4.4
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	61
Invert Level (m)	36.350
Minimum Outlet Pipe Diameter (mm)	75

©1982-2018 Innovyze

Hydro-Brake® Optimum Outflow Control

Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	4.4
Flush-Flo™	0.092	1.3
Kick-Flo®	0.092	1.3
Mean Flow over Head Range	-	3.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	4.2	3.000	6.5	7.000	9.8
0.200	1.9	1.400	4.6	3.500	7.0	7.500	10.1
0.300	2.2	1.600	4.8	4.000	7.5	8.000	10.4
0.400	2.6	1.800	5.1	4.500	7.9	8.500	10.7
0.500	2.8	2.000	5.4	5.000	8.3	9.000	11.0
0.600	3.1	2.200	5.6	5.500	8.7	9.500	11.3
0.800	3.5	2.400	5.9	6.000	9.1		
1.000	3.9	2.600	6.1	6.500	9.4		

©1982-2018 Innovyze

APPENDIX K
SUDS IMPLEMENTATION & MAINTENANCE PLANS

SUDS IMPLEMENTATION PLAN

READING STATION SHOPPING PARK

READING

1.1 This SuDS Implementation Plan sets out measures to be implemented during construction of the surface water drainage system for the scheme to ensure the site and areas downstream are protected from runoff during construction of the development. It is recommended that the plan is incorporated into the Contractors Construction Health and Safety Plan with the development carried out in accordance with the measures proposed.

1.2 During construction, it is normal practice for a drainage system to be installed at an early stage in the programme. However, it is not always possible to ensure that impermeable areas created as part of the development are immediately connected to the new drainage system.

1.3 It may not always be possible to ensure that new impermeable areas are immediately connected to the drainage system. Therefore, the following additional measures should be implemented to ensure construction runoff is appropriately managed:

- Protective coverings should be used to help prevent runoff stripping material stockpiles.

- Plant and wheel washing should take place in a designated location. The area should be tanked and not allowed to discharge into the drainage system or infiltrate into the ground. Effluent should be treated as contaminated waste and disposed off site by a licensed waste management operator.

- Surfaces used as access roads and storage areas during construction should be swept regularly to prevent the accumulation of dust and mud.

- Should groundwater be encountered in excavations such water should not be discharged to the drainage system until the amount of suspended solids has been reduced though the controlled use of skips or tanks, which will act as stilling basins.

- To prevent contamination associated with the use of oils and hydrocarbons during construction, the Contractor should ensure that the following precautionary measures are employed during construction:

  - Regular maintenance of machinery and plant.
  - Use of drip trays.
  - Regular checking of machinery and plant for oil leaks.
  - Use of correct storage facilities.
  - Regular checks for signs of wear and tear on tanks.
  - Specific procedures are followed when refuelling.
  - Use of a designated area for refuelling.
  - Emergency spill kit to be located near refuelling area.
  - Regular emptying of bunds.
  - Tanks should be located in secure areas to stop vandalism.

1.4 The above measures would help to ensure that untreated construction runoff would not be discharged to the surface water drainage system.

1.5 The use of permeable paving will require changes to conventional construction practices and procedures used for traditional car parking and other paved areas, which during the initial stages of the development are often used as access roads and storage areas. Together with runoff from the construction site, which can be heavily laden with silt, such activities are likely to block the permeable paving system, therefore, the following measures would be implemented to address the issue

- Installation of the permeable paving would be carried out at the end of the development programme, when most construction activities are complete, thus minimising the risk of clogging.

- Should it be necessary to construct areas of porous surfacing at an early stage in the construction programme, an impermeable layer of Dense Bitumen Macadam (DBM) would be laid beneath the surfacing materials to act as a temporary road surface. When most construction activities are complete, holes would be punched through the impermeable layer with final surfacing laid.

1.6 During construction all components of the drainage system should be constructed in accordance with relevant drawings, specifications and manufacturer's guidelines. Further to this Building Control should visit site on a regular basis to inspect completed works and ensure that the drainage system is installed correctly.

SUDS MAINTENACNE & MANAGEMENT PLAN

READING STATION SHOPPING PARK

READING

1.1 This Drainage Management and Maintenance Plan provides details of the plan proposed for maintenance and management of the proposed drainage / SuDS components.

1.2 It is recommended that each element of the proposed drainage system is maintained in accordance with the regime set out in the tables below.

Table 1: Below Ground Drainage System - Operation and Maintenance Requirements

Maintenance schedule	Required action	Frequency
Regular maintenance	Remove all litter and debris from external hard landscaped areas and adjacent landscaping, which may pose a risk to the performance of the system.	Monthly.
	Remove build-up of sediment / silt in catch-pits and dispose of oils / petrol residues using safe standard practices.	As required.
	Stabilise and mow adjacent landscaped areas and remove weeds.	
Remedial actions	Repair or rehabilitate inlet and outlets to ensure they are in good condition and operating as designed.	
	Remediate any landscaping, which has raised to within 50mm of the level of adjacent hard landscaping.	
Monitoring	Check of all inlets / outlets for blockages or evidence of physical damage with any necessary remedial action or clearance carried out if required.	On a monthly basis for the first 3 months of operation, thereafter every 6 months & following severe rainfall events.
	Inspect all surfaces for ponding, or silt accumulation. Record areas where water is ponding for more than 48 hours and carry out any remedial work deemed necessary.	After severe storms.

Table 2: Green Roof - Operation and Maintenance Requirements

Maintenance schedule	Required action	Frequency
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth.	Every 6 months / annually or as required.
	During establishment (ie year one), replace dead plants as required.	Monthly.
	Post establishment, replace dead plants as required.	Annually (in autumn).
	Remove fallen leaves and debris from deciduous plant foliage.	Every 6 months or as required.
	Remove nuisance and invasive vegetation, including weeds.	
	Mow grasses (if appropriate) as required. Clippings must be removed and not allowed to accumulate.	
Remedial actions	If erosion channels are evident, these should be stabilised with additional soil substrate similar to the original material. Sources of erosion damage must be identified and controlled.	As required.
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate.	
Monitoring	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes, and roof structure for proper operation, integrity of waterproofing and structural stability	Annually / after severe storms.
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources.	
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system.	
	Inspect underside of roof for evidence of leakage	

Table 3: Permeable Paving - Operation and Maintenance Requirements

Maintenance schedule	Required action	Frequency
Regular maintenance	Remove all litter and debris from drained surfaces areas and adjacent hard / soft landscaping, which may pose a risk to the performance of the system.	Monthly.
	Sweep permeable paved areas. If necessary use jet wash or suction sweeper. Any jointing aggregate lost from the joints must be replaced as necessary with 2/6.3mm single sized aggregate, brushed into joints.	Three times a year at end of winter, mid-summer, after autumn leaf fall, or as required based on site-specific observations of clogging.
	Stabilise and mow adjacent landscaped areas and remove weeds.	As required.
Remedial actions	Remediate any landscaping, which has raised to within 50mm of the level of adjacent hard landscaping.	
	Carry out remedial work to any depressions, rutting and cracked or broken paving blocks within the permeable paved areas that are considered detrimental to the structural performance or a hazard to users.	
	Carry out repair / rehabilitation works to inlets, outlets, overflows and vents.	
Monitoring	Inspect silt accumulation rates within the permeable paved areas and establish appropriate brushing frequencies.	Annually.
	Check of all inlets, outlets, overflows and vents for blockages or evidence of physical damage with any necessary remedial action or clearance carried out if required.	On a monthly basis for the first 3 months of operation, thereafter every 6 months & following severe rainfall events.
	Inspect and identify any areas that are not operating correctly	On a monthly basis for the first 3 months of operation, thereafter every 6 months & following severe rainfall events.

Table 4: Geocellular Storage Tanks / Soakaways - Operation and Maintenance Requirements

Maintenance schedule	Required action	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for first 3 months of operation, then every 6 months.
	Debris removal from catchment surface (where may cause risks to performance).	Monthly.
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly / after severe storms.
	Remove sediment from pre-treatment structures.	Annually, or as required.
Remedial actions	Repair/rehabilitation of inlets, outlet, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually and after large storms.

Table 5: Flow Control Chamber - Operation and Maintenance Requirements

Maintenance schedule	Required action	Frequency
Regular maintenance	Cleaning off the flow control device of any debris/ sediment	As required
Remedial Actions	Flow control device repairs.	As required
	Repair of erosion damage, or damage to chamber.	
Monitoring	Inspection of the chamber for debris and sediment build up.	Monthly for first 3 months, thereafter, every 6 months and following severe storm events.

Table 6: Bioretention Systems - Operation and Maintenance Requirements

Maintenance schedule	Required action	Frequency
Regular maintenance	Remove litter and surface debris and weeds	Quarterly
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial Actions	Remove and replace filter and vegetation above	As required but likely to be > 20 years
Monitoring	Inspect infiltration surface for silting and ponding time, record de-watering time of the facility	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly

4 PROPOSED DEVELOPMENT DESCRIPTION

Introduction

4.1 This chapter of the ES provides a description of the proposed development for the purposes of identifying and assessing the potential environmental impacts and likely environmental effects of the proposed development in the technical assessments of ES Volume 1 (Chapters 6-10) and ES Volume 2 (Chapters 1-2).

4.2 In accordance with the EIA Regulations, this chapter sets out the physical characteristics of the built development, the proposed access and egress arrangements, the landscaping strategy, utility requirements and estimated emissions and arisings.

4.3 A general description of the application site is provided in ES Chapter 1: Introduction, with more detailed descriptions provided in each technical assessment within ES Volume 1 and ES Volume 2, and is therefore not repeated here.

4.4 Further detailed information on the proposed development can be found within the following planning application documents:

- Design and Access Statement;
- Planning Statement;
- Development Parameters (Schedule and Plans);
- Design Code;
- Energy Strategy; and
- Utilities Strategy.

Proposed Development Description

4.5 As mentioned in ES Chapter 1: Introduction, the Applicant is submitting an outline planning application to enable the redevelopment of the application site. The application seeks permission for the following:

"Outline planning permission with the details of access, appearance, landscaping, layout and scale reserved for later determination. Demolition and redevelopment to comprise: up to [115,000] sqm GEA in one or more land uses comprising: Residential (Class C3 and including PRS); Offices (Use Class B1(a); development in Use Classes A1, A2, A3 (retail), A4 (public house), A5 (take away), C1 (hotel), D1 and D2 (community and leisure); car parking; provision of new plant and renewable energy equipment; creation of servicing areas and provision of associated services, including waste, refuse, cycle storage, and lighting; and for the laying out of the buildings; routes and open spaces within the development; and all associated works and operations including but not limited to: demolition; earthworks; provision of attenuation infrastructure; engineering operations. All development, works and operations to be in accordance with the approved Development Parameters Schedule and Plans."

4.6 The proposed development would comprise:

- Demolition of the existing buildings on the application site;
- Below ground excavation necessary for below ground surface water attenuation;
- Construction of up to four new buildings, up to approximately 112.9 meters above ordnance datum (m AOD);
- Delivery of a total maximum floorspace of up to 115,000 m^2 gross external area (GEA), which could include:
  - up to a maximum of 1,000 new residential units within a maximum floorspace of up to 100,000 m^2 GEA, provided within a range of apartment buildings of varying scale and a mix of unit sizes, including a proportion of affordable homes;
  - up to a maximum floorspace of 6,000 m^2 GEA flexible retail, leisure and community uses (Use Class A1-A5, D1-D2);
  - up to a maximum floorspace of 115,000 m^2 GEA office use (Use Class B1a);
  - up to a maximum floorspace of 7,000 m^2 GEA hotel use (Use Class C1);
- Delivery of up to 62 car parking spaces for blue badge and car club spaces;
- Delivery of cycle storage in line with current policy requirements; and
- Delivery of a mix of public and private open space, including children's playspace, equivalent to a minimum of 10 % of the application site area.

4.7 As the proposed development could be brought forward in a number of different forms within the extent of the minimum and maximum use class parameters, the EIA has been undertaken on the basis of adopting a 'worst-case' assessment approach, as described in ES Chapter 2: EIA Process and Methodology.

4.8 Given the degree of flexibility being sought at this outline stage, the proposed development could come forward in a range of different ways at the detailed design stage, including:

- A non-residential scheme delivering up to 115,000 m^2 GEA with one or more land uses comprising B1a, C1, A1-A5, D1-D2; or
- A residential-led scheme delivering up to 115,000 m^2 GEA including up to 100,000 m^2 GEA C3 land use with the remainder comprising one or more of B1a, C1, A1-A5, D1-D2; or
- A mixed-use scheme delivering up to 115,000 m^2 GEA including a mix of land uses comprising C3, B1a, C1, A1-A5, D1-D2.

4.9 The detailed layout, scale, appearance and landscaping of the proposed development would be subject to reserved matters submissions. Accordingly, for these matters, maximum parameters have been set within which the reserved matters applications (RMAs) would be brought forward.

4.10 The Development Parameters define the overall quantum and nature of the proposed development and provide a controlling set of design guidelines in relation to each plot, residential unit numbers and mix, within which the reserved matters would be brought forward. The RMAs must therefore accord with the development parameters. That is how the methodology used in this ES will be validated.

4.11 The Development Parameters that have been assumed for the EIA are outlined in Table 4.1 and are presented in Figures 4.1 – 4.7.

Table 4.1: Schedule of Parameter Plans

Dwg No.	Name	Description
PP-100 – Development Footprint (see Figure 4.1)	Development Footprint	Definition of the developable area within which the proposed development would be delivered, inclusive of buildings, landscaping and open space.
PP-101 – Site Access & Egress (see Figure 4.6)	Site Access & Egress	Definition of areas which site access and egress would be provided

Table 4.1: Schedule of Parameter Plans		
Dwg No.	**Name**	**Description**
PP-102 – Building Plots (see Figure 4.2)	Building Plots	Areas within which each plot would be delivered on the application site
PP-103 – Plot Heights Non-residential Use (see Figure 4.3)	Plot Heights Non-residential Use	Maximum heights of plots if non-residential uses were to be brought forward
PP-104 – Plot Heights Residential Use (see Figure 4.4)	Plot Heights Residential Use	Maximum heights of plots if residential uses were to be brought forward
PP-105 – Plot Heights Mixed Use (see Figure 4.5)	Plot Heights Mixed Use	Maximum heights of plots if a mix of uses were to be brought forward
PP-106 – Basement Footprint (see Figure 4.7)	Basement Footprint	Zones which could provide excavation for below ground flood attenuation

Site Arrangement and Land Use

4.12 The proposed development would be developed within the Development Footprint area shown in Figure 4.1 (Parameter Plan 100).

4.13 The arrangement of the proposed development across the application site is shown in Figure 4.2 (Parameter Plan 102). The proposed development would comprise four Plots (A-D). The Plots would comprise a maximum floorspace of 115,000 m^2.

Land Use Distribution

4.14 Figure 4.2 (PP-102) defines the maximum extents of Plots A-D. Table 4.2 describes the minimum separation distances between the Plots.

Table 4.2: Minimum Separation Distances between Development Plots			
Minimum Separate Distance Category	**Residential to Non-Residential**	**Residential to Residential**	**Non-Residential to Non-Residential**
Window to Window	20 m	20 m	15 m
Balcony to Balcony	n/a	16 m	n/a
Balcony to Window	18 m	18 m	n/a

4.15 There would be a minimum separation distance of 15 m between Plots to define the North-South routes when non-residential use is proposed on adjacent Plots. In the event that at least one of the adjacent Plots is developed for residential use, this distance would increase to 20 m to ensure privacy for residents.

4.16 The North-South route between Plots C and D links the town centre to the river, and would form part of the route of the proposed 'Kennet-Thames Spine'. This link is considered an important pedestrian thoroughfare and in this location the minimum permitted separation distances between Plots, irrespective of use, would be 23 m.

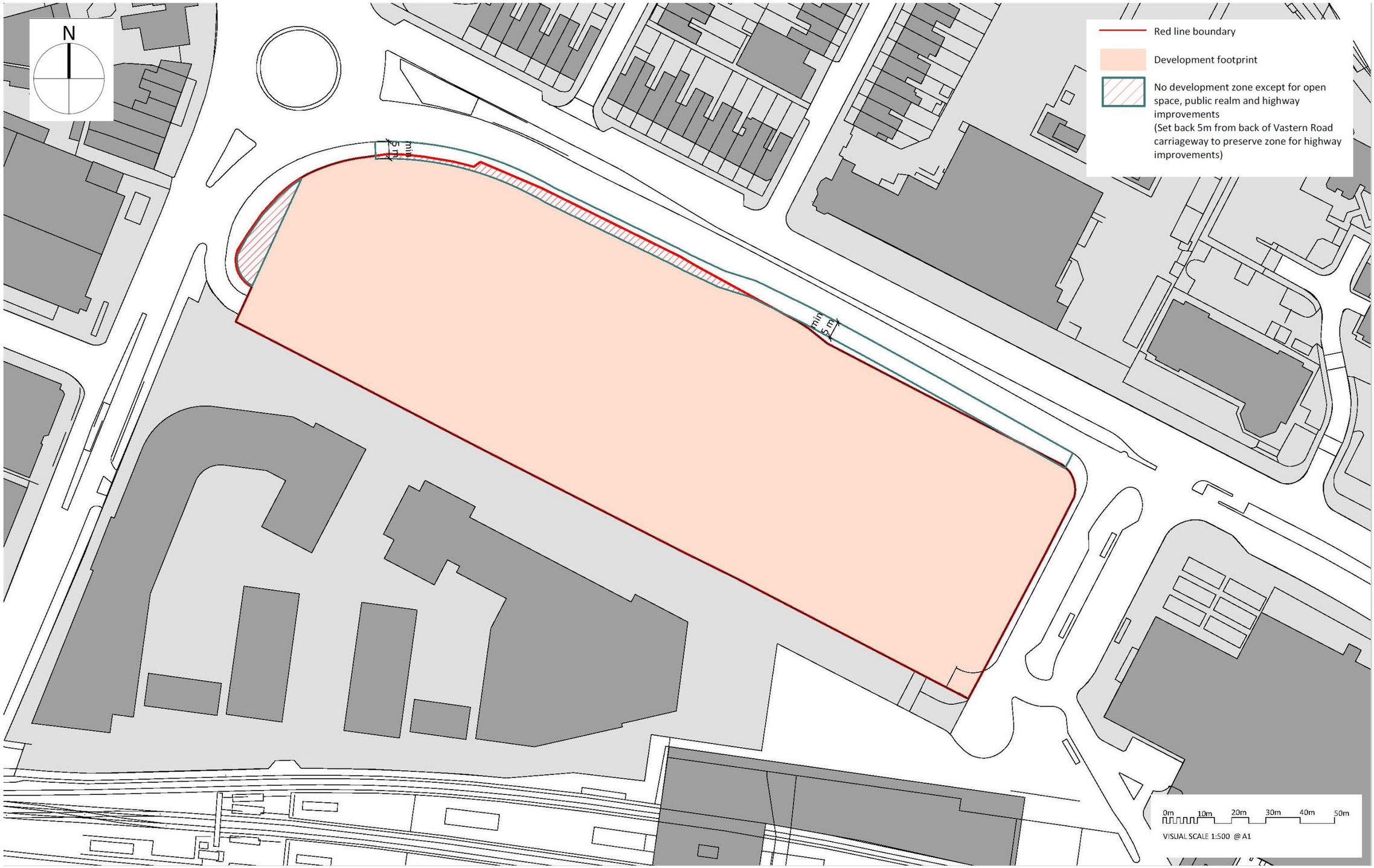


Figure 4.1: Parameter Plan 100 – Development Footprint

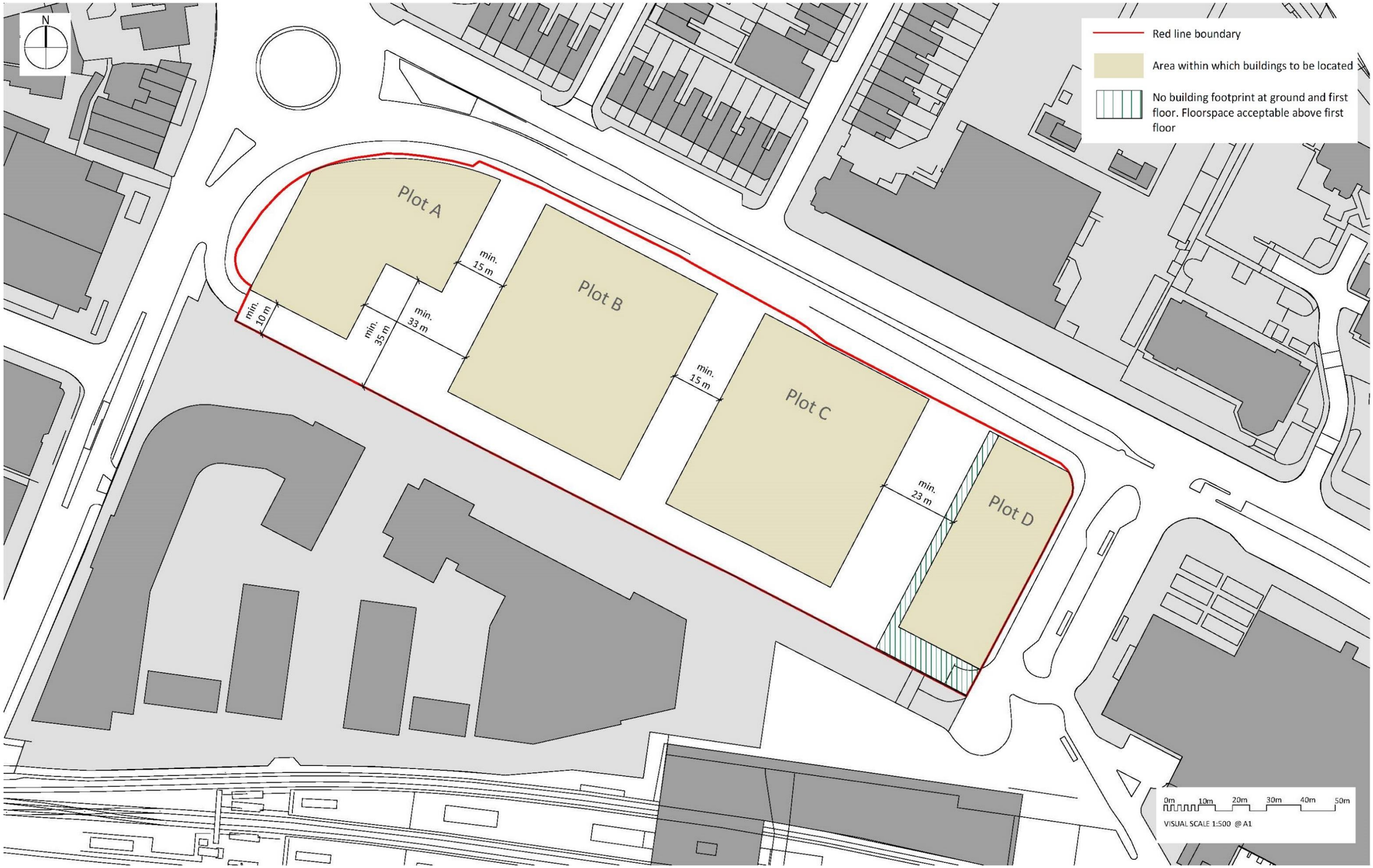


Figure 4.2: Parameter Plan 102 – Building Plot Allocation (Non-Residential)

Quantum and Use Classes

4.17 The total floorspace provided by the proposed development would not be more than 115,000 m^2 GEA. Table 4.3 outlines the minimum and maximum floorspace by Use Class which could be brought forward in order to achieve the overall maximum GEA of 115,000 m^2.

Table 4.3: Minimum and Maximum Floorspace by Land Use

Use Class		Plot A	Plot B	Plot C	Plot D	Total GEA
C3 Residential Units	Minimum	0	0	0	0	0
	Maximum	18,500	23,500	27,800	30,200	100,000
B1a Offices	Minimum	0	0	0	0	0
	Maximum	20,000	31,000	35,000	29,000	115,000
C1 Hotel	Minimum	0	0	0	0	0
	Maximum	8,000	8,000	8,000	8,000	8,000
A1-A5, D1-D2	Minimum	2,000				2,000
	Maximum	7,000	7,000	7,000	7,000	7,000

Residential Unit Mix and Tenure

4.18 The proposed development could deliver up to 1,000 residential units. Residential dwellings would be provided through a range of apartments ranging from studio to 2+ bedroom apartments. The proposed tenure has been assumed to be the following for the purposes of the EIA:

- a minimum of 40 % studio and 1 bedroom apartments;
- a maximum of 60 % studio and 1 bedroom apartments; and
- a maximum of 60 % 2+ bedroom apartments shall be provided.

4.19 Of the residential units to be delivered, some would be affordable housing.

4.20 Should any of the non-residential land uses be brought forward, this would comprise one or more of the uses outlined within Table 4.3.

Built Form, Height and Massing

4.21 The maximum height of the proposed buildings with Plots A – D would depend on whether they are developed for 'residential use', or 'non-residential use', or a combination of the two in a 'mixed use'.

4.22 The maximum height of each Plot is defined in Figures 4.3 - 4.5 (PP-103 - PP-105). All roof plant and structures would be provided within the maximum height. Table 4.4 summarises the maximum height for each plot within the application site according to the potential future land use type.

Table 4.4: Maximum Plot Heights

Plot	Maximum Height Non-Residential Use	Maximum Height Residential Use	Maximum Height Mixed Use
A	83 m AOD	94.4 m AOD	94.4 m AOD
B	83 m AOD	92.8 m AOD	92.8 m AOD
C	87 m AOD	94.4 m AOD	94.4 m AOD
D	112.9 m AOD	112.9 m AOD	112.9 m AOD

4.23 It should be noted that these heights represent a maximum within which the detailed proposals would come forward and therefore do not represent the actual form in which the proposed development is likely to be delivered.

4.24 The Design Code makes commitments in respect of how the built form, height and massing could be delivered at the detailed design stage to facilitate a high quality and landmark development.



Figure 4.3: Parameter Plan 103 - Building Maximum Heights for Non-Residential Use



Figure 4.4: Parameter Plan 104 - Building Maximum Heights for Residential Use



Figure 4.5: Parameter Plan 105 - Building Maximum Heights for Mixed Use

Material Palette and Façade Detailing

4.25 For the proposed development, different options have been selected in respect of materiality, architectural style and detailing, to be implemented through the Design Code.

4.26 The Design Code states that the design of the buildings would be coherent and familial throughout the proposed development. All buildings would share key elements such as materials, colour, proportion or graphic elements that provide a uniform appearance. The main materials for facades would be brick, concrete, wood, glass, metal.

Open Space and Public Realm

4.27 The proposed development would provide 10 % of the application site area (0.177 hectares) for Open Space provision. Within that area, no built development would be permitted other than:

- Hard and soft landscaping;
- Public realm;
- Amenity spaces (inclusive of playspace provision);
- Structural planting;
- Footpaths and cycleways and their associated apparatus;
- Creations of roads and footpaths in order to provide connections for the built development; and
- Creation of ecological habitats (including landscape planting with known biodiversity value, trees, hedges and shrubs).

4.28 The Design Code makes commitments in respect of delivering a high quality design in order to create a distinct sense of place.

Landscape and Biodiversity Enhancement

4.29 At this outline stage, the precise habitats, species mix, locations and areas of landscape planting are not yet fixed and would be confirmed at the detailed design stage and would be subject to reserved matters applications.

4.30 The proposed development would result in the loss of 15 trees. The majority of the tree removals from within the application site are of relatively low amenity value. The most significant tree removals would be on the boundary of the Vastern Road. Trees, especially mature specimens on the boundary of the application site, would be retained wherever possible as per advice provided in the Arboriculture Impact Assessment that accompanies the application.

4.31 Proposed tree planting would strengthen and enhance the characteristics of the existing tree stock and appropriate species would be selected to complement the application site.

Lighting

4.32 As stated in the Design Code, the proposed development would deliver appropriately designed external lighting to ensure a safe environment for site users. Any external lighting would comply with the Institute of Lighting Professionals, Guidance Notes for the Reduction of Obtrusive Light GN01:2011[1]. The proposed development would also seek to minimise upwards light and obtrusive light and avoid light spill onto trees, hedges and bird and bat boxes wherever possible.

Access and Egress

4.33 The Access and Egress parameter plan (PP-101), as shown in Figure 4.6, outlines the proposed site access and egress points for the proposed development.

Vehicular Access

4.34 The main access point to the proposed development would be off Caversham Road via the existing access to the application site on the western site boundary, shown as Zone A in PP-101 on Figure 4.6.

4.35 A separate point of vehicular egress would be provided on to Vastern Road, in a similar type of arrangement to the existing, allowing only left-turn (westbound) movements out of the application site, shown as Zone B in PP-101 in Figure 4.6. Traffic heading east from the application site would need to make a U-turn at the Caversham Road / Vastern Road roundabout.

4.36 The internal roads would provide access to the small amount of car parking proposed and also provide access for service/delivery vehicles. The internal road layout and arrangement would be confirmed at the detailed design stage.

Pedestrian and Cycle Access

4.37 The proposed development would provide pedestrian and cycle access through the application site. Pedestrians and cyclists would access the application site from Caversham Road, Trooper Potts Way, and Vastern Road. As indicated in the Design Code, the internal layout would be designed to give priority to pedestrian and cycle movement through the provision of shared surfaces, surface treatments and landscaping provision.

4.38 It is understood that a new pedestrian/cycle crossing on Vastern Road is being sought by RBC in conjunction with this and also the Scottish and Southern Energy (SSE) development opposite to the north. The precise location of the crossing has yet to be determined.

Emergency Vehicle Access

4.39 Emergency vehicles would be able to access and navigate the proposed development using the same access and egress points, and internal road network as discussed above.

Parking

Car Parking

4.40 The number of parking spaces would be determined as part of an RMA. However, for the purposes of the EIA, it has been assumed that a maximum of 50 Blue Badge spaces would be provided for the potential residential uses, with four additional Blue Badge spaces assumed for each of the non-residential uses (office, retail, hotel), totalling a maximum of 62 spaces (100 % Blue Badge). The RBC's Blue Badge parking requirements are set out in their 'Parking Standards and Design' SPG[2]. However, the quantum for the various land uses is expressed in relation to the total number of ordinary spaces, which, in the case of the application site, would be zero. However, it is stated that all developments should provide a minimum of three disabled spaces and therefore the proposed provision exceeds this minimum requirement.

[1] Institute of Lighting Professionals, 2011. Guidance Notes for Reduction of Obtrusive Light.

[2] Reading Borough Local Development Framework, 2011. Revised Parking Standards and Design. RBC 2011.

Cycle Parking

4.41 The proposed development would provide cycle parking in accordance with the adopted standards present at the time of making a Reserved Matters submission. The RBC's current standards would require 0.5 - 1 space per unit for flats; for B1 office it is 1 space per 200 m^2 Ground Floor Area (GFA), whilst for retail it is generally one space per six staff plus one space per 300 m^2 GFA. For hotels the standard is one space per six staff.

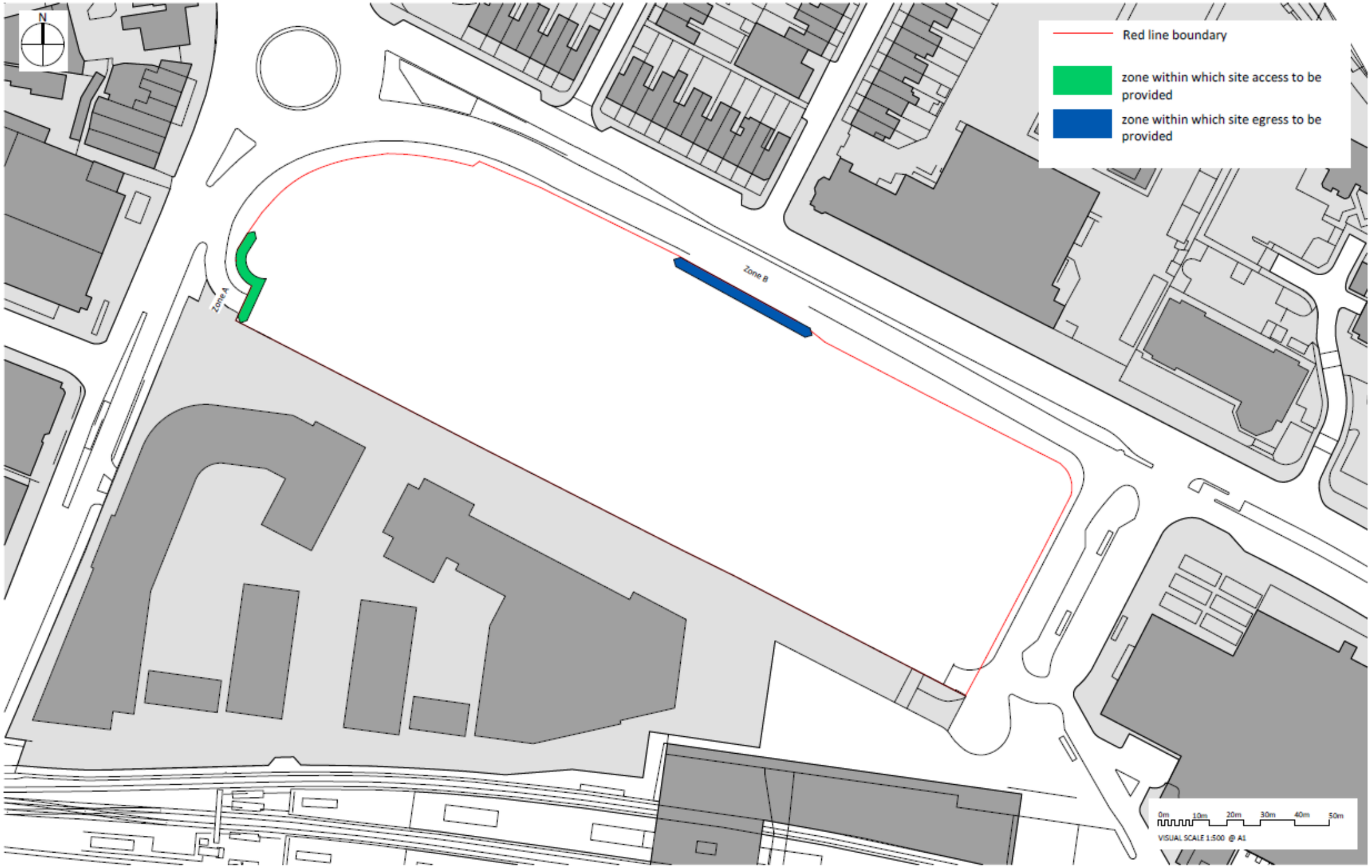


Figure 4.6: Parameter Plan 101 - Proposed Site Access and Egress

Servicing and Deliveries

4.42 All servicing and deliveries would be accommodated within the site through a combination of dedicated loading bays and/or informal on-street loading/unloading. Servicing and delivery vehicles would access the proposed development in the same way as other traffic i.e. in via Caversham Road and out via Vastern Road. In the event that the proposed development comes forward as either a mixed-use or residential scheme, the layout would be designed such that delivery vehicles would be able to get sufficiently close to the residential cores, whilst adequate turning space would be provided for refuse vehicles etc.

Waste Management

Waste Arisings

4.43 The total estimated waste arising for the proposed development has been calculated in accordance with good practice guidance and is detailed in the Operational Waste Management Plan (OWMP) that accompanies the planning application.

4.44 Due to the outline nature of the application and the range of floor areas that could be delivered as part of the scheme, waste arisings were calculated for three potential schemes: a residential led scheme; and commercial-led scheme; and a mixed-use scheme. Through this exercise, it was calculated that the worst-case scenario for waste arisings would be the commercial-led scheme.

4.45 To illustrate a worst-case scenario, it was assumed that a maximum of 7,000 m^2 of A3 land use would be delivered as A3 land uses (food and drink establishments) are likely to give rise to the highest volumes of waste per m^2 of floor area. The estimated waste arisings for the various scenarios considered, including the commercial scenario, are shown in Table 4.5.

Table 4.5: Worst Case Proposed Development Waste Arisings

Land Use	Floor Area	Weekly Waste Arisings (L)			
		Residual	MDR*	Food	Total
Scenario 1 - Residential					
Residential (1,000 units)	400 x 1 Bed	20,000	20,000	2,000	42,000
	600 x 2 Bed	51,000	51,000	3,000	105,000
B1 Office	8,000 m^2 GEA (6,460 m^2 NIA)	13,458	13,458	n/a	26,917
A3	7,000 m^2 GEA (5,652.5 m^2 NIA)	70,656	28,263	42,394	141,312
Total					315,229
Scenario 2 - Commercial					
Residential	0	0	0	0	0
B1 Office	108,000 GEA (87,210 m^2 NIA)	181,688	181,688	n/a	363,375
A3	7,000 m^2 GEA (5,652.5 m^2 NIA)	70,656	28,263	42,394	141,312
Total					504,687
Scenario 3 – Mixed Use					
Residential (500 units)	200 x 1 Bed	10,000	10,000	1,000	21,000
	300 x 2 Bed	25,500	25,500	1,500	52,500

Table 4.5: Worst Case Proposed Development Waste Arisings

Land Use	Floor Area	Weekly Waste Arisings (L)			
		Residual	MDR*	Food	Total
B1 Office	54,000 m^2 GEA (43,605 m^2 NIA)	90,844	90,844	n/a	181,688
A3	7,000 m^2 GEA (5,652.5 m^2 NIA)	70,656	28,263	42,394	141,312
Total					396,500

*Mixed-dry recyclables (MDR)

4.46 The estimates provided in the Table 4.5 are for illustrative purposes and show that the volume and composition of waste varies greatly according to the proposed land uses. Furthermore, wastes from retail and offices would differ further in their composition with the office being mainly paper waste, whereas the retail waste is likely to be mostly packaging and possibly some food residues. Restaurants and food establishments generate a substantial proportion of food waste.

4.47 The strategy for disposing, storing and collecting waste would be determined at the detailed design stage and a detailed Operational Waste Strategy will accompany the RMAs. This strategy is to be secured by means of an appropriately worded planning condition.

4.48 Due to the large quantities of waste likely to be generated by the proposed development it is likely that waste would require compaction on-site prior to collection. Compacting waste into bins allows a direct reduction of the number of bins requiring collection and therefore reduces the storage space required, as well as the time required to service developments.

4.49 Each individual housing unit and business unit would be required to sort their waste internally into the following categories:

- Dry Mixed Recycling;
- Organic Waste (Food and Garden); and
- Mixed Non-Recycling Waste.

4.50 All waste will be managed in accordance with the requirements of British Standard 5906:2005 Waste Management in Buildings, Code of Practice (BS 5906:2005), Part H6 of the Building Regulations (2010) and RBC Waste Management Guidance. The proposed development would be designed to be compliant with all relevant waste management policy and to encourage a high level of reuse and recycling. These commitments would be secured by means of an appropriately worded planning condition.

Plant and Ventilation

Heating

Residential

4.51 Each of the residential blocks would have their own centralised heating and cooling system located at roof level. The proposed system utilises air to water based heat pumps to serve an energy loop passing throughout the building to serve each residential apartment. Within each apartment, an individual heat pump system would provide heating/cooling along with domestic hot water utilising the energy loop as the prime energy source. Final delivery of heating and cooling within each apartment would be by radiators and fan convectors.

Non-residential

4.52 A similar system would be adopted for the non-residential buildings, with the exception of, using a fan coil unit as the emitter for the commercial areas to provide heating and cooling instead of a radiator.

Cooling and Ventilation

Residential

4.53 Each of the residential apartments would be fitted with openable windows; the specification of which would be determined during detailed design and informed by the noise assessment within this ES. In addition, residential units would be designed to be dual aspect in nature and to permit through ventilation. All apartments would also have openable windows to improve the circulation of clean-air though each of the units.

Non-Residential

4.54 In the event of a non-residential development, mechanical ventilation would be provided to the offices. A number of air handling units would be provided to serve each block independently. Each air handling unit would be complete with a thermal wheel to provide heat recovery and benefit from the free heat generated by the proposed development. Tempered air would be provided to each office floor from the air handling units by a range of galvanized ductwork passing through the building. The air handling units would be located at roof level and each plot would have stand-alone units. The intake and exhaust ductwork would be suitably located to ensure there is no re-circulation or near external pollutants.

Utilities

Electricity

4.55 The main electrical point of connection (POC) to each block would be from proposed new SSE (Scottish and Southern Electricity Network) substations located around the application site. These connections would be in addition to the existing supplies which would be retained to provide temporary power during construction.

4.56 The electrical demand of the proposed development would be 9 MVA, which exceeds the existing supply and therefore upgrade works to the electricity network would be required for the proposed development in order to meet the future electrical demand.

Gas

4.57 Gas is not proposed for the proposed development.

Water

Potable Water

4.58 The point of connection for the water supply would be located along Vastern Road, taken from the existing Thames Water owned water main.

4.59 The water demand of the proposed development would be calculated through the size and number of the proposed residential units. Upgrade work may be required for the proposed development to the existing local mains and this would be subject to detailed development. As is standard practice, ongoing consultations would be undertaken with Thames Water to agree the necessary scope of works.

Foul Water

4.60 It is proposed that foul flows from the development are drained into a traditional below ground network of gravity drained pipework prior to discharging to the existing Thames Water foul sewer which currently serves the application site. Where the sewer is located within the application site and affected by the development proposals it would be diverted via agreement with Thames Water.

4.61 Consultation with Thames Water based on initial development proposals established modelling and potential off-site improvement works would be required to ensure the receiving sewer could accommodate the increase in foul flows. As is standard practice, ongoing consultations would be undertaken to agree the necessary scope of works.

Surface Water Management

4.62 The results of the FRA concludes that there are a number of SuDS options that are feasible within the proposed development to limit surface water flows to a peak flow rate of 3.5 litres per second (l/s), providing a significant reduction in comparison to pre-development rates from the application site.

4.63 The surface water discharged from the proposed development would be limited as close as practically possible to greenfield runoff rates and discharged via gravity to a culverted watercourse located south-east of the application site.

4.64 The SuDS measures to be incorporated into the proposed development would comprise:

- Green / blue roofs;
- Below ground geocellular attenuation tanks;
- Permeable paving; and
- Filter strips, Tree pits / Bioretention systems.

4.65 Three geocellular attenuation tanks are proposed to store and attenuate surface water flows for all storm events up to and including the 1 in 100 year + 40 % allowance for increase in peak rainfall intensity over the lifetime of the development. The locations of these are not set but would be positioned below areas of landscaping within the areas shown in Figure 4.7 (Parameter Plan 106).

4.66 All car parking areas would comprise of permeable paving, whilst surface water runoff generated from access roads would be managed by filter strips, tree pits / bioretention systems where possible, which in turn would discharge to the below ground network of surface water drainage.

4.67 Attenuated flows would be restricted by a Hydrobrake flow control device which would be fitted within a catchpit manhole prior to discharging flows to the culverted watercourse.

4.68 The SuDS proposals would provide high levels of treatment to surface water runoff generated from roof areas and parking / access roads, which would improve the quality of runoff discharged to the culverted watercourse. Furthermore, the SuDS proposals would assist in maximising and enhancing amenity and biodiversity potential across the application site.

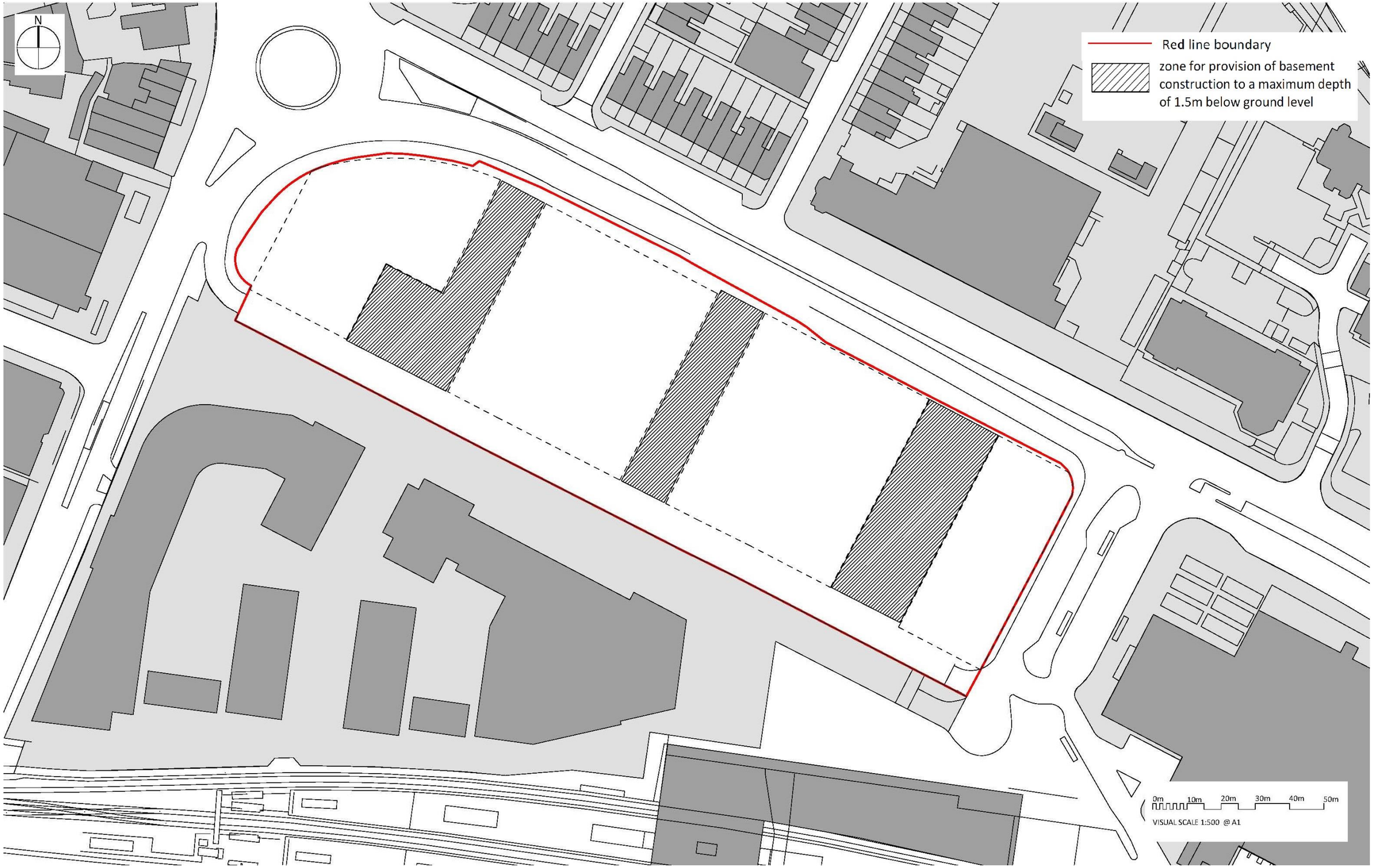


Figure 4.7: Parameter Plan 106 - Excavation Zone for Below Ground Attenuation

Resources, Emissions and Residues

Resource Use

Energy

4.69 A Residential Energy Strategy and a Non-Residential Energy Strategy are accompanying the application and demonstrates how the proposed development would use passive and low energy design technologies to reduce baseline energy demand and CO_2 emissions followed by the application of low and zero carbon technologies.

4.70 The energy strategies have been designed in accordance with the following energy efficiency hierarchy:

- Lean: Maximise passive design to minimise energy usage: return on investment.
- Clean: Ensure any technologies added into the building are efficient and well designed.
- Green: Once development has been as efficient as possible through passive design, less renewables are required to achieve the energy benchmark, therefore reducing capital cost.

4.71 The residential energy strategy would achieve a 35% CO2 emission reduction against the Building Regulations Approved Document L2A : 2013 baseline. The non-residential energy strategy would exceed the Building Regulations 2013 compliant baseline scheme by 15.59%.

Potable Water

4.72 The residential units would have water efficient sanitary fittings installed to meet a water consumption rate of 110 litre (l) or less per person per day.

Materials

4.73 During the detailed design and RMA stages, material optimisation and opportunities to promote a circular economy would be considered as part of the proposed development. Where feasible, the design team would prioritise materials that:

- have a low embodied energy, including those that can be re-used intact or recycled at the end of their useful life and therefore support the circular economy in construction;
- achieve a rating of A+ to D in the BRE's The Green Guide for key building elements - external walls, windows roof, upper floor slabs, internal walls, floor finishes / coverings;
- can be sustainably sourced: 100 % of timber and timber products should be sourced from accredited Forest Stewardship Council (FSC) or Programme for the Endorsement of forestry Certification (PEFC) source; materials that are BES6001 (min very good) where possible or ISO14001 certified;
- are durable to cater for their level of use and exposure; and
- will not release toxins into the internal and external environment, including those that deplete the earth's stratospheric ozone layer.

4.74 Material efficiencies would be integrated with the waste hierarchy principles, identifying opportunities to reuse existing materials and reducing construction waste.

4.75 The opportunity to locally source materials would be investigated during the detailed design stage.

4.76 Durable materials would be sought to reduce degradation and reduce the need to use additional materials over the proposed development's lifetime.

4.77 These commitments would be secured by means of an appropriately worded planning condition.

Emissions

To Air

4.78 The proposed development would target an overall 15 % reduction in Regulated CO_2 emissions through energy efficiency measures using hybrid evaporative free cooling and future provision of district heating network.

4.79 Operational air emissions would primarily arise from road traffic. These are summarised in Chapter 7: Air Quality.

To Sewers and Water

4.80 An FRA has been undertaken for the proposed development which includes an assessment of surface water runoff. The results of the FRA were used to inform and ensure measures for reduced surface water runoff were integrated into the design of the proposed development. The total maximum surface water discharge rate for the proposed development as a whole would be 4.2 litres per second (l/s).

4.81 All proposed buildings would be connected to a traditional network of below ground gravity drained pipework for the discharge of foul water. The existing foul sewer where affected within the site would be diverted under agreement with Thames Water, whilst the existing outfall from the site along Trooper Potts Way would be retained and utilised via the construction of a new manhole.

4.82 In total, the proposed development would have a maximum peak foul water flow of approximately 42.0 l/s; however this would be subject to the final selected development uses.

4.83 Thames Water have advised modelling and potential off-site reinforcement works could be required to ensure the foul flows from the proposed development could be accommodated within the foul sewer network. As is standard practice, ongoing consultations would be undertaken to agree the necessary scope of works.

To Land

4.84 No routine emissions to land are anticipated with the operational stage of the proposed development.

Sustainability Proposals

4.85 The sustainability strategy follows the hierarchy set by Reading Policy which incorporates the principals of Lean, Clean and Green to demonstrate the methods to reduce the carbon emissions from the proposed development.

4.86 At this stage, three development options are presented within the parameters mix-use, office or residential scheme options.

4.87 The following energy efficiency measures would be incorporated into the selected scenario:

- Enhancing the building fabric envelope thermal performance by introducing thermal insulation to achieve lower capacity heating systems thereby reducing energy consumption;
- Providing new high performance glazing in order to reduce solar heat gains thereby lowering the size of cooling plant and hence reducing energy consumption and CO_2 emissions for the operational building;
- Selecting high efficiency plant together with using high efficiency motors serving pumps, compressors and fans;
- Heat recovery within the ventilation plant;
- Increasing the size of air and water distribution ductwork and pipework in order to reduce the system resistance thereby allowing smaller pump and fan motors to be used reducing energy consumption;
- Increasing the thermal insulation performance on distribution pipework and ductwork to reduce standing heat losses/gains;
- Providing occupancy detection and automatic daylight dimming within the office area lighting control system;

- Using variable speed drive motors serving pumps and fans that allows the flow rates to be varied to match the building requirements reducing energy consumption;
- Using low energy high efficiency lamp sources;
- Maximising the use of daylighting within the building; and
- Improving building air leakage.

4.88 These measures would be secured by means of an appropriate worded planning condition.

Operational Provisions and Controls

Operational Management

4.89 As is standard practice, open space and public amenity areas would be managed and maintained by the landowner(s).

4.90 Aspects of operational management incorporated into the residential and non-residential uses would include technological and Integrated Electronic Security Systems, such as closed-circuit television (CCTV) cameras.

Emergency and Disaster Management

4.91 During the detailed design and RMA stages, consideration would be given to the following:

- Fire: All internal roads within the proposed development would be accessible by emergency vehicles and all buildings would be designed to be compliant with relevant Fire Safety Regulations;
- Flooding:
  - All finished floor levels would be at least 0.15 m above adjacent external ground levels;
  - The external ground profile around buildings would, where possible, be designed such that surface water would be directed away from buildings;
  - Extensive landscaping would be introduced at the detailed design stage which would reduce run-off rates; and
  - A combination of SuDS features would be used throughout the proposed development in order to minimise the rate of discharge and volume of runoff. SuDS features proposed for the proposed development would potentially include: green roofs; soakaways/infiltration trenches and filter drains; permeable paving; and swales and basins.

Travel Plan

4.92 As part of the proposed development, the Applicant has developed an Interim Travel Plan to encourage the use of non-car modes of travel and ensure the sustainability of the proposed development.

4.93 The Travel Plan would provide a package of measures to encourage commercial users, staff and residents to use alternatives to single-occupancy car-use. The measures are as follows:

- Provision of secure cycle parking for residents, staff and visitors;
- Regular monitoring of cycle parking use;
- Provision of a 'car-lite' development which would have 100 % Blue Badge parking spaces;
- Promotion of flexible working arrangements.

4.94 Furthermore, the Interim Travel Plan proposes marketing and awareness raising strategies which would be implemented, namely:

- Distribution of Travel Information Packs (TIP) to all future residents and employees of the proposed development (to include maps, public transport routes and frequencies and details of local amenities); and
- Display of Travel Plan posters and leaflets in reception areas, public notice boards and communal areas.

4.95 An Interim Travel Plan will be submitted alongside the planning application. The Final Travel Plan would be secured by means of an appropriately worded planning condition.

Delivery and Servicing Management Plan

4.96 A Delivery and Servicing Management Plan (DSMP) would be developed at the reserved matters stage. The objective of the DSMPs would be to manage deliveries and servicing to the application site in order to ensure efficient and successful operations (including refuse storage and collection). Effective management would ensure that the potential for vehicle conflicts is avoided and that the proposed development would have the minimum impact on both the surrounding highway network and pedestrian network.

4.97 The DSMPs will include details such as where deliveries and servicing would be undertaken from, who would be responsible for ensuring operations run effectively, what size vehicles are anticipated to require access and what frequency of vehicle movements are expected and would be secured by an appropriately worded planning condition.

Technical Appendix 2.5: Historic Environment Assessment

Reading Station Shopping Centre
Vastern Road
Reading
RG1 8AL

Historic Environment Assessment

NGR 471426 174045

Sign-off history

issue no.	Issue date	Prepared by	Reviewed by	Project Manager	Notes
1	16/12/2019	Ashley Blair (Archaeology) Judit Peresztegi (Graphics)	Christina Holloway (Project Manager)	Christina Holloway	Issue to client
2	20/12/2019	Christina Holloway	–	Christina Holloway	Re-issued for Ramboll comments

MOLA code: P19-143

www.mola.org.uk
© MOLA
Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED
tel 0207 410 2200 email: business@mola.org.uk
Museum of London Archaeology is a company limited by guarantee
Registered in England and Wales
Company registration number 07751831 Charity registration number 1143574
Registered office Mortimer Wheeler House, 46 Eagle Wharf Road, London N1 7ED

Contents

Executive summary 1

1 Introduction 2
1.1 Origin and scope of the report 2
1.2 Designated heritage assets 2
1.3 Aims and objectives 3

2 Methodology and sources consulted 4
2.1 Sources 4
2.2 Methodology 4

3 The site: topography and geology 6
3.1 Site location 6
3.2 Topography 6
3.3 Geology 6

4 Archaeological and historical background 8
4.1 Overview of past investigations 8
4.2 Chronological summary 8

5 Statement of significance 12
5.1 Introduction 12
5.2 Factors affecting archaeological survival 12
5.3 Archaeological potential and significance 12

6 Impact of proposals 14
6.1 Proposals 14
6.2 Implications 14

7 Conclusion and recommendations 15

8 Gazetteer of known historic environment assets 17

9 Planning framework 26
9.1 Statutory protection 26
9.2 National Planning Policy Framework 26
9.3 Local planning policy 28

10 Determining significance 30

11 Non-archaeological constraints 31

12 Glossary 32

13 Bibliography 34
13.1 Published and documentary sources 34
13.2 Other Sources 34
13.3 Cartographic sources 34
13.4 Available site survey information checklist 35

Figures

Cover: Ordnance Survey 1":mile map of 1830 (not to scale)

Fig 1 Site location

Fig 2 Historic environment features map

Fig 3 Historic British Geological Survey (BGS) borehole locations

Fig 4 Looking north-west across the north of the site (MOLA photograph 2019)

Fig 5 Looking west across the south-west of the site (MOLA photograph 2019)

Fig 6 Ordnance Survey 1":mile map of 1830 (not to scale)

Fig 7 Ordnance Survey 1st edition 25":mile map of 1879–81 (not to scale)

Fig 8 Ordnance Survey 2nd edition 25":mile map of 1899–1900 (not to scale)

Fig 9 Ordnance Survey 1:1250 scale map of 1956–57 (not to scale)

Fig 10 Ordnance Survey 1:1250 scale map of 1988–93 (not to scale)

Fig 11 Outline building plots parameter plan (Collado Collins Architects, Parameter Plan – Building Plots, dwg 17043, PP-102, Rev P10, 23-10-2019)

Fig 12 Outline attenuation tank parameter plan (Collado Collins Architects, dwg 17043, PP-105, Rev P1, 23-10-2019)

Note: site outlines may appear differently on some figures owing to distortions in historic maps. North is approximate on early maps.

Executive summary

Ramboll, on behalf of Aviva Life & Pensions UK Limited ('the Applicant'), has commissioned MOLA to carry out a historic environment assessment in advance of proposed development at Vastern Court Retail Park, Vastern Road, Reading, in the County of Berkshire.

The planning application is for:

> *'Outline planning permission with the details of access, appearance, landscaping, layout and scale reserved for later determination. Demolition and redevelopment to comprise: up to [115,000] sqm GEA in one or more land uses comprising: Residential (Class C3 and including PRS); Offices (Class B1(a); development in Classes A1, A2, A3 (retail), A4 (public house), A5 (take away), C1 (hotel), D1 and D2 (community and leisure); car parking; provision of new plant and renewable energy equipment; creation of servicing areas and provision of associated services, including waste, refuse, cycle storage, and lighting; and for the laying out of the buildings; routes and open spaces within the development; and all associated works and operations including but not limited to: demolition; earthworks; provision of attenuation infrastructure; engineering operations. All development, works and operations to be in accordance with the approved Development Parameters Schedule and Plans'.*

The site is not within an area of archaeological potential as designated by the Local Planning Authority.

This desk-based study assesses the impact of the scheme on buried heritage assets (archaeological remains). Above ground heritage assets (historic structures) are not discussed in detail, but they have been noted where they assist in the archaeological interpretation of the site.

Historically, the site was located within marshy ground to the north of the settlement at Reading and there is no evidence of extensive use or settlement in the vicinity of the site until the later post-medieval period.

Buried heritage assets that may be affected by the proposals comprise:

- ***Post-medieval land reclamation remains.** The site was in open land until the urban centre of Reading began to expand northward towards the River Thames in the early 19th century. Drainage canals can be seen on early 19th century maps crossing the land in which the site was located. Evidence of the drainage canals is likely to be found cut into the underlying alluvial deposits and would be of low significance.*
- ***Remains of the Great Western Railway yards**. In the later 19th and 20th centuries the site was occupied by the marshalling yards of the Great Western Railway. There is high potential for evidence such as track beds of the railway lines connecting the coal depot to the station, throughout the site. Remains of this type would be of low significance.*

Survival of earlier archaeological remains is likely to be limited due to the development of the railway depot across the site, and subsequent development.

Possible construction impacts are outlined in this report: shallow works would be likely to truncate or remove post-medieval railway remains, new foundations or other deep ground disturbance could remove entirely any archaeological remains within their footprint. Although the detailed proposals have not yet been finalised, a full assessment has been undertaken on the impacts of the outline scheme on the significance of buried heritage assets.

The archaeological potential of the site is likely to be limited to remains of no more than low significance and therefore further survey work (i.e. archaeological evaluation trial trenches or pits) is not considered to be necessary. It is recommended that an archaeological watching brief during preliminary ground preparation and subsequent foundation construction, would mitigate the impacts of the proposals and ensure that any archaeological assets were not removed without record. This strategy could be refined and targeted by the prior archaeological monitoring of geotechnical investigations, which would clarify the nature and depth of deposits: based on the results, it is possible that no further work may be necessary..

Any archaeological work would need to be undertaken in consultation with RBC and in accordance with an approved Written Scheme of Investigation (WSI) and could be carried out under the terms of a standard archaeological planning condition set out with the grant of planning consent.

1 Introduction

1.1 Origin and scope of the report

1.1.1 Ramboll, on behalf of Aviva Life & Pensions UK Limited (hereafter referred to as 'the Applicant'), has commissioned MOLA (Museum of London Archaeology) to carry out a historic environment assessment of a proposed development of land at Reading Station Park, Reading, (hereafter referred to as 'the site'), as shown in Fig 1. The proposal comprises:

- Construction of approximately four new buildings, up to approximately 112.9mAOD, indicatively up to 23 storeys;
- Delivery of a total maximum floorspace of up to 115,000 m2 gross external area (GEA), which could include;
- Residential, retail, leisure and community, office and hotel use
- Construction of a single level basement;
- Demolition of existing buildings;
- New vehicular, pedestrian and cycle routes
- The proposed development would deliver below ground surface water attenuation. The parameter plans would allow for excavation up to 1.5mbgl for this within the areas shown in Parameter Plan 105.

1.1.2 This desk-based study assesses the potential impacts and likely effects of the proposed development on buried heritage assets (archaeological remains), if present, at the site. It forms a technical appendix of the Environmental Statement, and will enable the archaeological advisors to RBC to make an informed decision on the proposed development in the light of the likely effects upon any known or possible heritage assets. These are parts of the historic environment which are considered to be significant because of their historic, evidential, aesthetic and/or communal interest.

1.1.3 This report deals solely with the archaeological implications of the proposed development and does not cover possible built heritage issues, except where buried parts of historic fabric are likely to be affected. Above ground assets (i.e., designated and undesignated historic structures and conservation areas) on the site or in the vicinity that are relevant to the archaeological interpretation of the site are discussed. Whilst the significance of above ground assets is not assessed in this archaeological report, direct physical impacts upon such assets arising from the development proposals are noted. The report does not assess issues in relation to the setting of above ground assets (e.g., visible changes to historic character and views).

1.1.4 The assessment has been carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) (MHCLG 2019; see section 9 of this report) and to standards specified by the Chartered Institute for Archaeologists (CIfA 2014, 2017), Historic England (EH 2008, HE 2015), and Berkshire Council. Under the 'Copyright, Designs and Patents Act' 1988 MOLA retains the copyright to this document.

1.2 Designated heritage assets

1.2.1 Historic England's National Heritage List for England (NHL) is a register of all nationally designated (protected) historic buildings and sites in England, such as scheduled monuments, listed buildings and registered parks and gardens. The NHL does not include any nationally designated heritage assets within the site. The nearest nationally designated heritage asset is the Grade II listed Main Building of Reading General Station (NHL no 1321892), *c* 150m south of the site. he Scheduled Monument of Reading Abbey extends into the south-eastern edge of the study area, at its nearest c 375m south-east of the site boundary.

1.2.2 The site is not within either a conservation area or an area of archaeological potential as designated by the Local Planning Authority.

1.3 Aims and objectives

1.3.1 The aim of the assessment is to:

- identify the presence of any known or potential buried heritage assets that may be affected by the proposed development;
- describe the significance of such assets, as required by national planning policy (see section 9 for planning framework and section 10 for methodology used to determine significance);
- assess the potential impacts and likely effects upon the significance of the assets arising from the proposed development; and
- provide recommendations for further assessment where necessary of the historic assets affected, and/or mitigation aimed at reducing or removing completely any adverse impacts upon buried heritage assets and/or their setting.

2 Methodology and sources consulted

2.1 Sources

2.1.1 For the purposes of this report, documentary and cartographic sources including results from any archaeological investigations in the site and the area around it were examined in order to determine the likely nature, extent, preservation and significance of any buried heritage assets that may be present within the site. This information has been used to determine the potential for previously unrecorded heritage assets of any specific chronological period to be present within the site.

2.1.2 In order to set the site into its full archaeological and historical context, information was collected on the known historic environment features within a 550 m-radius study area around it, as held by the primary repository of such information within Berkshire, the Berkshire Historic Environment Record (BHER). The BHER is managed by Berkshire Archaeology and includes information from past investigations, local knowledge, find spots, and documentary and cartographic sources. The study area was considered through professional judgement to be appropriate to characterise the historic environment of the site. Occasionally there may be reference to assets beyond this, where appropriate, e.g., where such assets are particularly significant and/or where they contribute to current understanding of the historic environment.

2.1.3 The extent of investigations as shown on Fig 2 may represent the site outline boundary for planning purposes, rather than the actual area archaeologically investigated. Where it has not been possible from archive records to determine the extent of an archaeological investigation (as is sometimes the case with early work), a site is represented on Fig 2 only by a centrepoint.

2.1.4 In addition, the following sources were consulted:

- MOLA – in-house Geographical Information System (GIS) with statutory designations GIS data from Historic England, and archaeological publications;
- Historic England – information on statutory designations including scheduled monuments and listed buildings, along with identified Heritage at Risk;
- Berkshire Record Office – historic maps and published histories;
- Groundsure– historic Ordnance Survey maps from the first edition (1860–70s) to the present day;
- British Geological Survey (BGS) – solid and drift geology digital map; online BGS geological borehole record data;
- Aviva Investors – parameter plans (Collado Collins 2019), existing site topographical survey (Plowman Craven 2019);
- Internet Sources (please see bibliography)– web-published material including the LPA local plan (Reading Borough Council, 2019), and information on conservation areas and locally listed buildings.

2.1.5 The assessment included a site visit carried out on the 8 April 2019 in order to determine the topography of the site and the nature of the existing buildings on the site, and to provide further information on areas of possible past ground disturbance and general historic environment potential. Observations made on the site visit have been incorporated into this report.

2.2 Methodology

2.2.1 Fig 2 shows the location of known historic environment features within the study area. These have been allocated a unique historic environment assessment reference number (**HEA 1, 2**, etc), which is listed in a gazetteer at the back of this report and is referred to in the text. Where there are a considerable number of listed buildings in the study area, only those within the vicinity of the site (i.e. within 200 m) are included, unless their inclusion is considered relevant to the study. Conservation areas are not shown. All distances quoted in the text are approximate (within 5 m) and unless otherwise stated are measured from the nearest part of the site boundary.

2.2.2 Section 10 sets out the criteria used to determine the significance of heritage assets. This is based on four values set out in Historic England's *Conservation principles, policies and guidance* (EH 2008), and comprise evidential, historical, aesthetic and communal value. The report assesses the likely presence of such assets within (and beyond) the site, factors which may have compromised buried asset survival (i.e. present and previous land use), as well as possible significance.

2.2.3 Section 11 includes non-archaeological constraints. Section 12 contains a glossary of technical terms. A full bibliography and list of sources consulted may be found in section 13 with a list of existing site survey data obtained as part of the assessment.

2.3 Assumptions and limitations

2.3.1 Within the limitations imposed by dealing with historical material and maps, the information in this document is, to the best knowledge of the author and MOLA, correct at the time of writing. Further archaeological investigation, more information about the nature of the present buildings, and/or more detailed proposals for redevelopment may require changes to all or parts of the document.

3 The site: topography and geology

3.1 Site location

3.1.1 The site is located at Reading Station Park, Vastern Rd, Reading RG1 8AL (National Grid Reference 471427 174045: Fig 1). The site area is 1.8ha and is bounded by Vastern Road to the north-east, Trooper Potts Way to the east and south-east, Vastern House Sorting Office to the south and south-west and Caversham Road to the west and north-west. The site falls within the historic parish of Reading St Lawrence within the county of Berkshire.

3.1.2 The River Thames is 210 m north of the site at the location of Fry's Island. The River Kennet is 765 m south of the site.

3.2 Topography

3.2.1 Topography can provide an indication of suitability for settlement, and ground levels can indicate whether the ground has been built up or truncated, which can have implications for archaeological survival (see section 5.2).

3.2.2 A topographical survey of the site was undertaken in April 2019 by Plowman Craven and showed that the site is mostly flat with variation between 38.2 m above Ordnance Datum (mAOD) in the north-east corner of the car park to 38.6 mAOD at the western end of the southern range of buildings then falling to 38.4 mAOD in the north-west corner of the car park and 38.2 mAOD in the west entrance to the site (Plowman Craven 2019).

3.3 Geology

3.3.1 Geology can provide an indication of suitability for early settlement, and potential depth of remains.

3.3.2 The underlying geology comprises alluvium. In places the alluvium is capped by a fine-grained silt known as 'brickearth', which was laid down as alluvial and/or wind-blown deposits during the last glaciation around 17,000 BC. This produced fertile soils but was often exploited for the manufacture of bricks and much has been removed by quarrying or by subsequent building development. The bedrock of the area is comprised of the Seaford Chalk Formation and Newhaven Chalk Formation which is sedimentary bedrock formed between 89.8 and 72.1 million years ago during the Cretaceous period.

3.3.3 No recent geotechnical investigations have been undertaken within the site and consequently historic BGS borehole data have been used to understand the geology of the site. The BGS records six boreholes within the site which records show are actually test pits excavated in 1988 as part of a geotechnical investigation (BGS borehole reference numbers SU77SW892–SU77SW897). The ground level of the pits was not noted, and depths were recorded as metres below ground level (mbgl). Two boreholes, SU77SW623 and SU77SW297, undertaken outside the site have also been used to understand the surrounding geology. SU77SW623 was taken in on Caversham Road 75m north-west of the site in 1999. SU77SW297 was taken on Vastern Road 95m east of the site in 1989. The locations of the boreholes and test pits are shown on Fig 3 and the results detailed in Table 1.

3.3.4 Table 1 differentiates between modern made ground (i.e. containing identifiably modern inclusions such as concrete and plastic) and undated made ground, which may potentially contain deposits of archaeological interest. In all likelihood, the undated made ground comprises post-medieval railroad development.

Table 1: summary of historic BGS borehole data (BGS 2019)
Levels are in metres below ground level (mbgl)

BH ref.	Modern made ground	Undated made ground	Natural alluvium	Natural gravel	Top of natural chalk
SU77SW892	<0.3	0.3–1.7	1.7–2.6 (terminated)	–	Not reached
SU77SW897	<0.2	0.2–2.1	2.1–2.3 (terminated)	–	Not reached
SU77SW896	<0.4	0.4–1.8	1.8–2.5 (terminated)	–	Not reached
SU77SW895	<0.5	0.5–2.4	2.4–2.7 (terminated)	–	Not reached
SU77SW894	<0.3	0.3–1.4	1.4–1.9	1.9–2.5 (terminated)	Not reached
SU77SW893	<0.2	0.2–1.5	1.5–2.6 (terminated)	–	Not reached
SU77SW623	<1.9	–	1.9–2.4	2.4–6.9	6.9
SU77SW297	<1.4	1.4–1.8	1.8–2.4	2.4–10.0 (terminated)	Not reached

3.3.5 The results of the test pits excavated in 1988 suggest that the undated made ground overlies the site to a depth of 2.4 m in places overlying alluvial deposits. Although the BGS maps show the presence of brickearth within the site, none was found during the previous geotechnical investigation, possibly as a result of truncation through railway yard development in the later post-medieval period. Although the BGS does not record the presence of river terrace gravels underlying the alluvial deposits, a borehole taken within the site (SU77SW894) recorded gravels at 1.9mbgl and both boreholes taken in the vicinity of the site (SU77SW623 and SU77SW297) show gravel deposits are present to the east and west of the site under alluvial deposits.

4 Archaeological and historical background

4.1 Overview of past investigations

4.1.1 There have been no previous investigations within the site. 29 previous investigations, primarily comprising evaluations and watching briefs, have been conducted within the 550m-radius study area. The investigations were mostly undertaken to the south and east of the site within the bounds of the historic town of Reading.

4.1.2 The closest investigation to the site is an evaluation undertaken on Brigham Road in 1998–99 45 m north of the north-east corner of the site (**HEA 2**) which confirmed the presence of alluvium and localised peat deposits; however, no additional archaeological remains were identified. The results suggested that the evaluation site was located within a possible north–south inlet of the River Thames.

4.1.3 The results of these investigations, along with other known sites and finds within the study area, are discussed by period, below. The date ranges given are approximate.

4.2 Chronological summary

Prehistoric period (800,000 BC–AD 43)

4.2.1 The Lower (800,000–250,000 BC) and Middle (250,000–40,000 BC) Palaeolithic saw alternating warm and cold phases and intermittent perhaps seasonal occupation. During the Upper Palaeolithic (40,000–10,000 BC), after the last glacial maximum, and in particular after around 13,000 BC, further climate warming took place and the environment changed from steppe-tundra to birch and pine woodland. It is probably at this time that Britain first saw continuous occupation. Erosion has removed much of the Palaeolithic land surfaces and finds are typically residual. Two lower Palaeolithic hand axes were found by chance, one in 1904 in a drainage trench on Station Road 330m south of the site (**HEA 48**) and another in 1903 on Vachel Road 375m south-west of the site (**HEA 50**). A struck Levalloisian flake was found by chance near Caversham Road 435m south-west of the site (**HEA 51**).

4.2.2 The Mesolithic hunter-gatherer communities of the postglacial period (10,000–4000 BC) inhabited a still largely wooded environment. The river valleys would have been favoured in providing a dependable source of food (from hunting and fishing) and water, as well as a means of transport and communication. Evidence of activity is characterised by flint tools rather than structural remains and has been recovered from the Thames in two places noted by the BHER. This evidence consists of a tranchet axe, pick and blade found in the Thames River 230m west of the site (**HEA 43**) and seven tranchet axes, four picks, and a mace found in the Thames 330m north of the site (**HEA 44**).

4.2.3 The Neolithic (4000–2000 BC), Bronze Age (2000–600 BC) and Iron Age (600 BC–AD 43) are traditionally seen as the time of technological change, settled communities and the construction of communal monuments. Farming was established and forest cleared for cultivation. An expanding population put pressure on available resources and necessitated the utilisation of previously marginal land.

4.2.4 Evidence of Neolithic activity in the study area was primarily found by chance and consists of an unspecified number of Neolithic axes and a perforated hammer head dredged from the Thames 230m west of the site (**HEA 43**), a Late Neolithic to Early Bronze Age basin shaped decorated drinking cup found within the Thames 330m north of the site (**HEA 44**), and a flint axe found in St Laurence's Churchyard 420m south-east of the site (**HEA 62**).

4.2.5 Unspecified stray finds dated to the Bronze Age were found during excavation to the rear of 1 Friar Street in 1998–99, 420m south-east of the site (**HEA 14**). Additional evidence of Bronze Age activity, consisting of a Middle Bronze Age dagger, socketed knife, two palstaves, a socketed sickle, a socketed axehead, a leaf shaped spearhead, a basal looped spearhead and a Bronze Age pot, was dredged from the Thames 230m west of the site (**HEA 43**). An additional Bronze Age spearhead was noted as being retrieved from the Thames opposite Caversham 330m north of the site (**HEA 44**).

4.2.6 An Early Iron Age brooch was found by chance at Friar Street 365m south of the site

(**HEA 55**).

4.2.7 Although the site is located on a possible gravel terrace between the channels of two rivers, previous geotechnical investigations show the presence of deep alluvial deposits across the site suggesting that it may have been regularly inundated. No indication of occupation has been found within the study area and the evidence from this period is limited to chance finds. Although it is possible that extensive development of the study area in the later medieval and post-medieval periods has removed evidence of settlement and use during the prehistoric period, it is more likely that the marshy nature of the site did not allow for such use, and that activity in and around the site was confined to hunting and possibly, later, farming.

Roman period (AD 43–410)

4.2.8 The Roman town of *Calleva Atrebatum,* located at Silchester roughly 12.1km to the south-west of the site, likely represented the main urban centre in the region during this period. This is reflected in the fact that there is little archaeological evidence for the Roman occupation of Reading, although it is thought that this may be partly the result of extensive urban development of the area from the medieval period onwards (Norton and Poore 2007).

4.2.9 Although settlement within Reading is unlikely, the use of the Thames and the Kennet to transport goods and people is probable. Evidence for Roman activity within the study area is primarily limited to chance finds comprised of a 3rd century AD Brass coin of Magnentius found on Greyfriars Road 355m to the south-west of the site (**HEA 49**), a 1st century dupondius (coin) of Vespasian found in the sump of a new slipway on the Thames River in 1956 180m to the north-east of the site (**HEA 42**), and Romano-British coarseware sherds found on the site of the former Littlewoods store on Friar Street 460m to the south of the site (**HEA 60**). Unspecified stray finds dated to the Roman period were found during excavation to the rear of 1 Friar Street in 1998–99 420m south-east of the site (**HEA 14**).

4.2.10 The site was located outside any known settlements; however, given the site's location near the channel of the Thames it is possible that isolated finds may be present within the alluvium or at the interface between the gravels and the alluvium.

Early medieval (Saxon) period (AD 410–1066)

4.2.11 Following the withdrawal of the Roman army from England in the early 5th century AD, Germanic ('Saxon') settlers arrived from mainland Europe, with occupation in the form of small villages and an economy initially based on agriculture. By the end of the 6th century a number of Anglo-Saxon kingdoms had emerged, and as the ruling families adopted Christianity, endowments of land were made to the church. Landed estates (manors) can be identified from the 7th century onwards; some, as Christianity was widely adopted, with a main 'minster' church and other subsidiary churches or chapels. In the 9th and 10th centuries, the Saxon Minster system began to be replaced by local parochial organisation, with formal areas of land centred on settlements served by a parish church.

4.2.12 The place-name 'Reading' is thought to have derived from a Saxon tribe known as *Readingas*, who settled in this area in the 6th century (Reading Borough Council 2008). Reading is first mentioned in the Anglo-Saxon Chronicle in 871 AD, in the year that the Danes invaded Wessex, took Reading and put up fortifications between the Kennet and the Thames (Ditchfield and Paige 1923, fn. 1). It was during this period that Roman roads converging on Silchester begun to be replaced with roads meeting in Reading, and a church was established on the current site of Reading Minster, 670m to the south of the site (Reading Minster 2018). G. G. Astill's *Historic Towns in Berkshire* contains a possible projection of the extent of the Saxon settlement (not reproduced) which is thought to have been centred on the church suggesting that the site was located just outside of the settlement between the north edge and the Thames River. The lines of Danish defences of Reading were also illustrated in G. G. Astill's *Historic Towns in Berkshire* and a north–south eastern defence line was plotted by the BHER with the northern terminus located at 230m south-east of the site (**HEA 33**).

4.2.13 The burial of a man was found by chance in 1831, 100 yards east of the end of the engine sheds at Reading Station during the digging of ballast pits 60m south of the site (**HEA 38**). The skeleton was accompanied by a Scandinavian 'Gripping Beast' style sword dated to the late 8th to early 9th century and the skeleton of a horse (BHER Monument entry MRD3891). Unspecified stray finds dated to the Saxon period were found during excavation to the rear of 1

Friar Street in 1998–99 420m south-east of the site (**HEA 14**).

4.2.14 The site was likely within open cultivated fields or pasture between the north side of the settlement at Reading and the Thames.

Later medieval period (AD 1066–1485)

4.2.15 Reading Abbey was founded by Henry I in 1121 350m south-east of the site (**HEA 34**). The founding of the abbey focused attention away from the old market in St Mary's Butts to the gates of the new abbey, and this was reflected in the road layout with Broad Street (500m south of the site) and New Street (now Friar Street, 380m south of the site) laid out to provide access to it (Cotswold Archaeology 2015, 19). After the Norman invasion of 1066, William the Conqueror gave to the abbey of St Martin at Battle a church as well as 29 *mansurae* in the town of Reading. In the Domesday Survey, Reading is referred to as a borough, with the town and manor being surveyed separately (Ditchfield and Paige 1923, fn. 5–6).

4.2.16 The remains of a wall associated with Reading Abbey was found during a watching brief in 1987–89 on Forbury Road 385m to the south-east of the site (**HEA 25**). A medieval mortar floor of a cellar or undercroft associated with the dormitory area of Reading Abbey was identified during a watching brief and evaluation within Forbury Gardens and Abbey Ruins in 2004–05 385m south-east of the site (**HEA 22**).

4.2.17 A Franciscan Friary was founded in Reading in 1233 and was initially located by the River Thames, possibly in Vastern Meadows (**HEA 39**) which was reportedly given to the Friars Minor by the Abbot and Convent of Reading in 1233 and given the general location point 230m south of the site by the BHER (BHER Monument entry MRM16015). The Friary was moved to New Street (Friar Street) in *c* 1285. Building works at 7 Greyfriars Road revealed the footings of a large building thought to have been associated with the Friary and two gilt and enamelled bronze heraldic pendants were found near at the site of the Post Office on Friar Street 410m south-west of the site (**HEA 52**). At the Greyfriars Day Nursery (**HEA 20**) burials associated with the old Friary's cemetery were found 460m south-west of the site and near to the location of two extended skeletons found by workmen during the excavation of the foundations of Greyfriars Vicarage 470m south-west of the site (**HEA 59**).

4.2.18 Archaeological investigations within the study area have uncovered extensive evidence of the medieval development and use to the south of the site. Structural evidence of occupation during the 12th to 13th centuries has been found on 99–105 Friar Street (**HEA 21**) 470m south-west of the site. A series of earthen and chalk floors were found with a flint and chalk wall, a posthole, a hearth and flint nodule post pads during evaluation at the rear of 1 Friar Street 420m south of the site (**HEA 14**). Excavation at 1 Friar Street revealed the remains of a later medieval building with chalk floors and a drain thought to be part of the Hospitium Almshouses (**HEA 14**). Evidence of industrial activity including leather and metal working was identified during a watching brief on Friar Street (**HEA 11**) 390m south of the site. Dumping activity is thought to have occurred at Greyfriars Church (**HEA 30**) 480m south-west of the site during this time. Evidence of backland activity in the form of a possible hearth, pits, and linear ditch was found during evaluation in 2005 in Shoesmiths Court 350m south of the site (**HEA 10**) and in medieval pits found during evaluation and excavation in 2003 at 25–26 Friar Street 305m south of the site (**HEA 9**).

4.2.19 It is expected that the site would have been outside of the area of medieval development in Reading possibly within open cultivated fields or pasture.

Post-medieval period (AD 1485–present)

4.2.20 During the early post-medieval period, development within Reading remained within the limits of the medieval town, as can be seen from John Speed's map of 1611 (not reproduced, Berkshire Record Office, D/Ex2385/1). The site was located to the north of the development between the northern boundary and the Thames. An undated linear feature thought to have been backfilled in the later medieval or early post-medieval periods was identified during a watching brief and evaluation on Station Hill and Friars Walk 270m south-west of the site (**HEA 7**).

4.2.21 During the Civil War, Reading was adopted as a Royalist garrison between 1642 and 1643. In 1642 the town was subject to fortification, comprising mostly bastions linked by earthen banks (Astill 1978). The site is located 240m north of an east–west aligned section of these defences

(**HEA 32**). Reading was besieged in April 1643 and fell to Parliamentary forces in May 1643. It remained under Parliamentary control until the end of the Civil War in 1651 (VCH 1923, *Berkshire iii*, 342–64).

4.2.22 The Ordnance Survey 1":mile map of 1830 (Fig 6) shows the site as part of open land labelled 'Vasterns', likely meadowland, to the north of Reading. Drainage canals are shown to the north and south of the site leading to the Thames to the north of the site. It is possible that the Vasterns were marshy requiring drainage and land reclamation activities in order to allow for consistent use.

4.2.23 The Great Western Railway was enabled by an act of Parliament in 1835 in order to create a double tracked railway line connecting London and Bristol. Isambard Kingdom Brunel was the engineer retained by Great Western Railway to construct the line and as a result the line was initially built using his broad-gauge tracks which required considerably more land within the railway cut. The work on the line began in 1836 at both ends with the line to Reading completed in 1840 and the full line's completion in 1841 (Great Western Archive 2013). Reading Station was originally designed by Isambard Kingdom Brunel and built in 1840. The main building of Reading General Station (**HEA 5**) is Grade II listed and an enlargement and remodelling of the original design was undertaken by Mr Lane, the Chief Engineer of the Great Western Railway Company between 1865 and 1867 (National Historic List 2019, entry 1321892). A railway works was constructed to the north of the station.

4.2.24 The Ordnance Survey 1st edition 25":mile map of 1879–81 (Fig 7) shows the development of the railway to the south of the site with a works building and railway tracks extending into the south-east corner of the site. The site is crossed by two drainage canals leading to a single canal from the north-east side of Vastern Road. Industrial buildings including a timber yard and malthouses have been constructed to the west of the site. The land to the north of Vastern Road remains open to the Thames.

4.2.25 The Ordnance Survey 2nd edition 25":mile map of 1899–1900 (Fig 8) shows the coal depot of the Great Western Railway Works has been constructed within the site. The land to the north of the site has been fully developed with terraced houses and industrial works including a saw mill, electric works and iron works. The land to the west of the site has been redeveloped as terraced houses. The railway works continued to expand and develop until it was at its largest extent as seen in the Ordnance Survey 1:1250 scale map of 1956–57 (Fig 9).

4.2.26 The Ordnance Survey 1:1250 scale map of 1969–72 (not reproduced) shows clearance of the railway work apparatus to the east of the site and the construction of a small car park in the west of the site suggesting that the works were no longer a priority.

4.2.27 The site has been completely cleared and redeveloped by the Ordnance Survey 1:1250 scale map of 1988–93 (Fig 10) and is now as existing in Fig 1. The railway works to the south-west of the site have been demolished and redeveloped as a sorting office.

5 Statement of significance

5.1 Introduction

5.1.1 The following section discusses historic impacts on the site which may have compromised archaeological survival from earlier periods, identified primarily from historic maps, and information on the likely depth of deposits.

5.1.2 In accordance with the NPPF, this is followed by a statement on the significance of buried heritage assets within the site, the potential impacts and likely effects derived from current understanding of the baseline conditions, past impacts, and professional judgement.

5.2 Factors affecting archaeological survival

Natural geology

5.2.1 Current ground level is at 38.2–38.6 mAOD. There is no geotechnical data for the site. Based on BGS boreholes in the vicinity, the predicted level of natural geology within the site is as follows:

- The top of truncated alluvium is at 35.8 – 37.2 mAOD (1.4–2.4 m below ground level/mbgl)
- The top of untruncated Gravel is at 35.8–36.7 mAOD (1.9 –2 .4 mbgl)

5.2.2 Between the top of the natural and the current ground level is modern made ground and undated made ground. The latter may potentially contain remains of archaeological interest.

Past impacts

5.2.3 The site was developed as part of the Great Western Railway works at Reading with the primary impact being the construction of railway lines. These are likely to have locally affected the top 1.0 – 1.5 m of ground, although the entire area of the works may have been levelled prior to their construction, removing any earlier remains to the depth of the ground disturbance.

5.2.4 The scale and depth of clearance and removal of buried obstructions after the closure of the marshalling yard and subsequent redevelopment are not known.

Likely depth/thickness of archaeological remains

5.2.5 Post-medieval railway remains are possible within the undated made ground just underlying the modern foundations and hard standing. Earlier remains of post-medieval land reclamation activities and isolated remains from earlier periods are possible within the alluvial deposits.

5.3 Archaeological potential and significance

5.3.1 The nature of possible archaeological survival in the area of the proposed development is summarised here, taking into account the levels of natural geology and the level and nature of later disturbance and truncation discussed above.

5.3.2 *The site has low potential to contain prehistoric remains*. Although the site is located on a gravel terrace between the channels of two rivers, previous geotechnical investigations show the presence of deep alluvial deposits across the site suggesting that it may have been regularly inundated. No evidence of settlement has been found within the study area and the evidence from this period is limited to chance finds. It is likely that the marshy nature of the site did not allow for extensive use or settlement and its use was for intermittent resource exploitation.

5.3.3 *The site has low potential to contain Roman remains.* The site was located outside any known settlements; however, given the site's location near the channel of the Thames it is possible that isolated finds may be present within the alluvium or at the interface between the gravels and the alluvium.

5.3.4 *The site has low potential to contain medieval remains.* Reading was developed as a town in the Anglo-Saxon (early medieval) period and continued to gain prominence and wealth throughout the later medieval period. The settlement was located to the south of the site and orientated around the high street and Reading Abbey. It is likely that the site was located within open fields or within a marshy interface of the Thames on the periphery of the settlement throughout these periods.

5.3.5 *The site has high potential to contain post-medieval remains.* Reading began to expand northward towards the Thames in the early 19th century. Drainage canals can be seen on early 19th century maps crossing the land in which the site was located. Evidence of the drainage canals is likely to be found cut into the underlying alluvial deposits and would be of **low** significance. Evidence of the later 19th and 20th century railway works is likely to be present throughout the site and would be of **low** significance.

6 Impact of proposals

6.1 Proposals

6.1.1 The Applicant will submit an outline planning application for the proposed development, which will reserve the details of access, appearance, landscaping, layout and scale for later determination. The proposed development would comprise:

- Construction of approximately four new buildings, up to approximately 112.9mAOD;
- Delivery of a total maximum floorspace of up to 115,000 m2 gross external area (GEA), which could include;
- Residential, retail, leisure and community, office and hotel use
- Demolition of existing buildings;
- New vehicular, pedestrian and cycle routes
- The proposed development would deliver below ground surface water attenuation. The parameter plans would allow for excavation up to 1.5mbgl for this within the areas shown in Parameter Plan 105.

6.1.2 Piled foundations are anticipated.

6.2 Implications

6.2.1 The identification of physical impacts on buried heritage assets within a site takes into account any activity which would entail ground disturbance, for example site set up works, remediation, landscaping and the construction of new basement/attenuation areas and foundations. As it is assumed that the operational (completed development) phase would not entail any ground disturbance, there would be no additional archaeological impact and this is not considered further.

6.2.2 It is outside the scope of this archaeological report to consider the impact of the proposed development on upstanding structures of historic interest, in the form of physical impacts which would remove, alter, or otherwise change the building fabric, or predicted changes to the historic character and setting of historic buildings and structures within the site or outside it.

Preliminary site works

6.2.3 Works carried out as part of the initial site set up, including preliminary site stripping and demolition, the installation of site fencing and welfare facilities, is assumed for the purposes of this assessment to cause ground disturbance to a maximum depth of 0.5 mbgl.

6.2.4 This would extend into undated made ground, which potentially contains remains of archaeological interest, and would entirely remove any remains to this excavation depth. In all likelihood the undated made ground is of late 19th/early 20th century date and only post-medieval remains, of low heritage significance, would be affected.

Breaking out foundation slab

6.2.5 Breaking out of the existing foundation/floor slab would potentially have an impact, truncating or removing entirely any archaeological remains directly beneath the slab. This might include 19th century railway depot remains.

Piled foundations

6.2.6 Any archaeological remains within the footprint of each pile would be removed as the pile is driven downwards. The severity of the impact would therefore depend on the pile size, type and pile density. The pile type is not currently known. Augered piles/continuous flight auger (CFA) piles would minimise the impact upon possible archaeological remains, whereas vibro-compacted piles may cause additional impact through vibration and deformation of fragile surrounding remains, in particular at the level of the water table.

6.2.7 The insertion of pile caps and connecting ground beams, along with the excavation of a pile guide trench, typically extend no more than 1.0 – 1.5 mbgl and would remove any archaeological remains within the footprint of these works to this depth.

Service / utilities trenches/ drains

6.2.8 The proposed excavation of new service trenches and drains would extend to a depth of 1.0 – 1.5 mbgl as assumed for the purposes of this assessment. This would entirely remove any archaeological remains within the trench footprint.

Attenuation tanks

6.2.9 The excavation of up to three attenuation tanks, , would extend to a depth of 1.5 mbgl. This would entirely remove any archaeological remains within the tank footprint.

7 Conclusion and recommendations

7.1.1 The site does not contain any nationally designated historic assets. The site is not within a conservation area or an area of archaeological potential as defined by RBC.

7.1.2 The site has a:

- low potential for prehistoric remains;
- low potential for Roman remains;
- low potential for medieval remains;
- high potential for post-medieval remains.

7.1.3 Survival of archaeological remains is likely to be limited due to the development of the railway depot across the site during the late 19th century and 20th century. Remains of the railway may be of archaeological interest.

7.1.4 The proposed development would comprise the demolition of the existing buildings, and the construction of new buildings which are likely to have piled foundations. Preliminary groundworks would truncate or remove all heritage assets to the depth of the ground disturbance. Piled foundations would remove all heritage assets within the footprint of the pile and, depending on the density of the piling, potentially reduce future access to any remaining assets surviving between the piles.

7.1.5 Table 2 summarises the known or likely buried assets within the site, their significance, and the impact of the proposed scheme on asset significance.

Table 2: Impact upon heritage assets (prior to mitigation)

Asset	Asset Significance	Impact of proposed scheme
Post-medieval land reclamation and railway remains (high potential)	Low	Breaking out existing foundations, preliminary site works, piling, attenuation tanks, service trenches Significance of asset reduced to negligible

7.1.6 The archaeological potential of the site is likely to be limited to remains of no more than low significance and therefore further survey work (i.e. archaeological evaluation trial trenches or pits) is not considered to be necessary. It is recommended that an archaeological watching brief during preliminary ground preparation and subsequent foundation construction, would mitigate the impacts of the proposals and ensure that any archaeological assets were not removed without record. This strategy could be refined and targeted by the prior archaeological monitoring of geotechnical investigations, which would clarify the nature and depth of deposits: based on the results, it is possible that no further work may be necessary.

7.1.7 Any archaeological work would need to be undertaken in accordance with an approved Written Scheme of Investigation (WSI) and could be carried out under the terms of a standard archaeological planning condition set out with the grant of planning consent.

8 Gazetteer of known historic environment assets

8.1.1 The gazetteer lists known historic environment sites and finds within the 550m-radius study area around the site. The gazetteer should be read in conjunction with Fig 2.

8.1.2 The BHER data contained within this gazetteer was obtained on 17/04/2019 and is the copyright of Berkshire County Council 2019.

8.1.3 Historic England statutory designations data © Historic England 2019. Contains Ordnance Survey data © Crown copyright and database right 2019. The Historic England GIS Data contained in this material was obtained in April 2019. The most publicly available up to date Historic England GIS Data can be obtained from http://www.historicengland.org.uk.

Abbreviations
ASE – Archaeology South East
CA – Cotswold Archaeology
FA – Foundations Archaeology
HER – Historic Environment Record
JMHS – John Moore Heritage Service
NHL – National Heritage List for England (Historic England)
OAU – Oxford Archaeological Unit
TVAS – Thames Valley Archaeological Services
TWA – Trust for Wessex Archaeology
WA – Wessex Archaeology

HEA No.	Description	Site code/ HER/NHL No.
1	**Great Western Railway (GWR) – London to Reading Station** The Great Western Railway was authorised by an Act of Parliament in 1835 to construct a line from London to Bristol. Construction of the line began in late 1835/1836, using a variety of contractors and some direct labour. The first section to be completed, from London to Maidenhead Riverside (Taplow), opened in 1838. This was followed by the opening of the line to Twyford in July 1839, Reading in March 1840, Steventon in June 1840, Challow (also known as Farringdon Road) in July 1840, Wootton Bassett in December 1840, Chippenham in May 1841 and Bridgwater and Bath in June 1841.	MRD6024 MRM17606 MRD6041 MRM17607 MRD6042
2	**Brigham Road, Reading, Berkshire** *Evaluation, TVAS, 1998–99* No archaeological features were present in any of the 12 trenches and no artefacts were recovered, either from the trenches or the spoil heaps. The presence of alluvium and localised peat deposits were, however, confirmed. It is possible that the position of the latter may indicate the former presence of a north-south orientated inlet channel of the River Thames. In the light of the evaluation results it is unlikely that archaeological deposits will be damaged or destroyed by the proposed development of the site.	ERD21 BRR98/80
3	**Vastern Road, Reading, Berkshire** *Evaluation, WA, 1995* Archaeological investigation of a vacant lot bordering the River Thames prior to redevelopment. Sixteen machine excavated trenches were dug. The work revealed the present ground level to be largely artificial, resting on approximately 1.5m of made ground comprised chiefly of ash and cinder dumps. A single linear feature, most probably a land drain of 19th century date, was revealed running north–south across the west end of the site, normal to the line of the River Thames. Alluvial silty clays were encountered in all trenches at depths between 1.4mbgl and 1.7mbgl.	ERM249 MRD6571 MRD6573
4	**Tudor Road, Reading, Berkshire** *Watching brief, FA, 2000* No significant archaeological features or deposits were identified. The whole of the study area had been highly disturbed in the late post-medieval and modern periods	ERD99
5	**Main Building of Reading General Station** *Grade II listed building* Main building of Reading General Station built in 1865–67, architect Mr Lane (Chief Engineer of the GWR Co). Enlargement and remodelling of I K Brunel's original station of *c* 1840 with Italianate details.	NHL1321892

HEA No.	Description	Site code/ HER/NHL No.
6	**St. Pauls Church, York Road, Reading** *Evaluation and standing building survey, FA, 2001* The church was recorded to Level 3 recording prior to its demolition. The measured survey encompassed the floor plan, one lateral cross-section, internal elevation of a section of the arcade and clerestory, and the external elevation of the main east window. On completion of demolition of the church the site was then subject to an archaeological field evaluation. The stratigraphic sequence identified during the evaluation works consisted of river terrace gravels at c. 2.0mbgl, beneath a layer of alluvial clay averaging 1m thick. The clays were sealed, with a clean layer of gravel make-up/hardcore up to 1.8m thick. The evaluation revealed no archaeological finds or features which pre-dated the construction of the church.	ERD61 MRD15611
7	**Station Hill and Friars Walk (Plots B & D), Friar Street, Reading** *Watching brief and evaluation, ASE, 2016* The watching brief focused on two areas and recorded modern demolition material to a depth of at least 1.2bgl, most probably the result of the construction of the 1960's buildings. The evaluation showed that modern disturbance has occurred across the site, with thick layers of made ground 1.2–1.6m in depth covering the development area. Beneath the made ground layers a sequence of organic alluvial deposits were recorded. These were unable to be fully excavated due to water ingress. The artefacts recovered from these deposits may be intrusive due to the soft nature of the sediments. The function of the undated linear feature is unclear, although the deposits visible from the top of the trench suggest it was backfilled within the medieval or post-medieval periods. It is unclear whether the undated linear feature partially uncovered in the north sondage relates to the square watercourse feature illustrated on Coates 1802 map of Reading.	SHR15 ERM1955 MRM18235
8	**Station Hill and Friars Walk, Friar Street, Reading, Berkshire** *Evaluation, FA, 2009* A medieval or early post-medieval feature was identified in Trench 1, cut into the top of the natural gravel. Two layers identified in Trench 4 are also likely to be of similar date. Trenches 2 and 3 yielded a sequence of modern deposits, which directly overlaid the 'natural' clay.	SHR09 ERM1320 MRM16558
9	**25–26 Friar Street, Reading, Berkshire** *Evaluation and excavation, FA, 2003* During the evaluation and excavation archaeological features of medieval, late medieval and early post-medieval date were revealed including a possible Civil War ditch. These archaeological features predominantly consisted of medieval and post-medieval pits with occasional post holes. A number of pits showed evidence of recutting. The pits contained moderate quantities of pottery. Some animal bone was also recovered during the excavations. The distribution of medieval and post-medieval features is consistent with traditional backland activity. Six environmental samples were also taken from a number of pit fills. Analysis of these samples revealed charred cereal grains and chaff.	ERM483 MRM16013 MRM16014 MRM16016 MRM16042
10	**Shoesmiths Court, Reading, Berkshire – Area 9** *Evaluation, FA, 2005* Evidence of 12–14th century traditional medieval backland activity was revealed in the form of a possible hearth, five pits of varying size and a linear ditch. This pattern of activity was subsequently disrupted with either the construction of a cellared structure in the southern half of the site or the excavation of a substantial gravel extraction quarry pit. A number of late medieval and early post-medieval (14th–16th century) pits and ditches were also identified. A number of pits of post-medieval date (16th–18th century) were also identified, late Post-medieval/modern features and three undated pits. The archaeological features at the site contained limited quantities of pottery. The pottery evidence does, however, point to several phases of activity spanning the 12th century through to the 19th century.	ERM541 MRM16017

HEA No.	Description	Site code/ HER/NHL No.
11	**Friar Street road repair, Reading, Berkshire** *Watching brief, TVAS, 2013* The trench observed measured 13m in length, 4.2m wide and *c*1.4m deep. The stratigraphy revealed consisted of 0.1m of tarmac overlying 0.15m of concrete, overlying 0.4m of mid grey flinty gravel made ground overlying 0.2m of mid grey gravelly clay. This in turn overlay 0.2m of a dark grey silty deposit containing material pressed in from the above layer but which may in fact be part of the layer below (60). This was a dark grey brown silty clay layer with frequent pieces of flint and measured 0.3m deep. It contained 13 sherds of 13th to 14th century pottery, 70 pieces of animal bone, 22 pieces of roof tile and 68 pieces of leather, mostly comprising shoe soles. The pottery comprised 13 sherds of Surrey Whiteware of mid-13th–mid-15th century date. Most are of 'Coarse Border Ware' type which is common in the town. A small assemblage of 70 fragments of animal bone was recovered from three contexts. Twenty-two fragments of brick and tile were also recovered. The uneven form and finish of these pieces suggests that they date broadly to the medieval period. A total of 68 pieces of leather were recovered suggesting the presence of shoemaking and leather working on or near the site dated to the late 14th and early 15th century. Three pieces of metalwork comprising iron nails were also recovered.	ERM1449 FSR13/42 MRM16784
12	**172 Friar Street, Reading** *Evaluation and excavation, OAU, 1997* Four phases of occupation were identified on the site. A consistency of activity was also indicated with three phases of hearths or fireplaces with robbing taking place after each phase. The first phase probably dates to the 13th and 14th centuries. The second phase can be tentatively dated to the 15th or 16th century on the basis of pottery from the layer that seals it. The next period is a large area of robbing, previously recorded during the evaluation, which produced 18th century clay pipes. The final phase is represented by a herringbone brick surface of 19th or early 20th century date. Finds from the site include pottery, a fragment of window glass, an annular brooch and a pin with a wire wound head, as well as ceramic building material.	ERD27 ERM831 REFMS97 MRD15495– MRD15508 MRD3938
13	**Aldwych House, Blagrave Street, Reading, Berkshire** *Evaluation and watching brief, TVAS, 2013* The upper levels of the natural geology have been heavily truncated by post medieval activity on site. Natural chalk geology was observed in Trench 2 at an excavated depth of 0.8m, a height of 41.0m OD. No deposits of archaeological interest were observed and no finds were recovered. Evidence for activity on the site is limited to constructions of mid-20th century date with any evidence for earlier activity having been removed or truncated by the 20th century constructions.	ERM1566 ERM1632 AHR13/214
14	**Rear of 1 Friar Street, Reading, Berkshire** *Evaluation and excavation, TVAS, 1998–99* A single trench was excavated covering an irregular rectangular area of 11.5 sq. m. Beneath layers of made ground and demolition deposits of late post-medieval date, were a series of earthen and chalk floors, a probable flint and chalk wall, a posthole, a hearth and possibly flint nodule post pads. One of the deposits produced pottery of 12th-13th century date. From within the overlying layers of made-ground were a number of decorated and glazed tiles of medieval date which almost certainly originate from the Abbey buildings. Six excavation trenches were dug prior to development of site. Several phases of activity were identified, the earliest being stray finds of probable Bronze Age, Roman and Saxon date. Elements of a medieval building comprising walls, foundations, chalk floors and a drain were recorded and probably represent a part of the Hospitium Almshouses. Post-medieval phases included evidence for the robbing out of the earlier walls, the digging of pits and evidence of metalworking.	ERD152 ERD153 RFS98/71 MRD15734 MRD15735
15	**21-23 Valpy Street, Reading, Berkshire** *Watching brief and evaluation, WA, 1997* There were no archaeological deposits revealed during the course of the watching brief, although significant amounts of modern disturbance and truncation were identified. Three evaluation trenches were subsequently dug. One of these was badly disturbed. The two remaining trenches both contained features dated to the post-medieval period. Trench 2 contained a robbed wall footing, a pit and a small scoop. Trench 3 contained a shallow pit containing pottery of post-medieval date.	ERM283 W4022 MRD7305 MRD7306 MRD7307 MRD7309 MRD7308

HEA No.	Description	Site code/ HER/NHL No.
16	**Forbury Roundabout, Reading** *Excavation, WA, 1987–89* Groundworks for the construction of new carriageways revealed a length of the Plummery Wall and associated stratigraphy on the south (Abbey) side. The alignment of a 17m length of wall of flint and mortar build ran approximately east–west. Immediately against the south face of the wall was a single sherd of sooted, scratch-marked cooking-pot likely to date between the mid-12th and early 13th century. South of the wall a series of features cutting through natural deposits of chalk and gravel were observed following contractors groundworks. At least three were noted in plan and two more were evident in the section. The features took the form of roughly circular pits, up to 3m across and 1m deep with irregular rounded profiles. In at least two, the remains of congealed mortar adhered to the sides and formed the majority of the fill. It is suggested that the pits are quarries or borrows for gravel and chalk required in the construction of the wall and the North Gate, and that the mortar is the residue from in situ mixing. Two burnt clay hearths, not in situ, were noted in the section. Immediately above the second hearth a number of unburnt human bones from at least three individuals were recovered. No grave cut was recognised in the disturbed soil profile. Further investigation in this area was provided by the stripping of tarmac overlying the section in which the bones were found. A salvage excavation was then undertaken which demonstrated at least some of the bones to derive from an articulated burial. An analysis of the human bones showed burial 1 to be a female adult and burial 2 a juvenile male. The skull of a male sheep was also recovered.	ERM493 MRD1385 MRD1386 MRD1387 MRD1388
17	**Land at 5–21 Tudor Road, Reading, Berkshire** *Evaluation, FA, 2012* The evaluation comprised the excavation of one trench measuring 2m x 25m. The trench was located parallel to, and mid-way between Tudor Road and Stanshawe Road. Natural grey clay with orange mottling and root disturbance was identified at an average depth of *c* 1.2mbgl. The clay was overlaid by a dark brown humic clay silt containing much modern brick, glass and general rubble. This layer was *c* 0.9m thick. This was in turn overlain by a dark humic clay silt topsoil up to 0.30m thick. No archaeological finds or features were present in the trench. The presence of a thick layer of rubble filled clay silt overlying the natural suggests that the site had been truncated.	ERM1401 TRR11
18	**5 Greyfriars Road, Reading, Berkshire** *Evaluation, TVAS, 1994* Trench 1 was located in the south west corner of the site and showed that the original (pre-Victorian) ground surface had been largely truncated, presumably by cellaring. No finds or deposits of archaeological significance were revealed. Trench 2 exposed old topsoil *c* 0.2 m thick lay beneath the car park surface, which in turn overlay a stony clay loam on gravel. At the west end of the trench a well was located. This was unexcavated but its upper fill and the brickwork were of fairly recent origin (Victorian).	ERM449 GFR94 MRD7368
19	**The Vicarage, 64 Friar Street, Reading, Berkshire** *Watching brief, TVAS, 2006* Only modern artefacts such as brick rubble, slate, glass and animal bone, all of which date from the 19th century or later were observed but not retained.	ERM643 VFR 06/82
20	**The Greyfriars Day Nursery, 64 Friar Street, Reading** *Evaluation and excavation, JMHS, 2011* The archaeological evaluation comprised the excavation of six test pits (all 1 metre square). These were located in the positions of the proposed piles. Later medieval remains related to the priory were found including burial remains and disarticulated human skeletons as well as a metalled surface.	ERM1267 RGFS10 MRM16549 MRM16550 MRM16548

HEA No.	Description	Site code/ HER/NHL No.
21	**99–105 Friar Street, Reading, Berkshire** *Evaluation and excavation, TVAS, 1995* Trench 1 revealed eight subsoil features pre-dating the 18th century comprising pits/scoops and a posthole; five features of 12th–13th century date and a pit of 13th–14th century date; a posthole of 14th–15th century date and a pit of 16th–17th century date. Trench 2 was subsumed within trench Z1A during the subsequent excavation and revealed floor deposits, pits a scoop and postholes of 14th–15th century date. Trench 3 revealed deposits and cut features of late post-medieval date. Excavated evidence shows the development of 2 adjoining properties fronting Friar Street with open plots of land to the rear. The excavation suggests that the presence of a single hearth along the street frontage in each phase may show a single structure across both plots. The size of the buildings and the nature of the finds indicate a low status site. The first structural evidence is dated to the 12th century and the last to the 19th–20th century.	ERD33 ERD34 FSR95 MRD15512– MRD15551
22	**Forbury Gardens and Abbey Ruins, Reading, Berkshire** *Watching brief and evaluation, WA, 2004–05* A watching brief on all hard and soft landscaping works such as service trenches, soakaways and tree planting involved in the project and to undertake exploratory excavations in advance of building works. 39 trenches were excavated. These comprised four trenches within the east range of the Cloisters and below the Cloister Arch; five trenches in the Dormitory and Reredorter area; and 29 trenches within Forbury Gardens. A single trench was excavated within the south transept of the Abbey church to remove a tree stump. In the Forbury Gardens the area has been subject to frequent and widespread ground disturbances. The natural Reading Beds substrata were only reached in 13 of the 29 trenches excavated within this area. Overall, short lengths of wall or wall foundations were encountered in several of the deep soak-away trenches and the locations and/or depth of these trenches were modified to preserve the walls in situ. The most significant trench excavated was the small trench dug below the Cloister Arch. This exposed parts of the original masonry facing and decorative stonework of this important route between the Nave of the church and the Cloisters. A small area of decorated medieval tile floor also survived, as did the remains of two subsequent plain tile floors laid directly above it. A medieval mortar floor, probably that of a cellar or undercroft was recorded below the present ground level in the Dormitory. Other works within the Dormitory area showed that most of the buried archaeological remains have been very badly disturbed or completely destroyed by two large air-raid shelters. *Watching brief, TVAS, 2013* Watching brief carried out during the removal of 22 trees, including one ash tree in the vicinity of the Abbey Ruins. In all cases, only 0.15 to 0.20 metres of the topsoil surrounding each stump was affected. The work did not disturb any archaeological deposits and no finds were recovered.	ERM412 MRM15880 MRM15878 FGR 03/118 ERM228
23	**St Laurence's Church Yard, The Forbury, Reading, Berkshire** *Watching brief, WA, 2006* 8 test pits were excavated. A deposit of coarse building sand and brick rubble was visible in the base and sections of the test pit 1. A clean, mid-reddish brown garden soil with charcoal flecks was found beneath the pavement slabs and in the base of the test pit 2. Test pit 3 exposed the foundation of the retaining wall of the churchyard. The foundation comprised three courses of flint rubble wall beneath the brick wall. The flint rubble foundation may represent the remains of the earlier flint wall, which is still extant along the southern side of the churchyard. Test pit 4 was dug to a depth of over 1m in order to expose the foundation of the retaining wall of the churchyard. The brick wall was observed to a depth of only 0.1m below the paving slab. This rested on a dressed stone foundation. It is possible that the stone is reused from the remains of Reading Abbey. Alternatively, the structure may relate to the remains of a burial vault or another structure. Test pit 5 exposed the foundation of the retaining wall of the churchyard. The brick wall was observed to a depth of 0.6m below ground level and then sat on flint rubble wall, as observed in test pit 3. The brick well identified in test pit 6 sat on a flint rubble wall as observed in test pits 3 and 5. Test pit 7 was found the base of the brick retaining wall and lower flint rubble wall. Test pit 8 exposed the brick retaining wall and lower flint rubble wall.	ERM509

HEA No.	Description	Site code/ HER/NHL No.
24	**Former NCP Car Park, Forbury Road, Reading, Berkshire** *Evaluation and watching brief, WA, 2007–08* 10 interventions were undertaken, seven evaluation test pits during the first stage and three trenches during the second stage. Each trench/test pit was excavated to the top of archaeology or underlying natural deposits, with the exception of test pits 4 and 7, which were abandoned. The results of the evaluation trenching found no significant archaeological remains; however, it was possible to identify an alluvial sequence capped by a peat horizon.	ERM871
25	**Forbury Road, Reading** *Watching brief, TWA, 1987–89* The narrow cutting was exposed for only a limited period and was obscured by trench sheeting and could not be safely entered. An apparently deliberate cut into the gravel on the south (Abbey) side of the wall was infilled with a gravelly brown soil with chalk flecks. Within the cut was a structure composed of mortared chalk lumps, each approximately 0.2m x 0.2m, and seen to run south-west to north-east. The walling exposed was c. 1m thick and survived to a height of *c* 1.8m.	W236 ERM494 MRM15914
26	**Former Cooper BMW, Kings Meadow Road, Reading, Berkshire.** *Evaluation and watching brief, TVAS, 2018* Consistent stratigraphy was recorded across the site and comprised up to 1.5m of modern made ground, lying above between 1m and 1.5m of alluvial clay above red yellow sandy gravel. Due to the interventions being up to 3m deep, it was not possible to investigate in detail the gravel and alluvial deposits. No deposits of archaeological interest were identified and no finds were recovered.	KMR 14/191 ERM2254 ERM2255
27	**Caversham Flood Risk Management, Reading** *Watching brief, CA, 2017* In the west of the site the natural geological substrate was predominantly silty clay with deposits of sand and chert gravel occasionally present, particularly in the north of the area further from the river. It was encountered between 0.4m and 1.3m, below made ground layers or alluvial flood deposits. In the eastern part of the site the natural geology was encountered between 0.1m and 2.9m. It consisted of sandy and silty clays with deposits of sand and gravel. Subsoil deposits, where encountered, were consistent with alluvial or overbank flooding events. Deep made ground deposits were encountered most notably in Trial Pits 13, 14, and 19, where they were recorded up to 2m thick. No features or deposits of archaeological interest were observed during groundwork.	CFRM 17 ERM2113
28	**Elliott's Joinery Works, Gosbrook Road, Caversham, Berkshire** *Evaluation, AOC, 1998* A total of nine trenches were excavated. All the trenches were excavated until natural gravels were encountered, which was at a level of between 35.9m–36.9m OD. All trenches were sealed by recent overburden and fill material which ranged from 0.3m to 0.8m. No significant archaeological deposits or features and finds were encountered. The only features and finds were modern, including large quantities of wood chips and off-cuts, suggesting that the site was not developed until the early 20th century for Elliott's Joinery Works.	EJG 98 ERD16
29	**King's Meadow Lido, Kings Meadow Road, Reading** *Watching brief, TVAS, 2017* The groundwork, although limited, identified stratified deposits, dating to the construction of the Lido, and also identified river silts of unknown date. All other areas did not reach depths that would have been archaeologically relevant. The area close to the structure revealed that there was a reduced level of around 0.8m during the construction of the Lido. This ground reduction was backfilled with various rubble and gravels. No archaeologically relevant features were uncovered and no finds were retrieved.	KML15/58 ERM2157

HEA No.	Description	Site code/ HER/NHL No.
30	**Land at Greyfriars Church, Friar Street, Reading, Berkshire** *Evaluation, FA, 2012* The evaluation has identified the presence of later medieval and post-medieval/modern stratified deposits within the site. A large cut feature probably later medieval was found in Trench 3, although its form and function remain unclear. In Trench 2 another cut feature was revealed. This was poorly dated, although it was visually distinct from the cut feature and was not necessarily related to it. Numerous tip layers dated to the later medieval through post-medieval/modern were excavated in Trenches 1 and 3 indicated the site had been utilised as a dump. An additional cut feature contained later medieval pottery sherds within one of the fill layers at a depth of *c* 0.9mbgl (42.5m OD).	GFS12 ERM1648 MRD3938 MRM17581 MRD3939
31	**South Eastern and Chatham Railway - Reading line**	MRD6125
32	**Civil War Defences at Reading, Berkshire** Civil War Defences as shown on the 1643 siege of Reading map.	MRD15703
33	**Reading, Berkshire** Possible line of Danish Defences, as illustrated in G.G. Astill's Historic Towns in Berkshire.	MRD15633
34	**Reading Abbey, Reading, Berkshire** Benedictine monastery founded in 1121 and consecrated as Cluniac monastery in 1164 by Henry I. Contains St Laurence's hospitium and St Laurence's School. The Hospitium of St. John the Baptist for 13 poor people founded by the Abbey in the 1190s. It also consisted of guest apartments for possibly up to 400 people. It stood to the north of St Laurence's Church whose north aisle served as the hospital's chapel. The hospital appears to have elapsed in the 15th century and the building was converted into a grammar school. During internal alterations at the Hospitium in 1927, 3 wall foundations and two skeletons were found in a trench. The skeletons were reburied in St Laurence's Churchyard. Recorded by William Smallcombe 06/05/1927.	MRD1374 MRD1398 MRD3943 MRD15563
35	**Reading to Mortimer Station, Berkshire** Section of Basingstoke branch railway line between Reading and Mortimer Station.	MRD6122 MRD6048
36	**Caversham Road Underbridge, Reading, Berkshire** Steel girder railway underbridge, constructed *c* 1890s.	MRM16715
37	**The Vastern Road Brook - Vastern Road to Kings Meadow, Reading, Berkshire** The Vastern Road Brook is a storm/flood culvert that runs alongside the north of Vastern Road. It is shown on the 1st Edition OS Map as a linear feature running alongside the north part of Vastern Road and onto Kings Meadow, where there is a sluice. The culvert is still functional and was re-discovered in *c* 2005, under an iron cover. The full extent and exact alignment of the brook along the north of Vastern Road is not known, nor is the location from which it originates.	MRM15994
38	**Reading Station, Reading, Berkshire** *Findspot* The burial of a man and a horse, with a sword, was discovered in 1831 100 yards east from the end of the engine sheds at Reading Station. According to Peake, the burial was found during the digging of ballast pits. Analysis of the sword pommel suggests that it is a Scandinavian `Gripping Beast' style of the 8th century. Its worn condition and advanced style accord with a date of interment soon after 800 AD.	MRD3891
39	**Vastern Meadows, Reading, Berkshire** Vastern Meadows comprised land given to the Friars Minor by the Abbot and Convent of Reading in 1233.	MRM16015
40	**Reading Station** *Findspot* Fragments of medieval pottery were found in the foundations of the new garage near the GWR Station.	MRD11371
41	**Corn Exchange, Reading, Berkshire** *Findspot* A 14–15th century pilgrim's bottle was found during building work at the site of the old Corn Exchange.	MRD11398
42	**Vastern Road, Reading, Berkshire** *Findspot* A dupondius of Vespasian was found in the sump of a new slipway to the Thames in 1956.	MRD11296

HEA No.	Description	Site code/ HER/NHL No.
43	**Thames River** *Findspot* A tranchet axe, a pick and a blade from the "Thames" at Reading. Neolithic axes and a perforated hammer head were dredged from the River Thames at Reading. Bronze Age artefacts, a Middle Bronze Age dagger blade, a socketed knife, two bronze palstaves, a bronze socketed sickle, a socketed axehead, a leaf shaped bronze spearhead, a basal looped spearhead and a Bronze Age pot dredged from the River Thames at Reading. An iron Merovingian bit and iron knife, iron spearhead and a 12th century battle axe was recovered. An arrowhead from the River Thames at Reading of suggested 13th–14th century date. A 17th Century bayonet recovered from the Thames at Reading.	MRD11164 MRD11185 MRD11218 MRD11346 MRD11395 MRD11401
44	**Thames River** *Findspot* Seven Mesolithic tranchet axeheads (2 light and 5 medium), four picks and a mace from the Thames at Caversham. A Prehistoric plano-convex knife was recovered from the River Thames at Caversham in 1998. Also found in the Thames at Caversham was the butt of a broken flint axe. Bronze Age spear-head from Thames opposite Caversham. Late Neolithic/Early Bronze Age basin shaped drinking cup decorated with punctured lines from the Thames at Caversham.	MRD11150 MRD11202 MRD11227 MRD11228
45	**Great Western Hotel, Reading, Berkshire** *Findspot* A silver halfpenny of Edward III was found below the ballroom of the Old Great Western Hotel in Reading.	MRD11367
46	**Blagrave Street, Reading, Berkshire** *Findspot* An undated flint wall was revealed under the service yards of the Grand Hotel.	MRD3964
47	**Wiston Terrace, Reading, Berkshire** *Findspot* Sherds of medieval pottery, glass, copper gross, clay pipes etc. were found during foundations digging in Wiston Terrace, Reading.	MRD11370
48	**Station Road, Reading, Berkshire** *Findspot* In 1904 a Lower Palaeolithic hand axe was found in a drainage trench in Station Road, Reading.	MRD9049
49	**Greyfriars Road, Reading** *Findspot* A 3rd brass of Magnentius was found in Greyfriars Road, Reading.	MRD11262
50	**Vachel Road, Reading, Berkshire** *Findspot* The Lower Palaeolithic hand axe was found in 1903. It is an ovate hand axe in a sharp, slightly stained and slightly patinated condition.	MRD9047
51	**Caversham Road, Reading, Berkshire** *Findspot* Finely struck Levalloisian flake was found in Caversham Road, Reading.	MRD9048
52	**7 Greyfriars Road, Reading, Berkshire** *Findspot* Demolition and building work at 7 Greyfriars Road revealed some fragmentary remains of the flint and mortar footings of a substantial building, almost certainly connected with the Friary which was built nearby after Abbot Robert of Burgate had given the Friars of Reading a new site in 1285. Two gilt and enamelled bronze heraldic pendants were found at the site of the Post Office in Friar Street.	MRD3933
53	**New Street/Friar Street, Reading, Berkshire** New Street/Friar Street was first documented in 1186.	MRD3931

HEA No.	Description	Site code/ HER/NHL No.
54	**Friar Street, Reading, Berkshire** *Findspot* During excavations for the foundations for new premises in Friar Street in Reading in August 1888, some fragments of human bone and a skull were dug out. These were at a depth of 4ft (1.2m) and were in association with animal bones. Later that year the remains of approximately six skeletons were recovered from a similar level. Also found was a Charles I farthing and two brass hand-made pins of rude construction	MRD3978
55	**Friar Street, Reading, Berkshire** *Findspot* An Early Iron Age brooch was found at Friar Street, Reading.	MRD11254
56	**Blagrave Street, Reading, Berkshire** *Findspot* A 12th/13th century jug of red hard ware was found in Blagrave Street, Reading.	MRD11365
57	**Blagrave Street, Reading, Berkshire** Blagrave Street is a post-medieval street in the centre of Reading.	MRD3987
58	**Reading Chronicle Building, Valpy Street, Reading** *Findspot* A post-medieval well was found whilst renovating a floor beneath the Reading Chronicle Building.	MRD3989
59	**Greyfriars Vicarage, Reading, Berkshire** *Findspot* Two extended skeletons were found by workmen during the digging of foundations for the new Greyfriars Vicarage (on west side). The burials are assumed to be connected with the old friary. The section showed that the fillings of the graves had already been disturbed by the footings for the previous vicarage built by Sir John Soane.	MRD4467
60	**Friar Street, Reading, Berkshire** *Findspot* Romano-British coarse sherds from the site of the former Littlewoods store.	MRD11257
61	**10 Queen Victoria Street, Reading, Berkshire** *Findspot* A quantity of 13th century pottery, including a thumb impressed rim sherd from a cooking pot in green glazed ware, was found 6ft (1.8m) down under 10 Queen Victoria Street in Reading.	MRD11369
62	**St Laurence's Churchyard, Reading, Berkshire** *Findspot* A Neolithic flint axe was found in St Laurence's Churchyard, Reading.	MRD11209
63	**Scottish and Southern Energy, 55 Vastern Road, Reading, RG1 8BU** *Locally listed building*	DRM2842

9 Planning framework

9.1 Statutory protection

Listed Buildings and Conservation Areas

9.1.1 The *Planning (Listed Buildings and Conservation Areas) Act 1990* sets out the legal requirements for the control of development and alterations which affect buildings, including those which are listed or in conservation areas. Buildings which are listed or which lie within a conservation area are protected by law. Grade I are buildings of exceptional interest. Grade II* are particularly significant buildings of more than special interest. Grade II are buildings of special interest, which warrant every effort being made to preserve them.

9.2 National Planning Policy Framework

9.2.1 The Government issued the *National Planning Policy Framework* (NPPF) in March 2012 (DCLG 2012) and supporting *Planning Practice Guidance* in 2014 (DCLG 2014). The 2012 NPPF was revised and a new NPPF published in July 2018, with minor revisions in February 2019 (MHCLG 2019).

Conserving and enhancing the historic environment

9.2.2 The NPPF section concerning "Conserving and enhancing the historic environment" (section 12 of the NPPF 2012) has been replaced by NPPF 2018 Section 16 (unchanged in February 2019), reproduced in full below:

> **Para 184.** Heritage assets range from sites and buildings of local historic value to those of the highest significance, such as World Heritage Sites which are internationally recognised to be of Outstanding Universal Value. These assets are an irreplaceable resource, and should be conserved in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of existing and future generations.
>
> **Para 185.** Plans should set out a positive strategy for the conservation and enjoyment of the historic environment, including heritage assets most at risk through neglect, decay or other threats. This strategy should take into account:
>
> - a) the desirability of sustaining and enhancing the significance of heritage assets, and putting them to viable uses consistent with their conservation;
> - b) the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring;
> - c) the desirability of new development making a positive contribution to local character and distinctiveness; and
> - d) opportunities to draw on the contribution made by the historic environment to the character of a place.
>
> **Para 186.** When considering the designation of conservation areas, local planning authorities should ensure that an area justifies such status because of its special architectural or historic interest, and that the concept of conservation is not devalued through the designation of areas that lack special interest.
>
> **Para 187.** Local planning authorities should maintain or have access to a historic environment record. This should contain up-to-date evidence about the historic environment in their area and be used to:
>
> - a) assess the significance of heritage assets and the contribution they make to their environment; and
> - b) predict the likelihood that currently unidentified heritage assets, particularly sites of historic and archaeological interest, will be discovered in the future.
>
> **Para 188.** Local planning authorities should make information about the historic environment, gathered as part of policy-making or development management, publicly accessible.
>
> **Proposals affecting heritage assets**

> **Para 189.** In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should have been consulted and the heritage assets assessed using appropriate expertise where necessary. Where a site on which development is proposed includes, or has the potential to include, heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.
>
> **Para 190.** Local planning authorities should identify and assess the particular significance of any heritage asset that may be affected by a proposal (including by development affecting the setting of a heritage asset) taking account of the available evidence and any necessary expertise. They should take this into account when considering the impact of a proposal on a heritage asset, to avoid or minimise any conflict between the heritage asset's conservation and any aspect of the proposal.
>
> **Para 191.** Where there is evidence of deliberate neglect of, or damage to, a heritage asset, the deteriorated state of the heritage asset should not be taken into account in any decision.
>
> **Para 192.** In determining applications, local planning authorities should take account of:
>
> - a) the desirability of sustaining and enhancing the significance of heritage assets and putting them to viable uses consistent with their conservation;
> - b) the positive contribution that conservation of heritage assets can make to sustainable communities including their economic vitality; and
> - c) the desirability of new development making a positive contribution to local character and distinctiveness.
>
> **Considering potential impacts**
>
> **Para 193.** When considering the impact of a proposed development on the significance of a designated heritage asset, great weight should be given to the asset's conservation (and the more important the asset, the greater the weight should be). This is irrespective of whether any potential harm amounts to substantial harm, total loss or less than substantial harm to its significance.
>
> **Para 194.** Any harm to, or loss of, the significance of a designated heritage asset (from its alteration or destruction, or from development within its setting), should require clear and convincing justification. Substantial harm to or loss of:
>
> - a) grade II listed buildings, or grade II registered parks or gardens, should be exceptional;
> - b) assets of the highest significance, notably scheduled monuments, protected wreck sites, registered battlefields, grade I and II* listed buildings, grade I and II* registered parks and gardens, and World Heritage Sites, should be wholly exceptional.
>
> **Para 195.** Where a proposed development will lead to substantial harm to (or total loss of significance of) a designated heritage asset, local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm or total loss is necessary to achieve substantial public benefits that outweigh that harm or loss, or all of the following apply:
>
> - a) the nature of the heritage asset prevents all reasonable uses of the site; and
> - b) no viable use of the heritage asset itself can be found in the medium term through appropriate marketing that will enable its conservation; and
> - c) conservation by grant-funding or some form of not for profit, charitable or public ownership is demonstrably not possible; and
> - d) the harm or loss is outweighed by the benefit of bringing the site back into use.
>
> **Para 196.** Where a development proposal will lead to less than substantial harm to the significance of a designated heritage asset, this harm should be weighed against the public benefits of the proposal including, where appropriate, securing its optimum viable use.
>
> **Para 197.** The effect of an application on the significance of a non-designated heritage asset should be taken into account in determining the application. In weighing applications that directly or indirectly affect non-designated heritage assets, a balanced judgement will be required having regard to the scale of any harm or loss and the significance of the heritage asset.
>
> **Para 198.** Local planning authorities should not permit the loss of the whole or part of a heritage asset without taking all reasonable steps to ensure the new development will proceed after the loss has occurred.

Para 199. Local planning authorities should require developers to record and advance understanding of the significance of any heritage assets to be lost (wholly or in part) in a manner proportionate to their importance and the impact, and to make this evidence (and any archive generated) publicly accessible. However, the ability to record evidence of our past should not be a factor in deciding whether such loss should be permitted.

Para 200. Local planning authorities should look for opportunities for new development within Conservation Areas and World Heritage Sites, and within the setting of heritage assets, to enhance or better reveal their significance. Proposals that preserve those elements of the setting that make a positive contribution to the asset (or which better reveal its significance) should be treated favourably.

Para 201. Not all elements of a Conservation Area or World Heritage Site will necessarily contribute to its significance. Loss of a building (or other element) which makes a positive contribution to the significance of the Conservation Area or World Heritage Site should be treated either as substantial harm under paragraph 195 or less than substantial harm under paragraph 196, as appropriate, taking into account the relative significance of the element affected and its contribution to the significance of the Conservation Area or World Heritage Site as a whole.

Para 202. Local planning authorities should assess whether the benefits of a proposal for enabling development, which would otherwise conflict with planning policies but which would secure the future conservation of a heritage asset, outweigh the disbenefits of departing from those policies.

9.3 Local planning policy

9.3.1 The Reading Borough Local Plan was adopted 4 November 2019. The Local Plan replaces the previous development plans - the Core Strategy, Reading Central Area Action Plan and Sites and Detailed Policies Document – and is the main consideration in planning decisions. The relevant policies are as follows:

EN1: Protection and Enhancement of the Historic Environment

Historic features, areas of historic importance and other elements of the historic environment, including their settings will be protected and where possible enhanced. This will include:

- Listed Buildings;
- Conservation Areas;
- Scheduled Monuments;
- Historic parks and gardens; and
- Other features with local or national significance, such as sites and features of archaeological importance, and assets on the Local List.

All proposals will be expected to protect and where possible enhance the significance of heritage assets and their settings, the historic character and local distinctiveness of the area in which they are located. Proposals should seek to avoid harm in the first instance. Any harm to or loss of a heritage asset should require clear and convincing justification, usually in the form of public benefits.

Applications which affect Listed Buildings will not have an adverse impact on those elements which contribute to their special architectural or historic interest including, where appropriate, their settings.

Applications which affect Historic Parks and Gardens will safeguard features which form an integral part of the special character or appearance of the park or garden. Development will not detract from the enjoyment, layout, design, character, appearance, features or setting of the park or garden, key views out from the park, or prejudice its future restoration.

Applications which affect, or have the potential to affect, the significant features of heritage assets should be justified by a Heritage Statement.

The Council will monitor buildings and other heritage assets at risk through neglect, decay or other threats, proactively seeking solutions for assets at risk including consideration of appropriate development schemes that will ensure the repair and maintenance of the asset, and, as a last resort, using its statutory powers.

Where there is evidence of deliberate neglect or of damage to a heritage asset, the deteriorated state of the heritage asset should not be taken into account in any decision.

EN2: Areas of Archaeological Significance

Applicants should identify and evaluate sites of archaeological significance by consulting the Historic Environment Record. This will require an assessment of the archaeological impacts of development proposals to be submitted before the planning application is determined. Planning permission will not be granted in cases where the assessment of the archaeological impacts is inadequate.

Where remains cannot be preserved 'in situ,' remains should be properly excavated, investigated and recorded. This will require adequate provision for the identification, investigation, recording and publication of the archaeological resource. Where appropriate, Section 106 agreements will be negotiated to protect, enhance and interpret archaeological remains.

Development proposals which will have an adverse effect on scheduled monuments and other nationally important archaeological remains and their settings will not be allowed unless there is clear and convincing justification in the form of overriding public benefits.

EN4: Locally Important Heritage Assets

Development proposals that affect locally important heritage assets will demonstrate that development conserves architectural, archaeological or historical significance which may include the appearance, character and setting of the asset.

Planning permission may be granted in cases where a proposal could result in harm to or loss of a locally important heritage asset only where it can be demonstrated that the benefits of the development significantly outweigh the asset's significance. Where it is accepted by the Local Planning Authority that retention is not important, recording of the heritage asset should be undertaken and submitted alongside development proposals. Replacement buildings should draw upon heritage elements of the previous design, incorporating historical qualities that made the previous building significant. This may include appearance, scale and architectural quality.

10 Determining significance

10.1.1 'Significance' lies in the value of a heritage asset to this and future generations because of its heritage interest, which may be archaeological, architectural, artistic or historic. Archaeological interest includes an interest in carrying out an expert investigation at some point in the future into the evidence a heritage asset may hold of past human activity, and may apply to standing buildings or structures as well as buried remains. Known and potential heritage assets within the site and its vicinity have been identified from national and local designations, HER data and expert opinion. The determination of the significance of these assets is based on statutory designation and/or professional judgement against four values (EH 2008):

- *Evidential value*: the potential of the physical remains to yield evidence of past human activity. This might take into account date; rarity; state of preservation; diversity/complexity; contribution to published priorities; supporting documentation; collective value and comparative potential.
- *Aesthetic value*: this derives from the ways in which people draw sensory and intellectual stimulation from the heritage asset, taking into account what other people have said or written;
- *Historical value*: the ways in which past people, events and aspects of life can be connected through heritage asset to the present, such a connection often being illustrative or associative;
- *Communal value*: this derives from the meanings of a heritage asset for the people who know about it, or for whom it figures in their collective experience or memory; communal values are closely bound up with historical, particularly associative, and aesthetic values, along with and educational, social or economic values.

10.1.2 Consultation on draft revisions to the original *Conservation Principles* document which set out the four values was open from November 2017 until February 2018. The revisions aim to make them more closely aligned with the terms used in the NPPF (which are also used in designation and planning legislation): i.e. as archaeological, architectural, artistic and historic interest. This is in the interests of consistency, and to support the use of the Conservation Principles in more technical decision-making (HE 2017).

10.1.3 Table 3 gives examples of the significance of designated and non-designated heritage assets.

Table 3: Significance of heritage assets

Heritage asset description	Significance
World heritage sites Scheduled monuments Grade I and II* listed buildings Historic England Grade I and II* registered parks and gardens Protected Wrecks Heritage assets of national importance	Very high (International/ national)
Historic England Grade II registered parks and gardens Conservation areas Designated historic battlefields Grade II listed buildings Burial grounds Protected heritage landscapes (e.g. ancient woodland or historic hedgerows) Heritage assets of regional or county importance	High (national/ regional/ county)
Heritage assets with a district value or interest for education or cultural appreciation Locally listed buildings	Medium (District)
Heritage assets with a local (i.e. parish) value or interest for education or cultural appreciation	Low (Local)
Historic environment resource with no significant value or interest	Negligible
Heritage assets that have a clear potential, but for which current knowledge is insufficient to allow significance to be determined	Uncertain

10.1.4 Unless the nature and exact extent of buried archaeological remains within any given area has been determined through prior investigation, significance is often uncertain.

11 Non-archaeological constraints

11.1.1 It is anticipated that live services will be present on the site, the locations of which have not been identified by this archaeological report. Other than this, no other non-archaeological constraints to any archaeological fieldwork have been identified within the site.

11.1.2 Note: the purpose of this section is to highlight to decision makers any relevant non-archaeological constraints identified during the study, that might affect future archaeological field investigation on the site (should this be recommended). The information has been assembled using only those sources as identified in section 2 and section 13.4, in order to assist forward planning for the project designs, working schemes of investigation and risk assessments that would be needed prior to any such field work. MOLA has used its best endeavours to ensure that the sources used are appropriate for this task but has not independently verified any details. Under the Health & Safety at Work Act 1974 and subsequent regulations, all organisations are required to protect their employees as far as is reasonably practicable by addressing health and safety risks. The contents of this section are intended only to support organisations operating on this site in fulfilling this obligation and do not comprise a comprehensive risk assessment.

12 Glossary

Alluvium	Sediment laid down by a river. Can range from sands and gravels deposited by fast flowing water and clays that settle out of suspension during overbank flooding. Other deposits found on a valley floor are usually included in the term alluvium (e.g. peat).
Archaeological Priority Area/Zone	Areas of archaeological priority, significance, potential or other title, often designated by the local authority.
Brickearth	A fine-grained silt believed to have accumulated by a mixture of processes (e.g. wind, slope and freeze-thaw) mostly since the Last Glacial Maximum around 17,000BP.
B.P.	Before Present, conventionally taken to be 1950
Bronze Age	2,000–600 BC
Building recording	Recording of historic buildings (by a competent archaeological organisation) is undertaken *'to document buildings, or parts of buildings, which may be lost as a result of demolition, alteration or neglect',* amongst other reasons. Four levels of recording are defined by Royal Commission on the Historical Monuments of England (RCHME) and Historic England. Level 1 (basic visual record); Level 2 (descriptive record), Level 3 (analytical record), and Level 4 (comprehensive analytical record)
Built heritage	Upstanding structure of historic interest.
Colluvium	A natural deposit accumulated through the action of rainwash or gravity at the base of a slope.
Conservation area	An area of special architectural or historic interest the character or appearance of which it is desirable to preserve or enhance. Designation by the local authority often includes controls over the demolition of buildings; strengthened controls over minor development; and special provision for the protection of trees.
Cropmarks	Marks visible from the air in growing crops, caused by moisture variation due to subsurface features of possible archaeological origin (i.e. ditches or buried walls).
Cut-and-cover [trench]	Method of construction in which a trench is excavated down from existing ground level and which is subsequently covered over and/or backfilled.
Cut feature	Archaeological feature such as a pit, ditch or well, which has been cut into the then-existing ground surface.
Devensian	The most recent cold stage (glacial) of the Pleistocene. Spanning the period from *c* 70,000 years ago until the start of the Holocene (10,000 years ago). Climate fluctuated within the Devensian, as it did in other glacials and interglacials. It is associated with the demise of the Neanderthals and the expansion of modern humans.
Early medieval	AD 410–1066. Also referred to as the Saxon period.
Evaluation (archaeological)	A limited programme of non–intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area.
Excavation (archaeological)	A programme of controlled, intrusive fieldwork with defined research objectives which examines, records and interprets archaeological remains, retrieves artefacts, ecofacts and other remains within a specified area. The records made and objects gathered are studied and the results published in detail appropriate to the project design.
Findspot	Chance find/antiquarian discovery of artefact. The artefact has no known context, is either residual or indicates an area of archaeological activity.
Geotechnical	Ground investigation, typically in the form of boreholes and/or trial/test pits, carried out for engineering purposes to determine the nature of the subsurface deposits.
Head	Weathered/soliflucted periglacial deposit (i.e. moved downslope through natural processes).
Heritage asset	A building, monument, site, place, area or landscape positively identified as having a degree of significance meriting consideration in planning decisions. Heritage assets are the valued components of the historic environment. They include designated heritage assets and assets identified by the local planning authority (including local listing).
Historic environment assessment	A written document whose purpose is to determine, as far as is reasonably possible from existing records, the nature of the historic environment resource/heritage assets within a specified area.
Historic Environment Record (HER)	Archaeological and built heritage database held and maintained by the County authority. Previously known as the Sites and Monuments Record
Holocene	The most recent epoch (part) of the Quaternary, covering the past 10,000 years during which time a warm interglacial climate has existed. Also referred to as the 'Postglacial' and (in Britain) as the 'Flandrian'.
Iron Age	600 BC–AD 43
Later medieval	AD 1066 – 1500

Last Glacial Maximum	Characterised by the expansion of the last ice sheet to affect the British Isles (around 18,000 years ago), which at its maximum extent covered over two-thirds of the present land area of the country.
Locally listed building	A structure of local architectural and/or historical interest. These are structures that are not included in the Secretary of State's Listing but are considered by the local authority to have architectural and/or historical merit
Listed building	A structure of architectural and/or historical interest. These are included on the Secretary of State's list, which affords statutory protection. These are subdivided into Grades I, II* and II (in descending importance).
Made Ground	Artificial deposit. An archaeologist would differentiate between modern made ground, containing identifiably modern inclusion such as concrete (but not brick or tile), and undated made ground, which may potentially contain deposits of archaeological interest.
Mesolithic	12,000 – 4,000 BC
National Record for the Historic Environment (NRHE)	National database of archaeological sites, finds and events as maintained by Historic England in Swindon. Generally not as comprehensive as the country HER.
Neolithic	4,000 – 2,000 BC
Ordnance Datum (OD)	A vertical datum used by Ordnance Survey as the basis for deriving altitudes on maps.
Palaeo-environmental	Related to past environments, i.e. during the prehistoric and later periods. Such remains can be of archaeological interest, and often consist of organic remains such as pollen and plant macro fossils which can be used to reconstruct the past environment.
Palaeolithic	700,000–12,000 BC
Palaeochannel	A former/ancient watercourse
Peat	A build-up of organic material in waterlogged areas, producing marshes, fens, mires, blanket and raised bogs. Accumulation is due to inhibited decay in anaerobic conditions.
Pleistocene	Geological period pre-dating the Holocene.
Post-medieval	AD 1500–present
Preservation by record	Archaeological mitigation strategy where archaeological remains are fully excavated and recorded archaeologically and the results published. For remains of lesser significance, preservation by record might comprise an archaeological watching brief.
Preservation in situ	Archaeological mitigation strategy where nationally important (whether Scheduled or not) archaeological remains are preserved *in situ* for future generations, typically through modifications to design proposals to avoid damage or destruction of such remains.
Registered Historic Parks and Gardens	A site may lie within or contain a registered historic park or garden. The register of these in England is compiled and maintained by Historic England.
Residual	When used to describe archaeological artefacts, this means not *in situ,* i.e. Found outside the context in which it was originally deposited.
Roman	AD 43–410
Scheduled Monument	An ancient monument or archaeological deposits designated by the Secretary of State as a 'Scheduled Ancient Monument' and protected under the Ancient Monuments Act.
Site	The area of proposed development
Site codes	Unique identifying codes allocated to archaeological fieldwork sites, e.g. evaluation, excavation, or watching brief sites.
Study area	Defined area surrounding the proposed development in which archaeological data is collected and analysed in order to set the site into its archaeological and historical context.
Solifluction, Soliflucted	Creeping of soil down a slope during periods of freeze and thaw in periglacial environments. Such material can seal and protect earlier landsurfaces and archaeological deposits which might otherwise not survive later erosion.
Stratigraphy	A term used to define a sequence of visually distinct horizontal layers (strata), one above another, which form the material remains of past cultures.
Truncate	Partially or wholly remove. In archaeological terms remains may have been truncated by previous construction activity.
Watching brief (archaeological)	A formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons.

13 Bibliography

13.1 Published and documentary sources

CIfA [Chartered Institute for Archaeologists] 2014a, *Standards and guidance for commissioning work or providing consultancy advice on archaeology and the historic environment*, Published December 2014, Reading.

CIfA [Chartered Institute for Archaeologists] 2017, *Standards and guidance for historic environment desk-based assessment*, Published December 2014, updated January 2017, Reading

DCLG [Department of Communities and Local Government], March 2012 *National Planning Policy Framework*

DCLG [Department of Communities and Local Government], March 2014 *Conserving and Enhancing the Historic Environment: Planning Practice Guide*

Domesday Book, A Complete Translation, eds Williams, A. and Martin, G.H. 1992, 2002. London: Penguin Books

EH [English Heritage], 2008 *Conservation principles, policies and guidance.* Swindon

HE [Historic England] 2015a, *The Setting of Heritage Assets – Historic Environment Good Practice Advice in Planning: 3*. Historic England in collaboration with the Historic Environment Forum, second edition, Historic England July 2015.

HE [Historic England] 2015b *Managing Significance in Decision-Taking in the Historic Environment – Historic Environment Good Practice Advice in Planning: 2*. Historic England in collaboration with the Historic Environment Forum, second edition, Historic England July 2015.

HE [Historic England] 2017 *Conservation Principles for the Sustainable Management of the Historic Environment,* Consultation Draft, 10th November 2017 https://content.historicengland.org.uk/content/docs/guidance/conservation-principles-consultation-draft.pdf

Humphery-Smith C, 1984 *The Phillimore Atlas and Index of Parish Registers*.

MHCLG [Ministry of Housing, Communities and Local Government], 2019 *National Planning Policy Framework,* revised February 2019

Reading Borough Council, 2019 *Reading Borough Local Plan* Adopted November 2019

13.2 Other Sources

British Geological Survey online historic geology borehole data and digital drift and solid geology data
Berkshire Historic Environment Record
Historic England designation data
Internet – web-published sources:

The Great Western Archive (2013) History of the Great Western Railway [Online] Available at http://www.greatwestern.org.uk/m_in_gwr.htm Accessed 28-11-2019

Reading Borough Council (2019) Local Planning Policy [Online] Available at https://www.reading.gov.uk/newlocalplan Accessed 28-11-2019

Groundsure historic Ordnance Survey mapping
Berkshire Record Office

13.3 Cartographic sources

Ordnance Survey maps
Ordnance Survey 1" map (1830)
Ordnance Survey 1st edition 25" map (1879–81).
Ordnance Survey 2nd edition 25" map (1899–1900).
Ordnance Survey 1:1250 scale maps (1956–57, 1969–72, 1988–93)

Engineering/Architects drawings

Collado Collins Architects, Parameter Plan – Building Plots, dwg 17043, PP-102, Rev P10, 23-10-2019
Collado Collins Architects, Parameter Plan – Plot Heights Non-Residential Use, dwg 17043, PP-103, Rev P6, 23-10-2019

Collado Collins Architects, Parameter Plan – Plot Heights Residential Use, dwg 17043, PP-104, Rev P15, 23-10-2019
Collado Collins Architects, Parameter Plan – Basement Footprint, dwg 17043, PP-105, Rev P1, 23-10-2019
Plowman Craven, Reading Station North Topographical Survey, dwg. 40652-004T-01-1, Rev: A, 02-07-2019

13.4 Available site survey information checklist

Information from client	**Available**	**Format**	**Obtained**
Plan of existing site services (overhead/buried)	not known	–	N
Levelled site survey as existing (ground and buildings)	Y	pdf/CAD	Y
Contamination survey data ground and buildings (inc. asbestos)	not known	–	N
Geotechnical report	N	–	N
Envirocheck report	not known	–	N
Information obtained from non-client source	**Carried out**	**Internal inspection of buildings**	
Site inspection	Y	Y	



Fig 1 Site location

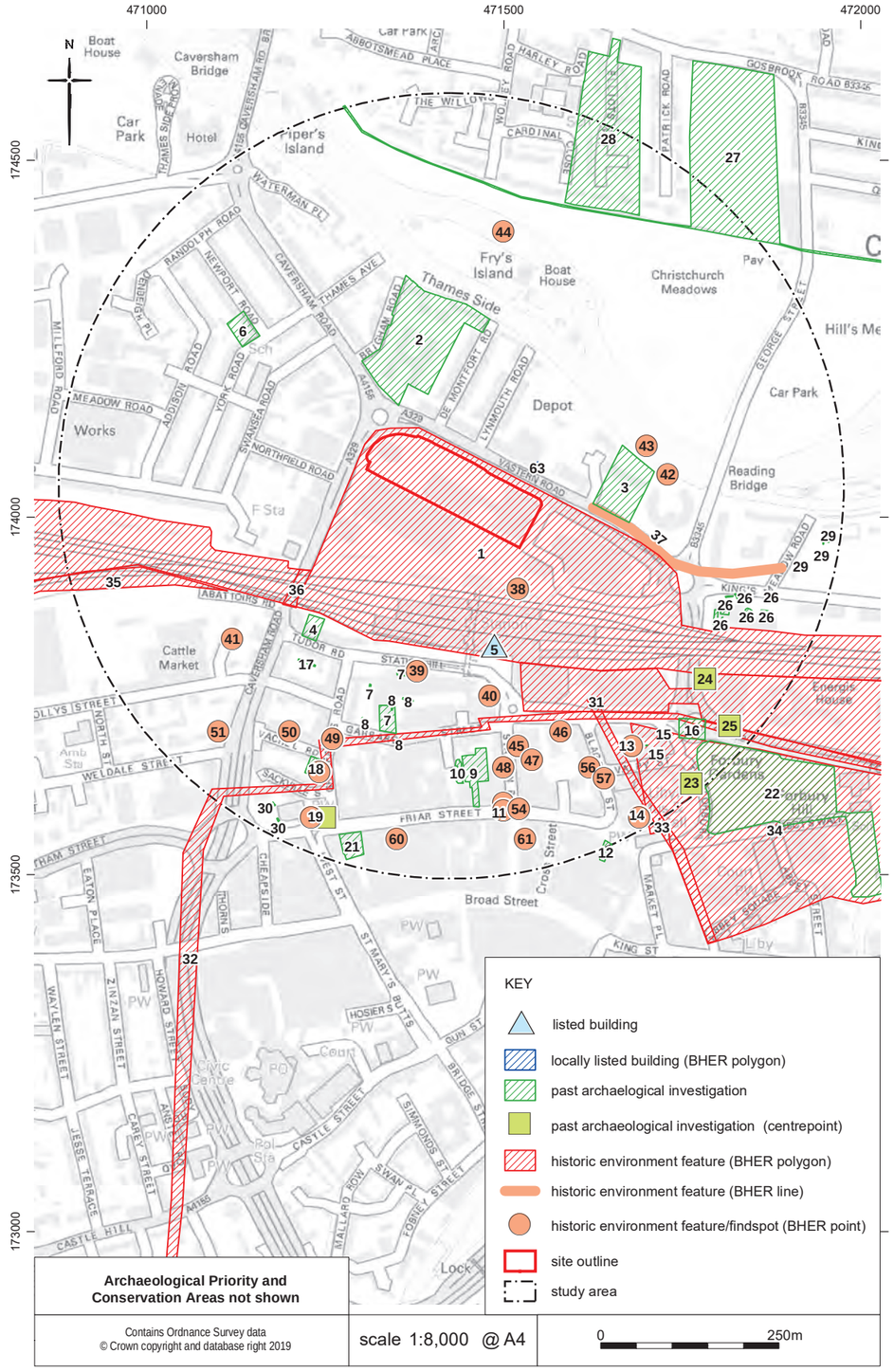


Fig 2 Historic environment features map

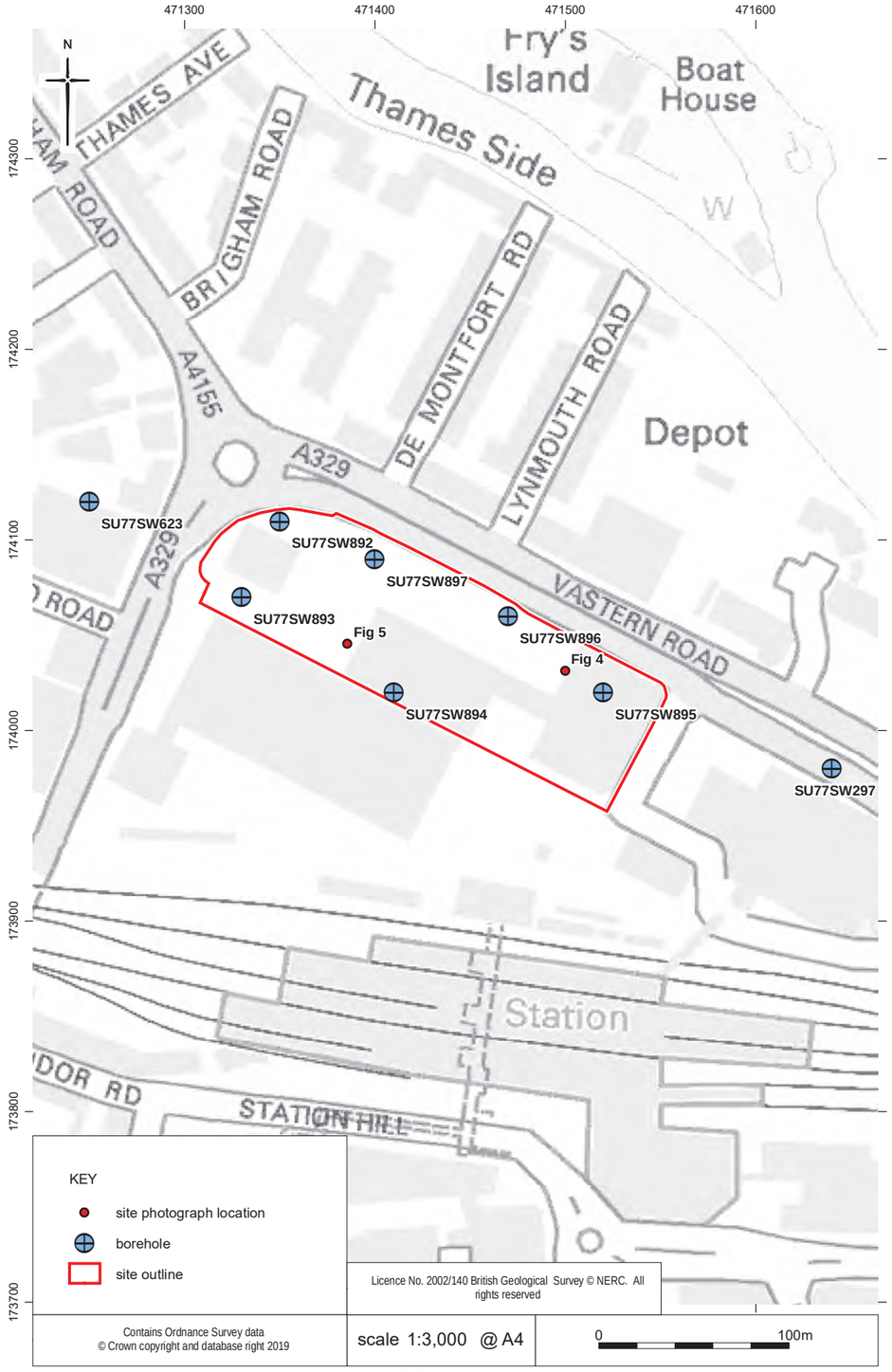


Fig 3 Historic British Geological Survey (BGS) borehole locations and existing site photograph locations

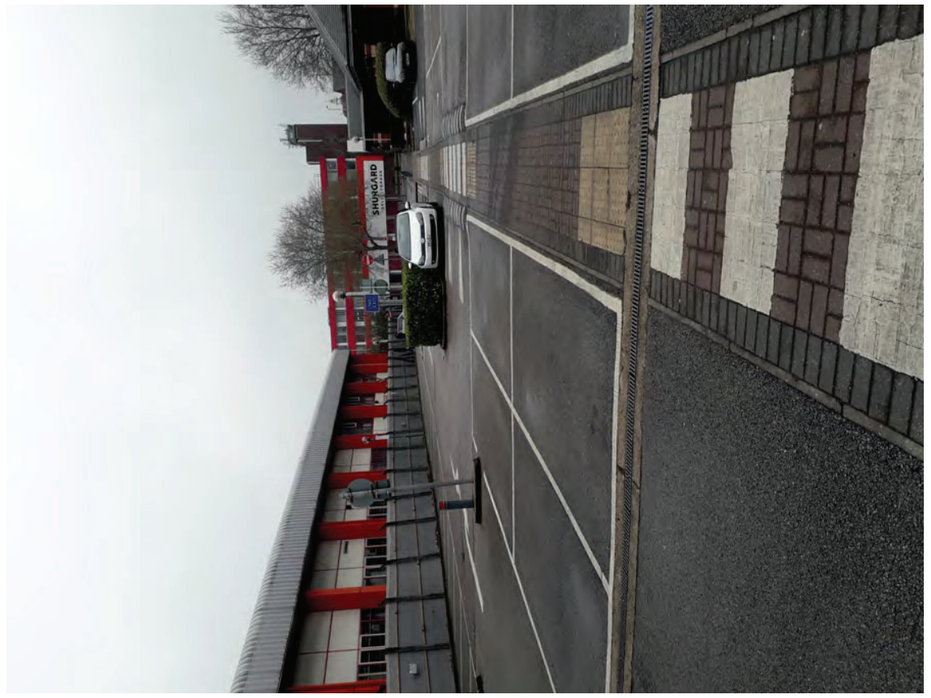


Fig 5 Looking west across the south-west of the site (MOLA photograph 2019)

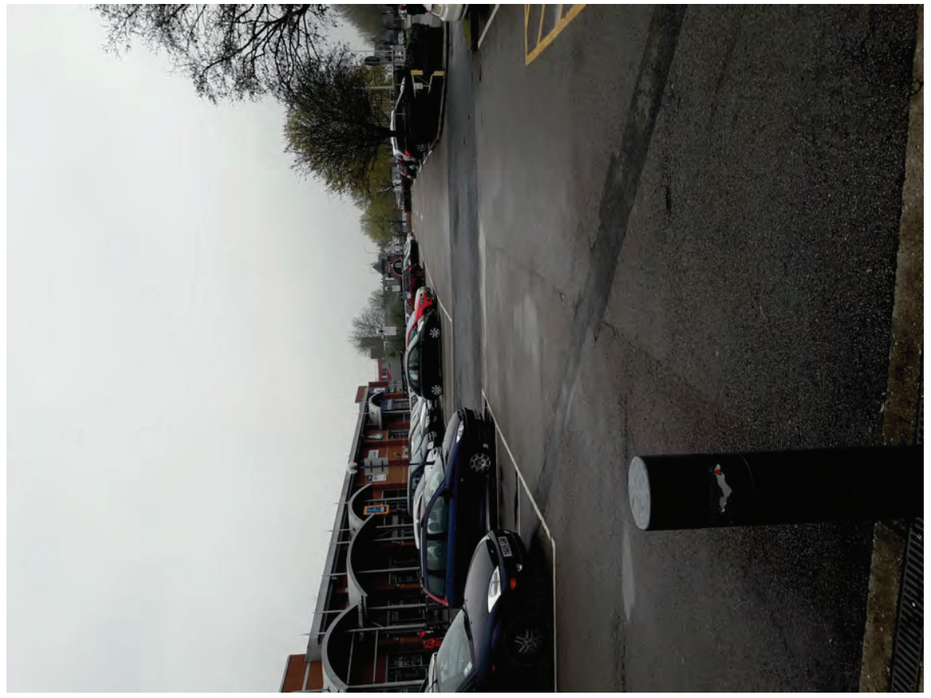


Fig 4 Looking north-west across the north of the site (MOLA photograph 2019)



Fig Or nance ur e 1 mi e map of 1 0 (not to sca e)

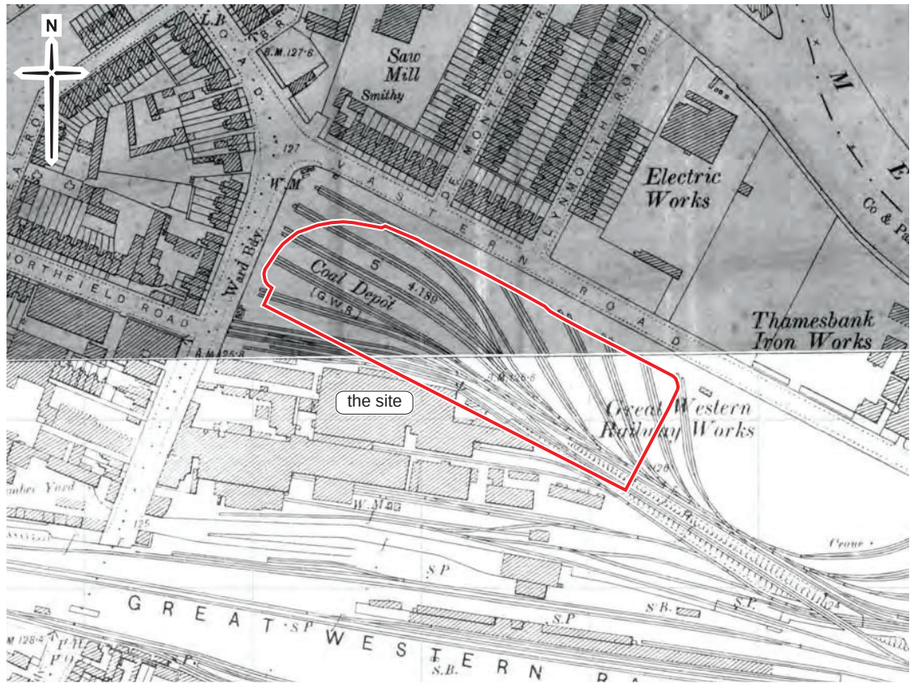


Fig Or nance ur e 2n e ition 25 mi e map of 1 99 1900 (not to sca e)

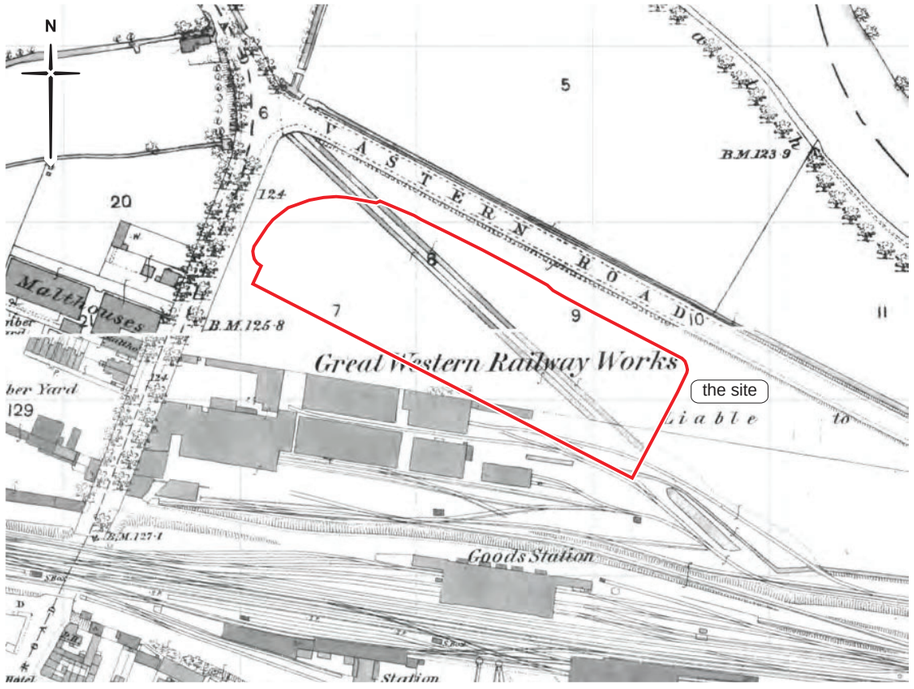


Fig Or nance ur e 1st e ition 25 mi e map of 1 9 1 (not to sca e)

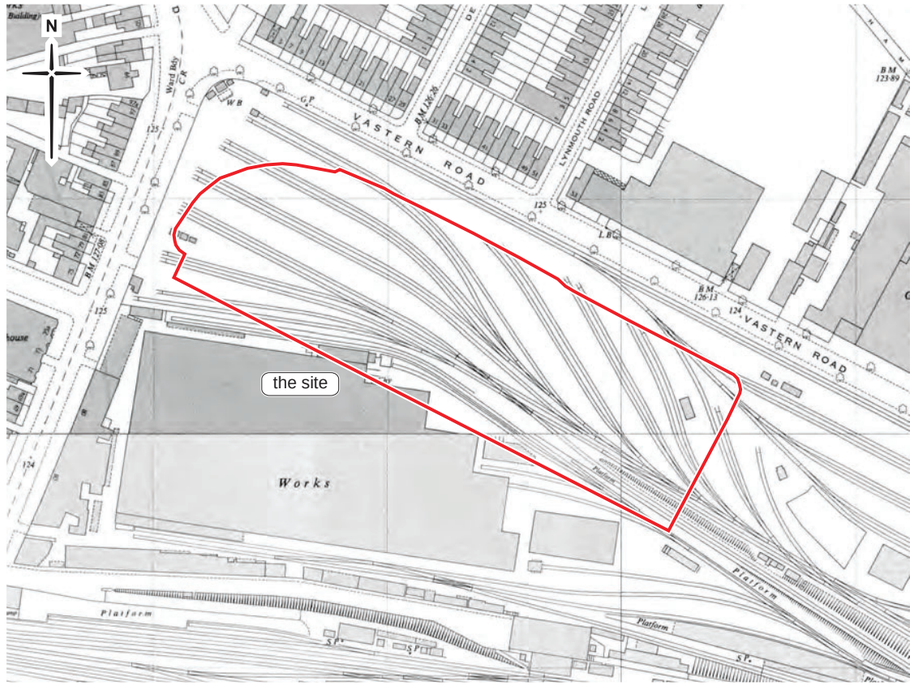


Fig 9 Or nance ur e 1 1250 sca e map of 195 5 (not to sca e)

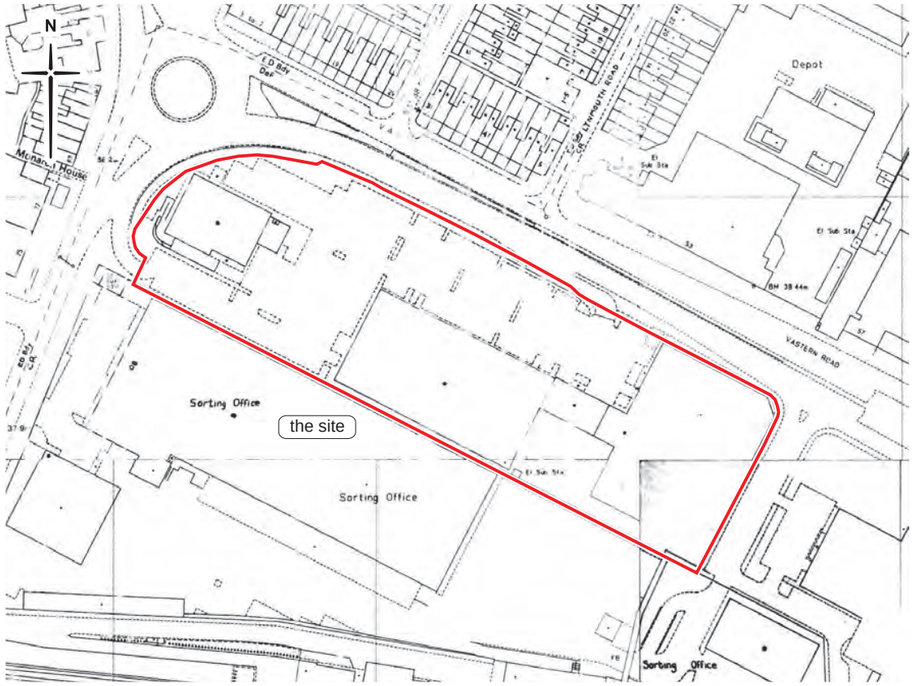


Fig 10 Or nance ur e 1 1250 sca e map of 19 9 (not to sca e)

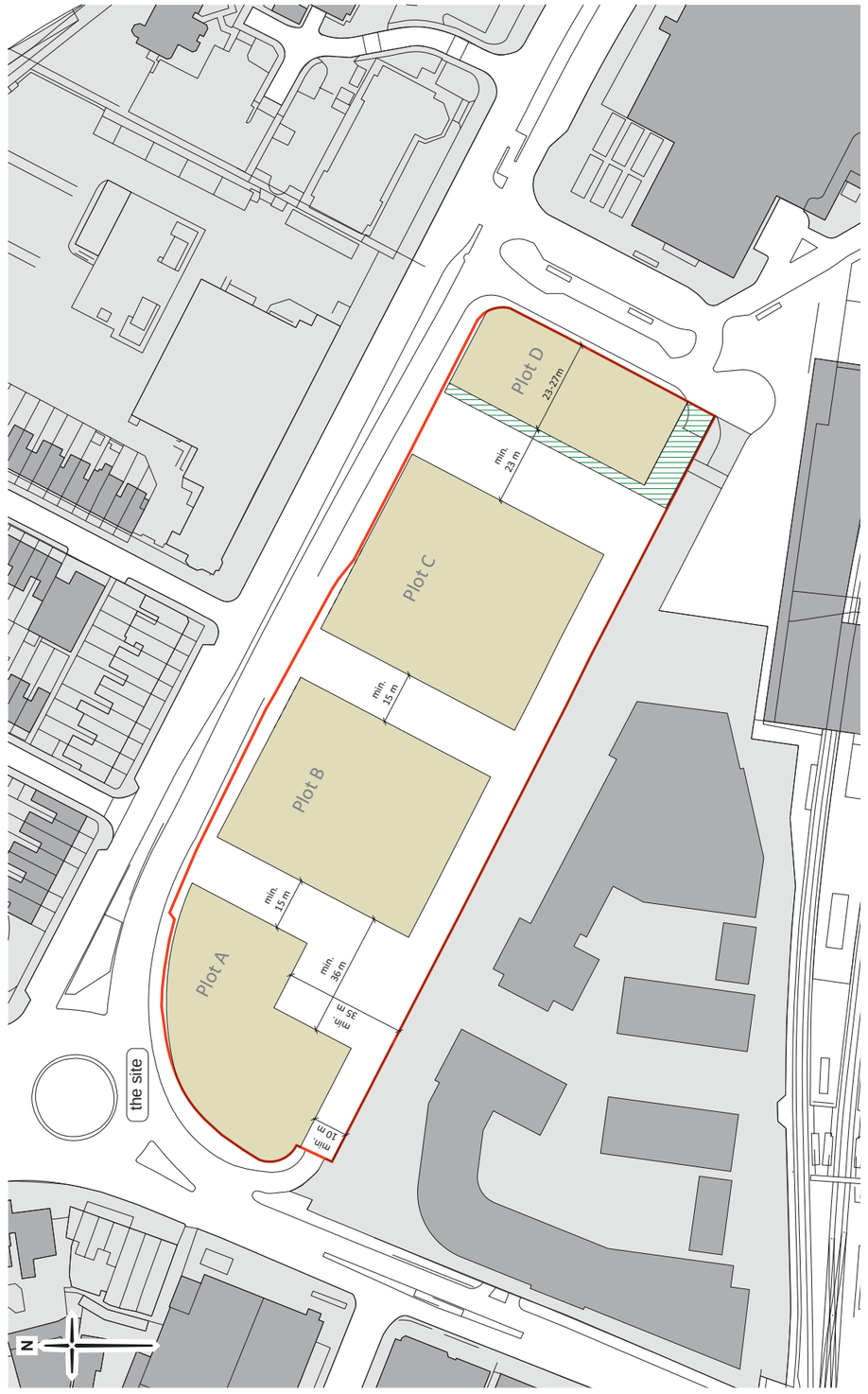


Fig 11 Out ine ui ing p ots parameter p an (o a o o ins Architects arameter an ui ing ots wg 1 04 -102 e 10 2 -10-2019)

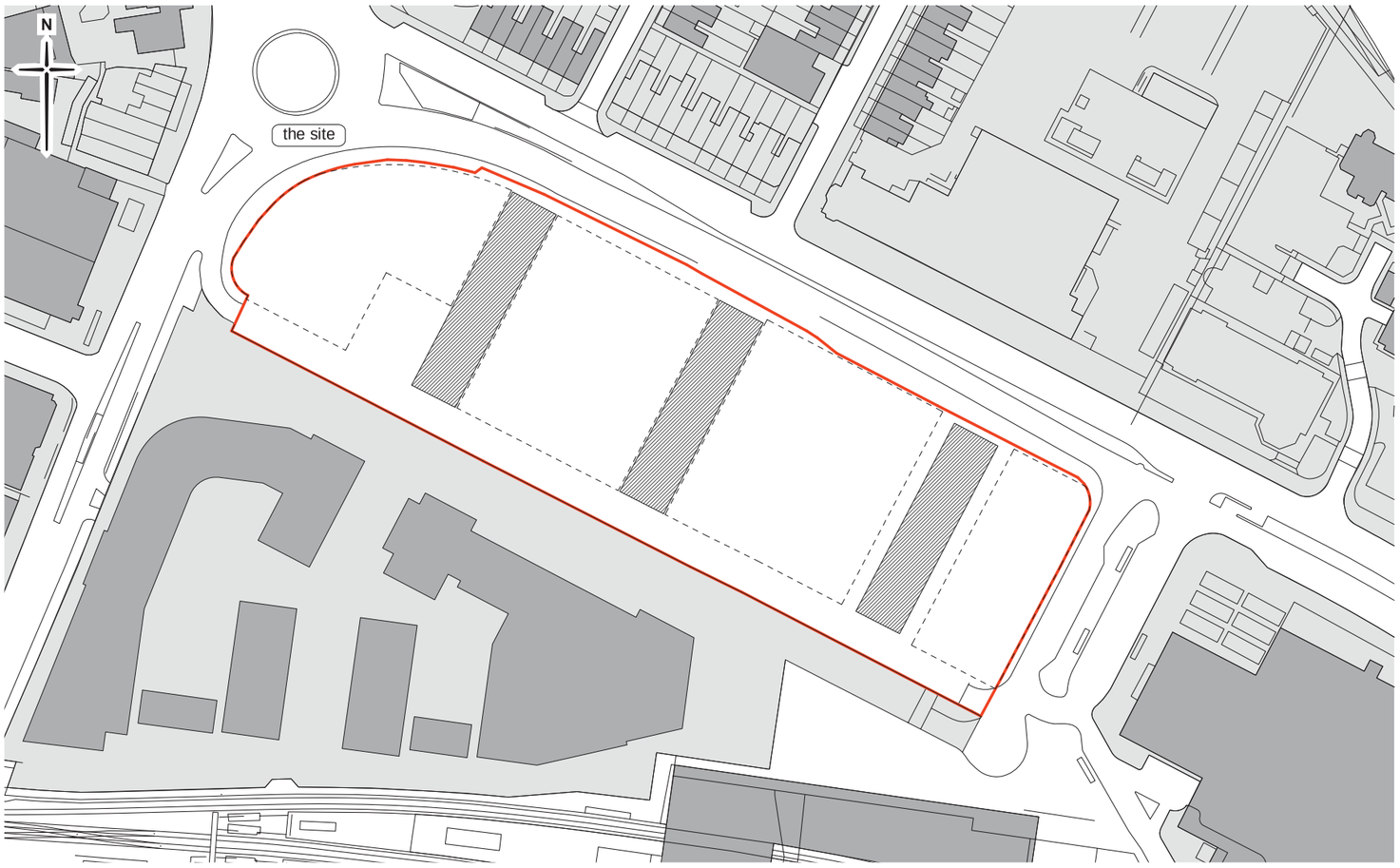


Fig 12 Out ine attenuation tank parameter p an (o a o o ins Architects arameter an asement Footprint wg 1 04 -105 e 1 2 -10-2019)

Technical Appendix 2.6: Summary Planning Policies

Policy Matrix

Policy		Environmental Statement Chapters							Technical Appendices			
		Socio-Economics	**Air Quality**	**Noise and Vibration**	**Wind**	**Daylight, Sunlight and Overshadowing**	**Townscape and Visual**	**Built Heritage**	**Preliminary Risk Assessment**	**Ecological Impact Assessment**	**Flood Risk Assessment**	**Historic Environment Assessment**
National Planning Policy Framework, 2019[1]		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Planning Policy Guidance, 2019[2]		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
Reading Borough Local Plan, 2019[3]	H1: Provision of Housing	✓										
	H3: Affordable Housing	✓										
	EN1: Protection and Enhancement of the Historic Environment											✓
	EN2: Areas of Archaeological Significance											✓
	EN4: Locally Important Heritage Assets											✓
	EN12: Biodiversity and the Green Network									✓		
	EN14: Trees, Hedges And Woodlands									✓		
	EN15: Air Quality		✓									
	EN16: Pollution and Water Resources			✓					✓	✓		
	EN17: Noise Generating Equipment			✓								
	CC3: Adaptation To Climate Change				✓							
	CC8: Safeguarding Amenity				✓							
	CR10: Tall Buildings				✓	✓	✓					
Reading Station Area Framework, 2010[4]				✓		✓	✓					

[1] Secretary of State for Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework.
[2] https://www.gov.uk/government/collections/planning-practice-guidance
[3] Reading Borough Council, 2019. Reading Borough Local Plan.
[4] Reading Borough Council, 2010. Reading Station Area Framework.

Policy Matrix

Policy	Environmental Statement Chapters							Technical Appendices			
	Socio-Economics	Air Quality	Noise and Vibration	Wind	Daylight, Sunlight and Overshadowing	Townscape and Visual	Built Heritage	Preliminary Risk Assessment	Ecological Impact Assessment	Flood Risk Assessment	Historic Environment Assessment
Reading City Centre Framework, 2008[5]						✓					
Reading Housing and Economic Land Availability Assessment, 2017[6]						✓					
Reading Tall Buildings Strategy, 2008[7]						✓					
Reading Biodiversity Action Plan[8]											
Reading Local Development Framework, Sites and Detailed Policies Document, (Altered 2015)					✓						
Reading Central Area Action Plan (AAP), 2009					✓						
The European Air Quality Framework Directive and Daughter Directives[9],[10]		✓									
Clean Air Strategy, 2019[11]		✓									
Part IV of the Environment Act, 1995 (as amended)[12]		✓									
Air Quality Action Plan, 2009 (as revised)[13]		✓									
Air Quality Strategy, 2007[14]		✓									
Air Quality Standards (Amendment) Regulations, 2016[15]		✓									
Environmental Protection UK/Institute of Air Quality Management Guidance, Land-Use Planning Guidance, 2017[16]		✓									
Local Air Quality Management Technical Guidance, 2016 (LAQM.TG(16))[17]		✓									
IAQM guidance on the Assessment of Dust from Demolition and Construction, 2016[18]		✓									

[5] Reading Borough Council, 2008. Reading City Centre Framework.
[6] Reading Borough Council, 2017. Reading Housing and Economic Land Availability Assessment.
[7] Reading Borough Council, 2008. Reading Tall Building Strategy.
[8] Reading Borough Council, 2005-2015. The Reading Biodiversity Action Plan.
[9] European Commission, 2008. Directive 2008/50/EC. Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.
[10] European Air Quality Directive, 2004. European Air Quality Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.
[11] Defra, 2019. Clean Air Strategy.
[12] Secretary of State, 1995. The Environment Act part IV Air Quality, HMSO.
[13] Reading Borough Council, 2009. Air Quality Action Plan.
[14] Department for Environment, Food and Rural Affairs, 2007. Air Quality Strategy for England, Scotland, Wales and Northern Ireland. HMSO.
[15] Statutory Instrument, 2016. No. 1184, The Air Quality Standards (Amendment) Regulations 2016. HMSO.
[16] Institute of Air Quality Management and Environmental Protection UK, 2017. Land-Use Planning & Development Control: Planning for Air Quality.
[17] Department of the Environment, Food and Rural Affairs (Defra) in partnership with the Scottish Executive, The National Assembly for Wales and the Department of the Environment for Northern Ireland, 2016. 'Local Air Quality Management Technical Guidance, LAQM.TG(16)'. HMSO, London.
[18] Holman et al, 2016. IAQM Guidance on the assessment of dust from demolition and construction V1.1. Institute of Air Quality Management, London.

Policy Matrix

Policy		Environmental Statement Chapters							Technical Appendices			
		Socio-Economics	**Air Quality**	**Noise and Vibration**	**Wind**	**Daylight, Sunlight and Overshadowing**	**Townscape and Visual**	**Built Heritage**	**Preliminary Risk Assessment**	**Ecological Impact Assessment**	**Flood Risk Assessment**	**Historic Environment Assessment**
IAQM guidance on Land-Use Planning and Development Control: Planning for Air Quality, 2017[19]			✓									
Control of Pollution Act, Part III – Noise, 1974[20]				✓								
The Environmental Protection Act 1990, (as amended)[21]				✓								
Noise Policy Statement for England, 2010[22]				✓								
Sustainable Design and Construction: Adopted Supplementary Planning Document, 2019[23]				✓								
British Standards Institution	BS 4142:2014[24] – 'Methods for Rating and Assessing Industrial and Commercial Sound'			✓								
	BS 5228:2009+A1:2014[25] – 'Code of Practice for Noise and Vibration Control on Construction and Open Sites'			✓								
	BS 7385-2:1993[26] - 'Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Groundborne Vibration'			✓								
	BS 8233:2014[27] – 'Guidance on Sound Insulation and Noise Reduction for Buildings'			✓								
	BS 6472-1:2008[28] – 'Guide to Evaluation of Human Exposure to Vibration in Buildings. Vibration Sources Other Than Blasting'			✓								
	BS 8206-2:2008[29] Lighting for buildings. Code of practice for daylighting					✓						
Calculation of Road Traffic Noise, 1988[30]				✓								
Design Manual for Roads and Bridges, 2011[31]				✓								

[19] Moorcroft and Barrowcliffe. et al., 2017. Land-use Planning & Development Control: Planning for Air Quality. v1.2. Institute of Air Quality Management, London.
[20] Secretary of State, 1974, Control of Pollution Act, HMSO.
[21] Secretary of State, 1990. Environmental Protection Act 1990. HMSO.
[22] Department of the Environment, Food and Rural Affairs (Defra), 2010. Noise Policy Statement for England (NPSE).
[23] Reading Borough Council, 2019. Sustainable Design and Construction – Supplementary Planning Document.
[24] British Standards Institution, 2014. BS 4142:2014. Method for Rating and Assessing Industrial and Commercial Sound.
[25] British Standards Institution, 2014. BS 5228:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites.
[26] British Standards Institution, 1993. BS 7385-2:1993. Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Groundborne Vibration.
[27] British Standards Institution, 2014. BS 8233 2014. Guidance on sound insulation and noise reduction for buildings, BSI.
[28] British Standards Institution, 2008. BS 6472:2008. Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting, BSI.
[29] British Standards Institution, 2009. BS 8206-2:2008. Lighting for buildings. Code of practice for daylighting.
[30] Department of Transport and the Welsh Office, 1988. Calculation of Road Traffic Noise, DoT & Welsh Office.
[31] Highways Agency, 2011. Design Manual for Roads and Bridges Volume 11 Section 3 Part 7, HA.

Policy Matrix

Policy	Environmental Statement Chapters							Technical Appendices			
	Socio-Economics	Air Quality	Noise and Vibration	Wind	Daylight, Sunlight and Overshadowing	Townscape and Visual	Built Heritage	Preliminary Risk Assessment	Ecological Impact Assessment	Flood Risk Assessment	Historic Environment Assessment
IEMA Guidelines for Environmental Noise Impact Assessment, 2004[32]			✓								
WHO Guidelines for Community Health, 1999[33]			✓								
ProPG: Planning & Noise: Professional Practice Guidance on Planning & Noise[34]			✓								
ISO in 9613:1996[35]: Part 2 Attenuation of sound during propagation outdoors			✓								
Site Layout Planning for Daylight and Sunlight. A Guide to Good Practice, 2011[36]					✓						
CIE 146:2002 & CIE 147:2002: Collection on Glare[37]					✓						
Planning (Listed Building and Conservation Areas) Act, 1990[38]							✓				
The Setting of Heritage Assets, 2015[39]							✓				
Managing Significance in Decision-Taking in the Historic Environment, 2015[40]							✓				
Department for Digital, Culture, Media and Sport's 'Principles of Selection for Listing Buildings', 2010[41]							✓				
The Conservation of Habitats and Species Regulations, 2017[42]									✓		
The Countryside and Rights of Way Act, 2000[43]									✓		
The Wildlife and Countryside Act, 1981[44]									✓		

[32] Institute of Environmental Management & Assessment (IEMA), 2014. Guidelines for Environmental Noise Impact Assessment.
[33] World Health Organisation, 1999. Guidelines for Community Noise. Geneva.
[34] The Association of Noise Consultants (ANC), Institute of Acoustics (IoA), Chartered Institute of Environmental Health, 2017. Professional Practice Guidance on Planning & Noise (ProPG): New Residential Development.
[35] International Organization for Standardization, 1996. ISO 9613: 1996 Part 2 Attenuation of sound during propagation outdoors, ISO.
[36] Building Research Establishment, 2011. Site Layout Planning for Daylight and Sunlight. A Guide to Good Practice.
[37] International Commission on Illumination, 2002. CIE Collection on Glare.
[38] HM Government, 1990. The Planning (Listed Buildings and Conservation Areas) Act.
[39] Historic England, 2015. The Setting of Heritage Assets. Historic Environment Good Practice Advice in Planning Note 3 (Second Edition).
[40] Historic England, 2015. Managing Significance in Decision-Taking in the Historic Environment. Historic Environment Good Practice Advice in Planning: 2.
[41] DCMS, 2010. Principles of Selection for Listing Buildings.
[42] Secretary of State, 2017. The Conservation of Habitats and Species Regulations. HMSO.
[43] Secretary of State, 2000. The Countryside and Rights of Way Act. HMSO.
[44] Secretary of State, 1981. Wildlife and Countryside Act. HMSO.

Policy Matrix

Policy	Environmental Statement Chapters							Technical Appendices			
	Socio-Economics	Air Quality	Noise and Vibration	Wind	Daylight, Sunlight and Overshadowing	Townscape and Visual	Built Heritage	Preliminary Risk Assessment	Ecological Impact Assessment	Flood Risk Assessment	Historic Environment Assessment
Natural Environment and Rural Communities Act, 2006[45]									✓		
The Protection of Badgers Act, 1992[46]									✓		
UK Post-2010 Biodiversity Framework, 2012[47]									✓		
Natural Environment White Paper, 2011[48]									✓		
Biodiversity 2020, 2011[49]									✓		
Sustainable Drainage Systems: Non-statutory technical standards for sustainable drainage systems[50]										✓	

[45] Natural Environment and Rural Communities Act, 2006. HMSO.
[46] Secretary of State, 1992. Protection of Badgers Act 1992. HMSO.
[47] JNCC and Defra (on behalf of the Four Countries' Biodiversity Group), 2012. UK Post-2010 Biodiversity Framework.
[48] Department of the Environment, Food and Rural Affairs (Defra), 2011. Natural Environment White Paper. The natural choice: securing the value of nature.
[49] Department of the Environment, Food and Rural Affairs (Defra), 2011. Biodiversity 2020.
[50] Department of the Environment, Food and Rural Affairs (Defra), 2015. Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems.

Technical Appendix 7.1: EHO Consultation

From: Jarvis, Ross <Ross.Jarvis@reading.gov.uk>
Sent: 19 December 2019 11:50
To: Ana Gomes <ana.gomes@ramboll.co.uk>
Subject: RE: Air Quality Consultation - Vastern Road

Hi Ana,

Although the train station is outside the 30m range recommended in guidance, Reading is a large busy train station with multiple lines. I therefore think that the impact of this on the proposed development should be looked at. I agree with the rest of the proposed methodology.

Regards

Ross

Ross Jarvis
Senior Environmental Health Officer
Environmental Protection & Nuisance | Directorate of Economic Growth and Neighbourhood Services
Reading Borough Council
Civic Offices
Bridge Street
Reading
RG1 2LU

0118 937 2314 (72314)

Website | Facebook | Twitter | YouTube

From: Ana Gomes [mailto:ana.gomes@ramboll.co.uk]
Sent: 16 December 2019 16:19
To: Jarvis, Ross
Subject: Air Quality Consultation - Vastern Road

Classification).
This is an EXTERNAL EMAIL. STOP. THINK before you CLICK links or OPEN attachments.

Dear Jarvis,

Ramboll has been commissioned to undertake an air quality assessment as part of an EIA for the proposed development at Vastern Road.

The attached scoping opinion request report has been submitted recently to Reading Borough Council and includes all the proposed development relevant information. Air quality is one of the topics proposed to be scoped in and Section 7.2 of the report presents the methodology of the air quality assessment.
The report proposes to assess the potential impacts of demolition and construction activities, industrial, road and rail emissions and of a potential energy plant. However, given the proposed development relatively low base loads a CHP is not considered viable and therefore no energy plant is being proposed as part of the development.

The development is located approximately 50m from Reading Rail Station and no stationary or moving diesel locomotives have been identified within 15m or 30m, respectively, of potential future receptors within the proposed development (TG(16)). The rail emissions are considered to have an insignificant impact on the proposed development and therefore we proposed to scope out rail emissions from the assessment. Also, no existing off-site emissions from industrial sites in proximity to the proposed development have been identified.

We propose to use the closest monitoring tubes to the site for model verification (DT51 to 53). Unfortunately, we do not have all the relevant road links traffic data to be able to include the automatic site in the verification process.
The development would replace the current existing retail park and a net reduction of approximately 3000 daily vehicles has been predicted. Although we expect an improvement in local air quality due to traffic flows reduction, we proposed to model both site suitability and impact of development.

Please, could you let me know if you agree with the proposed methodology within the scoping report and the above? Also, do you have any further concerns regarding air quality?

Thank you for your time.

Kind regards
Ana Gomes
Senior Air Quality Consultant

M 07583 102977
ana.gomes@ramboll.co.uk
Ramboll UK Limited Registered in England & Wales Company No: 03659970
Registered office: 240 Blackfriars Road, London SE1 8NW

Click here to report this email as spam.

The information in this e-mail is confidential to the intended recipient to whom it has been addressed and may be covered by legal professional privilege and protected by law. Reading Borough Council does not accept responsibility for any unauthorised amendment made to the contents of this e-mail following its dispatch. If received in error, you must not retain the message or disclose its contents to anyone. Please notify us immediately quoting the name of the sender and the addressee and then delete the e-mail. Reading Borough Council has scanned for viruses. However, it is your responsibility to scan the e-mail and attachments (if any) for viruses. Reading Borough Council also operates to the Protective Document Marking Standard as defined for the Public Sector. Recipients should ensure protectively marked emails and documents are handled in accordance with this standard (Re: Cabinet Office - Government Security Classification).

Technical Appendix 7.2: Air Quality

Intended for
Aviva Life & Pensions UK Limited

Date
February 2020

Project Number
1700003910

READING STATION PARK
AIR QUALITY TECHNICAL APPENDIX 7.2

Project No.	**1700003910**
Issue No.	**1**
Date	**14/02/2020**
Made by	**Ana Gomes**
Checked by	**Lesley Vining**
Approved by	**Lesley Vining**

Made by:

Checked/Approved by: Lesley CR Vining

This report has been prepared by Ramboll UK Limited with all reasonable skill, care and diligence, and taking account of the Services and the Terms agreed between Ramboll UK Limited and the Client. This report is confidential to the Client, and Ramboll UK Limited accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by Ramboll UK Limited beforehand. Any such party relies upon the report at their own risk.
Ramboll UK Limited disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the Services.

Version Control Log

Revision	Date	Made by	Checked by	Approved by	Description
1	14/02/2020	AG	LV	LV	Issue for Submission

Ramboll
240 Blackfriars Road
London
SE1 8NW
United Kingdom
T +44 20 7808 1420
www.ramboll.co.uk

CONTENTS

GLOSSARY		**I**
1.	**LEGISLATION AND POLICY FRAMEWORK**	**1**
1.1	International Legislation and Agreements	1
1.2	Local Air Quality Management (LAQM)	1
1.3	National Planning Policy and Legislation	3
1.4	Local Policy	5
1.5	Additional Guidance	5
2.	**DUST RISK ASSESSMENT METHODOLOGY**	**7**
3.	**MODEL INPUTS AND RESULTS PROCESSING TOOLS**	**11**
4.	**TRAFFIC DATA, RAIL EMISSIONS AND MODELLED ROAD NETWORK**	**12**
5.	**MODEL VERIFICATION**	**14**
5.1	Nitrogen Dioxide	14
6.	**BACKGROUND CONCENTRATIONS**	**17**

LIST OF TABLES

Table 2.1: Objectives Included in Air Quality Regulations (England) 2000 for Purpose of Local Air Quality Management 2
Table 2.2: UK Objectives for $PM_{2.5}$ 2
Table 2.3: Locations Where National Air Quality Objectives Apply 2
Table 3.1 Determining Dust Emission Magnitude 7
Table 3.2 Determining Receptor Sensitivity 8
Table 3.3 Determining Sensitivity of the Area - Dust Soiling Effects on People and Property 9
Table 3.4 Determining Sensitivity of the Area – Human Health Impacts 9
Table 3.5 Determining Risk of Dust Impacts - Demolition 10
Table 3.6 Determining Risk of Dust Impacts - Earthworks 10
Table 3.7 Determining Risk of Dust Impacts – Construction 10
Table 3.8 Determining Risk of Dust Impacts –Trackout 10
Table 5.1: Traffic Data Used Within the Assessment 12
Table 5.2: Rail Emissions Used Within the Assessment 12
Table 6.1: Verification Factor 14
Table 7.1: Background factors at Reading AURN 17

LIST OF FIGURES

Figure 5.1: Model Inputs and Road Network 13
Figure 6.1: Comparison of Measured NO_2 with Primary Adjusted Modelled NO_2 15
Figure 6.2: Comparison of Measured NO_2 with Primary Adjusted Modelled NO_2 Concentrations . 15
Figure 6.3: Comparison of Measured NO_2 with Fully Adjusted Modelled NO_2 Concentrations 16

GLOSSARY

Abbreviations	Meaning
AADT	Annual Average Daily Traffic
ADMS	Air Dispersion Modelling System
AQS	Air Quality Strategy
AQOs	Air Quality Objective
AQMA	Air Quality Management Area
CEMP	Construction Environmental Management Plan
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
Diffusion Tube	A passive sampler used for collecting NO2 in the air
EFT	Emission Factor Toolkit
EPUK	Environmental Protection UK
HDV	Heavy Duty Vehicle; a vehicle with a gross vehicle weight greater than 3.5 tonnes. Includes Heavy Goods Vehicles and buses
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen oxides, generally considered to be nitric oxide and NO2. Its main source is from combustion of fossil fuels, including petrol and diesel used in road vehicles
NPPF	National Planning Policy Framework
PM_{10}	Small airborne particles less than 10 µm in diameter
PPG	Planning Practice Guidance
Receptor	A location where the effects of pollution may occur
RBC	Reading Borough Council
SPG	Supplementary Planning Guidance

1. LEGISLATION AND POLICY FRAMEWORK

1.1 International Legislation and Agreements

1.1.1 European Union Ambient Air Quality and Clean Air for Europe, 2008

EU Directive 2008/50/EC[1] on ambient air quality and cleaner air for Europe (the CAFE directive) sets out the ambient air quality standards for nitrogen dioxide (NO_2) and particulate matter with an aerodynamic diameter of less than 10 µm (PM_{10}) to be achieved by 1 January 2010 and 2005 respectively. The Air Quality Standards Regulations 2010[2] implements the requirements of the Directive into United Kingdom (UK) legislation.

The Directive contains a series of limit values for the protection of human health and critical levels for the protection of vegetation. Compliance with the European Union (EU) Limit Values is mandatory. However, Member States can apply for a time extension for compliance, subject to approval of an action plan by the European Commission.

In December 2015, the Department for Environment Food and Rural Affairs (Defra) on behalf of the UK Government produced plans to improve air quality in the UK in order to meet the EU targets in the shortest possible time[3]. The adequacy of these plans to bring about the necessary improvements in air quality to meet the relevant NAQOs within the shortest time possible were successfully challenged within the High Court in 2016.

Subsequently, in 2017 a plan for the reduction in roadside NO_2 concentrations was released[4] which requires local authorities to identify local actions to accelerate the improvement in air quality in their jurisdictions. It also includes the national measures, including banning the sale of conventionally powered cars and light goods vehicles by 2040 and further investment in cleaner transport.

1.1.2 Clean Air Strategy

Defra published a new Clean Air Strategy 2019[5] in January 2019, setting out how the UK will significantly reduce harmful air pollutant emissions by 2020 and 2030. The Clean Air Strategy contains an intention of working towards the World Health Organisation guideline value for $PM_{2.5}$ of 10 µg/m^3. The timetable for this has not been set.

1.2 Local Air Quality Management (LAQM)

Part IV of the Environment Act 1995[6], requires the UK Government to publish an Air Quality Strategy and local authorities to review, assess and manage air quality within their areas. This is known as Local Air Quality Management (LAQM).

The 2007 Air Quality Strategy[7] establishes the policy for ambient air quality in the UK. It includes the Air Quality Objectives (AQOs) for the protection of human health and vegetation for 11 pollutants. Those AQOs included as part of LAQM are prescribed in the Air Quality (England) Regulations 2000 and the Air Quality (Amendment) (England) Regulations 2002. Table 2.1 presents the AQOs for NO_2 and PM_{10} the two pollutants of most concern in urban areas.

[1] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

[2] Secretary of State, 2010. Statutory Instrument 2010 No. 1001, Air Quality Standards Regulations 2010. HMSO.

[3] Defra, December 2015. Improving air quality in the UK, Tackling nitrogen dioxide in our towns and cities, UK overview document. Defra.

[4] Department for Environment, Food and Rural Affairs, 2017. UK plan for tackling roadside nitrogen dioxide concentrations. Defra.

[5] Defra, 2019. Clean Air Strategy.

[6] Secretary of State, 1995. The Environment Act part IV Air Quality, HMSO.

[7] Department for Environment, Food and Rural Affairs, 2007. Air Quality Strategy for England, Scotland, Wales and Northern Ireland. HMSO.

Table 1.1: Objectives Included in Air Quality Regulations (England) 2000 for Purpose of Local Air Quality Management

Pollutant	Air Quality Objective		
	Concentration	Measured As	Date to be Achieved By
NO_2	200 micrograms per metre cubed (µg/m^3) not to be exceeded more than 18 times per year	1 hour	31 December 2005
	40 µg/m^3	Annual mean	
PM_{10}	50 µg/m^3 not to be exceeded more than 35 times per year	24 hour mean	31 December 2004
	40 µg/m^3	Annual mean	

Analysis of long-term monitoring data suggests that if the annual mean NO_2 concentration is less than 60 µg/m^3 then the one-hour mean NO_2 objective is unlikely to be exceeded where road transport is the main source of pollution. Therefore, in this assessment this concentration has been used to screen whether the one-hour mean objective is likely to be achieved (Defra, 2016). Similar to NO_2, a PM_{10} annual mean below 32 µg/m^3 is used to screen whether the 24-hour PM_{10} mean objective is likely to be achieved (Defra, 2016).

The 2007 Air Quality Strategy also introduced a new policy framework for tackling $PM_{2.5}$ which included an exposure reduction target and a 'backstop' annual mean NAQO. The exposure reduction target is focussed on reducing average concentrations across the most polluted urban areas and is therefore not applicable to individual schemes, whilst the annual mean NAQO can be considered a concentration cap to ensure environmental compliance. The UK NAQO for $PM_{2.5}$ are provided in Table 2.2.

Table 1.2: UK Objectives for $PM_{2.5}$

Averaging Period	Objective	Target Date
Annual mean	25 µg/m^3	2020
3 year running annual mean	15 % reduction in concentrations measured at urban background sites	Between 2010 and 2020

The NAQOs apply to external air where there is relevant exposure to the public over the associated averaging periods within each NAQO. Guidance is provided within LAQM.TG (16)[8] issued by Defra for Local Authorities, on where the NAQOs apply, as detailed in Table 2.3. The NAQOs do not apply in workplace locations, to internal air or where people are unlikely to be regularly exposed (i.e. centre of roadways).

Table 1.3: Locations Where National Air Quality Objectives Apply

Averaging Period	Objectives should apply at	Objectives should generally not apply at
Annual mean	All locations where members of the public might be regularly exposed. Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access. Hotels, unless people live there as their permanent residence. Gardens of residential properties.

[8] Department for Environment, Food and Rural Affairs, 2016. Local Air Quality Management Technical Guidance LAQM.TG (16). HMSO.

Table 1.3: Locations Where National Air Quality Objectives Apply		
Averaging Period	**Objectives should apply at**	**Objectives should generally not apply at**
24 Hour Mean	All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.	Kerbside sites (as opposed to locations at the building façade), or any other location where public exposure is expected to be short term.
1 Hour Mean	All locations where the annual mean and: 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expect to spend one hour or longer.	

It should be noted that the EU Limit Values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and legal responsibility. The compliance date for the NO_2 Limit Values was 1 January 2010, which is five years later than the date for the NAQO.

The Limit Values are mandatory whereas the NAQOs are policy objectives. Local authorities are not required to achieve them, but have to demonstrate effort of working towards their achievement. In addition, the Limit Values apply in all locations except:

- where members of the public do not have access and there is no fixed habitation;
- on factory premises or at industrial installations; and
- on the carriageway/central reservation of roads except where there is normally pedestrian access.

Where a local authority's review and assessment of its air quality identifies that air quality is likely to exceed the NAQOs, it must designate these areas as AQMAs and draw up an Air Quality Action Plan (AQAP) setting out measures to reduce pollutant concentrations with the aim of meeting the NAQOs.

1.3 National Planning Policy and Legislation

1.3.1 The National Planning Policy Framework

The revised NPPF[9] sets out the Government's planning policies for England and how these are expected to be applied. In relation to achieving sustainable development, paragraph 8 states that:

"*Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives): …*

c) an environmental objective – to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using

[9] Ministry of Housing, Communities and Local Government (2019). National Planning Policy Framework.

natural resources *prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy."*

So that sustainable development is pursued in a positive way, at the heart of the Framework is a presumption in favour of sustainable development. Paragraph 11 states that plans and decisions should apply a presumption in favour of sustainable development, which for decision-taking means:

"… d) where there are no relevant development plan policies, or the policies which are most important for determining the application are out-of-date, granting permission unless:…

ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole."

Paragraph 54 on planning conditions and obligations states:

"Local planning *authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition."*

Paragraph 102 on promoting sustainable transport states:

"Transport issues should be considered from the earliest stages of plan-making and development proposals, so that: …

d) the environmental impacts of traffic and transport infrastructure can be identified, assessed and taken *into account – including appropriate opportunities for avoiding and mitigating any adverse effects, and for net environmental gains; …"*

Paragraph 103 continues to state:

"Significant *development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health."*

Paragraph 170 on conserving and enhancing the natural environment states:

"*Planning policies and decisions should contribute to and enhance the natural and local environment by: …*

e) preventing new and existing development from contributing to, being put at unacceptable risk from*, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land stability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans, and…"*

Paragraph 180 within ground conditions and pollution states:

"Planning policies and decisions should also ensure that new development is appropriate for its location *taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development."*

Paragraph 181 states that:

"Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel *management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan."*

Paragraph 182 states that:

"Planning policies *and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed…"*

1.4 Local Policy

1.4.1 Reading Borough Local Plan

Reading Borough Local Plan was adopted on 4th November 2019[10]. The Local Plan sets out RBC planning policies for development in Reading up to 2036, and is the main consideration in deciding planning applications. Policy EN15 on Air quality States:

"Development should have regard to the need to improve air quality and reduce the effects of poor air quality.

i. Development that would detrimentally affect air quality will not be permitted unless the effect is to be mitigated. The following criteria should be taken into account:

- *Whether the proposal, including when combined with the cumulative effect of other developments already permitted, would worsen air quality;*
- *Whether the development is within, or accessed via, an Air Quality Management Area; and*
- *Whether it can be demonstrated that a local worsening in air quality that would not detrimentally affect human health or the environment would be offset by an overall improvement in air quality, for instance through reduction in the need to travel.*

ii. Where a development would introduce sensitive uses (such as residential, schools and nurseries, hospitals, care facilities) into, or intensify such uses within, an Air Quality Management Area, detrimental effects on that use will be mitigated. Mitigation measures should be detailed in any planning application. If there are significant detrimental effects that cannot be mitigated, the application should be refused.

iii. Where required, planning obligations will be used to secure contributions to measures to tackle poor air quality or for air quality monitoring."

1.4.2 Air Quality Action Plan

RBC reviewed its existing Air Quality Action Plan in 2016, which has been in place since 2009[11]. The revised Air Quality Action Plan contains measures to improve air quality across Reading, specifically targeting action on the key pollutants of concern – Nitrogen Dioxide and Particulate Matter (PM_{10} and $PM_{2.5}$). The actions within the plan are split into the two key areas: Intervention and Education/Promotion.

1.5 Additional Guidance

1.5.1 Institute of Air Quality Management: Construction Dust Guidance, 2016 v1.1

The IAQM produced guidance[12] to assist in the assessment of air quality impacts from demolition and construction activities. This guidance provides a consistent methodology for assessing the risks of dust impacts from demolition and construction activities and for identifying the correct level of mitigation which should be applied to avoid significant air quality effects.

[10] Reading Borough Council (2019). Reading Borough Local Plan.

[11] Reading Borough Council (2009) Air Quality Action Plan.

[12] Holman et al, 2016. IAQM Guidance on the assessment of dust from demolition and construction V1.1. Institute of Air Quality Management, London.
Available: http://www.iaqm.co.uk/text/guidance/construction-dust-2014

1.5.2 Environmental Protection UK/Institute of Air Quality Management Guidance, Land-Use Planning Guidance, 2017

Environmental Protection UK (EPUK), together with the IAQM, produced updated guidance in 2017[13] on how air quality impacts should be assessed within the land-use planning and development control process. This guidance provides clear criteria to determine when a detailed air quality assessment is required and a methodology for assessing the significance of air quality effects.

[13] Institute of Air Quality Management and Environmental Protection UK, 2017. Land-Use Planning & Development Control: Planning for Air Quality. Available: http://www.iaqm.co.uk/text/guidance/air-quality-planning-guidance.pdf

2. DUST RISK ASSESSMENT METHODOLOGY

Table 2.1 Determining Dust Emission Magnitude

Large	Medium	Small
Demolition		
• total building volume >50,000 m^3 • potentially dusty construction material (e.g. concrete) • on-site crushing and screening • demolition activities >20 m above ground level	• total building volume 20,000m^3 – 50,000 m^3 • potentially dusty construction • demolition activities 10-20 m • above ground level	• total building volume <20,000 m^3 • construction material with low potential for dust release (e.g. metal cladding or timber) • demolition activities <10 m above ground • during wetter months
Earthworks		
• total site area >10,000 m^2 • potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size) • >10 heavy earth moving vehicles active at any one time • formation of bunds >8 m in height • total material moved >100,000 tonnes	• total site area 2,500 m^2 - 10,000 m^2 • moderately dusty soil type (e.g. silt) • 5-10 heavy earth moving vehicles active at any one time • formation of bunds 4 m – 8 m in height • total material moved 20,000 - 100,000 tonnes	• total site area <2,500 m^2 • soil type with large grain size (e.g. sand) • <5 heavy earth moving vehicles active at any one time • formation of bunds <4 m in height • total material moved <20,000 tonnes • earthworks during wetter months
Construction		
• total building volume >100,000 m^3 • piling • on-site concrete batching • sandblasting	• total building volume 25,000 m^3 - 100,000 m^3 • potentially dusty construction material (e.g. concrete) • piling • on-site concrete batching	• total building volume <25,000 m^3 • construction material with low potential for dust release (e.g. metal cladding or timber)
Trackout		
• >50 HDV (>3.5t) movements in any one day • potentially dusty surface material (e.g. high clay content) • unpaved road length >100 m	• 10-50 HDV (>3.5t) movements in any one day • moderately dusty surface material (e.g. high clay content) • unpaved road length 50 m – 100 m	• <10 HDV (>3.5t) movements in any one day • surface material with low potential for dust release • unpaved road length <50 m

Table 2.2 Determining Receptor Sensitivity

High	Medium	Low
Sensitivities of People to Dust Soiling Effects		
• users can reasonably expect enjoyment of a high level of amenity; or • the appearance, aesthetics or value of their property would be diminished by soiling; and the people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • indicative examples include dwellings, museums and other culturally important collections, medium and long term car parks and car showrooms.	• users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; or • the appearance, aesthetics or value of their property could be diminished by soiling; or • the people or property would not reasonably be expected to be present continuously or regularly for extended periods as part of the normal pattern of use of the land. • indicative examples include parks and places of work.	• the enjoyment of amenity would not reasonably be expected; or • property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • there is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • indicative examples include playing fields, farmland(unless commercially-sensitive horticultural), footpaths, short term car parks and roads.
Sensitivities of People to the Health Effects of PM_{10}		
• locations where members of the public are exposed over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, a relevant location would be one where individuals may be exposed for eight hours or more in a day). • indicative examples include residential properties, hospitals, schools and residential care homes should also be considered as having equal sensitivity to residential areas for the purposes of this assessment.	• locations where the people exposed are workers, and exposure is over a time period relevant to the air quality objective for PM_{10} (in the case of the 24-hour objectives, • a relevant location would be one where individuals may be exposed for eight hours or more in a day). • indicative examples include office and shop workers, but will generally not include workers occupationally exposed to PM_{10}, as protection is covered by Health and Safety at Work legislation.	• locations where human exposure is transient. • indicative examples include public footpaths, playing fields, parks and shopping streets.
Sensitivities of Receptors to Ecological Effects		
• locations with an international or national designation *and* the designated features may be affected by dust soiling; or • locations where there is a community of a particularly dust sensitive species such as vascular species included in the Red Data List For Great Britain.	• locations where there is a particularly important plant species, where its dust sensitivity is uncertain or unknown; or • locations with a national designation where the features may be affected by dust deposition.	• locations with a local designation where the features may be affected by dust deposition. • indicative example is a local Nature Reserve with dust sensitive features.

Table 2.2 Determining Receptor Sensitivity

High	Medium	Low
• indicative examples include a Special Area of Conservation (SAC) designated for acid heathlands or a local site designated for lichens adjacent to the demolition of a large site containing concrete (alkali) buildings.	• indicative example is a Site of Special Scientific Interest (SSSI) with dust sensitive features.	

Table 2.3 Determining Sensitivity of the Area - Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 2.4 Determining Sensitivity of the Area – Human Health Impacts

	Annual Mean PM_{10} concentration	Number of Receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	>32 µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	>28-32 µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	>24-28 µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24 µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium		>1	High	Medium	Low	Low	Low
Low		>1	Medium	Low	Low	Low	Low

Table 2.5 Determining Risk of Dust Impacts - Demolition

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Table 2.6 Determining Risk of Dust Impacts - Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

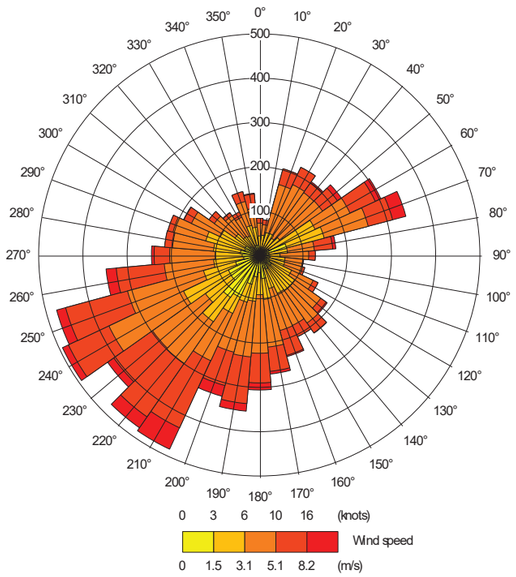
Table 2.7 Determining Risk of Dust Impacts – Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 2.8 Determining Risk of Dust Impacts –Trackout

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

3. MODEL INPUTS AND RESULTS PROCESSING TOOLS

Meteorological Data	2018 Hourly meteorological data from Farnborough Station has been used in the model. The wind rose is shown below. 
ADMS	Version 4.1.1
Street Canyon	ADMS Advanced Street Canyon module was used to represent the effect of trapping and recirculating pollutants. The canyons included are shown in Traffic Data and Road Network. Building heights were assumed to be 3 m per floor
Time Varying Emission Factors	Based on Department for Transport statistics. Table TRA0307. Motor vehicle traffic distribution by time of day and day of the week on all roads, Great Britain: 2018.
Latitude	51
Surface Roughness	A value of 1 for Citie sand Woodlands was used to represent the modelled area. A value of 0.3 for agricultural areas was used to represent the meteorological station site.
Minimum Monin-Obukhov length	A value of 30 for Large Towns was used to represent the modelled area and the meteorological station site.
Emission Factor Toolkit (EFT)	V9.0 , May 2019.
NO_x to NO_2 Conversion	NO_x to NO_2 calculator version 7.1, May 2019
Background Maps	2017 reference year background maps

4. TRAFFIC DATA, RAIL EMISSIONS AND MODELLED ROAD NETWORK

Traffic data

Table 4.1: Traffic Data Used Within the Assessment

Road Link	2018 Baseline		2025 Without Development (DM)		2025 With Development (DS)	
	AADT	HDV	AADT	HDV	AADT	HDV
Caversham Road	23,004	1175	25891	1291	25196	1299
Caversham Road (South Vastern Road)	28,547	1,226	31,999	1,369	31242	1394
Vastern Road	22,805	1,675	26,535	1,888	23651	1934
Vastern Road (South Kings Meadow Road)	21,225	395	24563	452	23402	470
Bagnall Way	2,745	154	3002	168	3002	168
George Street	19,498	199	21892	224	21654	228
Troopers Potts Way	1,973	290	2694	367	2694	367

Rail Emissions

Table 4.2: Rail Emissions Used Within the Assessment

Rail	2017 Emissions	
	Tonnes/year 1x1 km	g/km/s
NO_2	23.5	0.74
PM_{10}	2.1	0.07
$PM_{2.5}$	0.6	0.02

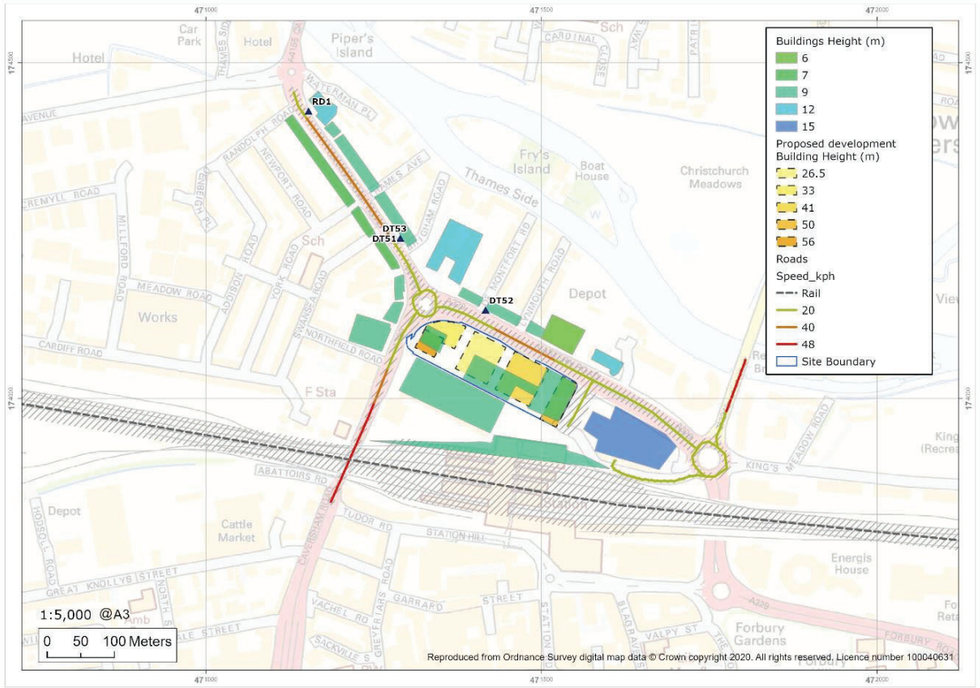


Figure 4.1: Model Inputs and Road Network

5. MODEL VERIFICATION

5.1 Nitrogen Dioxide

The model has been run to predict the 2018 annual mean road-NOx contribution at three monitoring locations (identified in Table 6.1). Concentrations have been modelled at 2 m height.

The model output of road-NOx has been compared with the 'measured' road-NOx, which was calculated from the measured NO_2 concentrations and the adjusted background NO_2 concentrations within the NOx from NO_2 calculator.

A primary adjustment factor was determined as the slope of the best fit line between the 'measured' road contribution and the model derived road contribution (Figure 6.1). This factor was then applied to the modelled road-NOx concentration for each monitoring site to provide adjusted modelled road-NOx concentrations. The total nitrogen dioxide concentrations were then determined by combining the adjusted modelled road-NOx concentrations with the predicted background NO_2 concentration within the NOx from NO_2 calculator. A secondary adjustment factor was finally calculated as the slope of the best fit line applied to the adjusted data and forced through zero (Figure 6.2).

Table 5.1: Verification Factor

Monitor	Monitored NO_2 µg/m³	Measured Road NOx µg/m³	Modelled Roadside NO_x µg/m³	Ratio Measured NOx/ Modelled road NOx	Total NO_2 after adjustment µg/m³	% Difference in NO_2 after adjustment
DT51	41.5	33.61	21.1	1.59	37.51	-9.7
DT52	33.0	14.66	17.3	0.85	35.46	7.5
DT53	34.8	18.47	19.2	0.96	36.53	5.0

The results imply that overall, the model was under-predicting the road-NOx contribution. This is a common experience with this and most other models. The final NO_2 adjustment is minor.

Figure 6.3 compares final adjusted modelled total NO2 at each of the monitoring sites, to measured total NO_2, and shows the 1:1 relationship, as well as ±10% and ±25% of the 1:1 line.

The following primary and secondary adjustment factors have been applied to all modelled nitrogen dioxide data:

Primary Adjustment Factor	1.1843
Secondary adjustment factor	0.9939

Model uncertainty has been estimated by calculating the root mean square error (RMSE). The calculated RMSE was 2.9 µg/m³ (7%) after adjustment which is within the suggested value (10% of the objective being assessed) in LAQM.TG(16). The model has therefore performed sufficiently well for use within this assessment.

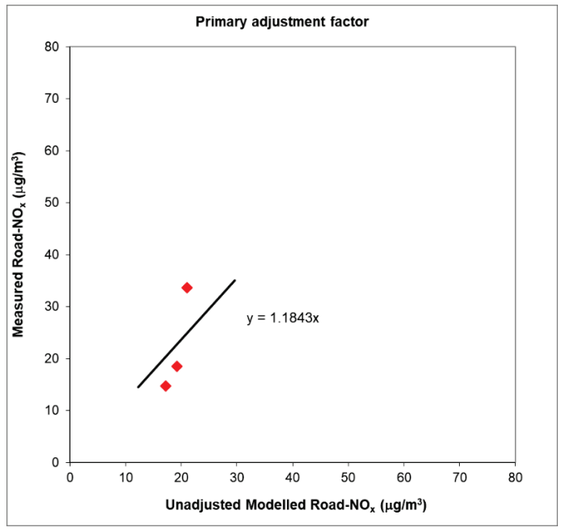


Figure 5.1: Comparison of Measured NO_2 with Primary Adjusted Modelled NO_2

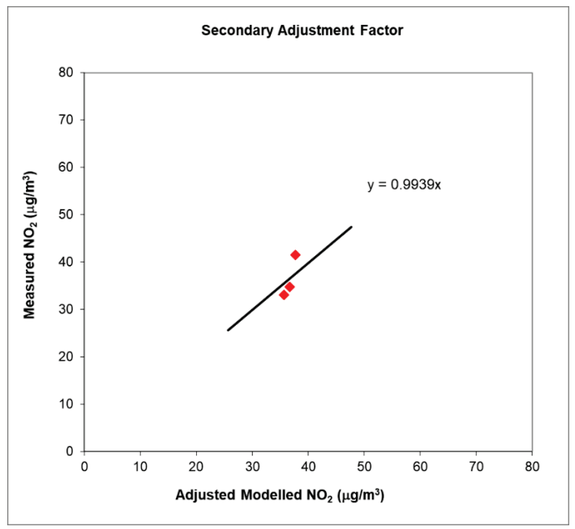


Figure 5.2: Comparison of Measured NO_2 with Primary Adjusted Modelled NO_2 Concentrations

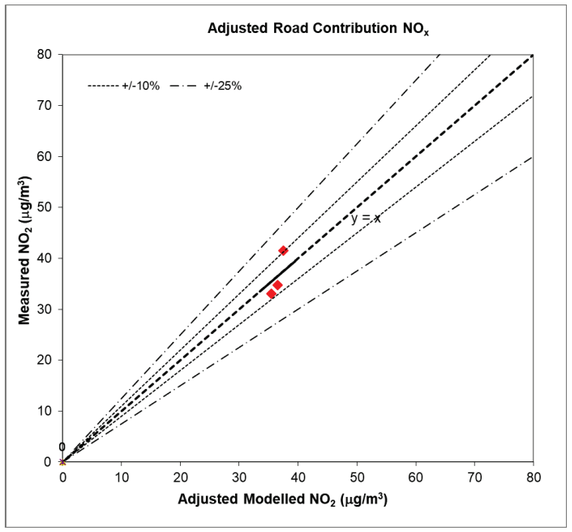


Figure 5.3: Comparison of Measured NO_2 with Fully Adjusted Modelled NO_2 Concentrations

5.1.1 Particulates (PM_{10} and $PM_{2.5}$)

With the exception of the urban background monitoring site, there is no PM_{10} or $PM_{2.5}$ monitoring in close proximity to the proposed development site. Therefore, the primary adjustment factor calculated for NO_2 concentrations has been applied to the modelled road-particulates concentrations.

6. BACKGROUND CONCENTRATIONS

Defra publish details of estimated background concentrations of pollutants for each 1 km grid square across the country. The RBC operates a continuous background automatic at Reading Old Cemetery between London Road and Wokingham Road, which is also part of the AURN network. In order to more accurately reflect background concentrations across the study area, Defra mapped background concentrations have been compared against concentrations measured at the site in 2018 to produce a calibration factor which is applied to background concentrations across the study area. The background factors are presented in Table 7.1.

Table 6.1: Background factors at Reading AURN

Station	Defra Modelled Background (µg/m^3)	Measured Concentration (µg/m^3)	Factor
NO_2	23.5	26.0	1.1
PM_{10}	16.6	13.0	0.8
$PM_{2.5}$	11.6	7.0	0.6

The factors have been applied to the mapped background for both baseline and future year scenarios across the study area.

Technical Appendix 8.1: Legislation and Guidance

TECHNICAL APPENDIX 8.1: NOISE AND VIBRATION LEGISLATION AND GUIDANCE

1. National Legislation

1.1 Control of Pollution Act, 1974, Part III - Noise

The Control of Pollution Act, 1974[1] (CPA) is a combination and refinement of earlier Acts including: The Public Health Act, 1936[2] (replaced by the Public Health Act 1990, Part III) and the Noise Abatement Act 1960[3].

Section 60 enables a Local Authority to serve a notice on a person (this includes a company) who is carrying out, or who is planning to carry out, works of construction, demolition, road-works, railway maintenance etc. in order to control the noise from those operations.

Section 61 also enables such a person to apply to the Local Authority for consent in respect of such works. The Act introduces the concept of using 'Best Practicable Means' (BPM) to control the impact of noise, where significant impacts are likely to occur. BPM refers to the selection of plant, techniques and equipment to reduce noise whilst considering local conditions, current state of technical knowledge and the financial implications. Factors such as timing, duration, location and opportunities for acoustic screening or separation are employed; in order to ensure that impacts are controlled in so far as is reasonably practicable. The demonstrable use of BPM can also be used as a defence to enforcement action under nuisance legislation.

1.2 The Environmental Protection Act, 1990 (as amended)

Section 79 of the Environmental Protection Act 1990[4] (EPA) declares that a number of matters, including noise, are to be statutory nuisances. Under the provisions of the Environmental Protection Act, the Local Authority is required to inspect its area periodically to detect any nuisance and, where a complaint of a statutory nuisance is made by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint.

1.3 National Planning Policy Framework, 2019

The National Planning Policy Framework (NPPF)[5] adopted in 2019 in England outlines the Government's planning policies and requirements for the planning system. The NPPF forms a material consideration in planning decisions and hence must be complied with for planning permission to be granted.

Paragraph 180 of the NPPF states that the planning system should seek to:

- *"Mitigation and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;*

[1] Secretary of State, 1974, Control of Pollution Act, HMSO. Available: http://www.legislation.gov.uk/ukpga/1974/40/contents

[2] Secretary of State, 1960, Noise Abatement Act, HMSO.

[3] Secretary of State, 1960, Noise Abatement Act, HMSO. Available: http://www.legislation.gov.uk/ukpga/1960/68/section/1/enacted

[4] Secretary of State, 1990. Environmental Protection Act 1990, The Stationary Office. Available: http://www.legislation.gov.uk/ukpga/1990/43/contents

[5] Ministry of Housing, Communities & Local Government, 2019. The National Planning Policy Framework. HMSO.

- *Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason".*

To achieve these aims the NPPF refers to the Noise Policy Statement for England 2010.

1.4 Noise Policy Statement for England, 2010

The Noise Policy Statement[6] for England sets out the long-term vision of Government noise policy: to promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

The NPSE outlines the following three aims for the effective management and control of environmental, neighbour and neighbourhood noise:

- *"Avoid significant adverse impacts on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life."*

The guidance defines two concepts applied to noise impacts. These are:

- NOEL is defined as: *"This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.";*
- LOAEL which is defined as: *"This is the level above which adverse effects on health and quality of life can be detected.";* and
- SOAEL which is defined as the level above which significant adverse effects on health and quality of life occur.

The three aims can therefore be interpreted as follows:

- The first aim is to avoid noise levels above the SOAEL;
- The second aim considers situations where noise levels are between the LOAEL and SOAEL. In such circumstances, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur; and
- The third aim considers situations where noise levels are between the LOAEL and NOEL. In these circumstances, where possible, reductions in noise levels should be sought through the pro-active management of noise.

The NPSE recognises that it is not possible to have single objective noise-based measures that define the SOAEL, LOAEL and NOEL that are applicable to all sources of noise in all situations. The levels are likely to be different for different noise sources, receptors and at different times of the day.

1.5 Planning Practice Guidance

In March 2014, the Department for Communities and Local Government (DCLG) (now the Ministry for Housing, Communities and Local Government) released its PPG web-based resource to support the NPPF. The guidance advises that local planning authorities should consider:

- "*Whether or not a significant adverse effect is occurring or likely to occur;*
- *Whether or not an adverse effect is occurring or likely to occur; and*

[6] Ministry of Housing, Communities and Local Government, 2017. Planning practice guidance. HMSO. London.

- *Whether or not a good standard of amenity can be achieved*."

The PPG qualifies the effect of noise based on whether a source is noticeable and/or intrusive and/or causes a change in behaviour or attitude.

The Lowest Observed Adverse Effect Level (LOAEL) is described as noise that can be heard and can cause small changes to behaviour and/or attitudes, for example turning up the volume on the television. The LOAEL affects the acoustic character of the area such that there is a perceived change in the quality of life.

The Significant Observed Adverse Effect Level (SOAEL) is defined as the level at which noise causes a change in behaviour and/or attitude, such as avoiding certain activities during periods of intrusion or, where there is no alternative to ventilation, having to keep windows closed most of the time because of the noise.

The latest version of PPG introduced the concepts of NOEL (No Observed Effect Level), and UAEL (Unacceptable Adverse Effect Level). Full details of the PPG on effects are provided in Table 1.

Table 1: PPG Guidance

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

Factors to be considered in determining if noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise and cumulative impacts.

2. Local Policy

2.1 Reading Local Plan

The Reading Borough Local Plan[7] adopted 2019 has several general requirements in relation to noise; primarily associated with reducing stress caused by traffic noise, safeguarding amenity and not damaging the environment including sensitive receptors. This applies to all developments and must be balanced with other factors where 'employment land' is proposed.

Specifically, EN16 states that "proposals for development that are sensitive to the effects of noise…will only be permitted in areas where they will not be subject to high level of such pollution, unless adequate mitigation measured are provided to minimise the impact of such pollution". This is reiterated for residential areas in Central Reading in CR6 which reads "ii) Proposals for new residential developments within the central area will be required to demonstrate how the issue of potential noise disturbance from neighbouring land uses and other sources, and air quality implications of residential development, have been considered and if necessary, mitigated. New residential development should not be located next to existing town centre uses where those uses would give rise to unacceptable level of noise and disturbance to the occupiers of the new scheme, unless this can be mitigated."

With reference to plant noise, EN17 requires that "Where noise generating equipment is proposed, the noise source specific level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor." The Local Plan also impresses the importance of assessing cumulative impacts and not changing behaviours or attitudes of people as a result of noise.

Noise guidance in the Local Plan relating to advertising and drinking establishments is not considered relevant to the proposed development.

[7] Reading Borough Council, 2019. Reading Local Plan, Reading Borough Council. Available: http://www.reading.gov.uk/media/10410/Reading-Borough-Council-Local-Plan/pdf/Local_Plan_Adopted_November_2019.pdf

2.2 Reading Core Strategy

The Reading Core Strategy adopted in 2008 and altered in 2015 highlights that inappropriate building design has resulted in noise disturbance from late-night commercial activity upon residential activity.

Implementation of the Core Strategy is via a set of strategic policies, with more detail given in the Reading Borough Local Development Framework. The following policy contain reference to noise

- Policy CS34 – *"development will only be permitted where it would not be damaging to the environment through air, land, noise or light pollution … proposals for development that are sensitive to the effect of air, noise or light pollution will only be permitted in areas where they will not be subject to high levels of such pollution, unless adequate mitigation measures are provided to minimise the impact of such pollution."*

2.3 Reading Station Area Framework

The Reading Station Area Framework[8] states that tall buildings must avoid significant negative noise impacts on existing residential properties and the public realm. It outlines the importance of having a transition zone from high-rise to low-rise residential areas so that pollution (including noise) is managed and minimised.

New development must, through good design, minimise external environmental noise.

2.4 Sustainable Design and Construction: Adopted Supplementary Planning Document July 2011

This document supplements the Local Plan and highlights the need to mitigate noise from infrastructure to residential development via sound insulation, bunds and noise barriers. In addition, it states that noise pollution should be kept to a minimum in areas near protected species in both the design and during construction phase. An updated version was consulted upon in late 2019 but has not yet been published.

3. Guidance

3.1 BS5228:2009+A1:2014 - 'Code of Practice for Noise and Vibration Control on Construction and Open Sites'

BS 5228:2009+A1:2014 (British Standards Institute (a), 2009) gives recommendations for basic methods of noise and vibration control relating to construction work. It also provides guidance concerning methods of predicting and measuring noise and vibration and assessing its impact on those exposed to it. The prediction method considers the noise emissions level of proposed plant, the separation distance between the source and the receiver and the effect of the intervening topography and structures.

[8] Doyle Town Planning and Urban Design with Peter Brett Associates, 2010. Reading Station Area Framework, Reading Borough Council. Available: http://www.reading.gov.uk/media/1674/Reading-Station-Area-Framework/pdf/Reading-Station-Area-Framework.pdf

3.2 BS4142:2014 - 'Methods for Rating and Assessing Industrial and Commercial Sound'

BS4142:2014 – Method for rating and assessing industrial and commercial sound provides a method for assessing the significance of noise emissions from industrial and/or commercial sound source.

The significance of industrial and commercial sound is assessed based on the difference between the rating level resulting from plant operation measured or predicted at the nearest noise sensitive premises, and the existing background noise level in the area, as determined by a noise survey. BS 4142 states:

'a) Typically, the greater this difference, the greater the magnitude of the impact.

b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.'

e) A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value.'

BS4142 also sets out the following rating penalties based on the characteristics of the noise source:

- Tonality: up to 6 dB rating penalty applicable depending on its perception;
- Impulsivity: up to 9 dB rating penalty applicable depending on its perception;
- *Other sound characteristics*: a 3 dB penalty applicable for readily distinctive sound feature characteristics that are neither tonal or impulsive;
- Intermittency: a 3 dB penalty applicable for specific sound that has identifiable on/off conditions.

3.3 BS8233:2014– 'Guidance on sound insulation and noise reduction for buildings'

Guidance on the acceptable noise levels within residential buildings is given in British Standard BS8233:2014. The internal noise levels depend on the use of each room and the sensitivity to noise of the activities expected to be conducted in the rooms. An extract of the indoor ambient noise levels for dwellings is reproduced in Table 2.

Table 2: BS8233 indoor ambient noise levels for dwellings

Activity	Location	Daytime	Night-time
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Note 7 referring to Table 5 in BS8233 states that where development is considered necessary or desirable, despite external noise levels above World Health Organisation guidelines (detailed in section 3.8), the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.

For external amenity areas such as gardens, courtyards and terraces, BS8233 specifies that it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ acceptable in noisier environments. However, it is also recognised that these guidelines values are sometimes not achievable in all circumstances where the development might be desirable.

3.4 World Health Organisation Guidelines

The World Health Organisation (WHO) published their 'Guidelines for Community Noise' in 1999. The 'Guidelines for Community Noise' set out guidance on appropriate noise levels for different scenarios to ensure that communities are not subjected to unacceptable levels of noise. These are presented in Table 3. It should be noted that the WHO guidelines, although widely referenced in UK, have no legal status.

Table 3: World Health Organisation Guidelines for Noise

Specific Environment	Critical Health Effect(s)	LAeq /dB	Time Base [hours]	LAFmax / dB
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, Indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45

Technical Appendix 8.2: Baseline Noise Survey

TECHNICAL APPENDIX 8.2: BASELINE NOISE SURVEY

1. Methodology

A baseline noise survey was carried out by Ramboll to establish the existing conditions around the application site and at nearby noise-sensitive receptors. The baseline noise survey comprised attended daytime measurements at two locations undertaken on 26 and 27 June 2019.

The dominant noise source observed during the attended measurements on Caversham Road was the road traffic along Caversham Road itself (A329). The dominant noise source observed during attended measurements at the location along Vastern Road was road traffic along Vastern Road. There was also noise from operational plant at a substation along Caversham Road. The monitoring locations are given in Figure 1.

Attended noise measurements were taken at an approximate height of 1.5 m from the ground and a minimum of 3 m from the façade of any surrounding buildings. These measurements are, therefore, considered representative of free field measurements and taken in accordance with BS7445-1:2003. The calibration of the sound level meter was checked before and after measurements were taken. No significant drift was observed.

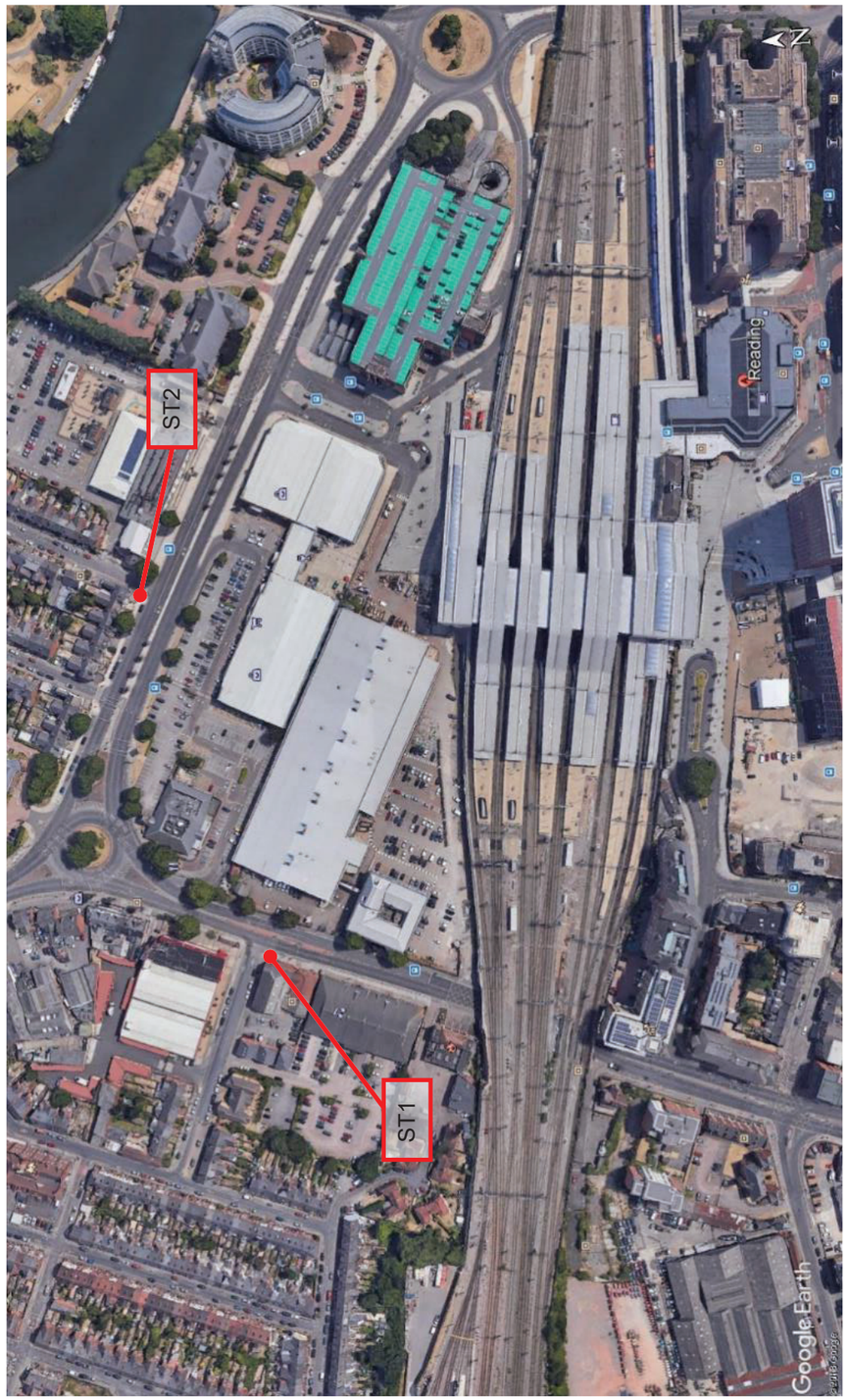


Figure 1: Noise Baseline Survey Measurement Locations

Reading Station Park

RAMBOLL

Technical Appendix 8.2: Baseline Noise Survey

1.1 Equipment

The unattended noise survey was carried out using the following equipment:

- Bruel and Kjaer 2250 sound level meter. Serial number: 3002075; and
- Bruel and Kjaer 4231 sound calibrator. Serial number: 2642788.

All measurement equipment owned or hired and operated by Ramboll has regular calibration checks carried out by external companies traceable to UKAS or national standards.

1.2 Results

The key results of the daytime attended noise measurements are presented in Table 1. Night-time measurements are given in Table 2.

Table 1: Summary of Daytime Attended Measurements

Location	Start Time	Ambient noise levels / dB $L_{Aeq,15mins}$	Background noise levels / dB $L_{A90,15mins}$	Maximum noise levels / dB $L_{AFmax,15mins}$
ST1	11:14	74	66	90
	12:31	74	65	94
	13:14	73	63	96
ST2	11.38	69	62	82
	12:53	69	60	91
	13:38	70	60	82

Table 2: Summary of Night-time Attended Measurements

Location	Start Time	Ambient noise levels / dB $L_{Aeq,15mins}$	Background noise levels / dB $L_{A90,15mins}$	Maximum noise levels / dB $L_{AFmax,15mins}$
ST1	23:11	68	55	81
	23.56	67	50	84
	02:09	62	44	78
	02:50	64	44	81
	03:32	66	44	89
ST2	23:34	64	45	79
	00.17	66	47	92
	02:29	64	42	85
	03:11	61	42	81
	03:51	61	43	79

Technical Appendix 8.3: Construction Plant

TECHNICAL APPENDIX 8.3: CONSTRUCTION PLANT

1. Proposed Plant

Table 1 outlines the construction noise plant proposed for each activity during construction, percentage on-time and the data used from BS5228-1.

Table 1: Construction Plant and Percentage On-Time

Activity	Plant	Percentage on-time	BS5228 reference
Enabling and Demolition	Concrete Crusher	50	Table C.2 no. 3
	360 Excavators large	100	Table C.1 no. 12
	360 Excavators small	80	Table C.2 no7
	Concrete Breaker	80	Table C.1 nos. 1&2
	Compactors	50	Table C.2 no. 42
	Mobile Cranes	20	Table C.4 no. 39
	Tower Cranes	40	Table C.4 no. 48
	MEWPS	40	Table C.4 no. 59
	Scaffolding	80	Table D.7 no. 1
	Fork Lifts	50	Table D.7 94
	Small Tools (drills/cutters)	100	Table D.6 no. 53 (petrol disc cutter)
Substructure	360 Excavators large	100	Table C.1 no. 12
	360 Excavators small	50	Table C.2 no7
	Concrete Breaker	20	Table C.1 nos. 1&2
	Compactors	100	Table C.2 no. 42
	Piling rigs	50	Table C.3 no. 14
	Mobile Cranes	20	Table C.4 no. 39
	Tower Cranes	100	Table C.4 no. 48
	Concrete Pumps	70	Table C.5 no. 25
	Scaffolding	20	Table D.7 no. 1
	Fork Lifts	50	Table D.7 94
	Small Tools (drills/cutters)	100	Table D.6 no. 53
Supersturcture	Tower Cranes	100	Table C.4 no. 48
	Concrete Pumps	70	Table C.5 no. 25
	MEWPS	100	Table C.4 no. 59
	Goods/passenger hoists	100	Table C.4 no. 61
	Cantilever decks	100	Table C.4 no. 55 (telescopic handler as no data available)
	Scaffolding	20	Table D.7 no. 1
	Fork Lifts	60	Table D.7 94
	Small Tools (drills/cutters)	100	Table D.6 no. 53 (petrol disc cutter)
Envelope	Mobile Cranes	10	Table C.4 no. 39
	Tower Cranes	100	Table C.4 no. 48

Reading Station Park

Table 1: Construction Plant and Percentage On-Time

	Concrete Pumps	10	Table C.5 no. 25
	MEWPS	100	Table C.4 no. 59
	Goods/passenger hoists	100	Table C.4 no. 61
	Small Tools (drills/cutters)	100	Table D.6 no. 53 (petrol disc cutter)
Fit-out	MEWPS	50	Table C.4 no. 59
	Goods/passenger hoists	50	Table C.4 no. 61
	Fork Lifts	80	Table D.7 94
	Small Tools (drills/cutters)	50	Table D.6 no. 53 (petrol disc cutter)

Technical Appendix 8.3: Construction Plant
RAMBOLL

Technical Appendix 8.4: Site Suitability

TECHNICAL APPENDIX 8.4: SITE SUITABILITY FOR RESIDENTIAL USE

1. Introduction

This technical appendix outlines the site suitability for its intended purpose from a noise perspective. It is, therefore, an outline assessment of possible design solutions.

The effect of noise sources on the proposed residential development (as the most noise-sensitive of the proposed uses) have been assessed in line with BS8233:2014 and Professional Practice Guidance (ProPG) on Planning & Noise developed by the Institute of Acoustics (IOA).

ProPG considers new residential that will primarily be exposed to transportation noise. The preparation of this guidance was overseen by a Working Group consisting of representatives of the Association of Noise Consultants (ANC), IOA and Chartered Institute of Environmental Health (CIEH), together with practitioners from a planning and local authority background.

This guidance has been produced to provide practitioners with advice on a recommended approach to the management of noise within the planning system in England. It takes into account the guidance on the control and mitigation of noise detailed in the National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE) and presents them in one overall document. It also provides further clarification and guidance for appropriate noise levels and suitable design, such as proposing suitable maximum noise levels in bedrooms at night.

In addition, the London Plan sets out how to assess risk of overheating (detailed in Energy Assessment Guidance), which will be the dominant criteria in this instance.

2. Methodology

Figure 1 below summarises the overarching assessment methodology which has been used to assess site suitability. Namely, determine the criteria; establish the baseline; modelling and prediction methodology; assessment; and mitigation by design.

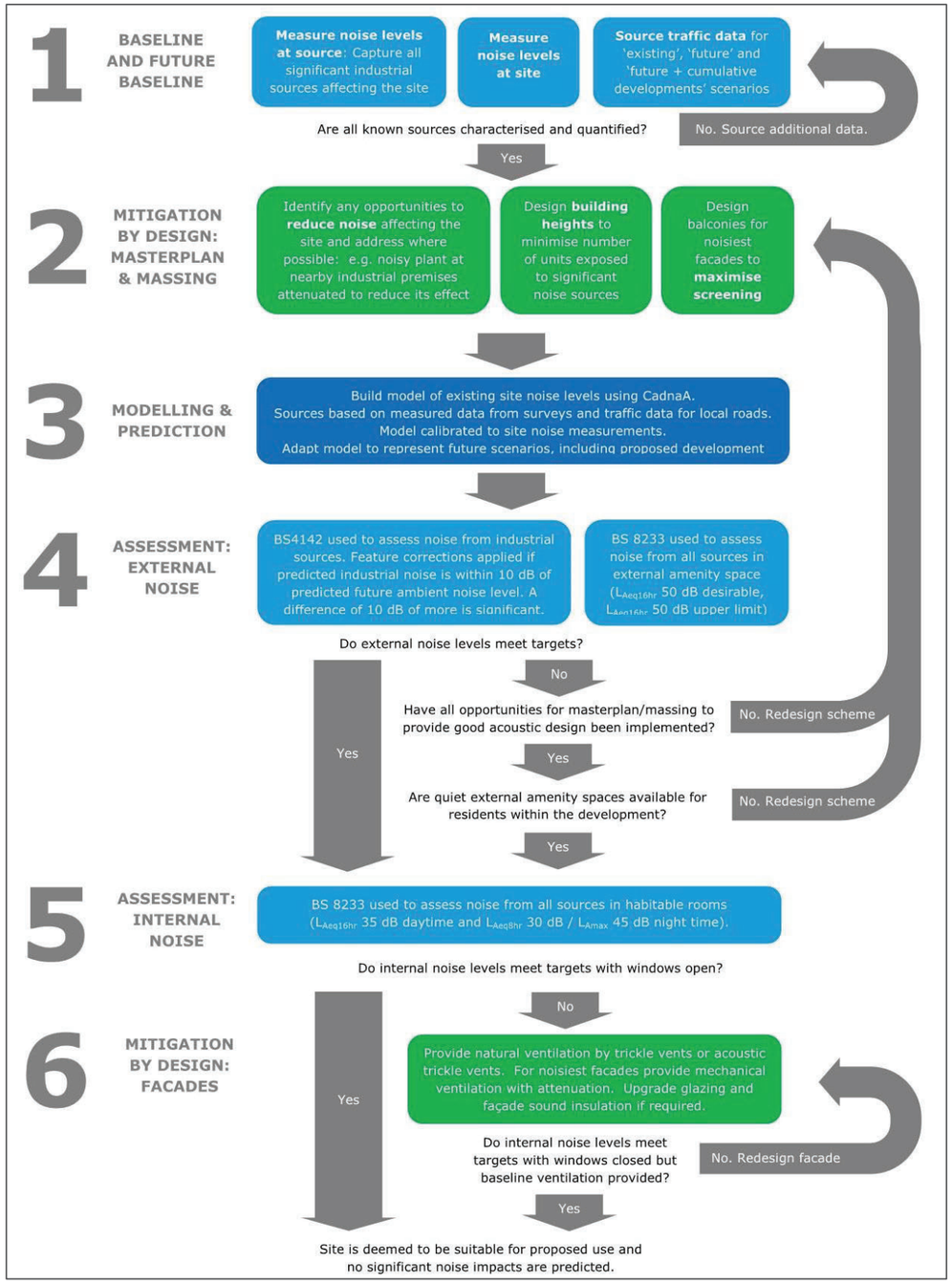


Figure 1: Site Suitability Assessment Methodology Flowchart

3. Criteria

3.1 Internal Ambient Noise Level

The internal ambient noise levels have been assessed in line with BS8233:2014 and RBC's pre-application response, which recommends that for resting/sleeping conditions in living rooms and bedrooms, the internal noise levels should not exceed 35 dB LAeq,16hour (daytime) and 30 dB LAeq,8hour (night time).

Consideration has also been given to the individual noise events, which should not regularly exceed 45 dB LAmax during night time hours. The highest measured night-time maximum noise event was 92 dB LAFmax, with events typically up to 89 dB LAFmax. For the purpose of this assessment, 89 dB LAFmax has been used.

3.2 External Amenity Noise Levels

The noise levels in external amenity areas have been assessed in line with BS 8233:2014, which recommends that noise in external amenity spaces should not exceed 55 dB LAeq,T in busy urban areas.

In addition, ProPG states the following:

- *"Where, despite following a good acoustic design process, significant adverse noise impacts remain on any private external amenity space (e.g. garden or balcony) then that impact may be partially off-set if the residents are provided, through the design of the development or the planning process, with access to:*
- *a relatively quiet façade (containing openable windows to habitable rooms) or a relatively quiet externally ventilated space (i.e. an enclosed balcony) as part of their dwelling; and/or a relatively quiet, protected, publicly accessible, external amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance)."*

4. Baseline

Noise measurements were undertaken to quantify the baseline noise climate at the application site as described in Technical Appendix 8.2: Baseline Noise Survey.

The noise measurements were used to calibrate the baseline noise model (undertaken with commercially available noise mapping software – CadnaA) and the noise levels incident on the façade were predicted using the predicted future traffic flows.

5. Modelling and Prediction

Noise levels at the application site have been predicted using the CadnaA suite of noise modelling software. This software utilises standard acoustic principles in conjunction with approved prediction methodologies (ISO 9613-2) and is an industry-standard method for predicting and assessing the impact of noise from a variety of sources.

The following noise sources were incorporated into the model:

- Traffic links surrounding the application site; and
- Existing plant noise audible at the north-west corner of the Former Royal Mail site.

The application site was assumed to comprise acoustically reflecting '100% hard ground' as it predominantly tarmacked or paved. All buildings were assumed as acoustically reflecting. The model was set to consider three-orders of reflection. This is considered to represent a typical 'worst case' in terms of noise propagation from the roads within the study area.

6. Assessment

6.1 Internal Ambient Noise Level

Figure 2 shows the predicted noise levels at the façade of the proposed development during daytime. This shows that the daytime noise levels on the north-western façade are up to 72 dB LAeq, whilst some of the south-eastern façade noise levels are as low as 52 dB LAeq.

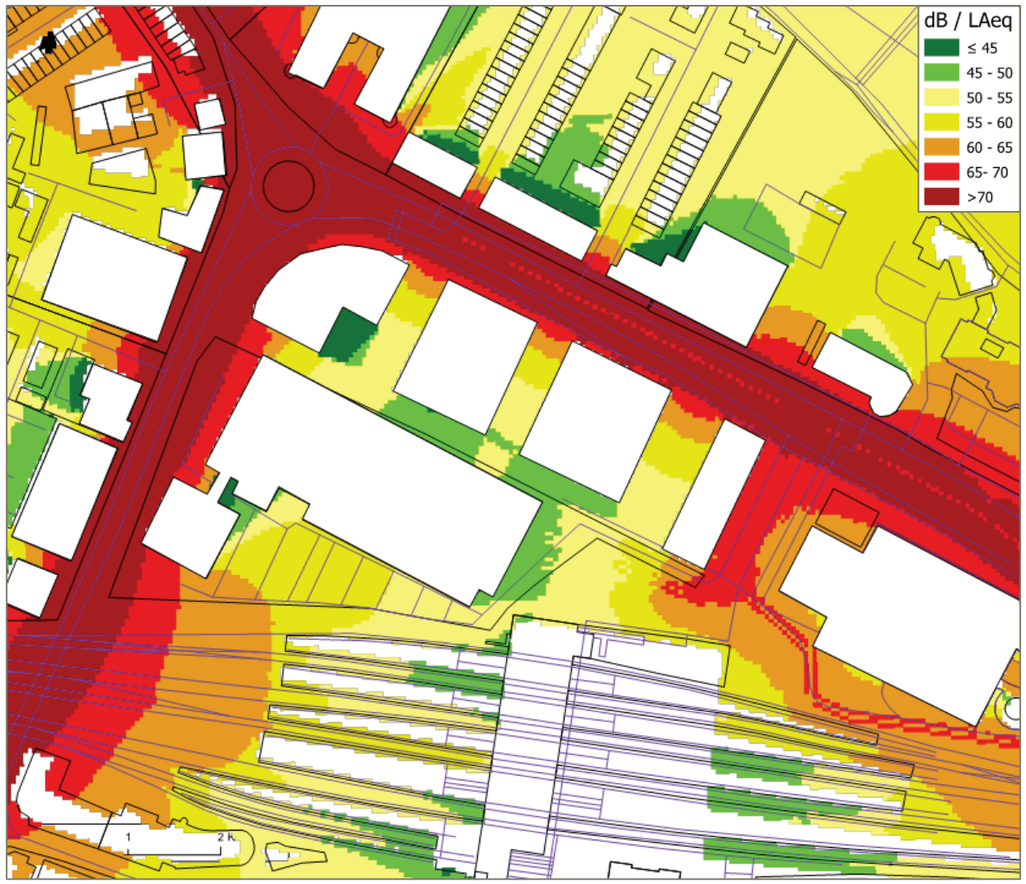


Figure 2: Daytime noise levels incident on the proposed development

For the purpose of this assessment, the maximum night-time noise levels have been used as the governing criterion. This is because the measured maximum night-time noise levels are typically >20 dB higher than the ambient noise levels (the criteria for maximum levels is 15 dB higher than the ambient) meaning the maximum targets are more onerous. Similarly, achieving the night-time criteria is more onerous than achieving the daytime criterion. Any mitigation required to achieve the night-time noise criteria will, by default, also achieve the daytime noise criterion.

Table 2 outlines a potential ventilation strategy and outline glazing performance standards which would be suitable to achieve the required level of attenuation. These are minimum performance requirements and assume the non-glazed element of the façade has a sound insulation performance of at least Rw 67 dB. This is a high level of sound insulation performance and could comprise cavity brickwork with resilient ties with an independent internal lining. This would need to be developed during detailed design.

Table 2: Sound Insulation Performance of Building Façade

Daytime external ambient noise levels / dB L_{Aeq}	Night-time external maximum noise events / dB L_{AFmax}	Typical glazing sound insulation performance (R_w +C_{tr}), dB	Potential ventilation strategy
52 - 72	89	40 (not exceeding 10% of the façade area)	Mechanical whole-house ventilation

The exact build-ups and products to meet the acoustic criteria would be developed during the detailed design. To value engineer this design, further noise measurements would be undertaken around the site, along with more detailed modelling of the massing of the proposed development at the Former Royal Mail site.

With the application of a façade strategy similar to that given in Table 1, the internal ambient noise levels are predicted to fall below the target level. On this basis Negligible effects are predicted in terms of internal noise levels within the proposed hotel rooms and serviced apartments.

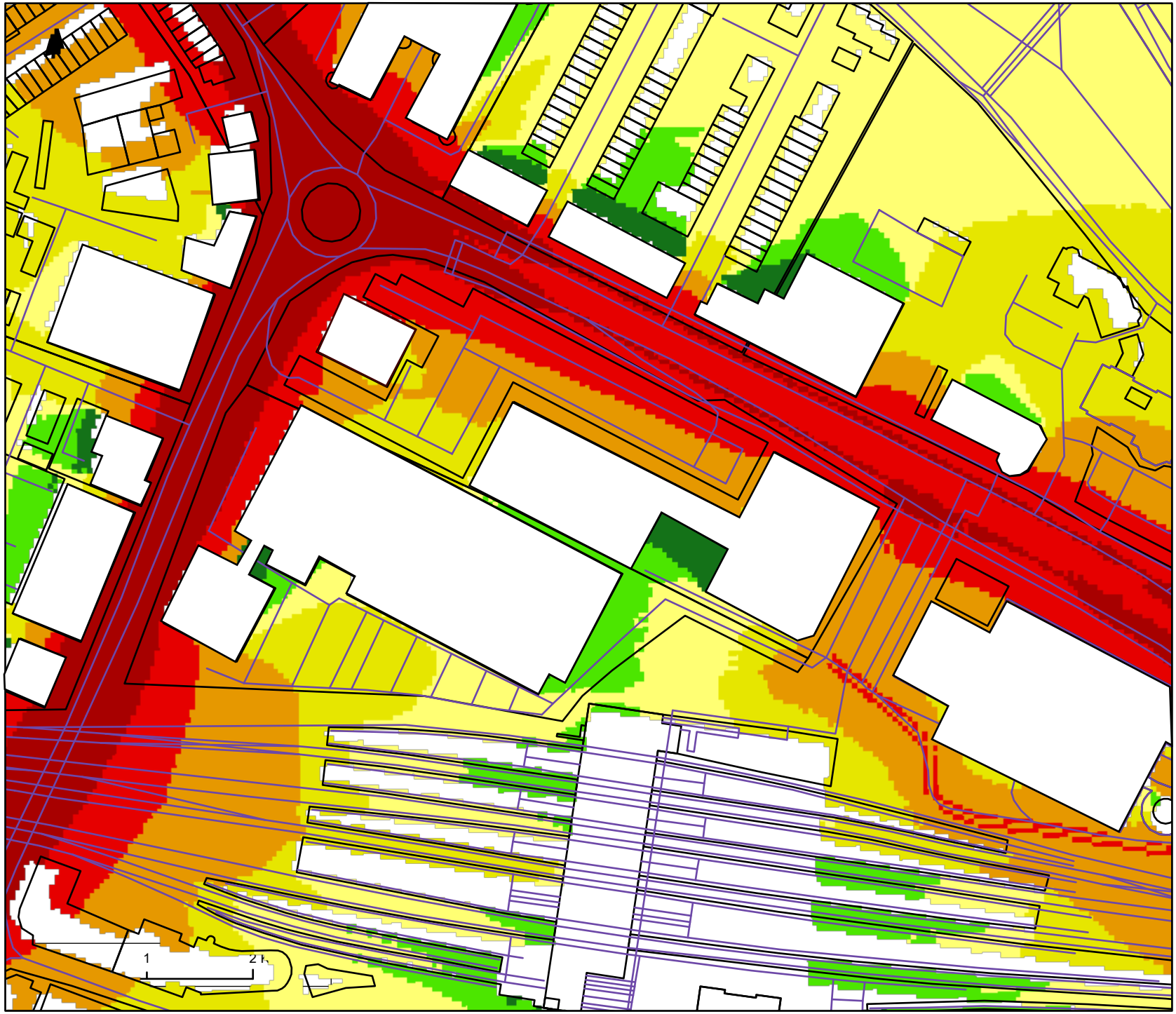
6.2 External Amenity Noise Levels

The proposed amenity spaces are located in the thoroughfares between the plots and the amenity space to the rear of the site.

The noise levels on the thoroughfare nearest to Vastern Road would be up to 68dB LAeq. However, at the rear of the site both on the thoroughfares and amenity space the noise levels are predicted to be 49-52 dB LAeq. Therefore, all residents would have access to amenity spaces with noise levels less than the 55 dB LAeq threshold.

As noise levels in some areas would be below the threshold for external amenity noise, **Negligible** effect is predicted.

Technical Appendix 8.5: Daytime Ambient Noise Levels



Legend

Baseline

dB / LAeq

- ≤ 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65- 70
- >70

Figure Title

Appendix 8.5A: Baseline ambient noise level

Project Name

Reading Station Park

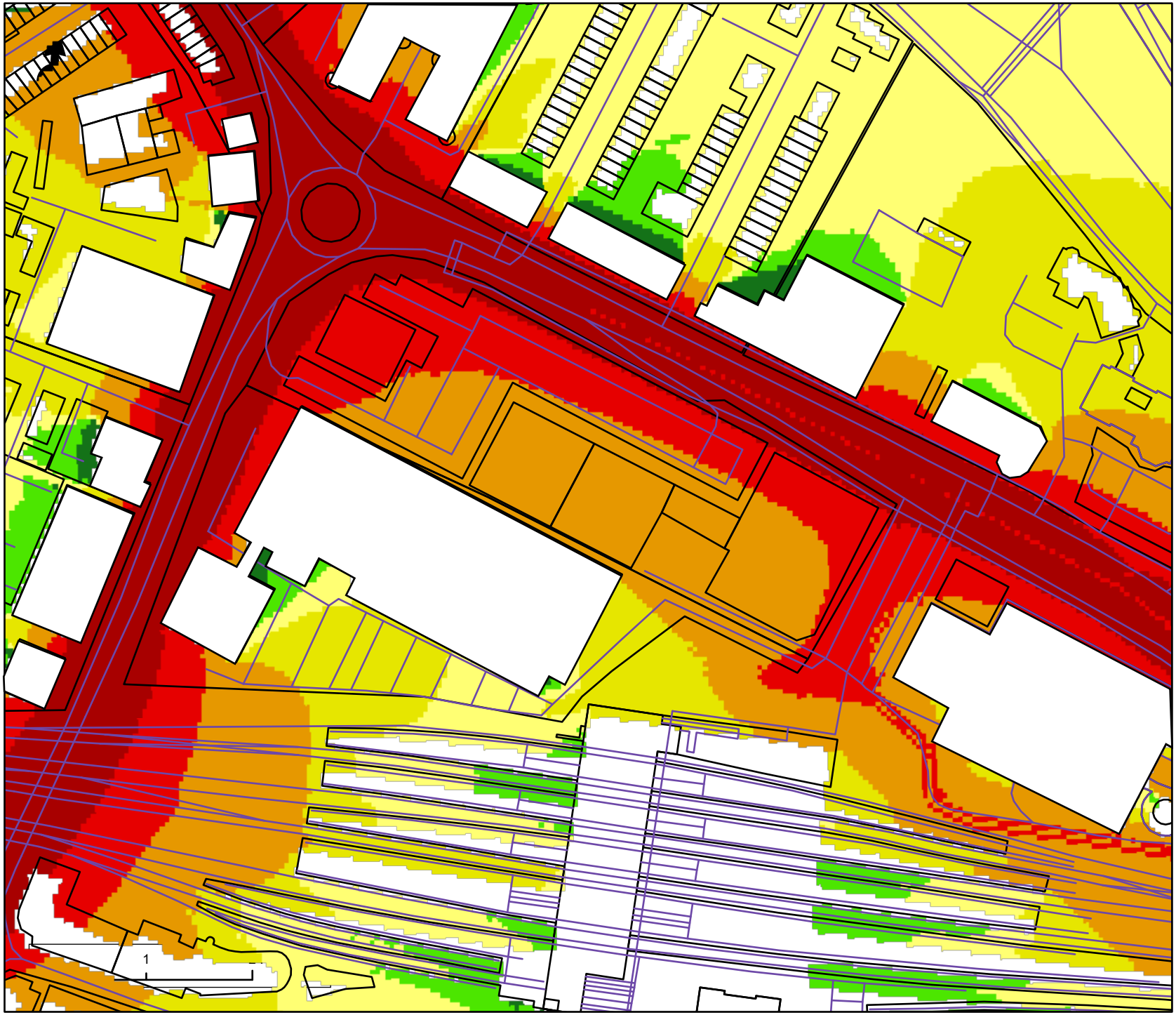
Project Number	Figure No.
1700003910	A
Date	**Prepared By**
January 2020	CF
Scale	**Issue**
NTS @A4	1

Client

Aviva Life & Pensions UK Limited

RAMBOLL

Reproduced from Ordnance Survey digital map data © Crown copyright 2018. All rights reserved. Licence number 100040631



Legend

Future baseline

dB / LAeq

- ≤ 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65- 70
- >70

Figure Title

Appendix 8.5B: Future baseline ambient noise level

Project Name

Reading Station Park

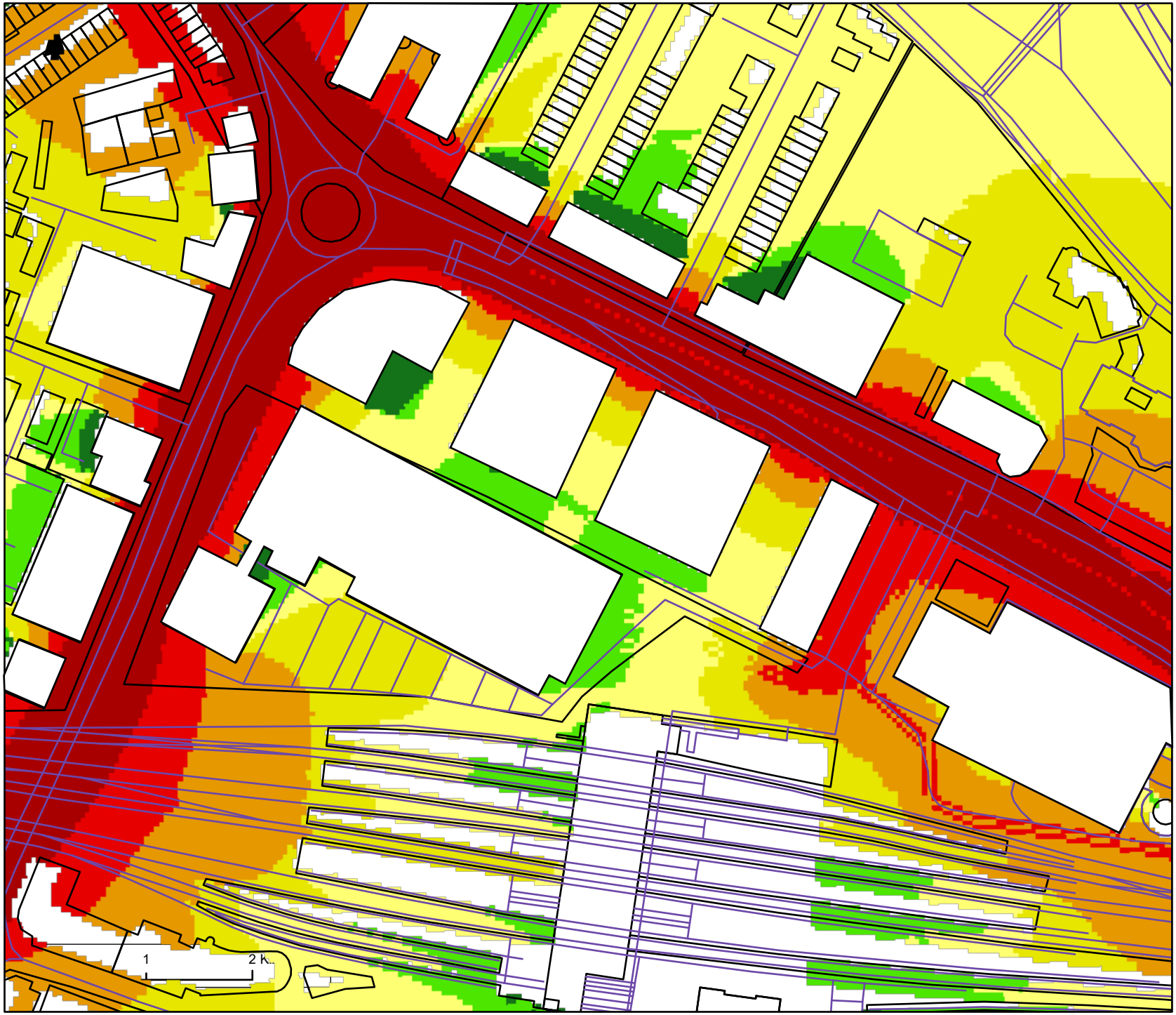
Project Number	Figure No.
1700003910	B
Date	**Prepared By**
January 2020	CF
Scale	**Issue**
NTS @A4	1

Client

Aviva Life & Pensions UK Limited

RAMBOLL

Reproduced from Ordnance Survey digital map data © Crown copyright 2018. All rights reserved. Licence number 100040631



Legend

Future

dB / LAeq

- ≤ 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65- 70
- >70

Figure Title

Appendix 8.5C: Future ambient noise level

Project Name

Reading Station Park

Project Number	Figure No.
1700003910	C
Date	**Prepared By**
January 2020	CF
Scale	**Issue**
NTS @A4	1

Client

Aviva Life & Pensions UK Limited

RAMBOLL

Reproduced from Ordnance Survey digital map data © Crown copyright 2018. All rights reserved. Licence number 100040631

5 DEMOLITION AND CONSTRUCTION ENVIRONMENTAL MANAGEMENT

Introduction

5.1 This chapter sets out the demolition and construction works of the proposed development and the key activities that would be undertaken during the works. This chapter also describes the management controls that form part of the development proposals that would be implemented to avoid, minimise and where not possible, mitigate the magnitude of potential environmental impacts.

5.2 Impacts arising during the construction and demolition processes are temporary, generally short-term and intermittent. Nevertheless, they can be sources of potentially significant effects on environmental resources and residential amenity.

5.3 It is not possible to predict in detail the specific environmental impacts and effects that may arise from the proposed development's demolition and construction works as detailed construction method statements and specifications have not yet been prepared and construction contractors not yet appointed. However, it is possible to establish the potential broad environmental impacts associated with the proposed development's demolition and construction works and to determine a framework for the management of these impacts to ensure that significant adverse effects are avoided. The framework would form the basis for a Construction Environmental Management Plan (CEMP), if required, to be implemented during the demolition and construction works. It is anticipated that the CEMP would be secured by means of an appropriately worded planning condition.

5.4 The CEMP would be prepared in accordance with standard best practice and regulatory requirements. The CEMP would include a Construction Traffic Management Plan (CTMP), as well as a Site Waste Management Plan (SWMP).

5.5 More specifically, the CEMP would set out policies, legislative requirements, thresholds/limits, procedures, roles and responsibilities relevant to the implementation of environmental and management controls throughout the duration of the works. The CEMP would be discussed and agreed with RBC in advance of works commencing on-site.

5.6 An outline of the anticipated environmental issues and necessary management controls that would be covered within the CEMP is provided within this chapter.

5.7 It is standard practice to allow the appointed Principal Contractor substantial input into documents such as the CEMP, CTMP and SWMP. However, at this stage of planning, contractors have not yet been appointed and detailed method statements have not yet been prepared. Nevertheless, the likely content of such documents can be reasonably predicted. As such it is considered that the identification and assessment of likely environmental effects is still achievable in the ES.

5.8 It is important to note that while this chapter does not assess the magnitude of potential impacts, nor the significance of likely effects during the demolition and construction works, as this is dealt with in individual technical assessments within ES Volume 1 (Chapters 6 - 10) and ES Volume 2 (Chapters 1 - 2). Controls set out in this chapter have been considered as embedded mitigation within of each technical assessment.

Programme of Works

5.9 Given the outline nature of the application, a detailed development programme has not yet been prepared. To enable assessment of likely environmental effects within this ES, an indicative, but feasible, programme has been developed by the Applicant based on a number of assumptions. These assumptions have been informed by an understanding of current and future projected market conditions, technical considerations and professional experience, all of which are considered to be reliable.

5.10 The indicative development programme is shown in Table 5.1 and is based on the assumption that planning consent is secured, and demolition begins in Q2 2021. For the purposes of the EIA, the development works are anticipated to be delivered in four phases and undertaken over a 51-month period, with completion targeted for Q2 2025.

5.11 The demolition of the existing on-site buildings and construction of the new buildings would take place sequentially in overlapping phases from west to east across the application site. Phase 1 would involve the demolition of the existing TGI Fridays and construction of Plot A. Phases 2 and 3 would involve the demolition of the existing Mothercare, Aldi and Majestic Wine buildings and the construction of Plot B and C. Finally, Phase 4 would involve the demolition of the Range and the construction of Plot D.

Table 5.1: Indicative Development Programme

Phases	Duration (weeks)	Commencement Date	Completion Date
Phase 1			
Demolition of existing TGI Fridays	12	06/04/2021	30/06/2021
Construction of Plot A Substructure	8	01/07/2021	25/08/2021
Construction of Plot A Superstructure	20	09/08/2021	10/01/2022
Construction of Plot A Envelope	30	01/11/2021	16/06/2022
Fitout of Plot A	56	17/01/2022	03/03/2023
Phase 2			
Demolition of existing Mothercare, Aldi and Majestic Wine	12	11/10/2021	14/01/2022
Construction of Plot B Substructure	10	17/01/2022	25/03/2022
Construction of Plot B Superstructure	22	02/03/2022	08/08/2022
Construction of Plot B Envelope	32	27/05/2022	24/01/2023
Fitout of Plot B	66	01/08/2022	27/11/2023
Phase 3			
Construction of Plot C Substructure	10	01/08/2022	10/10/2022
Construction of Plot C Superstructure	22	15/09/2022	01/03/2023

Table 5.1: Indicative Development Programme			
Construction of Plot C Envelope	32	07/12/2022	08/08/2023
Fitout of Plot C	74	22/02/2023	19/08/2024
Phase 4			
Demolition of existing The Range	12	25/04/2023	19/07/2023
Construction of Plot D Substructure	8	20/07/2023	14/09/2023
Construction of Plot D Superstructure	20	29/08/2023	29/01/2024
Construction of Plot D Envelope	30	20/11/2023	04/07/2024
Fitout of Plot D	65	05/02/2024	29/05/2025

Description of Works

Background

5.12 The proposed development would comprise the demolition of the two existing on-site buildings and the construction of four new buildings across Plots A-D.

5.13 The outline sequencing of construction works is identified below:

- Establish site including hoarding installation, welfare and any tree protection;
- Establish vibration and noise monitoring points;
- Enabling works including isolation of existing utilities;
- Asbestos removal following surveys within the existing buildings (where identified)
- Soft strip followed by hard demolition followed by grading to car park existing surface;
- Piling works;
- Utilities and drainage installation;
- Capping beam construction and ground floor slab;
- Superstructure core construction;
- Superstructure concrete frame and slabs;
- Envelope works;
- Roofing works;
- External landscaping and retail shop fronts;
- Internal fit out works commence as soon as areas are weather tight – temporary weathering scheme to be adopted to advance (every 5th floor);
- Internal works ahead of permanent weathering;
- Mechanical, electrical and plumbing (MEP) main plant installation and infrastructure to commence as soon areas are cleared and weatherproofed;
- Testing and commissioning (this would be an on-going process); and
- External works.

Enabling Works

5.14 The aim of the enabling works phases would be to establish the construction site.

5.15 The enabling works would include the following works:

- Undertaking appropriate pre-commencement surveys and investigations;
- Establishment of construction compound;
- Diversions and stopping up of existing utilities; and
- Possession of the existing on-site buildings.

5.16 Prior to commencement of works, the following third parties would be contacted and notified, as appropriate:

- RBC (to make arrangements regarding the commencement of demolition works and provide notification regarding hoarding licences, Section 61 agreement);
- Local resident liaison meetings;
- Highway and byways agencies (meetings to discuss logistics);
- Statutory utility companies (to make notifications regarding the location and termination of supplies into the application site and provision of necessary temporary supplies);
- Police and Fire Brigade (to be notified);
- Health and Safety Executive (HSE) (to be notified); and
- Environmental Health Office (to be notified).

5.17 All necessary awards, boundary agreement and permissions would be arranged and be put in place by the Applicant, before works commence on-site.

Pre-Commencement Surveys, Investigations, Consents and Licences

5.18 Prior to the commencement of the works, it is anticipated that the following investigations and activities would be required and secured by means of an appropriately worded planning condition:

- Asbestos Surveys of the buildings to be demolished;
- Geotechnical Investigations;
- Site Investigations (SI) works;
- CAT Scan of existing services; and
- Preparation of tender documents and method statements.

5.19 There would be a draining down and removal from site of pollutants/contaminants such as refrigeration gases, diesel fuel and engine oils, if any. In the event that asbestos is found within existing buildings, controlled and verified removal of the asbestos and any other hazardous material from such buildings would be undertaken.

5.20 Controlled and verified removal of asbestos or hazardous materials would be taken to an approved reception/disposal facility and in accordance with Control of Asbestos Regulations 2012[1], the Construction (Design and Management) Regulations 2015[2] and under a licence from the Health and Safety Executive (HSE).

5.21 Geotechnical and SI works would be required to inform the detailed structural design and to confirm ground conditions at the application site.

5.22 A Preliminary Risk Assessment has been undertaken of the application site and indicates the potential for contamination to exist (see Volume 3: Technical Appendix 2.3). In the event that contamination is identified following SI works, it would be dealt with by means of an appropriate Remediation Strategy to be secured by means of an appropriately worded planning condition.

[1] HMSO, 2012. Control of Asbestos Regulations 2012. HMSO.

[2] HMSO, 2015. Construction (Design and Management) Regulations 2015. HMSO.

Diversions and Existing Services

5.23 In addition to the above, the locations of existing apparatus, curtailment locations, diversions and de-activation of existing electricity transformers at the application site would be confirmed with service companies. The curtailment of existing domestic services would be arranged, as well as, the cut-off of existing private drainage within the boundary of the application site. Additionally, the protection and maintenance of the existing services would be carried out through liaison with the appropriate service companies to ensure continuity of supply.

Site Offices/Welfare Facilities and General Site Access

5.24 Hoarding would be erected around the application site perimeter or particular phase, as appropriate. The design of the hoarding would be agreed with RBC in advance. However, it is anticipated that the hoarding would comprise a 2.4 m high solid timber fence. The Principal Contractor would be required to maintain the hoarding to provide full security and safety for the general public. The hoarding would provide visual and acoustic screening of the application site from road level, as well as ensure the safety of pedestrians and vehicles.

5.25 The location of site accommodation and welfare facilities, such as drying rooms and toilets, would be agreed with RBC prior to commencement of works.

5.26 Separate access gates would be provided for pedestrian and vehicular access into the application site. Suitable security measures would be installed and operated, including 24 hours security as appropriate.

Temporary Works

5.27 Some temporary works would be necessary during the course of the proposed development demolition and construction stage, in order to protect the public and ensure the structural integrity of the construction works as they progress. These would range from simple propping of hoardings, to scaffold protection fans and crash decks for public protection, and temporary propping of temporary structures such as loading platforms. In all cases, these works would comply with legislation and would be designed and managed by the Principal Contractor who is obliged by law to employ a Temporary Works Co-ordinator.

5.28 Opening up works, where necessary, would be carried out to confirm assumptions made of the structure during the tendering process and to confirm the appropriateness of the demolition methodology. The demolition contractor would also utilise the existing record and archive drawings to produce temporary works solutions for back propping to the demolition floors and crane location requirements.

Demolition Works

5.29 The sequence of demolition allows the retail park to continue partial operations, as opposed to a wholesale decant.

5.30 Prior to the commencement of the hard demolition, a thorough soft strip of the existing buildings would take place. The soft strip would commence with the removal of all potential asbestos identified through the demolition and refurbishment asbestos survey, to be undertaken by licenced contractors.

5.31 The buildings would be demolished by means of a pneumatic scissors and concrete breaker. Materials suitable for crushing would be crushed, graded and stockpiled with some re-use within the application site. The remaining that cannot be recycled on-site is likely to be transferred to suitable tipper or waste haulage vehicles and removed off-site.

Construction Works

5.32 The construction works described in the following sections have been developed by the Client's appointed construction advisor, Mace, and describe the envisaged method of construction for the proposed development based on what is currently known about the application site and the development proposals, as well as standard industry practice.

Piling and Substructure

5.33 Following the removal of the existing car park and structures, the installation of the piling mat at ground floor level would occur before the piling works commence. Tests would be undertaken to confirm the bearing capacity of the mat before the rigs are delivered. Guide walls would be formed prior to the piling in order to correctly align the piles.

5.34 It is envisaged around two piling rigs would install the foundations end bearing piles to support the structure. Continuous Flight Auger (CFA) or Rotary rigs would be utilised depending on the ground investigation survey and interpretive report. CFA piling would be the preferred method as this is less intrusive to receptors.

5.35 The capping beam works would progress in line with the programmed work sequence to maintain suitable spatial separation between the activities. Excavators would remove the pile mat to capping beam formation level, prior to steel being fixed, shutters positioned, and concrete placed.

5.36 On completion of the capping beam, the reduced dig would commence to allow the below ground rain water attenuation tanks to be installed, followed by the ground floor slab. The subsequent vertical structures and slabs would be cast leading to the completion of the new structure.

5.37 During the substructure activities, excavation and installation of utilities provisions would be carried out.

5.38 Once sufficient substructure is in place, the tower crane can be installed which would be used to complete the ground floor slab and ready to start the superstructure.

Building Cores

5.39 Following the completion of the ground floor slab, the construction of the concrete core would commence.

Superstructure

5.40 Once the core is fully complete, or even partially complete, the columns and new floor plates would commence.

5.41 Static concrete pumps (located at ground level) would be used to place the concrete floor slab. The tower cranes would be used to service the superstructure works and cast the vertical concrete encasement elements and load out the decking, shutters and reinforcement.

5.42 The above follows a traditional form of construction. Subject to the detailed design, a prefabricated modular system could be used which would reduce the time on-site and number of deliveries to the application site.

5.43 External hoists would be installed to the new floor levels to facilitate the early vertical distribution of materials and removal of waste. Hoists would be located in strategic locations where materials can be easily offloaded.

5.44 The application site crane strategy would be prepared in accordance with the appropriate Aviation, Highways and Rail obligations. Possible impacts of the crane strategy, should tower cranes be used, might include road closures which would normally be necessary for the erection and dismantling of the

cranes. The timing and requirements would be discussed and agreed with the local authority and highways. The crane strategy would dictate the routing of deliveries to the crane pick points.

5.45 For the purposes of the EIA, it is anticipated that concrete would be delivered via ready mix concrete trucks from surrounding batching plants.

5.46 Modern Methods of Construction (MMC) would be considered in the construction of the proposed development, subject to commercial and technical viability.

Building Envelope

5.47 With the frame complete, the façade installation can commence. This would start immediately once sufficient structure allows clearance above the work zone. The cladding would be installed with the tower crane, working bottom up.

5.48 Scaffolding would not be required if the cladding is prefabricated and installed from the floor slabs.

5.49 After a suitable curing period of the new roof slab to the buildings, roof waterproofing and finishes would commence. This would complete the envelope works and so achieve a water tight structure.

5.50 On completion of the façade works, each level would be inspected and signed off prior to any following trades commencing.

Fit Out

5.51 Fit out would commence following the installation of the external envelope to each floor. (Approximately three floors below the current level of envelope installation). Temporary weatherproofing measures would be installed on every 5th floor. The finishes would be loaded out via the external hoists serving each tower. Due to the floor layout, a 'hoist apartment' on each floor would be created. This apartment would be the last to be fitted out on each floor following the removal of the external hoist and the bringing into (beneficial) use of the permanent lifts.

5.52 The installation sequence to each apartment is currently anticipated to be as follows (although potentially subject to change):

- 1st fix partition walls;
- 1st fix services to walls and ceilings;
- 2nd fix partitioning and ceiling installation;
- Sub floor installation;
- Kitchen and bathroom fit out (possibly pre-fabricated);
- Decoration;
- Final fix of components, white goods, sockets, switches, blinds, signage and floor finishes; and
- Commission and clean.

5.53 Service risers within the common areas on each of the floors would be completed in advance of the individual apartments. Certain lift installations would be prioritised and completed early to allow the external hoist to be disconnected from individual floors and the remaining 'hoist apartment' fitted out. Common area finishes would be left as late as possible, to reduce the risk of damage. Finishes below ground would commence as soon as the structural works are completed.

Open Space, Public Realm and Road Works

Open Space and Public Realm

5.54 In respect of the newly introduced open space network and pedestrian friendly public realm, the following works would be undertaken on-site:

- Site levelling;
- Introduction of appropriate paved materials; and
- Provision of play equipment and street furniture, including litter bins, benches, signage and lighting.

Roads Works and Access Arrangements

5.55 Construction of access roads, internal streets and surface parking would be undertaken. The primary access road would be delivered in advance of this. Works would also include layering of road fill material, levelling, compaction and finishing off with specified material such as bitumen tarmac and paving blocks.

Landscaping Works

5.56 Installation of the proposed soft landscaping would only commence upon completion of associated construction and fit out works to minimise potential plant material loss. Clean topsoil would be imported to fill and shape lawn and landscaped areas, with subsoil used on the strategic areas of open space.

Utilities and Service Installation

Electricity

5.57 The main electrical point of connection (POC) to each plot would be from proposed new SSE (Scottish and Southern Electricity Network) substations located around the application site. These connections would be in addition to the existing supplies which would be retained to provide temporary power during construction.

Gas

5.58 Gas is not proposed for the proposed development.

Water

5.59 The point of connection for the water supply would be located along Vastern Road, taken from the existing Thames Water owned water main.

5.60 The water demand of the proposed development would be calculated according to the size and number of the proposed residential units. Upgrade work may be required for the proposed development to the existing local mains. This would be subject to detailed development.

5.61 It is proposed to discharge foul water flows to the Thames Water foul sewer which currently serves the application site and is located along Trooper Potts Way. Thames Water have confirmed that modelling and potential upgrade works would be required to ensure the receiving sewer would have capacity to accommodate the increased foul flows.

Demolition and Construction and Contracting Strategy

5.62 The Principal Contractor would be responsible for a number of sub-contractors (piling, concrete, cladding etc.) and ultimately for the environmental management during the construction process.

5.63 Stringent contractual procedural and performance obligations would be placed on sub-contractors under a clear management structure.

Demolition and Construction Employment

5.64 The construction of the proposed development would generate employment; a proportion of which is expected to be generated on-site, with the rest being generated elsewhere in the construction supply chain, possibly including modular unit production facilities.

5.65 The construction works would have local benefits through construction training and targeting the local labour force. This would be achieved through employment and training initiatives. Full details of construction employment are provided in ES Chapter 6: Socio-Economics.

Hours of Work

5.66 The hours of work would adhere to the procedures set out in the approved CEMP. The standard hours of working which would include hours of delivery, would be the following, unless otherwise agreed with the RBC in advance.

5.67 Working hours would be agreed with the RBC but are expected to be:

- 08:00 to 18:00 hours Monday to Friday;
- 08:00 to 13:00 hours Saturday; and
- No working on Sundays or Bank Holidays.

5.68 In order to maintain the above working hours, the Principal Contractor may require, at certain times, a period of up to one hour before and after normal working hours, to undertake start and close down activities (this would not include works that are likely to exceed agreed maximum construction works noise levels).

5.69 Although working outside the stated hours would not normally be undertaken, it is possible that some deliveries may take place at night, and that certain works may have to be done during this period for safety or other considerations. If required, such works would be subject to reasonable notice and either securing the required licenses or obtaining prior agreement with RBC, who may impose certain restrictions.

5.70 All work which is intended outside of these hours, excluding emergencies, would be subject to prior agreement, and/or reasonable notice to RBC in terms of Section 61 (S61) of the Control of Pollution Act 1974.

Security

5.71 The perimeter of the construction compound would be secured with the use of hoarding, as shown in Figure 5.1.



Figure 5.1: Example Site Hoarding

5.72 Only authorised persons would be allowed on the application site. A gate marshall would be employed to control access/egress from the key application site entrances, as shown in Figure 5.2 The contact number for out-of-hours security would be visibly marked at application site entrances.



Figure 5.2: Example of Site Control Access Points

Health and Safety

5.73 All works on-site would be undertaken in accordance with the provisions of the Construction (Design and Management) (CDM) Regulations 2015[3]. A CDM Principal Designer would be appointed by the Applicant

[3] Construction (Design and Management) Regulations 2015. Guidance on Regulations. Health and Safety Executive.

and would work with the Project Team and Principal Contractor to ensure compliance with these Regulations.

5.74 All method statements would incorporate regulatory safety matters and a Health and Safety File would be maintained on-site for inspection by the HSE, RBC and others as appropriate.

Emergency Procedures

5.75 Procedures would be set in place to respond to any emergency incidents which may occur on-site. A site Pollution Incident Response Plan would be developed by the Principal Contractor prior to any construction works commencing on-site.

5.76 All appropriate staff would be trained and made aware of the spill contingency plan set in place. In the event of any incident the Applicant would be notified. Additionally, the Environment Agency and any other interested bodies would be notified as required.

5.77 Details on the emergency procedures would be provided in the Construction Phase Plan.

Communication

Community Liaison Manager

5.78 The Principal Contactor's site managers would be responsible for fulfilling the role of community liaison manager. The community liaison manager's responsibilities would comprise the following:

- Recording and responding to enquiries or complaints from the local community or public;
- Communicating to the local community the nature of the construction work that would be carried out;
- Communicating the programme of work to the local community, specifically highlighting any works that may result in complaints (e.g. noisy activities);
- Updating the local community of any changes to the nature of works or programme of works as necessary; and
- Establishing and maintaining good relationships with local stakeholder groups.

5.79 The contact's name and telephone number would be displayed at the entrance to the application site and on the perimeter in prominent locations.

Complaints Procedure

5.80 The Principal Contactor's site managers would make stakeholders aware of the complaints procedure as part of the communication programme. The complaints procedure would comprise the following aspects:

- Publicise the details for relevant application site contacts, including telephone and email contact detail;
- Set up and maintain a complaint register, which records all correspondence/telephone contact from the public or stakeholders;
- Classify the nature of correspondence (e.g. complaint, enquiry, comment);
- In the event of correspondence that requires action, assign to an appropriate member of the management team; and
- Ensure the close-out of actions and update complaints register with a record of all actions and outcomes.

[4] International WELL Building Institute. The WELL Standard. https://www.wellcertified.com/
[5] Declare – the nutrition label for buildings. https://living-future.org/declare/
[6] Cradle to Cradle Certified Products Registry. http://www.c2ccertified.org/products/registry

Materials and Resource Use

Selection

5.81 A strategy for minimising carbon emissions would be used when selecting materials. The final CEMP would detail the approach for a range of resource efficiency principles, including locally sourcing materials and services, auditing materials to demonstrate environmental performance (e.g. ISO 140018 or equivalent) and options for reuse of supplies. It would be carried out alongside a carbon foot printing procedure that would minimise carbon demands of the proposed development, identify the use of renewable energy resources, and incorporate efficient energy supply and low carbon technologies.

5.82 The design of the proposed development should maximise the potential to use pre-fabricated elements, and standard profiles and sections which can be easily assembled and disassembled for reuse elsewhere. Materials efficiency would be integrated with the waste hierarchy principles adopted for the scheme, such as identifying opportunities to reuse existing materials and reducing construction waste on site via appropriate benchmarks. Local material selection and procurement would be explored by the Principal Contractor.

5.83 Vulnerable areas of the buildings and wider scheme would be identified to ensure impact protection features are incorporated, and durable materials are specified, to reduce the degradation and use of additional materials over the lifetime of the development.

5.84 The proposed development would seek to create high quality, healthy internal environments for those living and working in and visiting the scheme. Materials selection and procurement would also be informed by the increasing availability of healthy certified materials, where feasible, including but not limited to materials and products that:

- meet testing and emissions standards for low or zero VOC as defined by Building Research Establishment's Environmental Assessment Method (BREEAM), Leadership in Energy and Environmental Design (LEED) and/or WELL[4];
- meet the toxic materials reduction standards set by the WELL standard;
- are Declare[5] label certified; and
- are Cradle to Cradle Certified Products[6].

5.85 Other tools would also be used to ensure that alternative materials with a recycled content and low embodied carbon are specified where possible:

- The Green Guide to Building Specification[7] would be used to ensure that major building elements are specified which have higher Green Guide Ratings (A-C); and
- WRAP's net waste toolkit[8] would be used to ensure that 'quick wins' and opportunities to increase recycled content are identified at early stages of the design.

5.86 Key materials are envisaged to include those indicated in Table 5.2.

Table 5.2: Indicative Key Construction Materials

Materials	Materials Required For
Concrete	Piling, pile caps, superstructure frame, lift cores, stairs, shear walls
Steel Reinforcement	Piling, pile caps, superstructure frame, lift cores, stairs, shear walls
Steel	Long span structures, minor structural elements

[7] Anderson, J, Shiers, D & Steele, K, 2009. The Green Guide to Building Specification – An Environmental Profiling System for Building Materials and Components, Fourth Edition, BRE Press.
[8] WRAP,2017; [online] NetWasteTool. Available, http://nwtool.wrap.org.uk/ToolHome.aspx

Brick / Blockwork	External envelope, some internal walls
Cross Laminated Timber	Upper levels of BF-F – floors and walls
Glulam Timber Beams	Long spans over openings
Cladding	External envelope
Glazing	External envelope
Partitions (boarding)	Internal walls

Storage and Handling

5.87 Due to the limited amount of space on-site, where practical, contractors would be expected to operate a 'just-in-time' policy for the delivery and supply of construction materials, and packaging would be returned. This means that materials would be brought to the application site just before their incorporation into the work, thereby minimising the need for on-site storage.

5.88 Where possible, prefabricated elements would be lifted directly into position from delivery vehicles. This would assist in reducing on-site storage and labour requirements and construction noise levels, thereby reducing potential nuisances to surrounding receptors.

5.89 Oils and hydrocarbons would be stored in designated locations with specific measures to prevent leakage and release of their contents, include the siting of storage areas away from surface water drains, on an impermeable base with an impermeable bund that has no outflow and is of adequate capacity to contain 110 % of the contents. Valves and trigger guns would be protected from vandalism and kept locked up when not in use. Details of appropriate storage and handling measures would be presented within the CMP.

5.90 All liquids and solids of a potentially hazardous nature (e.g. diesel fuel, oils and solvents) would be stored on surfaced areas, with bunding, and within secure areas, in accordance with the EA's requirements.

Enabling and Demolition Quantities and Waste Management

5.91 Table 5.3 provides an estimate of the quantities of material likely to be generated as a result of the enabling works and demolition of existing on-site buildings, structures, hardstanding, below ground features and foundations on-site.

5.92 Materials arising from the enabling and demolition stage of the proposed development would be recycled where reasonably practical.

Table 5.3: Indicative Estimate of Demolition Material Likely to be Generated on-site

Waste Arising	Approximate Weight (tonnes)
Concrete	7,000
Steel/metal	2,000
Plasterboard	200
Timber	100
Total Enabling Works and Demolition Waste	**9,300**

Excavation and Construction Key Quantities Material

5.93 Estimates of bulk material quantities for key construction components are provided in Table 5.4.

5.94 Waste arising from site clearance, primary infrastructure and earthworks is expected to comprise vegetation (limited), topsoil, rubble, tarmac from former hard standings, gravel and clay material.

5.95 Suitable material excavated during ground-works would be crushed and used as back-fill and piling mat material.

5.96 Any clean excavated material that cannot be reused on-site would be removed by licensed waste carriers and sent for reuse at another development site, or sent for disposal at appropriately licensed facilities (these are expected to be inert waste landfill sites).

5.97 Construction materials would be selected following the BRE 'Green Guide to Specification'. These include the following:

- Minimising embodied energy content (the energy used in manufacture);
- Using recyclable materials where they have high embodied energy; and
- Maximising the recycled content of the material, ease of maintenance, appropriate sourcing of materials and totally excluding deleterious and hazardous materials.

Table 5.4: Bulk Quantities During Construction

Waste Arising	Volume
Bulk Excavation and Pile Arisings	13,000 m^3
Packaging	120 tonnes
Plaster/ Cement	110 tonnes
Miscellaneous	80 tonnes
Timber	180 tonnes
Concrete	55,000 tonnes
Insulation	20 tonnes
Metal	4,500 tonnes
Plastics	55 tonnes
Inert	170 tonnes

Landfill Capacity

5.98 All relevant contractors would be required to investigate opportunities to minimise and reduce waste generation in line with WRAP's 'Halving Waste to Landfill' initiative by undertaking the following:

- Agreements with material suppliers to reduce the amount of packaging or to participate in a packaging take-back scheme;
- Implementation of a 'just-in-time' material delivery system to avoid materials being stockpiled, which increases the risk of their damage and disposal as waste;
- Use of standard size components in design detailing to eliminate risk at source where possible to do so;
- Attention to material quantity requirements to avoid over-ordering and generation of waste materials;
- Re-use of materials wherever feasible, e.g. re-use of excavated soil for landscaping. The Government has set broad targets of the use of reclaimed aggregate, and in keeping with best practice, contractors would be required to maximise the proportion of materials recycled;
- Segregation of waste at source where practical;
- Re-use and recycling of materials off-site where re-use on-site is not practical (e.g. through use of an off-Site waste segregation facility and re-sale for direct re-use or re-processing);
- Skips would be colour coded and signposted to reduce risk of cross contamination and covered to prevent dust and debris blowing around the site, these would be cleared on a regular basis; and

- Burning of wastes or unwanted materials would not be permitted on-site.

5.99 Relevant contractors would be required to carry out works in such a way that, as far as is reasonably practicable, the amount of spoil and waste to be disposed of by landfill is minimised and that any waste arising from the site are transported and disposed of in accordance with relevant legislation.

5.100 Waste generated by the proposed development would be minimised and reused wherever feasible. There is not predicted to be any significant effect upon landfill capacity as a result of the construction waste volumes.

Plant and Equipment

5.101 Consideration has been given to the types of plant and equipment that are likely to be used during the construction works. The typical types of plant and equipment associated with each key element of the works, as well as the estimated percentage on time for the equipment is set out within Table 5.5.

Table 5.5: Estimated Plant and Equipment Types

Plant and Equipment	Enabling Works and Demolition		Substructure		Superstructure		Envelope		Fit-out	
Concrete Crusher	✓	50 %	×		×		×		×	
360 deg Excavators (Large)	✓	100 %	✓	100 %	×		×		×	
360 deg Excavators (mini)	✓	80 %	✓	50 %	×		×		×	
Face Shovel	×		×		×		×		×	
Concrete Breaker	✓	80 %	✓	20 %	×		×		×	
Compactors	✓	50 %	✓	100 %	×		×		×	
Piling Rigs	×		✓	50 %	×		×		×	
Mobile Cranes	✓	20 %	✓	20 %	×		✓	10 %	×	
Tower Cranes	✓	40 %	✓	100 %	✓	100 %	✓	100 %	×	
Concrete Pumps	×		✓	70 %	✓	70 %	×		×	
Cradles	×		×		×		✓	10 %	×	
MEWPS	✓	40 %	×		✓	100 %	✓	100 %	✓	50 %
Goods/ Passenger Hoists	×		×		✓	100 %	✓	100 %	✓	50 %
Cantilever Decks	×		×		✓	100 %	×		×	
Scaffolding	✓	80 %	✓	20 %	✓	20 %	×		×	
Fork Lifts	✓	50 %	✓	50 %	✓	60 %	×		✓	80 %
Small tools (Drills / Cutters)	✓	100 %	✓	100 %	✓	100 %	✓	100 %	✓	50 %

Note: ✓ Usage of plant at the respective demolition and construction phase stage

Trips, Access and Routing Arrangements

Trip Generation

5.102 Table 5.6 provides a breakdown of the anticipated two-way (in and out) vehicle movements for each stage of the demolition and construction works.

Table 5.6: Estimated Daily Vehicle Movements

Activity	Estimated Daily Vehicle Movements
Demolition	24
Excavation	32
Piling	14
Sub-Structure and Superstructure	30
Envelope and Cladding	10
Internal Fit Out	10

5.103 The maximum number of HGV movements would be associated with the demolition, piling and earthworks, with an average of 70 trips (140 movements) per week for approximately 12 months. During the maximum peak construction period, when the substructure and superstructure works would overlap, this could increase to an average of 185 trips (370 movements) per week.

5.104 The most intensely used HGVs on the application site would likely comprise tipper trucks for the removal of excavated material, ready mix concrete trucks for the delivery of concrete, and articulated lorries for the delivery of cladding panels. These figures would be reviewed upon appointment of the Principal Contractor and be would be subject to prior approval of RBC. All contractors would be supplied with a vehicle route card and details of all access routes would be provided

5.105 Deliveries would be required to be booked in at least 24 hours in advance using electronic delivery booking system which would be controlled by the logistics manager. This booking in system would be followed and adhered to any unplanned deliveries would be turned away.

Site Access and Egress

5.106 The site is located within Reading town centre and is bounded by Reading railway station to the south and Vastern Road to the north. Given the constraints, the most suitable vehicle access would be from the west using Caversham Road.

5.107 The site would be accessed via the existing estate road to the west of the complex from Caversham Road. The main arterial route identified is A329 under the railway bridge with a height restriction of approximately 4.75 m, as shown in Figure 5.3.



Figure 5.3: Railway Bridge on A329

5.108 The access point to the application site would change in accordance with the different phases, as shown in Figures 5.4-5.6. This is to allow the existing on-site uses to remain operational while the early phases of the development are under construction, and then as the development progresses, to allow the later phases to be constructed and reduce the impact of demolition and construction traffic on new residential occupants of Plot A.

5.109 During phase 1, construction access to the application site would be from the west from Caversham Road.

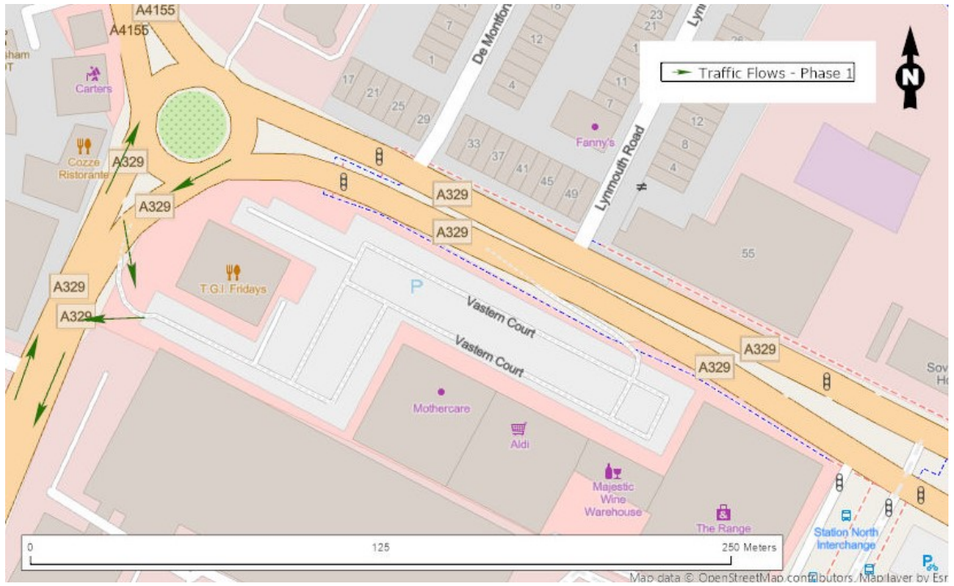


Figure 5.4: Construction Access for Phase 1

5.110 During Phases 2 and 3, access would be moved to the northern boundary of the application site, from Vastern Road, in the middle of the application site.

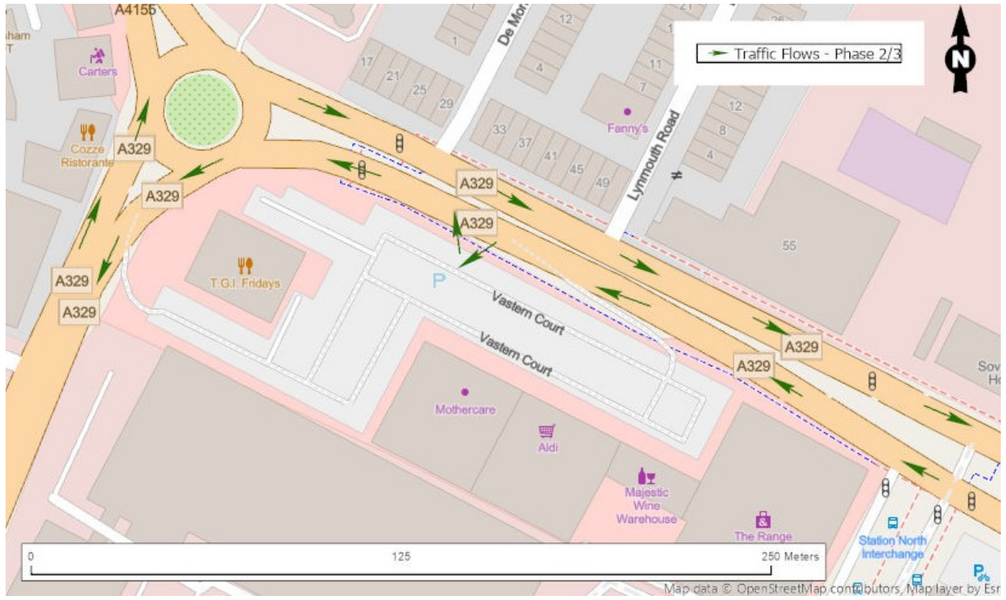


Figure 5.5: Construction Access for Phases 2 and 3

5.111 During Phase 4, access would remain along the northern boundary of the application site on Vastern Road, but would be moved further to the east, at the end of the existing car park.

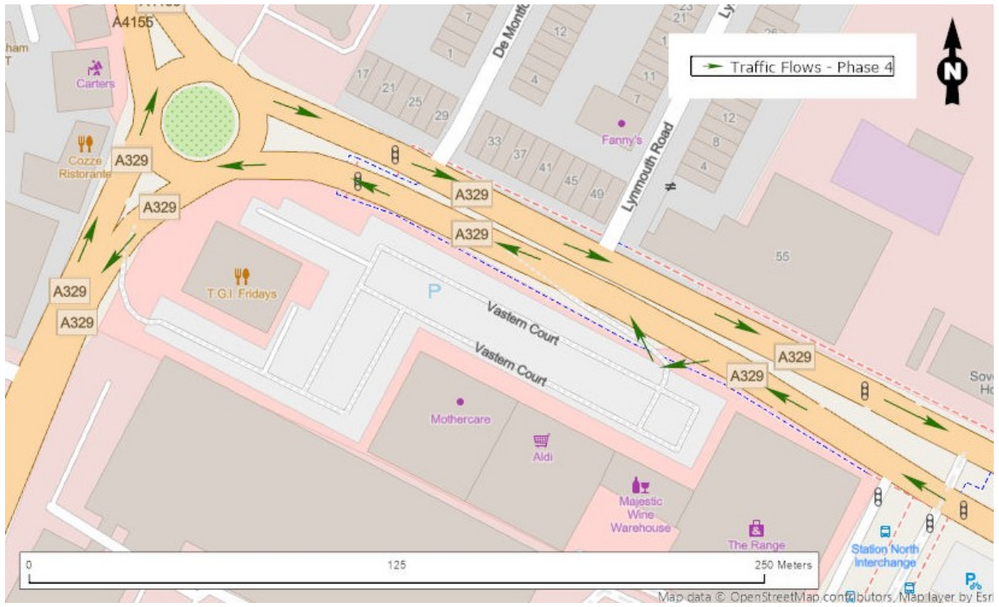


Figure 5.6: Construction Access for Phase 4

5.112 Access through the existing roads would be closely managed by traffic marshals and security with particular attention to cyclist using the cycle lane.

5.113 The application site would be able to accept all vehicle categories including a 10 m rigid truck and a 16 m articulated vehicle. Swept path analysis would be carried out at the detailed design stage.

5.114 Segregated traffic routes would be implemented on the site. Where the existing access to operational retail units is required for the public, it would require highway alterations in advance, but these can be positioned to eventually become the new permanent crossovers.

Construction Traffic Route

5.115 Construction traffic route is displayed in Figure 5.7.



Figure 5.7: Construction Traffic Route to Site

Closures and Diversion

5.116 Site activities with the potential to affect the public highways outside of the boundaries of the application site are as follows:

- Temporary footpath diversions/ closures may be required, and licences would be applied for in order to erect, adapt and dismantle this hoarding. Wherever possible the width of any retained footpath would be maintained at minimum 1.5 m wide;
- A mobile crane is required for erecting/dismantling the tower cranes. The tower crane contractor would develop a site-specific plan for this and seeking all relevant statutory approvals etc.;
- Delivery and installation of MEP capital plant. Whilst it is anticipated that the cranes on-site would be sized to carry out these lifting operations, the use of supplementary mobile cranes may be required from within the site boundary;
- Erection, adaption and striking of hoardings and scaffolding would be necessary in order to ensure the safety of operatives and the general public that would encroach into the public realm;
- Scaffolds would incorporate protection fans at an acceptable height and monarflex style sheeting; and
- Façade and external works at ground level where the works abut directly adjacent to the public realm. Wherever possible working access would be limited to ensure a minimum clear pedestrian footpath width of 1.5 m is maintained. A Method Statement would be agreed with RBC's Highways department for each eventuality and appropriate licences would be obtained where necessary.

Loading/Unloading Areas

5.117 The storage area for the proposed development would be within the application site boundary, utilising existing landscaping and parking areas. This would be constantly reviewed as works progress and the application site conditions change. Lighting, signage, fire points and pedestrian protection would need to be constantly updated and communicated to all as these works develop.

5.118 Unloading / loading and storage areas would be clearly defined and carefully considered to:

- Be established and maintained on-site, rather than off-site, as far as possible;
- Be segregated from pedestrian routes using barriers;
- Have sufficient room for all vehicle movements including turning space;
- Have adequate lighting and appropriate signage; and
- Have Fire Points and Spill Kits located in the immediate vicinity pertinent to the unloading / loading operations and / or materials being stored.

Pedestrian Access/Egress Routes and Parking Management

5.119 Pedestrian access routes for members of the public would be clearly displayed using appropriate and approved signage. Where necessary, such as through tunnels under scaffolding, additional lighting (including emergency power fittings) would be provided from the application site temporary electrical installation.

5.120 All pedestrian routes that are in close proximity to moving vehicles would be protected using appropriate physical barriers.

5.121 All operatives would access and egress to the application site via designated site control access points, which would be manned by site security. All contractors would book into the relevant security area for their area of works and having done so they would then proceed to their working areas using designated routes.

5.122 Once operatives have entered the application site they would only use designated pedestrian routes which would be clearly defined with relevant signage prominently displayed and updated as works progress and site dynamics change. Physical barriers would be installed to segregate vehicle and pedestrian movements and crossover points would be gated.

5.123 Safe 'green routes' would be established to ensure safe segregation between all vehicles and pedestrians/ construction operatives.

Environmental Controls and Mitigation

5.124 A review of the potential environmental impacts associated with the construction works has been undertaken to proactively inform the development proposals and agree appropriate mitigation measures.

Potential impacts can arise from day to day works or from individual instances of accidents, poor operation or management. They are, however, largely dependent on the implementation of effective controls e.g. the employment of dust suppression methods, use of a well trained workforce and properly maintained plant.

5.125 A summary of the potentially significant environmental impacts that could arise during the demolition and construction works and mitigation measures integral to the development proposals are provided in Table 5.6. Further detail and assessment of these likely impacts are provided in ES Chapters 6-10 and ES Volume 2.

5.126 Construction plant specifications have been defined allowing noise and other implications to be assessed. Potential impacts in many areas are largely dependent on attention to management control (e.g. watering to control dust, use of noise attenuated plant), which would be under the control of the Principal Contractors required, by tender requirements, to adhere to management controls and method statements.

Table 5.6: Summary of Potential Environmental Impacts during Demolition and Construction

Receptor	Potential Impacts	Mitigation
Below ground Heritage Assets (Archaeology)	• Damage to potential in-situ archaeological remains (if present).	• Archaeological site evaluation following demolition works and prior to substructure works, with further evaluation e.g. including any watching briefs required during earthworks as necessary).
Transport and Pedestrian Infrastructure	• Temporary traffic disruption caused by site traffic and an increase in HGV movements	• Implementation of a CTMP. • Use of RBC approved access points and routes to the application site, with deliveries outside peak hours where possible (and abnormal loads at quiet times, subject to agreement with RBC and TfL).
	• Transfer of mud and materials from vehicles onto public highways causing the potential for pollution hazards	• On-site wheel washing facilities or regular road sweeping to prevent water transfer to the road.
	• Temporary disruption to pedestrian access and routes within the locality of the application site.	• Implementation of a CTMP • Maintenance of footpaths around the application site, where possible, ensuring access is maintained for all.
Noise and Vibration	• Temporary increased noise levels at surrounding residential and commercial properties, from HGV vehicle movements and demolition / construction activities e.g. breaking out, crushing, piling, cutting etc.	• Installation of 2.4 m site hoarding. • Agreement of working hours with RBC, careful selection of quiet plant. • Appropriate siting and regular maintenance of plant. • Use of silenced and well-maintained plant conforming with the relevant EU directives relating to noise and vibration.
	• Vibration impacts on local buildings, due to increased vibration from demolition works, piling, use of heavy vehicles within the application site etc.	• The construction techniques proposed are considered unlikely to result in significant vibration impacts but the need for vibration monitoring / setting of vibration action levels would be discussed and agreed with RBC.
Air Quality	• Windblown dust generated from demolition works, earthworks, stockpiles, construction vehicle movements on unpaved surfaces, crushing etc.	• Dust suppression techniques, such as damping down, use of temporary screens, covering of stockpiles etc. • Preparation and Implementation of a Site Waste Management Plan (SWMP). • Appropriate sourcing of materials.
Soil and Groundwater	• Pollution incident through spill of fuels or chemicals, or discharge of sediment laden water / runoff.	• Appropriate storage of fuels and potentially hazardous construction materials within a secure site compound. • Provision of on-site pollution control kits. • Use of settlement system prior to discharge.
	• Siltation and contamination of surface water runoff and ground water.	• Use of settlement tanks, bunding and street sweeping to prevent contamination of the stormwater system.
	• Potential for soil contamination.	• Geotechnical Site Investigations that are being undertaken would be used to characterise current soil and groundwater conditions at the application site. In the event that contamination is found, soil would be removed and an appropriate Remedial Strategy developed in conjunction with RBC and the EA.
Ecology	• Accidental spills and discharges from the storage of fuels and construction materials which may create pollution hazards. • Accidental release of surface water runoff containing elevated levels of suspended sediments or other contaminants	• Appropriate storage of fuels and potentially hazardous construction materials within a secure site compound. • Provision of on-site pollution control kits. • Use of settlement system prior to discharge.
	• Permanent damage and loss of habitats. • Injury or death of protected birds and animals.	Works to remove trees to be undertaken outside of the bird breeding season of March to August in the event that nesting birds are encountered.
Natural Resource Use	• Waste generation and disposal of materials to landfill.	• Preparation and Implementation of an SWMP. • Waste minimisation at source, with segregation and recycling of waste generated.
	• Use of natural resources	• Preparation and Implementation of an SWMP. • Appropriate sourcing of materials.

Table 5.6: Summary of Potential Environmental Impacts during Demolition and Construction

Receptor	Potential Impacts	Mitigation
Site Workers	• Release of asbestos during demolition	• Completion of Asbestos Surveys and removal of all identified asbestos materials by a specialist contractor as part of the demolition works.
	• Exposure of construction staff to contamination, if confirmed during planned site investigations works.	• Use of Personal Protective Equipment (PPE).
Residential Amenity	• Temporary visual intrusion for nearby residents, occupiers of other land uses, pedestrians and passers-by. • Temporary visual intrusion of construction works on views into and out of the application site. • Temporary increases in road noise and vibration generated from construction vehicles. • Temporary increases in noise and vibration levels generated from the use of site plant and machinery. • Temporary generation of wind-blown dust nuisance from ground surfaces, stockpiles, vehicles, work faces and cutting and grinding of materials. • Temporary generation of exhaust emissions from lorries and plant delivering and removing materials including dust and particulates which may impact upon local air quality.	• Installation of 2.4 m site hoarding. • Standard, good site housekeeping. • Appropriate construction site layout. • On-site wheel washing facilities. • Dust management. • Demolition and construction traffic management. • Agreement of working hours with RBC careful selection of quiet plant, appropriate siting and regular maintenance, use of temporary acoustic barriers around specific activities etc. Setting of noise and vibration limits with associated monitoring during the works.

Mitigation and Scope of Environmental Management Controls

5.127 The following mitigation controls are typical for this type of development and would be committed to and delivered pursuant to either planning conditions, obligations contained in a legal agreement (under Section 106 of the Town and Country Planning Act, 1990) and supported as necessary by contractual obligations between the Applicant and the Principal Contractors or regulatory provisions in force from time-to-time.

Proposed Site Management Controls

Construction Environmental Management Plan

5.128 A CEMP would be prepared by the Principal Contractor and would include a Traffic and Logistics Plan (TLP).

5.129 The use of CEMPs is standard practice across the construction industry to reduce the risk of adverse effects during construction on sensitive environmental resources and to minimise disturbance to local residents. The CEMP can be expected to include matters such as:

- Commitments to follow Environment Agency Pollution Prevention Guidelines;
- Details of site waste management;
- Details of construction traffic management, including routes and signage;
- Details of working methods and their attendant mitigation measures;
- Measures to minimise / mitigate dust generation and dispersal;
- Measures to minimise / mitigate noise and vibration – using plant that conforms to the relevant standards on noise emissions; construction works would only be carried out during agreed hours of operation, except in emergency situations; the use of acoustic screening where appropriate; and
- Pollution incident response measures, including preparation of a spill management plan to prevent environmental effects in the event of a spill occurring.

Considerate Constructors

5.130 The Site would be registered with the 'Considerate Constructors Scheme'. This scheme ensures that contractors carry out their operations in a safe and considerate manner with due regard to passing pedestrians and road users.

Principal Contractor and Management of Sub Contractors

5.131 All contractors would be required to demonstrate how they would adhere to procedures set out within the CMP and EMP satisfying regulations and best practices regarding environmental control.

Environmental and Communication/Liaison Strategy

5.132 Roles and responsibilities would be clearly defined along with details on control measures and activities to be undertaken to minimise environmental effect and monitoring and record-keeping requirements. A commitment would be made to periodically review the documentation and undertake regular environmental audits implemented during the demolition and construction phase. Access would be given as required for Local Authority Environmental Officers to verify audits.

Emergencies and Environmental Incidences

5.133 Protocols to be implemented on-site in instances of emergencies and environmental incidents would be set out within the CEMP for approval by RBC.

Housekeeping and General Site Management

5.134 Hoardings would be erected around the application site to provide a clear and secure demarcation between operational activities and other areas and to provide information regarding the proposed development and its progress. Particular attention would be paid to locations supporting high volumes of pedestrian movement (for example on Vastern and Caversham Road), demolition and construction routes, access gates and security arrangements.

5.135 A 'clean site' policy would be maintained and contractors and their subcontractors would be expected to maintain a tidy application site. A street sweeper would be employed as required during the demolition, piling and excavation periods of the construction programme to make sure that the streets around the application site would be kept clean during the works.

Adjacent Residential Properties and Other Neighbours

5.136 The following mitigation and environmental controls would collectively limit potential visual, noise, vibration, traffic and dust impacts associated with the proposed development's construction works:

- Maintaining aesthetically appropriate site hoardings;
- Agreeing working hours with the RBC;
- Undertaking regular road sweeping;

- Arranging and locating potentially high impact site activities and plant away from neighbouring residential receptors;
- Selecting quiet plant and regularly maintaining plant;
- Implementing good site housekeeping measures;
- Directing site lighting away from sensitive receptors;
- Turning site lighting off outside of normal working hours;
- Screening scaffolding and active construction activities above hoarding levels, where practical;
- Implementing construction traffic management measures as agreed with RBC;
- Implementing and monitoring dust management measures;
- Implementing and monitoring noise and vibration measures; and
- Using temporary acoustic barriers around potentially noisy activities.

Archaeology

5.137 During demolition and substructure works, there is the potential for impacts on archaeological remains beneath the application site. The archaeological potential of the application site is likely to be limited to remains of no more than low significance and therefore further survey work (i.e. archaeological evaluation trial trenches or pits) is not considered to be necessary. It is recommended that an archaeological watching brief during preliminary ground preparation and subsequent foundation construction, would mitigate the impacts of the proposals and ensure that any archaeological assets were not removed without record.

Contaminated Soil

5.138 According to a Preliminary Risk Assessment undertaken of the application site (Technical Appendix 2.5, ES Volume 3) RBC currently classifies the application site as 'low risk' in terms of the potential for significant soil or groundwater contamination to be present at the application site. As is standard for redevelopment of sites of this nature, potential risks would need to be assessed through a site investigation and risk assessment.

5.139 During construction works, it is anticipated that a number of potentially contaminative liquids and chemicals including diesel required for emergency generators for site operations could be stored on-site. The following management and control measures would be included in the CEMP:

- Storing all liquids and solids of a potentially hazardous nature on surfaced areas, with bunding, in accordance with the EA's Pollution and Prevention Guidelines 2 (PPG2)[9] preventing pollution from above ground storage tanks. Whilst the EA's PPGs are no longer valid, these represent good practice and would therefore be followed;
- Ensuring that Contractors control and bund any hazardous substances used on-site (although at this stage none are anticipated), including oil drums or containers on-site, in accordance with Control of Substances Hazardous to Health (COSHH) Regulations (as amended) and ensure that oil or other contaminants are not allowed to reach water courses or ground water sources including aquifers;
- Storing all oils and chemicals in bunded areas in order to contain any spillages, should these occur. Bunding would be specified to ensure secondary containment of at least 110 % of the volume of the largest tank within the bund;
- Siting all filling points, gauges and vents within the bund;
- Placing tanks on impermeable bases to reduce the risk of spillage to groundwater. Integral or self-bunded tanks would be favoured; and
- Sealing the drainage system of the bund with no discharge to any watercourse, land or underground strata. Associated pipe work would be located above ground and protected from accidental damage.

5.140 Furthermore, all site works would be undertaken in accordance with the EA's Pollution Prevention Guidance Note 6 (PPG6)[10] and Pollution Prevention Guidance Note (PPG3)[11].

5.141 Construction vehicles would be properly maintained to reduce the risk of hydrocarbon contamination and would only be active when required. Construction materials would be stored, handled and managed with due regard to underlying soil and thus the risk of accidental spillage or release would be minimised.

5.142 As standard practice in brownfield development, the design of the construction would provide remediation. The construction of the proposed development would provide a clean cover layer in landscaped areas and give a concrete foundation slab to the correct design and thickness.

Water Resources

5.143 To ensure that no contaminant-pathway-receptors pathways are created and to reduce the potential for contamination to occur during construction, all site activities would be undertaken in accordance with the requirements of the Water Resources Act 1991[12], Water Act 2014[13], Control of Pollution (Oil Storage) Regulations 2001[14], and the Pollution prevention guidance[15]. The Applicant would also be responsible for obtaining all necessary consents and ensuring compliance with the conditions of the consents.

5.144 As a minimum the CEMP would cover the following provisions:

- all storage facilities should be located above ground and on suitably designed and managed hard-standing, bunded where necessary, to prevent any accidental spillages from being released to ground;
- management and handling of construction materials is undertaken with due care and consideration to minimise the risk of accidental spills; and
- material stockpiles should be adequately protected to avoid being washed or blown away from the immediate area.

5.145 Potential pathways for contamination would be minimised as follows:

- groundwater would be prevented from entering excavations by dewatering, if required;
- surface water would be prevented from entering excavations by using cutoff ditches, covering the excavation, or captured within the groundwater pumping system;
- potentially contaminating activities such as concrete preparation, vehicle washing and fuelling etc. are constrained to dedicated protected areas where contaminated water can be collected; and
- contaminated water from excavations would be collected within a settlement tank or lagoon to enable treatment prior to release.

5.146 In addition, the construction drainage system for the proposed development would be designed and managed to comply with BS 6031:2009[16], which details methods that should be considered for the general control of drainage on construction sites. Further advice is also contained within BS 8004:2015[17].

[9] Environment Agency, 2011. Pollution Prevention Guidelines 2 Above Ground Oil Storage Tanks. Environment Agency.
[10] Environment Agency, 2012. Pollution Prevention Guidelines 6 Working at Construction and Demolition Sites. Environment Agency.
[11] Environment Agency, 2006. Pollution Prevention Guidelines 3 Use and Design of Oil Separators Environment Agency.
[12] Secretary of State, 2009. Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009. London. HMSO
[13] Secretary of State, 2014. Water Act 2014. London. HMSO
[14] Secretary of State, 2001. Control of Pollution (Oil Storage) Regulations 2001. London. HMSO.
[15] Department of the Environment, Food and Rural Affairs (Defra), 2019. Pollution Prevention for Businesses. London. HMSO.
[16] British Standard Institution, 2009. BS6031:2009 British Standard Code of Practice for Earthworks. London. BSi.
[17] British Standard Institution, 2015. BS8004:2015 Code of Practise for Foundations. London. BSi.

5.147 Wherever possible, the Applicant would minimise the amounts of wastewater discharged from the application site. Surface drainage and wastewater would pass through settlement tanks and oil interception facilities before discharge to sewer. The Applicant would ensure that all potentially contaminated water, e.g. dewatering effluent, is disposed of in accordance with the Water Resources Act 1991[18] and Water Industry Act 1999[19], to the satisfaction of the EA and Thames Water.

5.148 An Emergency Incident Plan would be in place for the application site to deal with potential spillages and/or pollution incidents. This would include the provision of on-site equipment for containing spillages, such as emergency booms and chemicals to soak up spillages.

5.149 Any pollution incidents would be reported immediately to RBC and the regulatory bodies such as the EA.

Ecology

5.150 Dust generated from construction works would be managed by means of 2.4 m high site hoarding and dust suppression measures, such as the use of water sprays, dampening down of roads and covering of storage areas, such that the potential for adverse dust generation is reduced.

5.151 Construction drainage, air quality and noise management controls would be actively implemented at the application site to minimise potential construction impacts.

5.152 All lighting would appropriately be aimed, controlled and switched off when the application site is not operational (where practicable).

Transport

5.153 A CTMP would be developed and agreed in accordance with RBC to take into account legislative requirements (e.g. Highways Act 1980, the New Roads and Street Works Act 1991, Town and Country Planning Act 1990, Traffic Management Act 2004) Police, Fire Authority and HSE Guidance, Local Authority Transport Schemes and Neighbourhood Lorry Restrictions. The Traffic Management Plan would be reviewed and updated in line with the construction programme and would typically include details of the following:

- preferred hours of deliveries and removals (out of peak hours);
- agreed demolition and construction traffic routing and application site access points;
- road cleaning facility provisioning;
- temporary traffic control measures;
- temporary and permanent access to the works - for personnel/vehicles;
- off-loading and storage areas;
- traffic management procedures for waste disposal vehicles;
- personnel and vehicle segregation;
- equipment e.g. temporary fencing, signage etc.;
- temporary and permanent closures and diversions of footpaths;
- street furniture removal, if required; and
- site inductions.

5.154 Wheel cleaning facilities with adjoining hard standings would be located, when appropriate, at the access and egress points of the application site. These wheel cleaning facilities would be supplemented by regular road cleaning during the excavation and basement works and would have appropriate catchment areas.

Vehicle Routing

5.155 Vehicles making deliveries to the application site or removing spoil material would travel via designated routes which would be agreed with RBC as required. The Principal Contractor would liaise with RBC to provide directional signage on the principal routes on the highway network surrounding the application site, if required, in order to improve navigation.

5.156 In line with RBC's standard approved working hours, construction traffic movements are likely to take place on the local and wider highway network between 08:00 and 18:00 hours from Monday to Friday and 08:00 to 13:00 hours on Saturdays unless the times are constrained by planning conditions. Where possible vehicle movements would be scheduled out of peak hours (i.e. 08:00 – 09:00 and 17:00 – 18:00 during the weekdays.). Deliveries of the modular blocks would be made outside of peak hours, between 19.00 and 21.00.

5.157 Vehicles coming to the application site would have specific timeslots booked. It would be the responsibility of the driver and company to ensure they arrive on site at the designated time.

5.158 The construction sequence for the application site would be programmed to minimise the need for road closures. However, there may be instances when they are unavoidable. Where this is the case, road closures would be requested 6 - 12 weeks in advance and authorised by RBC.

5.159 The Principal Contractor would co-ordinate all deliveries and collections to/from the application site, and ensure that as far as possible that:

- all delivery and collection vehicles are aware of the proposed routing;
- prior to a delivery or collection, haulers would notify the relevant authorities in accordance with the Road Vehicles (Authorisation of Special Types) (General) Order 2003[20] if required;
- liaison would be undertaken with occupants of adjacent buildings to avoid delays to service deliveries due to construction vehicles; and
- deliveries would be made on a 'just in time' basis.

5.160 Larger vehicle movements would be scheduled to avoid peak hours on the local road network if at all possible. If an alternative construction traffic route is required, this would first be agreed with RBC.

5.161 Suppliers would be encouraged to consolidate deliveries where feasible. Where possible all deliveries would be made to designated areas within the application site. If for any reason it is necessary to load and unload outside site boundaries, the details and procedure for this would be agreed in advance with RBC.

5.162 There would be no waiting areas for site vehicles in the roads around the application site.

HGV Management

5.163 The most intensely used HGVs on the application site would be ready mix concrete trucks for the delivery of concrete and articulated lorries for the delivery of fabricated steelwork.

5.164 It is assumed that HGV construction traffic would be spread evenly over an 8 hour long working day (to avoid peak periods), although there may be slight peaks.

5.165 Loading and unloading of vehicles, dismantling of equipment such as scaffolding or moving equipment or materials around the application site would be conducted in such a manner as to minimise noise impacts to existing surrounding residential properties.

[18] Secretary of State, 1991. The Water Act 1991. HMSO.
[19] Secretary of State, 1999. Water Industry Act. London. HMSO.
[20] Secretary of State, 2003. Road Vehicles (Authorisation of Special Types) (General) Order. HMSO.

Parking Management and Staff Travel

5.166 A key aspect of the demolition and construction process would be the management of demolition and construction worker travel to and from the application site. Construction workers would be encouraged to access the application site by public transport, walking and cycling in order to reduce the potential impact of vehicle traffic during this temporary period. A series of measures would be implemented to encourage workers to travel using sustainable modes, which would form part of the CTMP, These may include:

- Cycle parking would be provided and this would be covered and secure;
- Facilities for changing and storing cycling clothes would be provided;
- The developer would investigate the provision of public transport vouchers to encourage workers to travel to the application site by bus or rail;
- The contractor would encourage workers to car share where possible and would set up a car sharing database to identify where matches could be made; and
- Travel information packs would be provided to all workers. These would be provided in either paper form or electronically and would include public transport timetables and information on cycling routes.

5.167 Parking provision would be provided on site, if possible, however this would be limited and spaces would be managed.

5.168 Vehicle movements would be managed to avoid queuing outside the application site access points.

Noise and Vibration

5.169 Effective co-ordination and time management of demolition and construction activities would be used to avoid adverse effects from noise and vibration to surrounding areas. Early and helpful communications with the surrounding and on-site receptors would assist in managing any complaints arising during the demolition and construction works of the proposed development.

5.170 Contractors would be required to ensure that works are carried out in accordance with best practicable means as stipulated in the Control of Pollution Act 1974. A full explanation of measures to control construction noise would be detailed in all construction method statements.

Noise Emissions

5.171 The precise needs and intentions in regards to noise control cannot, however, be specified until detailed construction planning and phasing programmes are complete.

5.172 As set out in Chapter 8: Noise and Vibration, noise levels from the demolition and construction of the proposed development have been predicted at noise-sensitive properties on-site and in close proximity to the application site and the impact of the noise assessed. Noise levels likely to be generated by the demolition and construction works have been predicted based on the type and number of plant likely to be in operation.

5.173 Noise control measures would include:

- Planning deliveries and removals out of peak hours where possible;
- Plan working hours to take account of the effects of noise upon persons in areas surrounding site operations and upon persons working on-site;
- Parking construction traffic off the public highway;
- Controlling the discharge of trucks from site to avoid congestion;
- Implementing traffic management systems at the entrances to the application site to control the traffic into the application site;
- Maintaining the 2.4 m site hoarding around the application site boundary to screen noise from low level sources and/or street level receptors;
- Agreeing working hours with RBC;
- Using 'silenced' plant and equipment wherever possible and maintaining plant on a regular basis in accordance with the relevant EU directives relating to noise;
- Selecting electrically driven equipment where possible in preference to internal combustion powered; hydraulic power in preference to pneumatic; and wheeled in lieu of tracked plant;
- Operating plant at low speeds where possible and incorporating automatic low speed idling;
- Siting noisy activities away from sensitive receptors, where possible;
- Certifying plant to meet relevant standards;
- Minimising disturbance from reversing bleepers through measures such as site layout, provision of screening or use of broadband sound emitting reversing alarms;
- Keep internal haul routes well maintained;
- Use rubber linings for chutes and dumpers to reduce impact noise;
- Switching off vehicle engines where vehicles are standing for extended periods and avoid unnecessary revving of vehicle engines;
- Start-up plant and vehicles sequentially rather than all together;
- Lowering materials whenever practicable rather than dropping; and
- Making all contractors familiar with the guidance in BS 5228[21] which would form a pre-requisite of their appointment.

Vibration

5.174 There are sensitive receptors located immediately along the eastern and southern boundaries of the application site. Noise and vibration surveys were carried out between 22 and 25 March 2019. An additional vibration survey was carried out on 26 June 2019.

5.175 BS 5228 Part 2[21] contains historic vibration measurement data for piling works, including the CFA method proposed for the proposed development.

5.176 Historic data presented in Table D.64 of BS 5228 suggest that vibration levels would fall to below 1 mm/s within 10 m of the piling works. The resulting PPV from CFA piling would likely be between 0.14 mm/s – 0.3mm/s. Vibration of less than 1 mm/s is unlikely to generate complaints from those living within nearby off-site sensitive properties. Historic data suggests that this method of piling is unlikely to lead to vibration that would cause damage to buildings, even cosmetic damage.

5.177 The following measures would be employed:

- Sequencing the piling programme so that numerous piles within 10 m of an affected property or buried utilities are not carried out successively. A maximum of three piles would be installed within 10 m of an affected property or buried utilities with a break before continuing in that area;
- Carrying out vibration monitoring during early piling works, away from any affected property or buried utilities, to quantify the levels of vibration likely to be attained; and
- Compiling an appropriate action plan for incorporation into the CEMP to ensure that the adverse effects of subsequent piling work, if identified, are minimised at all works.

[21] British Standards Institution, 2009 and 2014. British Standard 5228: 2009+A: 2014 Code of practice for noise and vibration control on construction and open sites. BSI

Air Quality

5.178 Dust and emission control and mitigation at the application site would be particularly important during earthworks and dry weather periods. To minimise adverse effects due to dust, the site-specific best practice measures described in Table 5.7 would be implemented by the Principal Contractor.

Table 5.7: Proposed Development Demolition and Construction Mitigation Measures for High Risk Sites

Works	Mitigation Measure
Communications	• Implement a stakeholder communication plan that includes community engagement before work commences on-site. • Display name and contact details of responsible person for dust issues on the application site boundary in addition to head/regional office contact information.
Dust Management Plan	• Develop and implement a Dust Management Plan (DMP), to be approved by the RBC.
Site Management	• Record all complaints and incidents in a site log. • Make the complaints log available to the RBC if requested. • Take appropriate measures to reduce emissions in a timely manner, and record the measures taken within the log. • Record any exceptional dust incidents on or off site in the log book, and the action taken to resolve the situation. • Hold regular liaison meetings with other high-risk construction sites within 500 m to limit the potential from cumulative impacts and to co-ordinate DMPs.
Monitoring	• Undertake regular on and off-site visual inspections where there are nearby receptors. • Carry out regular inspections to ensure compliance with the DMP and record results in the site log book. • Make the inspection log available to the RBC if requested. • Increase the frequency of inspections during activities with a high potential to create dust or in prolonged dry weather.
Preparing and Maintaining Site	• Plan application site layout during construction to locate dust generating activities as far as possible from receptors. • Use solid screens around dusty activities or site boundary that are at least as high as any stockpiles. • Avoid application site runoff of water and mud. • Fully enclose the application site or specific operations where there is a high potential for dust production and the application site is active for an extensive period. • Keep site fencing barriers and scaffolding clean using wet methods. • Remove dusty materials from the application site as soon as possible. • Prevent wind whipping from stockpiles by covering, seeding, fencing or damping down. • Carry out regular dust soiling checks of buildings within 100 m and provide cleaning if necessary. • Agree monitoring locations with RBC. • Install screens to minimise dust and pollution. • Provide showers and ensure a change of shoes and clothes are required before going off-site to reduce transport of dust.
Operating Vehicle/Machinery and Sustainable Travel	• Enforce an on-site speed limit of 10 mph. If long haul routes are required then speeds may be increased with suitable additional control measures, subject to approval of the nominated undertaker and with the agreement of the RBC. • Ensure vehicles switch off engines when stationary – no idling. • Avoid use of generators where possible. • Produce a CEMP to manage the sustainable delivery of materials. • Implement a sustainable travel plan for site workers.
Operations	• Cutting, grinding or sawing equipment only to be used with suitable dust suppression equipment or techniques. • Ensure adequate water supply for effective dust and particulate matter suppression (use recycled water where possible). • Use enclosed chutes, conveyors and covered skips. • Minimise drop heights of materials from loading and handling equipment and use fine water sprays on such equipment wherever appropriate. • Ensure suitable cleaning material is available at all times to clean up dry spills and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste Management	• Re-use and recycle waste to reduce dust from waste materials. • No bonfires.
Measures Specific to Demolition	• Soft strip inside buildings before demolition of external walls and windows. Ensure effective water suppression is used, preferably through the use of hand held sprays. • Ensure water suppression is used during demolition operations. • Avoid explosive blasting, use appropriate mechanical or manual alternatives. • Bag and remove biological debris or damp down material prior to demolition.
Measures Specific to Earthworks	• Re-vegetate earthworks and exposed areas/soil stockpiles as soon as practicable. • Use hessian, mulch or tackifiers* where it is not possible to re-vegetate or cover with topsoil. • Only expose small areas of ground or stockpile when working.
Measures Specific to Construction	• Ensure aggregates are stored in bunded areas and are not allowed to dry out. If required dry for a particular process appropriate additional control measures are required. • Avoid concrete scabbling** where possible. • Ensure bulk cement and other fine powder is delivered in tankers and stored in silos with suitable emission control during operation and delivery. • Smaller supplies of fine powder material to be in sealed containers and stored appropriately.
Measures Specific to Trackout	• Regular use of water-assisted dust sweepers to clean access and local roads. • Avoid dry sweeping of large areas. • Ensure vehicles entering and leaving the application site are appropriately covered to prevent emission during transport. • Inspect on-site haul roads for integrity and repair as necessary. • Inspections of haul roads to be recorded in site log, including any remedial action taken. • Implement a wheel washing system, with rumble grids where reasonably practical. • Ensure there is an adequate area of hard surfaced road between wheel wash facility and the application site exit, site size and layout permitting. • Access gate to be located at least 10 m from receptors, where possible. • Apply dust suppressants to locations where a large volume of vehicles enter and exit the application site.

Notes:*Tackifier is a sticky substance used to temporary bind the surface of stockpiled material at risk of generating dust emissions.

** Scabbling is the process of removing the surface layer of a concrete structure.

5.179 The Applicant would give detailed dust control protocols as part of their contracts for the application site.

Waste Management

5.180 Waste produced during all construction activities on site would be subject to the 'Duty of Care' under The Waste (England and Wales) Regulations 2011. It is the joint responsibility between the Principal Contractor and the Client to ensure that waste produced onsite is disposed of in accordance with legislation. The Waste Duty of Care Practice (November 2018) sets out practical guidance on how to meet waste duty of care requirements. It is issued under section 34(7) of the Environmental Protection Act 1990 (the EPA) in relation to the duty of care set out in Section 34(1) of that Act.

5.181 The Principal Contractor would audit waste carriers and disposal facilities and maintain documentary evidence that these requirements are being met. A register of waste carriers, disposal sites (including transfer stations) and relevant licensing details would be produced and maintained on site.

5.182 An area for waste collection and materials delivery and storage is expected to be provided within the site boundary. Materials that can be beneficially used in the future development of the site would be segregated directly on site.

Recycling

5.183 All generated waste would be sorted for reuse, recycling or disposal, and placed into their respective lorries. All non-hazardous waste that is not suitable for reuse on site would be loaded out onto waste trucks from the registered waste contractor, and once full, transported to a licensed recycling centre or nominated landfill site.

Disposal

5.184 All construction materials that cannot be re-used or recycled or would be disposed of at appropriately licensed disposal facilities. The destination of all waste or other materials from the application site would be notified to the relevant authority for approval. Deposition would be in accordance with the requirements of the:

- EA;
- Environmental Protection Act 1990[22];
- Controlled Waste Regulations 2012[23];
- Waste Regulations 2011[24];
- Hazardous Waste (England and Wales) Regulations 2005[25];
- Waste Duty of Care Code of Practice 2018[26]; and
- Environmental Permitting (Amended) Regulations 2016[27].

5.185 No burning of construction waste would take place on-site.

Cumulative Demolition and Construction Impacts

5.186 Site preparation, demolition and construction activities, when undertaken at the same time, have the potential to give rise to combined (cumulative) impacts and effects. Although temporary, these combined impacts, if not managed can give rise to potentially adverse effects on sensitive receptors in proximity to the application site, i.e. existing residential, community and open space receptors.

5.187 Such impacts are typically restricted to short periods of time. Even then, not all receptors would experience impact interactions during this time depending on phasing and proximity to the sensitive receptor. The majority of interactions are likely to arise from activities such as demolition works, noise and vibration from construction plant and vehicles, dust from plant and vehicles, the visual impacts of the work and passing HGVs.

5.188 In terms of residential amenity, demolition and construction works would typically be carried out outside of those hours when residents could reasonably expect quiet enjoyment of their properties. Demolition and construction works would typically be carried out between the hours of 08:00 to 18:00 hours, so residents would not be subjected to unreasonable impacts during daytime demolition and construction works periods.

5.189 Impact interactions that are likely to occur would generally be of a temporary and short term nature and would be carefully co-ordinated to ensure minimal disruption to sensitive receptors.

5.190 It is anticipated that the stringent management controls set out in this chapter would ensure that the potential construction and demolition of the proposed development would be kept to a minimum and as such, would limit the potential for further predicted impacts when considered in conjunction with the development proposals in the surrounding area. It is expected that other schemes in the area would also adopt similar stringent management controls.

5.191 The CEMP, to be secured by an appropriately worded planning condition, would be implemented during the demolition and construction works and would provide a framework within which activities on-site would be managed 'at source' to minimise impacts on all sensitive receptors.

Deconstruction of Proposed Development

5.192 The deconstruction of the proposed development would follow a demolition method and sequence. Safe working practices would be devised and implemented and would be undertaken according to typical dismantling techniques prevalent at the time.

5.193 The application site would be hoarded. Soft stripping works would then commence, removing all fixtures and fittings bringing the structure back to its shell.

5.194 When the development is at an appropriate level, long arm track mounted shear cutters would be used. The application site would then be taken down to ground level and temporary works installed to make the application site safe.

Summary

5.195 The development programme comprises the demolition of existing buildings, and construction of the proposed development as described in Chapter 4: Proposed Development Description. Assuming planning permission is secured, on-site works are projected to start Q2 2021 and the construction works to be completed in Q2 2025.

5.196 Demolition and construction works have the potential to cause environmental impacts, from subsurface works, noise, wastes, surface water runoff, and emissions to air. Measures to control potential environmental impacts would be set out within the CEMP (including a CTMP and SWMP) to be secured by appropriately worded planning conditions or obligations by means of a Section 106 legal agreement.

[22] Security of State, 1990. Environmental Protection Act 1990. London. HMSO
[23] Department of the Environment, Food and Rural Affairs (DEFRA), 2012. Controlled Waste (England and Wales) Regulations 2012. London. HMSO.
[24] Security of State, 2011. The Waste (England and Wales) Regulations. London. HMSO.
[25] Department of the Environment, Food and Rural Affairs (DEFRA), 2005. Hazardous Waste (England and Wales) Regulations, 2005. London. HMSO.
[26] Department of the Environment, Food and Rural Affairs (DEFRA), 2018. Waste Duty of Care Code of Practice 2018, HMSO.
[27] Security of State, 2016. Environmental Permitting (England and Wales) (Amended) Regulations, London. HMSO.

6 SOCIO-ECONOMICS

Introduction

6.1 This chapter of the ES presents an assessment of the potential impacts and associated likely significant effects with respect to socio-economics arising from the demolition and construction stage and completed development/operational stage of the proposed development.

6.2 The chapter describes the methods used to assess the potential impacts and likely effects; the baseline conditions at and surrounding the application site; the likely direct, indirect and wider socio-economic effects taking into consideration embedded mitigation; the need for additional mitigation; and the significance of residual effects.

Methodology

6.3 There is no published guidance for socio-economic assessment in EIA. Accordingly, the assessment has been informed by, but not limited to, the following legislation and policies:

- NPPF; [1]
- PPG;[2] and
- Reading Borough Local Plan 2019[3].

6.4 In addition, professional judgment has been applied.

Consultation

6.5 At the time of undertaking the assessment, the EIA Scoping Opinion remains outstanding.

6.6 In addition to the formal EIA Scoping Process, consultation was also undertaken with the RBC Acting Planning Manager and Michael Steen at Bright Futures for Children regarding the pupil yield multipliers for the education element of the assessment. Table 6.1 summarises the consultation with respect to socio-economics.

Table 6.1: Summary of Consultation

Consultee and Form/Date of Consultation	Summary of Comments	Action Taken
RBC Acting Planning Manager – Julie Williams. Email issued 30 October 2019.	A response was received regarding the use of CIL payments since 2015, but no detail on the pupil yields.	Calculations have been based on the yield multipliers from the RBC November 2013 Supplementary Planning Document.
Brighter Futures for Children – Michael Steen. Email issued 5 December 2019.	No response received.	Calculations have been based on the yield multipliers from the RBC November 2013 Supplementary Planning Document.

Assessment Scope

6.7 The assessment has been based on a series of development parameters, assumptions and commitments, as described in Chapter 2: EIA Process and Methodology, in Chapter 4: Proposed Development Description and in Chapter 5: Demolition and Construction Environmental Management. Due to the flexibility being sought in respect of land use classes, the socio-economics assessment has been undertaken based on a worst-case interpretation of the minimum and maximum land use schedule presented in Chapter 4: Proposed Development Description.

6.8 Table 6.3 summarises the use classes which have informed the various assessments presented within the ES Chapter and which are considered to represent the worst case for that particular assessment.

Technical Scope

6.9 The assessment considers the following:

- Review of on-site operations and any resulting employment loss;
- Development works and the resulting generation of direct and indirect employment and economic output, measured in Gross Value Added (GVA);
- Generation of direct and indirect employment and GVA resulting from the delivery of non-residential floorspace, taking account of existing on-site economic uses;
- Delivery of new housing including affordable housing;
- Introduction of a new residential population accommodated by the residential units and the resulting demand for local community services and infrastructure including:
  - Primary healthcare (GP and dental provision);
  - Early years, primary and secondary education;
  - Local expenditure generated by new households;
  - Open/play space;
- Impact on existing levels of deprivation in the study area; and
- Impact on perceptions of crime.

Spatial Scope

6.10 The application site is situated within the electoral ward of Abbey within the local authority of Reading, as shown in Figure 6.1.

[1] Secretary of State for Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework.
[2] https://www.gov.uk/government/collections/planning-practice-guidance
[3] Reading Borough Council, 2019. Reading Borough Local Plan. RBC.

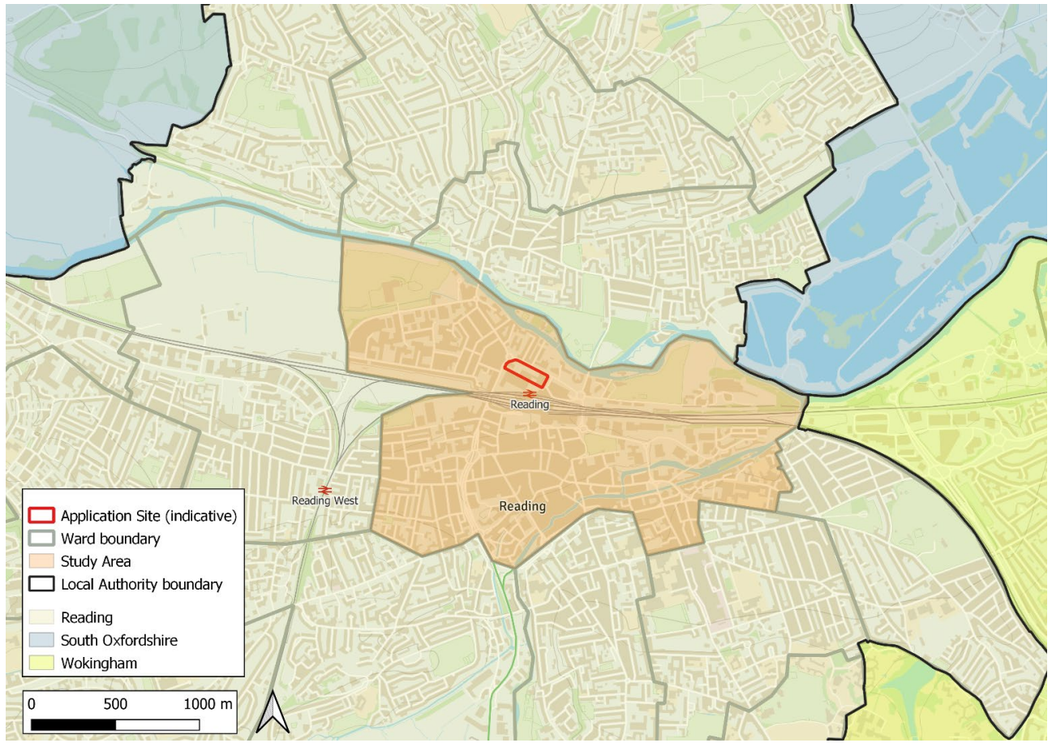


Figure 6.1 Socio-Economic Assessment Study Area

6.11 It is important when undertaking an assessment of the proposed development's potential impacts and likely social and economic effects that the geographical scope of the assessment is clearly understood and that the effects are assessed at the appropriate level.

6.12 The electoral ward of Abbey has been used to represent the study area for the socio-economic assessment as the application site sits entirely within this ward. Baseline conditions for the study area (local level) were compared to the RBC's area (borough level) and England (national level) wherever possible. Distance measures, as opposed to the study area, have been used for the assessment of primary healthcare because people travel beyond the study area for this service. Table 6.2 summarises the receptor selection criteria used within this assessment.

Table 6.2: Receptor Selection Criteria

Receptor	Measure	Justification
Housing	Study area and RBC area	The additional housing created by the proposed development is considered to impact predominantly on the study area and RBC.
Employment/Economic output	Application site, study area and RBC area	Both construction and operational employment is considered to impact predominantly on the study area and RBC.

Table 6.2: Receptor Selection Criteria

Receptor	Measure	Justification
Early years education	study area	RBC Childcare Sufficiency Assessment (CSA) 2017[4] provides data at ward level.
Primary education	2.6 km from the application site boundary	Based on the average distance travelled to a primary school according to the National Travel Survey 2017[5].
Secondary education	5.6 km from the application site boundary	Based on the average distance travelled to a secondary school according to the National Travel Survey 2017.
Primary healthcare (General Practitioner (GP) and dental provision)	study area	Since 2015, people can register with any GP of their choice. However, to limit assessment, provision within the study area has been considered as the area most likely to be impacted upon by the proposed development.
Open/play space	0.4 km and 0.8 km	Based on the radial catchments set out in RBC's Open Spaces Strategy Update Note 2018[6].
Deprivation	study area and RBC area	The proposed development is considered to impact predominantly on the study area and RBC area in respect of deprivation.
Crime	study area and RBC area	Crime Statistics available at ward level and the proposed development is considered to impact predominantly on the study area and RBC area in respect of crime.

Temporal Scope

6.13 The socio-economic assessment has given consideration to baseline conditions for the most recent year for which information is available and a future baseline has been considered for the anticipated year of completion and operation of the proposed development (June 2025) in respect of population and education.

6.14 Demolition phase effects have been considered over an 11-month period (assessing Plots A to D) and construction phase effects have been considered over the period July 2021 to June 2025, in accordance with the development programme set out in ES Chapter 5: Demolition and Construction Environmental Management.

Baseline Characterisation Method

Desk Study

6.15 Baseline characteristics have been established through interpretation of nationally recognised research, data and survey information sourced from official statistics, including:

- Office for National Statistics (ONS), 2018 Mid-Year Population Estimates (MYPE).[7],[8];
- ONS, 2016-based Sub National Population Projections (SNPP)[9];
- ONS, Census 2011[10];
- RBC, Annual Monitoring Report 2017-18[11];
- Experian, Retail Planner Data[12];
- ONS, Annual Population Survey[13] (APS);

4 RBC, October 2017, Childcare Sufficiency Assessment 2017: Final Report
5 DfT, 26 July 2018, National Travel Survey 2017
6 RBC, January 2018, Reading Open Spaces Strategy Update Note 2018
7 ONS, 25 October 2019, Population estimates by output areas, electoral, health and other geographies, England and Wales: mid-2018
8 ONS, 29 June 2019, Population estimates for the UK, England and Wales, Scotland and Northern Ireland: mid-2018
9 ONS, 24 May 2018, Subnational population projections for England: 2016-based
10 ONS, 2011 Census KS401EW and KS402EW
11 RBC, December 2018, Annual Monitoring Report 2017-18
12 Experian Retail Planner Data, 2017
13 Annual Population Survey, 2018 [downloaded via NOMIS 12 December 2019]

- ONS, Claimant Count[14];
- ONS, Job Seeker Allowance (JSA) claimants[15];
- ONS, Business Register and Employment Survey[16] (BRES) 2018;
- Oxford Economics, 2016-2019 Global Forecasting and Quantitative Analysis[17];
- National Health Service (NHS), GP Workforce Statistics as at 31 June 2019[18];
- NHS Digital database of General Dental practices as at 30th November 2018;
- RBC, Childcare Sufficient Assessment (CSA) 2017[19];
- Department for Education (DfE) Annual School Census January 2019[20];
- DfE, School Place Planning Data[21];
- Ordnance Survey (OS) Open Greenspaces[22];
- RBC, Parks, Outdoor Facilities & Open Spaces register[23];
- RBC, Reading Open Spaces Strategy Update Note 2018[24];
- Indices of Deprivation 2019[25]; and
- Police.uk[26]

Field Study

6.16 A field study was not undertaken as this was not considered necessary in order to characterise the baseline.

Assessment Method

Methodology

6.17 The assessment of socio-economic effects is based on a worst-case scenario. However, due to the flexible Development Parameters, the worst-case scenario differs with each of the receptors. Table 6.3 sets out the scenario which is considered worst-case for each of the receptors.

Table 6.3: Worst-case Scenario for Receptors

Receptor	Description
Housing	The worst-case scenario for housing assumed that no residential uses would be delivered.
Local Expenditure	Any new population generated by the proposed development (whether that be residential or employees) has the potential to generate local expenditure. Spending potential is greater for a residential population as spending would be on convenience, comparison and leisure goods and services. Spending from employees is assumed to be limited to convenience goods. The worst-case assessment for local expenditure assumed no residential development and 100 % employment uses. Again, to assess worst-case, it has been assumed that the employment floorspace would be occupied by the use classes which generate the least employment. This is 100,000 m^2 of office floorspace (B1a); 8,000 m^2 of hotel floorspace (C1) and 7,000 m^2 of leisure floorspace (D1-D2).
Employment/Economic output	The worst-case would be the scenario that generates the least employment/economic output. As such, the assessment of effects on employment/economic output assumed 100,000 m^2 residential floorspace (C3); 8,000 m^2 of hotel floorspace (C1); and 7,000 m^2 of leisure floorspace (D1-D2).
Education (early years, primary and secondary)	The worst-case scenario for education would be the scenario which generates the greatest extent of residential population and therefore demand for education services. As such, the assessment of effects on education assumed that the proposed development would deliver 1,000 residential units. It is also assumed that all residents would be new to the area and not already attending a local school/early year service. The development parameters state that all of the residential units would be apartments. To assess a worst-case scenario it has been assumed that the maximum of 60 % would be 2+ bedrooms and 40 % 1-bedroom apartments.
Primary healthcare (General Practitioner (GP) and dental provision)	The worst-case scenario for primary healthcare would be the scenario which generates the greatest extent of residential population and therefore demand for primary healthcare services. As such, the assessment of effects on primary healthcare assumed that the proposed development would deliver 1,000 residential units. It is also assumed that all residents would be new to the area and not already registered with a local health practitioner.
Open/play space	Worst-case scenario for open/play space would be the scenario which generates the greatest extent of residential population and therefore demand for open/play space. As such, the assessment of effects on open/play space assumes that the proposed development would deliver 1,000 residential units. The development parameters state that at least 10 % of the overall application site area would be provided as publicly accessible open space. Worst-case assessment assumes that the proposed development would deliver the minimum 10%.

Population

6.18 The size of the population generated by the proposed development has been determined by multiplying the number of residential units to be delivered by the proposed development by the average household size for the proposed development's anticipated year of completion (2025) as projected by the ONS, 2016-based household projections[27] for the RBC area.

Housing

6.19 The impact on the local housing stock has been assessed qualitatively based on the contribution that the proposed development would make to the identified housing needs established by planning policy or any potential shortfall in net housing completions identified in the RBC, Authority Monitoring Report 2017-18[28].

[14] ONS, Claimant Count October 2019 [downloaded via NOMIS 12 December 2019]
[15] ONS, Jobseeker's Allowance by occupation October 2019 [downloaded via NOMIS 12 December 2019]
[16] ONS, Business Register and Employment Survey 2018 [downloaded via NOMIS 12 December 2019]
[17] Oxford Economics, 2016-2019, GVA per Worker
[18] NHS, GP workforce Statistics March 2019 and location data of GP practices and branches and dental surgeries, May 2019
[19] RBC, October 2017, Childcare Sufficiency Assessment 2017: Final Report
[20] DfE, Annual School Census January 2019
[21] DfE, 28 March 2019, School planning tables: school capacity academic year 2017 to 2018
[22] https://www.ordnancesurvey.co.uk/business-government/products/open-map-greenspace
[23] https://www.reading.gov.uk/parks [accessed 12 December 2019]
[24] RBC, January 2018, Reading Open Spaces Strategy Update Note 2018
[25] MHCLG, 26 September 2019, English Indices of Deprivation 2019
[26] https://www.police.uk/ [accessed 12 December 2019]
[27] ONS, 2016-based subnational household projections
[28] RBC, December 2018, Annual Monitoring Report 2017-18

Local Expenditure

6.20 A quantitative assessment has been made on the potential for new residents living and employees working in the proposed development to increase spending on goods and services in the local area. This has been assessed by multiplying the proposed development's number of residential units/number of employees by average annual household/per person expenditure on convenience, comparison and leisure goods and services sourced from Experian (2017).

Employment

6.21 Current on-site employment operations have been informed by research undertaken by Jones Lang LaSalle (JLL) Real Estate Advisors.

6.22 The likely number of jobs generated during the demolition and construction stage has been assessed based on the Construction Industry Training Board (CITB), Labour Forecasting Tool (LFT). The LFT is able to produce labour forecasts based on historic data. The tool focuses on forecasting labour demand on a month-by-month basis by each occupational group throughout the demolition and construction phase of the proposed development. The LFT calculations have been based actual costs developed by Cast. Demolition and construction stage employment has been calculated separately. The demolition phase has assumed an 11-month demolition programme in accordance with the development programme set out in ES Chapter 5: Demolition and Construction Environmental Management. The construction phase has assumed a 48-month construction programme commencing in July 2021 and finishing in June 2025. The level of indirect employment generated during the demolition and construction period has been assessed quantitively by applying the ONS, Type 1 employment multiplier, 2015[29].

6.23 The completed and operational stage employment has been calculated using employment densities[30] applied to the proposed development's floorspace schedules by Use Class

6.24 Floorspace schedules for the proposed development have been provided by Gross External Area (GEA). GEA has been converted to Gross Internal Area (GIA) by assuming 95 % of the GEA following conversion guidance provided in the HCA, Employment Densities Guide, 3rd Edition, November 2015. However, the Employment Densities Guide requires some use class floorspaces by Net Internal Area (NIA). NIA figures have been calculated by assuming 90 % of the GIA area, again following conversion guidance provided in the HCA, Employment Densities Guide.

6.25 Guidance from the HCA, Additionality Guide, 4th Edition, 2014[31] has been used to understand the potential multiplier effects of the proposed development. The Additionality Guide establishes that gross additional employment levels would most likely be subject to a degree of 'leakage' (referring to the number of jobs likely to be taken up by people outside the RBC area); 'displacement' (the level of employment likely to be lost, moved or adversely affected by the employment created as a result of the proposed development) and 'composite multiplier effects' (the additional economic benefit that would be derived as a direct result of the income earned by the new employment as an indirect result of the supply chain linkages). These factors are collectively known as the additionality factors.

6.26 In this instance, it is considered that the degree of leakage would be high (50 %) on the basis that the employment opportunities created by the proposed development would serve not only the new population that would inhabit the proposed new dwellings but also residents of the wider RBC area and beyond; displacement levels would be low at 25 % as the proposed development is expected to take only limited trade from other parts of the RBC Area; and the composite multiplier effect would be local/sub-regional level and therefore 1.29 for the office use (B1a) and 1.38 for the recreational uses (C1 and D1-D2).

Economic Output

6.27 The level of economic output on the existing on-site operations has been measured through the generation of GVA per annum. GVA is a measure of economic impact, distributed through retained profit and wages. GVA resulting from existing on-site uses has been calculated by applying the average GVA per worker by Industry for the South East (SE) sourced from Oxford Economics, 2016-2019 Global Forecasting and Quantitative Analysis[32].

6.28 GVA resulting from the direct construction jobs has been calculated by applying the average GVA per construction worker per annum for the SE region sourced from Oxford Economics, 2016-2019 Global Forecasting and Quantitative Analysis. Further to this, a total indirect GVA per annum has been calculated using a national average GVA per worker figure.

6.29 GVA during the completed and operational stage has been assessed using the same Use Class floorspace assumptions used to calculate operational employment. This assumes a worst-case. The contribution that future residents and workers would make to the GVA output is assessed using the number of economically active residents and residents in employment from the ONS, APS for the 12 months to June 2019, applied to the total population anticipated to arise from the proposed development. The average GVA output per worker by Industry for the RBC area provided by Oxford Economics, 2016-2019 Global Forecasting and Quantitative Analysis[33] is applied to the anticipated number of employed residents of the proposed development and estimated on-site future workers to estimate the GVA contribution per annum.

Primary Healthcare

6.30 The number of future residents anticipated to live on the proposed development (as described within the assessment approach for population) has been compared to the levels of capacity within the primary healthcare system to determine whether or not the existing provision assessed within the baseline, would be able to accommodate the needs of the proposed development population.

6.31 To determine whether existing GP provision is under or over-capacity, GP to patient ratios of local practices were compared to the average for England of 1 GP for every 2,043 people. The ratio of 1 GP per 2,043 people was derived from GP workforce numbers published by NHS Digital as at June 2018 and 2018 MYPE (also as at June 2018). Reference was also made to NHS Services Finder in respect of whether the service is currently (as at 11 December 2019) accepting new patients.

6.32 It is not possible to determine the precise number of patient places available as no central census of dentists is conducted and no definitive ratio of patients per dentist exists. However, a telephone survey was undertaken with each of the identified practices on 16 December 2019 to identify whether they are accepting new patients.

Education

6.33 Pupil yields for flats/apartments provided by RBC (summarised in Table 6.4) have been applied to the proposed development's accommodation mix (by type and size) to calculate the number of early years, primary and secondary school aged children generated by the proposed development. The number of pupils generated by the proposed development has been compared to the level of surplus or deficit school places identified in the baseline assessment to determine whether the existing education provision would be able to accommodate the needs of the proposed development population.

[29] ONS (March 2019) Type 1 UK employment multipliers and effects, reference year 2015
[30] HCA (2015) Employment Densities Guide 3rd Edition
[31] HCA (2014) Additionality Guide 4th edition
[32] Oxford Economics, 2016-2019 Global Forecasting and Quantitative Analysis
[33] Oxford Economics, 2016-2019, GVA per worker

Table 6.4: RBC Pupil Yield Multipliers (number of children per new dwelling)

Age Group	Flats/Apartments	
	2 Bedroom	3+ Bedroom
Rising Fives (Age 4)	0.12	0.18
Primary (Ages 5 to 10)	0.17	0.22
Secondary (Ages 11 to 16)	0.05	0.17

Source: RBC, S106 Planning Obligations SPD, November 2013[34]

Open Space/Play Space

6.34 A qualitative assessment has been undertaken based on the proximity of the application site to existing open space and the quantum and accessibility of open space that would be delivered by the proposed development.

6.35 Open space requirements have been based on proximity standards set out RBC's 'Reading Open Spaces Strategy Update Note 2018[35]' and which are summarised in Table 6.5.

Table 6.5: RBC Open Space Provision Standards

Name	Description	Size	Radial Catchment
Borough Park	Varied character and facilities; open parkland, natural, formal, sport, play and relaxation; catering	60 hectare (ha)	Not specified
District Park	Varied character and facilities (but fewer than above); natural, formal, sport, play and relaxation	20 ha	1.2 km
Local Park	Relaxation, play and ball games	2 ha or 1 to 2 ha equipped	0.8km
Neighbourhood Park	LEAP (local equipped area for play) + informal space	0.1 to 0.2 ha equipped	0.4 to 0.8 km
Small recreational Open Spaces	'low-grade' recreation	0.1 to 0.2 ha	0.4 to 0.8 km
Linear Open Spaces	Relaxation; green link	Not specified	Not specified
Semi-Natural Sites	Comparatively undisturbed sites, managed for wild flora and fauna	Not specified	1.5 to 2.0km

Source: RBC, Reading Open Spaces Strategy Update Note, 2018

6.36 RBC does not provide public open/play space requirements per head of population. The Reading Open Spaces Strategy Update Note 2018 states that money collected through the Community Infrastructure Levy (CIL) will be used to fund open space infrastructure. However, RBC emphasise the importance of on-site delivery of open space where that can be achieved.

6.37 In the absence of open/play space requirements from RBC, reference has been made to guidance published by the Fields in Trust[36]. The 2015 guidance for open/play space provision in England is summarised in Table 6.6.

Table 6.6: Open/Play Space Quantity Guidance

Open Space Typology	Type	Quantity Guidance (hectares per 1,000 population)
Playing pitches	Formal	1.20
All outdoor sports	Formal	1.60
Equipped/designated play areas	Formal	0.25
Other outdoor provision (MUGAs and skateboard parks)	Formal	0.30
Parks and gardens	Informal	0.80
Amenity open space	Informal	0.60
Natural and semi-natural	Informal	1.80

Source: Fields in Trust, Guidance for Outdoor Sport and Play, 2015

6.38 The Fields in Trust guidance has been applied to the future residential population of the proposed development to provide the quantum of open/play space provision that would be required to be delivered as part of the proposed development.

Deprivation

6.39 The assessment has been undertaken on a qualitatively basis in respect of the proposed development and how this is likely to affect future deprivation levels within the area based on professional judgement.

Crime

6.40 Assessment has been qualitatively based on the extent to which increased population and modern housing design techniques are expected to impact upon perceptions of crime within the study area and have been based on professional judgement and experience.

Assessment Criteria

6.41 The criteria used to assess if an effect is significant or not, is set out in subsequent sub-sections. This has been determined by consideration of the sensitivity of the receptor, magnitude of impact, duration of the effect, geographical extent of the effect and application of professional judgement.

6.42 There are no technical significance criteria relating to assessment of socio-economic effects on human populations other than those that relate specifically to other technical areas such as pollution, noise etc. and these are dealt with in detail, in separate ES chapters, if necessary and, where appropriate, summarised within the socio-economics chapter. The significance of socio-economic effects has therefore been assessed using professional judgement in accordance with the outline methodology for determining sensitivity of receptors and magnitude of impacts and significance of effects.

6.43 Quantitative calculations have been undertaken where possible e.g. surplus or deficit of pupil places and comparative GP to patient ratios, and the level of significance determined by the effect at either local, district or national level. Where it is has not been possible to measure effects on a quantitative basis, a qualitative assessment has been provided.

[34] RBC, November 2013, S106 Planning Obligations Supplementary Planning Guidance
[35] RBC, January 2018, Reading Open Spaces Strategy Update Note 2018
[36] Fields in Trust, 2015, Guidance for Outdoor Sport and Play: Beyond the Six Acre Standard: England

Receptor Sensitivity Criteria

6.44 The sensitivity of receptors has been classified as low, medium or high, in accordance with the criteria set out in Table 6.7.

Table 6.7: Receptor Sensitivity Criteria

Sensitivity	Criteria
Low	The receptor/resource is tolerant of change without detriment to its character, is of low or local importance.
Medium	The receptor/resource has moderate capacity to absorb change without significantly altering its present character or is of high importance.
High	The receptor/resource has little ability to absorb change without fundamentally altering its present character or is of international or national importance.

Impact Magnitude Criteria

6.45 The magnitude of impact has been classified as low, medium or high, in accordance with the criteria set out in Table 6.8.

Table 6.8: Impact Magnitude Criteria

Magnitude of Impact	Criteria
Low	A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible/detectable but not material. The underlying character/composition/attributes of the baseline condition will be similar to the pre-development circumstances/situation.
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of the baseline will be materially changed.
High	Total loss or major/substantial alteration to key elements/features of the baseline (pre-development) conditions such that the post development character/composition/attributes will be fundamentally changed.

Significance Criteria

6.46 Significant effects have been determined based on the standard terminology and matrix approach defined in ES Chapter 2: EIA Process and Methodology and set out in Table 6.9, with moderate and major effects considered significant in EIA terms.

Table 6.9: Significance Criteria

Magnitude of Impact	Sensitivity of Receptors		
	Low	Medium	High
Low	None	Negligible	Minor
Medium	None – Negligible	Minor	Moderate
High	Minor	Moderate	Major

6.47 Duration of effect has been described as short, medium or long-term, in accordance with the criteria set out in Table 6.10.

Table 6.10: Duration of Effects Criteria

Duration	Criteria
Short	Up to 5 years
Medium	5 to 10 years
Long-term	10 years and over

Assumptions and Limitations

6.48 There are no further limitations or assumptions made other than those detailed in the assessment method above.

Baseline Conditions

Existing Baseline

Population

6.49 The ONS, 2018 MYPE estimate that the study area has a population of 14,700 people, accounting for 9 % of the RBC area's total population (163,200 people). The study area has a younger population profile than the both the RBC area and England. Only 6 % of the study area's population is aged 65+ years and over compared to 12% in the RBC area and 18 % in England. In contrast, the study area has a higher proportion of its population of working age (77 %) compared to just 67 % in the RBC area and 63 % in England. Whilst the study area has a younger population profile, the proportion of the population aged 0 to 15 years in the study area (17 %) is lower than the RBC area (21 %) and England (19%). Table 6.11 summarises the age profile of the study area, the RBC area and England by broad age group and Figure 6.2 compares the age profile of the study area, the RBC area and England by 5-year age group. All figures have been individually rounded and may not sum.

Table 6.11: Age Profile by Broad Age Group

2018 MYPE	Study Area	RBC Area	England
All people	14,700 (100 %)	163,200 (100 %)	55,977,200 (100 %)
Aged 0 to 15	2,500 (17 %)	33,900 (21 %)	10,748,500 (19 %)
Aged 16 to 64	11,300 (77 %)	109,300 (67 %)	35,049,500 (63 %)
Aged 65+	900 (6 %)	20,000 (12 %)	10,179,300 (18 %)

Source: ONS, 2018 MYPE

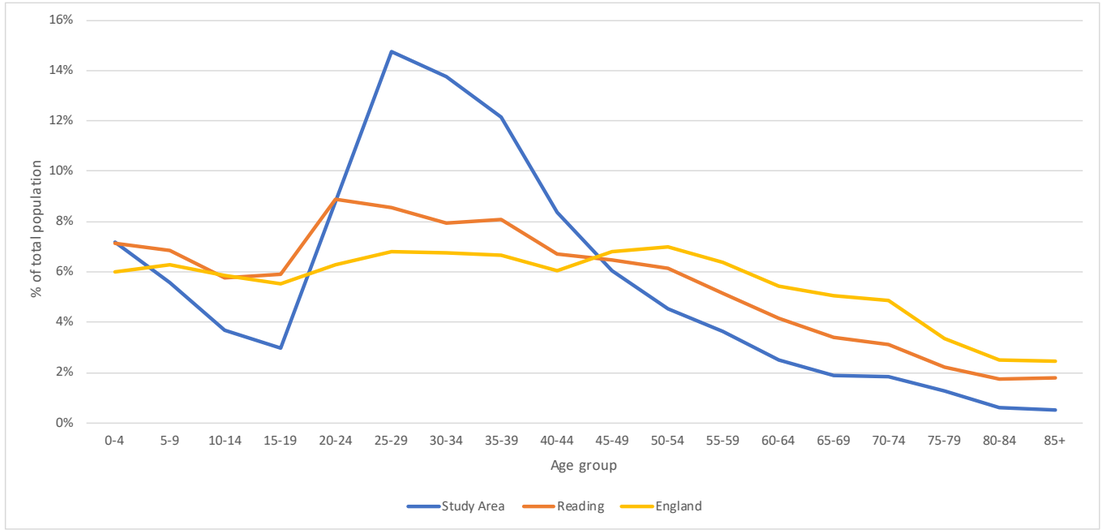


Figure 6.2 Age Profile by 5-year Age Group

Housing

6.50 The 2011 Census recorded approximately 65,551 households in the RBC area, 10 % of which (6,783) are within the study area. Table 6.12 highlights that accommodation within the study area predominantly takes the form of flats (72 %). The study area has a higher proportion of flats than the RBC area (32 %) and England (22 %). In contrast, the study area has a lower proportion of terraced (22 %); semi-detached (4 %) and detached properties (2 %) than the RBC area and England.

6.51 Accommodation within the study area is mainly private rented (51 %), which is in contrast to the RBC area and England where the majority of accommodation is owner occupied (55 % and 63 % respectively). Only 28 % of accommodation in the study area is owner occupied.

6.52 Caravans and other temporary structures are not included. All figures have been rounded and may not sum.

Table 6.12: Household Accommodation Type and Tenure

Type	Study Area	RBC Area	England
Detached	2%	12%	22%
Semi-detached	4%	25%	31%
Terraced	22%	30%	24%
Flats	72%	32%	22%
Tenure			
Owned	28%	55%	63%
Shared ownership	3%	2%	1%
Social rent	16%	16%	18%
Private rent	51%	26%	17%

Source: ONS, 2011 Census, Tables KS401EW and KS402EW [downloaded from NOMIS 12 December 2019].

6.53 The RBC Authority Monitoring Report 2017-2018 establishes that in 2017/18 there was a total of 700 net housing completions in the RBC area. This is above RBC's current annual housing target of 689 net homes per annum (2013-2036) as set out in the Reading Borough Local Plan (adopted November 2019)[37]. However, over the last five-years (2013/14 to 2017/18) net housing completions have totalled 3,164 which is equivalent to 633 per annum, falling short of the Local Plan requirement. Nonetheless, the RBC Authority Monitoring report 2017-18 projects completions over the years 2018/19 to 2025/26 to be in excess of the Local Plan requirement in each individual year.

Local Expenditure

6.54 Retail expenditure data from Experian (2017) reports the average annual household expenditure in the RBC area on convenience (food), comparison (non-food) and leisure goods and services as follows:

- Convenience = £4,966 per household per annum;
- Comparison = £8,442 per household per annum; and
- Leisure = £7,414 per household per annum.

Employment/Economic Output

6.55 The application site is currently occupied by four retail units (A1) and one restaurant (A3) as detailed in Table 6.13 along with the existing number of employees. In total, the application site is currently providing employment for 225 people.

Table 6.13: Existing Tenancy of Application Site

Occupant	Use Class	Employee Numbers	Floorspace (m^2)
The Range	A1	80	3,326
Mothercare	A1	30	1,440
Majestic Wine	A1	8	294
Aldi	A1	85	1,480
TGI Friday	A3	22	845

Source: JLL

6.56 Applying the average GVA per worker by Industry for the South East region to the application site's existing employment potential, it is estimated that the existing application site has the potential to generate a GVA of approximately £10.2 million per annum.

6.57 In the year ending June 2019 there were 90,800 residents in the RBC area aged between 16 and 64 years who were classified as economically active (ONS, APS, 2019). This is equivalent to 82 % of 16 to 64 year olds and 56 % of all people. This is above the average for England (79 % of 16 to 64 year olds). Economically active includes people in employment, the unemployed and full-time students.

6.58 In total 78 % of working age residents aged 16 to 64 years in the RBC area are in employment (ONS, APS, 2019), which is higher than the average for England (76 %). In the RBC area this is equivalent to 53 % of all people.

6.59 The unemployment rate in the RBC area (for those aged 16 to 64 years) in the year ending June 2019 was 4.6 % which is higher than the national average (4.1 %). Whilst not a measure of total unemployment, Claimant Count data provides a count of the number of people claiming unemployment

[37] RBC, Reading Borough Local Plan, Adopted November 2019, Policy H1

related benefits including JSA and UC within the study area. As at October 2019 there were 345 claimants of unemployment related benefits in the study area which is equivalent to 3.1 % of all residents aged 16 to 64 years. This is higher than the Claimant Count for the RBC area (2.7 %) and England (2.8 %).

6.60 In October 2019, there were 395 residents in the RBC area claiming JSA, of which 50 (i.e. 13 %) resided in the study area. Of those claiming JSA in the RBC area, the majority of people (190, equivalent to 48 %) are seeking employment in Sales Occupations, with the remaining looking for work in: elementary trades, plant and storage related occupations, administration occupations, corporate managers and skilled agricultural trades.

6.61 The RBC area is a net importer of labour. According to the 2018 BRES, there are 105,000 employees working in the RBC area, of which 43,000 (41 %) work within the study area. The study area has a comparatively high proportion of employees working in: the Retail sector (14 %); the Professional, Scientific and Technical sector (14 %); the Financial and Insurance sector (9 %); the Accommodation & Food Services sector (8 %) and Public Administration and Defence sector (7 %) in comparison to the RBC area average as is shown in Table 6.14.

Table 6.14: Percentage of Employees by Industrial Sector (Workplace Based)

Sector	Study Area	RBC Area	England
Retail	14%	11%	9%
Professional, scientific and technical	14%	11%	9%
Information and communication	10%	14%	4%
Business administration and support services	10%	10%	9%
Financial and insurance	9%	4%	3%
Accommodation and food services	8%	6%	7%
Public administration and defence	7%	4%	4%
Mining, quarrying and utilities	6%	3%	1%
Transport and storage (inc/. postal)	5%	4%	5%
Health	3%	12%	13%
Education	3%	6%	9%
Arts, entertainment, recreation and other services	3%	4%	4%
Wholesale	1%	3%	4%
Property	1%	1%	2%
Manufacturing	1%	2%	8%
Construction	1%	2%	5%
Motor trades	1%	2%	2%
Agriculture, forestry and fishing	0%	0%	1%
Total	100%	100%	100%

Source: ONS, BRES 2018

6.62 The data also identifies that there is a construction workforce, significant in size, already working within the study area. Whilst only 1% of employment within the study area is within the Construction sector, this is equivalent to 350 employees. In total, 2,250 people work in the Construction sector within the RBC area.

Primary Healthcare

6.63 There are six GP practices operating within the study area as shown in Figure 6.3. One of the GP Practices – Russell Street Surgery (Map No. 4) has a further two GP branches associated with the Practice: Coley Park Surgery (Map No. 4a) located in Reading but outside of the study area; and Burghfield Health Centre, Burghfield Common located in the local authority of West Berkshire. This Health Centre is not shown on Figure 6.2 due to the distance from the application site.

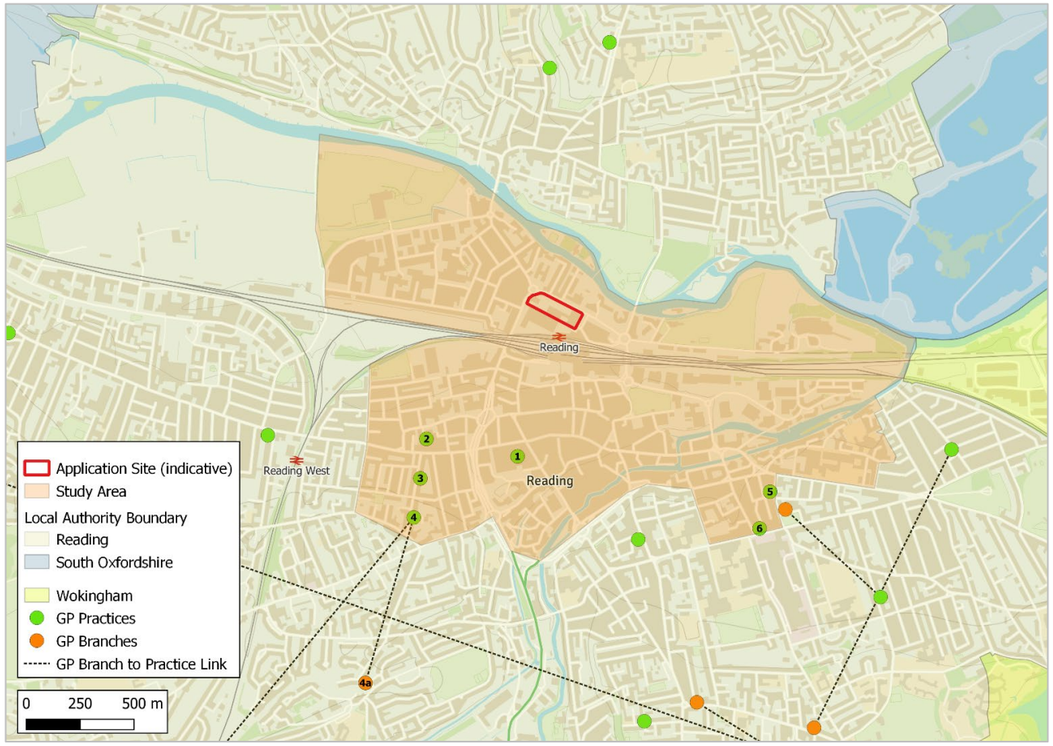


Figure 6.3: Existing General Practitioner Provision

Source: NHS Digital[38]

6.64 Table 6.15 presents the number of registered patients along with the number of Full Time Equivalent (FTE) GPs in the six identified GP Practices. As noted in the assessment methodology section, data is only published for GP Practices and therefore the data presented in Table 6.14 for the Russell Street Surgery, also includes data for the associated GP branches of Coley Park Surgery and Burghfield Health Centre.

[38] NHS Digital as at 31 May 2019

Table 6.15: Existing GP Provision and Capacities (June 2019)

Map No.	Surgery Name	GPs (FTE)	Registered Patients	GP to Patient Ratio	Surplus Capacity*
1	Reading Walk-In Health Centre	4.3	9,872	1:2,296	0
2	Chatham Street Surgery	1.1	6,836	1:6,215	0
3	Abbey Medical Centre	0.8	2,421	1:3,026	0
4	Russell Street Surgery	3.1	8,356	1:2,695	0
5	Eldon Road Surgery	0.7	3,235	1:4,621	0
6	Melrose Surgery	2.4	10,537	1:4,390	0
	Total	12.4	41,257	1:3,327	0

Source: NHS (June 2019)

*Assessed against the average for the South East region of 1 GP for every 2,245 people. Capacity is calculated by subtracting the existing GP to patient ratio from the average for the South East region and multiplying this by the number of FTE GPs at the surgery

6.65 All six GP practices are currently operating above capacity (assessed against the average for the South East region of 1 GP for every 2,245 people). Therefore, there is no surplus capacity within the existing GP provision in the study area.

6.66 There are four dental surgeries located within the study area as illustrated in Figure 6.4.

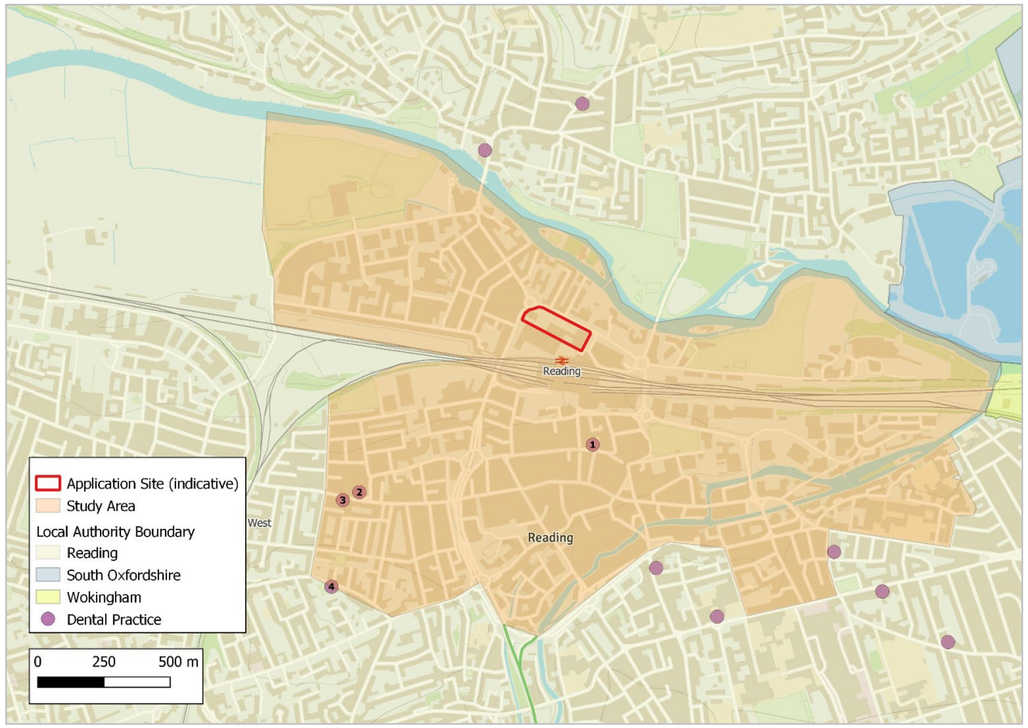


Figure 6.4: Existing Dental Provision

Source: NHS Digital

6.67 Table 6.16 provides details of the four dental practices along with an assessment of whether the practices are currently accepting new NHS/private patients.

Table 6.16: Existing Dental Provision (December 2019)

Map No.	Practice Name	Address	Accepting New Patients?	
			NHS	Private
1	Friar Street Dental Surgery	15 Friar Street, Reading, RG1 1DB	Yes	Yes
2	Inspire Dental Reading	124 Oxford Road, Reading, RG1 7NL	Yes	Yes
3	Reading Dental Sedation Clinic	165 Oxford Road, Reading, RG1 7UZ	Referral only	
4	Castle Hill Clinic	1c Tilehurst Road, Reading, RG1 7TW	Yes	Yes

Source: Telephone Survey dated 16 December 2019

6.68 One of the four dental practices (Reading Dental Sedation Clinic) offers treatment by referral only and of the remaining three dental practices, all three are accepting both new NHS and private patients. This indicates available dental provision within proximity of the application site currently.

Education

6.69 Early years education and care is provided in a number of ways including at local authority-maintained nursery schools, children's centres or primary schools with nursery classes, or privately through independent nursery schools, playgroups, child-minders or creches.

6.70 Reference to RBC's CSA 2017[39] identifies a total of 14 providers of formal early years/childcare provision within the study area providing a total of 629 registered places. The CSA identified 77 vacancies within the study area as at March 2017 (the latest available). Vacancies as a proportion of total places is equivalent to 12 % in the study area, marginally lower than the average for RBC (13 %).

6.71 A total of 21 primary schools have been identified within a 2.6 km radius of the application site as shown on Figure 6.5.

[39] RBC, October 2017, Childcare Sufficiency Assessment 2017: Final Report

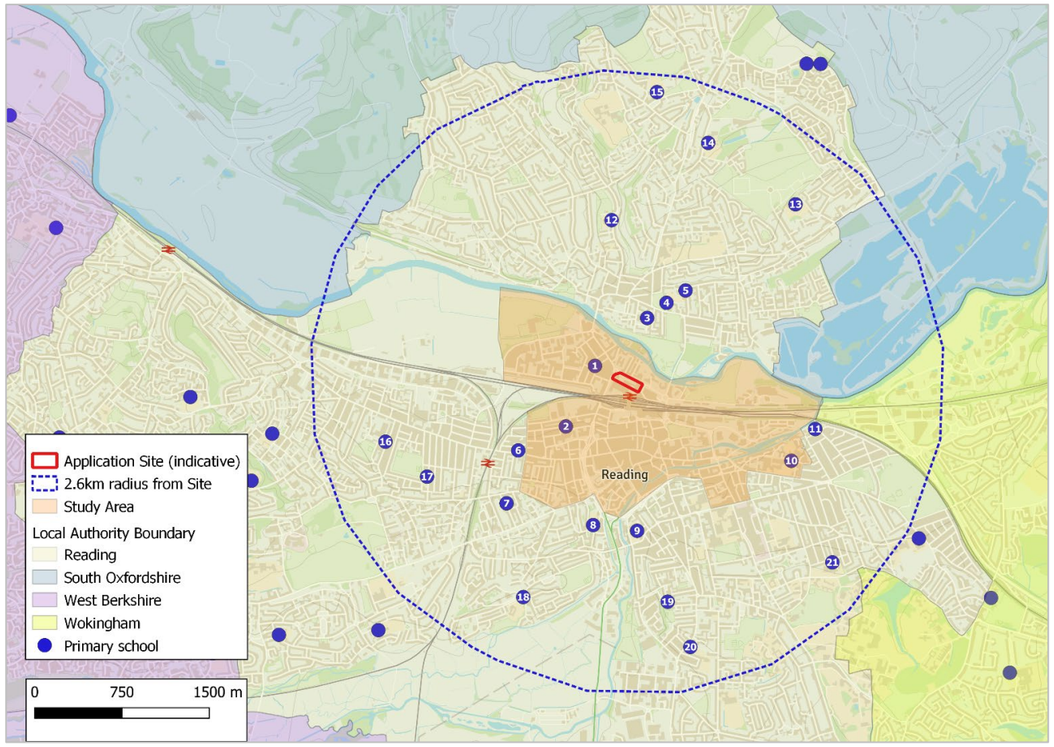


Figure 6.5: Existing Primary School Provision

6.72 Table 6.17 details the number of pupils on roll according to the January 2019 School Census and current capacity figures for each of the identified primary schools.

Table 6.17: Existing Primary School Provision within Study Area

Map No.	Name	Pupils on roll	Capacity	Surplus/Deficit Places
1	E P Collier Primary School	350	472	122
2	Civitas Academy	209	420	211
3	Thameside Primary School	408	420	12
4	The Heights Primary School	276	350	74
5	St Anne's Catholic Primary School	220	240	20
6	Oxford Road Community School	286	292	6
7	All Saints Junior School	95	100	5
7	All Saints Church of England Aided Infant School	60	60	0
8	Coley Primary School	273	300	27
9	Katesgrove Primary School	681	708	27
10	St John's Church of England Primary School	468	420	-48
11	New Town Primary School	290	472	182
12	Caversham Primary School	447	450	3
13	Micklands Primary School	400	420	20
14	The Hill Primary School	450	420	-30
15	Emmer Green Primary School	450	420	-30
16	Wilson Primary School	469	477	8
17	Battle Primary Academy	424	472	48
18	St Mary and All Saints Church of England Primary School	360	460	100
19	New Christ Church Church of England Primary School	184	210	26
20	The Palmer Primary Academy	441	498	57
21	Redlands Primary School	269	210	-59
	Total	7,510	8,291	781

Source: DfE, Annual School Census, January 2019

6.73 The primary school nearest to the application site, E P Collier Primary School, is currently operating under-capacity with a surplus of 122 places. In combination, all of the primary schools within 2.6 km of the application site are currently operating under-capacity with a surplus of 781 places.

6.74 A total of 11 secondary schools have been identified within a 5.6 km radius of the application site, as shown in Figure 6.6. However, one of the 11 secondary schools (Reading Girls' School, Map No. 8) is an all-girls school and therefore has been excluded from the assessment. Ten secondary schools have therefore been selected for assessment, with two of these schools (The Bulmershe School and Maiden Erlegh School) being located within the Local Education Authority (LEA) of Wokingham. The remaining eight secondary schools are located within the LEA of Reading. Table 6.18 details the number of pupils on roll according to the January 2019 School Census and current capacity figures for each of the 10 identified secondary schools.

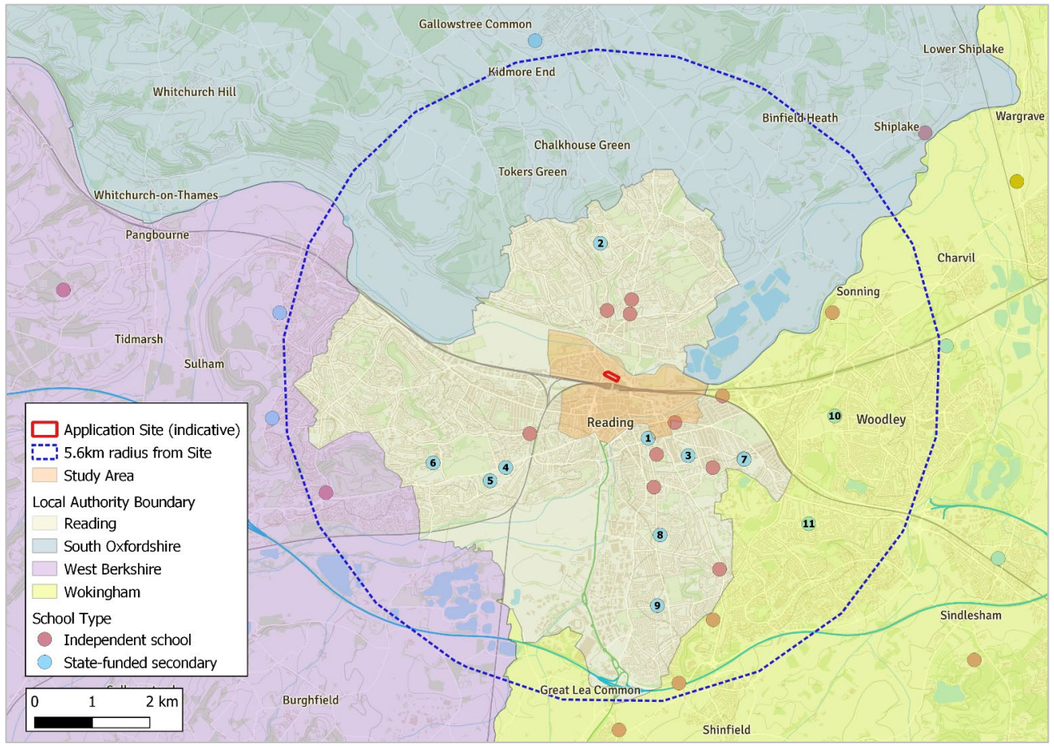


Figure 6.6: Existing Secondary School Provision

Table 6.18: Existing Secondary School Provision

Map No.	Name	LEA	Pupils on roll	Capacity	Surplus/deficit places
1	Kendrick School	Reading	739	760	21
2	Highdown School and Sixth Form Centre	Reading	1,357	1,440	83
3	Reading School	Reading	1,027	887	-140
4	The WREN School	Reading	589	1,176	587
5	Blessed Hugh Faringdon Catholic School	Reading	815	849	34
6	Prospect School	Reading	1,044	1,700	656
7	UTC Reading	Reading	453	600	147
8	Reading Girls' School	Reading	Not assessed		
9	John Madejski Academy	Reading	612	950	338
10	The Bulmershe School	Wokingham	1,145	1,383	238
11	Maiden Erlegh School	Wokingham	1,824	1,788	-36
Total			9,605	11,533	1,928

Source: DfE, Annual School Census, January 2019

6.75 The secondary school nearest to the application site, Kendrick School, is currently operating slightly under-capacity with 21 surplus places. In combination, all of the secondary schools within 5.6 km of the application site are currently operating under-capacity with a surplus of 1,928 places.

Open/Play Space

6.76 RBC's 'Reading Open Spaces Strategy Update Note 2018[40] acknowledges that the amount of public open space in the RBC area is broadly in line with the national guidelines and that the total provision of open space across the RBC area is adequate. However, there are parts of the RBC area which are deficient in open space provision with residents in and around the town centre being further away from public open space than the recommended standards. RBC's Open Space Strategy[41] adopts a 0.4 km to 0.8 km radius catchment for neighbourhood/local parks and play space and a 1.2 km radius catchment for larger parks and sports facilities as detailed earlier in this Chapter (see Table 6.5).

6.77 Reference to OS Open Greenspace identifies the provision of public open space within the required radial catchment of the application site according to RBC's open space standards. See Figure 6.7 and Table 6.19.

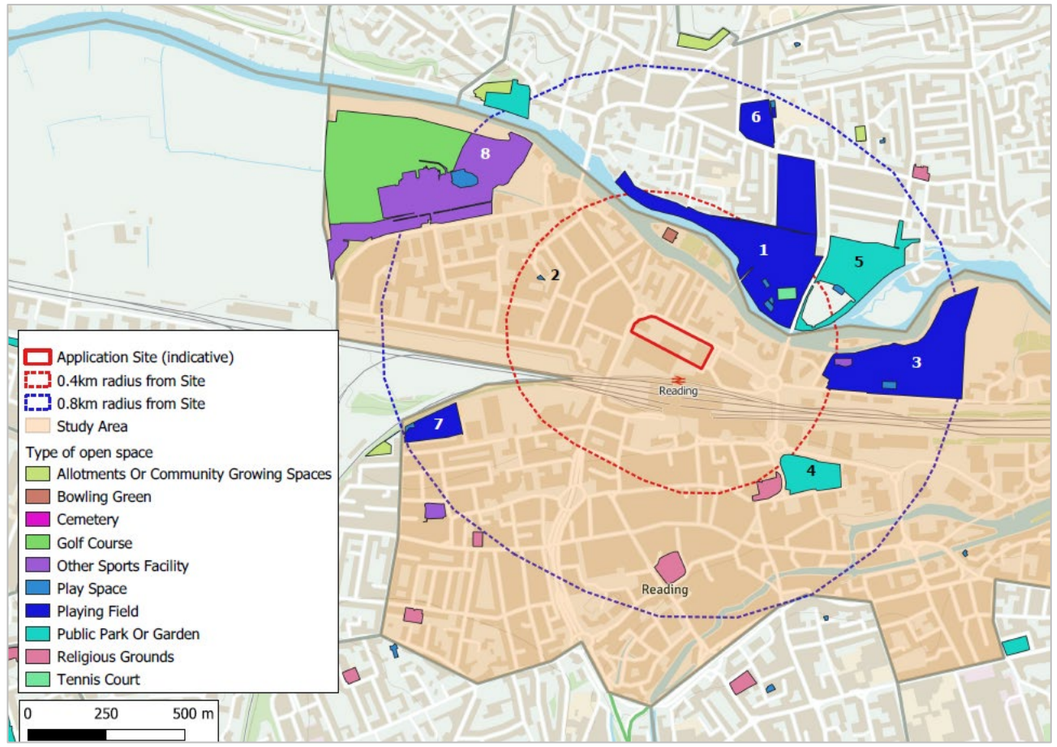


Figure 6.7: Existing Open/Play Space Provision

Source: OS Open Greenspace

[40] RBC, January 2018, Reading Open Spaces Strategy Update Note 2018

[41] RBC, January 2018, Reading Open Spaces Strategy Update Note 2018

Table 6.19: Existing Open/Play Space Provision

Map No.	Name	Radial Catchment	Description of Facility Surplus/Deficit Places
1	Christchurch Meadows	0.4 km	Playing field, children's play area, football, fishing and tennis
2	Denbeigh Place	0.4 km	Play space
3	King's Meadow	0.8 km	Playing field, children's play area, football, fishing and rugby
4	Forbury Gardens	0.8 km	Recreation ground
5	Hill's Meadow	0.8 km	Public park, skateboarding and BMX track
6	Westfield Road	0.8 km	Recreation ground and children's play area
7	Victoria Park	0.8 km	Recreation ground and children's play area

Source: RBC, Open Spaces Strategy Update Note, 2018

6.78 Figure 6.7 and Table 6.19 demonstrate that within a 0.4 km to 0.8 km radial catchment of the application site there are numerous sites providing a range of public open/play space provision, thereby meeting RBC's open space requirements.

Deprivation

6.79 According to the Indices of Deprivation 2019, the RBC area is ranked the 141st most deprived local authority in England (out of 326). However, within the RBC area there are pockets of considerable deprivation as illustrated in Figure 6.8. Of the 97 Lower Super Output Areas (LSOAs) in the RBC area, five LSOAs are within the most 10% deprived nationally.

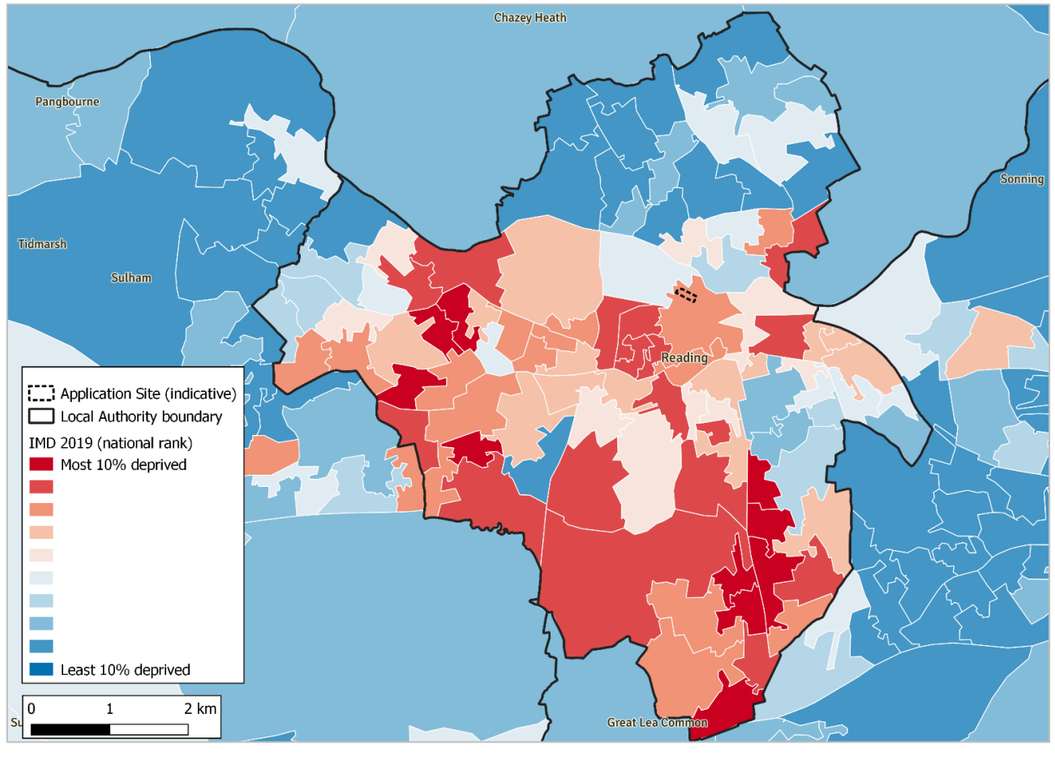


Figure 6.8: Deprivation Levels in RBC

Source: MHCLG, Indices of Deprivation 2019

6.80 The application site is located within the LSOA of Reading 011F. This LSOA is the 32nd most deprived LSOA in the RBC area (out of 97) and is within the 4th decile nationally, meaning it is within England's most 40% deprived. Table 6.20 details the decile for each of the seven domains (types) of deprivation. The domains comprise: Income Domain; Employment Domain; Education, Skills and Training Domain; Health Domain; Crime Domain; Barriers to Housing and Services Domain; and Living Environment Domain). Decile 1 represents that the LSOA is in the most 10% deprived of LSOAs nationally and decile 10 represents the least 10% deprived LSOAs in England.

Table 6.20: Index of Multiple Deprivation 2019 National Decile for LSOAs in which Application Site is located

Deprivation Domain	LSOA Reading 011F (National Decile)
Overall IMD	4
Income	5
Employment	7
Health Deprivation and Disability	3
Education, Skills and Training	6
Barriers to Housing and Services	1
Crime and Disorder	2
Living Environment	4

Source: MHCLG, Indices of Deprivation 2019

6.81 Table 6.21 demonstrates that on the Barriers to Housing Services domain, Reading 011F is within the top 10 % deprived nationally (1st decile). The Barriers to Housing Services domain measures the physical and financial accessibility of housing and local services, including household overcrowding and homelessness. Furthermore, LSOA Reading 011F is within the 2nd decile on the Crime and Disorder domain which measures the risk of personal and material victimisation. LSOA Reading 011F is relatively less deprived in respect of Employment (7th decile) and Education, Skills and Training (6th decile).

Crime

6.82 In October 2019 there were 398 incidents of crime reported within the study area. This is equivalent to 27 incidents per 1,000 population (assessed against the study area's baseline population of 14,670). The rate of crime in the study area is higher than the average for the RBC area of 10 incidents per 1,000 population.

6.83 Figure 6.9 demonstrates the physical location of the 398 incidents of crime in the study area and Table 6.21 details the incidents by type of crime alongside the average for the RBC area.

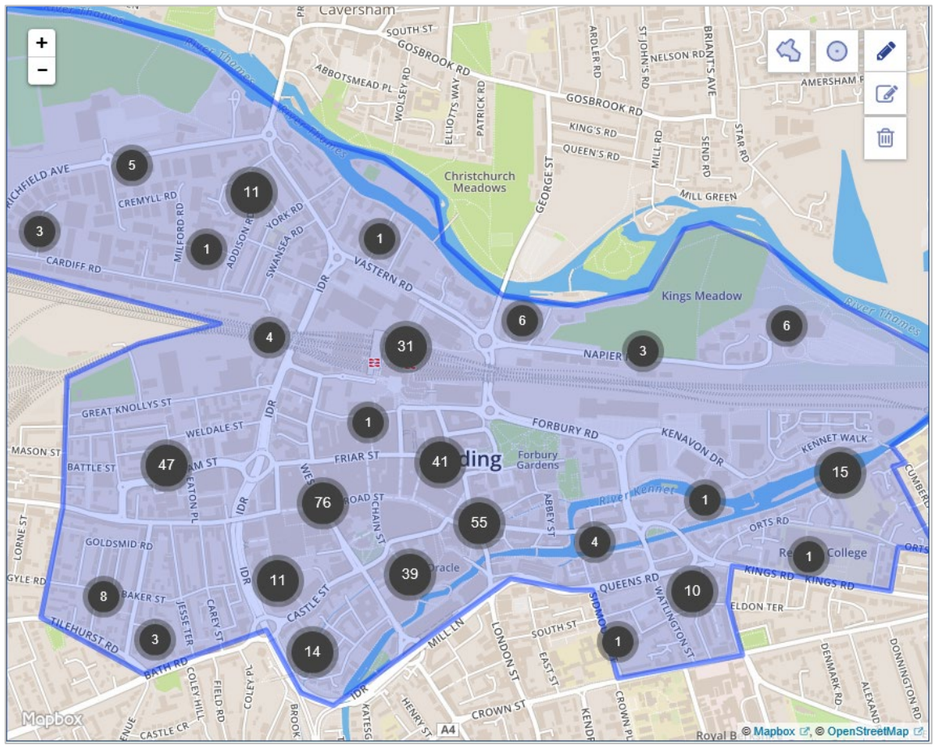


Figure 6.9: Reported Crime Incidents in Study Area (October 2019)

Source: Police.uk

Table 6.21: Incidents of Crime with Study Area and RBC Area(October 2019)

Incidents	Study Area	RBC Area
Anti-social behaviour	9 %	14 %
Bicycle Theft	11 %	5 %
Burglary	5 %	6 %
Criminal damage and arson	5 %	10 %
Drugs	5 %	4 %
Other crime	1 %	1 %
Other theft	10 %	7 %
Possession of weapons	0 %	0 %
Public order	6 %	5 %
Robbery	2 %	2 %
Shoplifting	12 %	5 %
Theft from the person	4%	2%

Table 6.21: Incidents of Crime with Study Area and RBC Area(October 2019)

Incidents	Study Area	RBC Area
Vehicle crime	3 %	6 %
Violence and sexual offences	29 %	33 %
Total	**100 %**	**100 %**
Number of Crimes	**398**	**1,587**

Source: Police.uk

6.84 The majority of incidents within the study area are acts of violence and sexual offences (29 %), although the proportion is slightly lower than the average for the RBC area. Incidents of shoplifting are higher in the study area than in comparison to the RBC area (1 2% compared to 5 %). Similarly, bicycle theft is also higher in the study area (11 %) compared to the RBC area (5 %). The higher incidents of shoplifting and bicycle theft in the study area is considered to be as a result of the Reading Railway Station and retail units located within the study area.

Future Baseline

Population

6.85 It is anticipated that development works would commence in April 2021 and would be complete by June 2025. The ONS 2016-based SNPP project that by 2025 the RBC area would have a population of 171,200. This represents an increase of 4.9 % from the existing baseline characteristics (year 2018) which is marginally higher than the growth projected for England over the same period (4.0 %). Table 6.22 summarises the RBC area's population by broad age group in 2025. As explained in the assessment methodology section, SNPPs are only published for local authority district areas and higher geographies and are therefore not available for the study area. All figures have been rounded and may not sum.

Table 6.22: Projected Age Profile (2025)

Age Profile	Study Area	RBC Area	England
All people	N/A	171,200 (100 %)	58,224,900 (100 %)
Aged 0 to 15	N/A	34,600 (20 %)	11,068,800 (19 %)
Aged 16 to 64	N/A	113,700 (66 %)	35,605,700 (61 %)
Aged 65+	N/A	22,900 (13 %)	11,550,400 (20 %)

Source: ONS, 2016-based SNPP[42]

6.86 By 2025 the working age population of the RBC area is projected to be 113,700 providing an increase of 4.0 % from the existing baseline. In comparison, England's working age population is projected to increase by just 1.6 %.

6.87 The ONS, 2016-based household projections project that by 2025 the average household size in the RBC area will be 2.43 persons per household.

Education

6.88 Future baseline characteristics in relation to primary and secondary school capacities are available for school planning areas (not individual schools). In 2018/19 there were 553 surplus primary places

[42] ONS, 24 May 2018, Subnational population projections for England: 2016-based

within the Central West Primary Planning Area. DfE forecasts indicate that by 2022/23 the number of surplus primary places will have reduced to 264.

6.89 Within the Reading Secondary Planning Area there were 1,779 surplus secondary places in 2018/19. DfE forecasts indicate that by 2024/25 the number of surplus places will have decreased to 133.

Sensitive Receptors

6.90 The receptors identified as being sensitive to the proposed development and which have been 'scoped-in' to the assessment are summarised in Table 6.23. The sensitive receptors are based on the potential for effects based on the development parameters rather than the sensitivity in EIA terms.

Table 6.23: Summary of Sensitive Receptors

Receptor	Sensitivity
Population	Low
Housing	Low
Local expenditure	Low
Employment	High
Economic output	High
Early years education	Low
Primary education	Low
Secondary education	Low
Primary healthcare – GP provision	Low
Primary healthcare – Dental provision	Low
Open/play space	Low
Deprivation	Low
Crime	Low

Assessment of Effects

Demolition and Construction Effects

6.91 Demolition effects are focused on employment. Similarly, construction effects are also focused on economic impacts including construction jobs and spending. Construction phase effects on education and primary healthcare have not been included in the assessment, as it is assumed that the construction workforce would use facilities near their place of residence and therefore not place any additional demand on local provision.

Employment/Economic Output

6.92 Employment would be created throughout the demolition phase. Based on calculations produced through use of the CITB LFT and the estimated demolition cost, it is anticipated that the demolition phase would support 39 jobs over the demolition period.

6.93 The construction phase of the proposed development is expected to generate a number of jobs across all construction disciplines from ground workers to construction management. Based on calculations produced through use of the CITB LFT, which are in turn based on an indicative construction cost, it is anticipated that the proposed development would support 531 direct FTE construction jobs on-site per month over the construction period. This average is considered to provide a conservative estimate as it would be further enhanced by workers who would construct open space and other landscaped areas not included within the LFT calculations.

6.94 In addition to jobs created as a direct effect of the construction and management of the proposed development, further indirect employment and economic benefit would be experienced as a result of the spin-off and multiplier effects. The level of indirect employment generated during the construction period has been assessed quantitively by applying the ONS Type 1 employment multiplier, 2015 to the direct construction employment (=0.97 x 531) resulting in 515 indirect jobs.

6.95 Construction phase employment would generate economic output, measured through the generation of GVA. Based on an average GVA per construction worker of £50,400 per annum for the SE region, the direct employment from the proposed development could generate a GVA of approximately £26.8 million per annum (=531 x £50,400). Over the 48-month construction period this is equivalent to £107.1 million. The indirect 515 jobs are expected to generate £26.7 million per annum based on applying the UK average GVA across all employment (=515 x £51,781). Over the 48-month construction period this is equivalent to £106.7 million. This would provide a combined GVA of £213.8 million over the construction period.

6.96 The creation of 12 demolition jobs and a further 531 direct and 515 indirect jobs over the construction period is considered to have a temporary, **Major Beneficial** effect (significant) at the Borough level on employment.

6.97 Generating a combined GVA of £213.8 million over the construction period the proposed development is considered to have a temporary, **Major Beneficial** effect (significant) at the Borough level on economic output during the construction phase for which no mitigation measures are required.

Completed Development Effects

6.98 Completed development effects on each socio-economic receptor have been assessed on the basis of the worst-case scenario outlined earlier in the Chapter in Table 6.3.

Demand for Housing

6.99 On the basis that no residential dwellings are delivered, it is considered that the proposed development would not contribute to RBC's future overall or affordable housing requirement and therefore the proposed development is considered to have a **Negligible** effect on housing (not significant) at the local level for which no mitigation measures are required.

Local Expenditure

6.100 Convenience goods expenditure from employees is based on convenience goods expenditure per person from Experian. Experian estimate that the national average expenditure per person per annum on convenience goods is £2,202. Based on professional judgement and in light of an equivocal evidence base, it is assumed that approximately 10 % of this annual spend per person could be spent by employees in the local area (i.e. buying lunch etc) which equates to some £220 per worker per annum. On the basis of an operational workforce of 3,522, this equates to annual growth in convenience goods expenditure of £775,795.

6.101 Baseline characteristics identified that there are currently 225 direct jobs on the application site. Applying the average convenience spend per person (£220) to these workers would suggest that the current on-site employees are spending £49,500 per annum in the local area.

6.102 On the basis that the proposed development's employee population has the potential to generate spend of £775,795 per annum, which is higher than the £49,500 spend by employees currently, it is considered that the proposed development would have a **Major Beneficial** effect (significant) on local expenditure at the local level for which mitigation measures are not required.

Employment/Economic Output

6.103 Table 6.24 illustrates the worst-case operational employment generation on the basis of the assumed floorspace set out earlier in this Chapter in Table 6.3. Zero employment is generated by the residential floorspace.

Table 6.24: Potential Operational Employment Generation

Use Class	m^2 per FTE Worker	Floorspace Provision (m^2)			Jobs (FTE)
		GEA	GIA	NIA	
Residential (C3)	N/A	N/A	N/A	N/A	N/A
Leisure (D1-D2)	65*	7,000	6,650	5,985	92
Hotel (C1)	67**	N/A	N/A	N/A	67
Total					**159**

* The Employment Densities Guide provides a range for Use Class D2 of between 65 and 300 m^2 per FTE worker depending on use. 65 m^2 has been assumed for this analysis as this reflects a mid-market/family fitness centre.

** Based on a maximum floorspace of 8,000 m^2, the hotel is assumed to have 200 bedrooms and the HCA Employment Densities Guide refers to an employment density of 1 job per 3-bedrooms.

Source: HCA[43]

6.104 Assuming the worst-case scenario for employment generation, 159 jobs could be generated by the proposed development.

6.105 As detailed in the assessment methodology section of this chapter, the proposed development's non-residential uses are considered to have a high level of leakage (50 %) and a low level of displacement (25 %). The composite multiplier effects applied are 1.38 for the leisure use and ; 1.29 for the office use. The additionality factors applied to the proposed development (worst-case) therefore result in the following calculations:

- 159 jobs minus 50 % leakage = 79 jobs;
- 79 jobs minus 25 % displacement = 60 jobs; and
- 60 jobs multiplied by between 1.29 and 1.38 = 76 jobs.

6.106 GVA generated by the proposed development (worst-case) would equate to £2.7 million per annum.

6.107 The residential floorspace (assumed to be 100,000 m^2 to represent worst case) would provide 1,000 residential units that would accommodate up to 2,430 residents (=1,000 dwellings x average household size of 2.43 for the RBC area in 2025). Based on the existing proportion of the total population that are economically active as determined in the baseline assessment (56 %), the proposed development would be expected to accommodate 1,361 economically active residents, of which 1,288 (53 %) are assumed to be in employment.

6.108 The growing resident workforce would deliver economic output. Applying the GVA output per worker for the RBC area (£62,853) to the estimated 1,288 future residents assumed to be in employment, the proposed development would generate around £80.9 m in GVA per annum (based on current values).

6.109 The number of net jobs generated by the proposed development (76 direct jobs) is lower than the number of jobs on existing on-site operations (225 jobs) and therefore the proposed development would have a **Minor Adverse** effect (not significant) on employment at the local and borough level which would not require mitigation. However, the existing on-site uses only generate GVA of £10.2 million per annum whereas the proposed development would generate GVA of £23.6 million per annum (worst-case). For this reason, it is considered that the proposed development would have a permanent, **Moderate Beneficial** effect (significant) on economic output at the local and borough level which is considered significant but for which mitigation is not required.

Primary Healthcare

6.110 Baseline characteristics identified six GP practices within the study area, one of which (Russell Street Surgery) has a further two GP branches associated with the Practice. All six of the GP practices are currently accepting new patients (as at 12 December 2019). However, compared to the SE regional average of 1 GP for every 2,245 patients, the six GP practices are collectively operating above this average with 1 GP for every 3,327 patients. Assessed against the SE average, this indicates no spare capacity within the existing GP provision.

6.111 To assess worst-case for the primary healthcare receptor, it has been assumed that the proposed development would deliver 1,000 residential units, providing homes to approximately 2,430 people. This assessment assumes that all 2,430 people would be new to the area and therefore would need to register with a new GP. This again assumes a worst-case scenario as some residents are likely to already be from the local area and therefore already registered with a local GP.

6.112 Given that there is no capacity within the existing GP provision, it is considered that proposed development would have a **Moderate Adverse** effect (significant) on GP provision at the local level for which mitigation is required.

6.113 In addition, four dental practices have been identified within the study area. However, one of the four dental practices (Reading Dental Sedation Clinic) offers treatment by referral only. Of the remaining three dental practices, all three are accepting both new NHS and private patients which indicates available dental provision within proximity of the application site currently.

6.114 Although all three dentists are currently accepting both new NHS and private patients, it is uncertain (because there is no central patient register) as to whether there would be surplus capacity to accommodate an additional 2,430 patients generated by the proposed development. For this reason, it is considered that the proposed development would have a **Minor Adverse** effect (not significant) on dental provision at the local level which is not considered significant and for which mitigation is therefore not required.

Education

6.115 To assess worst-case for the education receptor, it has been assumed that the proposed development would deliver 1,000 residential units. Pupil yield arising from the proposed development's 1,000 residential units (assuming 400 x 1-bed apartments and 600 x 2-bed apartments) has been calculated through application of RBC's pupil yield multipliers set out earlier in this chapter (Table 6.5). Table 6.25 presents the resulting pupil yield by education phase.

Table 6.25: Pupil Yield from Proposed Development

Type	Number of Units	No. of Pupils		
		Rising Fives	Primary	Secondary
Flat/Apartment (1 bed)	400	0	0	0
Flat/Apartment (2 bed)	600	72	102	30
Total	1,000	72	102	30

6.116 The proposed development is anticipated to yield 72 early years pupils; 102 primary school aged pupils; and 30 secondary aged pupils.

[43] HCA (2015) Employment Densities Guide 3rd edition, Homes & Communities Agency

6.117 Baseline characteristics identified 77 vacancies within the existing early years education provision in the study area which is in excess of the 72 early year places calculated to arise from the proposed development. On this basis, the proposed development is considered to have a negligible effect (not significant) on early years education for which mitigation is not required.

6.118 The nearest primary school to the application site (E P Collier Primary School) is currently operating under-capacity with a surplus of 122 places. Furthermore, baseline conditions identified an existing surplus of 781 primary pupil places within a 2.6 km radius of the application site. DfE forecasts identify that by 2022/23 there will be a surplus of 264 primary school places for the Central West Primary Planning Area (in which the application site is located) which would be sufficient to accommodate the 102 primary places arising from the proposed development. On this basis, the proposed development is considered to have a negligible effect (not significant) on primary education for which mitigation is not required.

6.119 The nearest secondary school to the application site (Kendrick School) is currently operating slightly under-capacity with a surplus of 21 places. However, within 5.6km of the application site, there is currently a surplus of 1,928 secondary school places. DfE forecasts indicate that this surplus will diminish over coming years and by 2024/25 the surplus number of secondary places will have reduced to 133. Nonetheless, this would still be sufficient to accommodate the 30 secondary places arising from the proposed development.

6.120 On this basis, the proposed development is considered to have a **Negligible** effect (not significant) on education for which mitigation is not required.

Open/Play Space

6.121 Total population arising from the proposed development's 1,000 residential units is calculated to be 2,430 people. In the absence of specific guidance from RBC, the quantity of formal/informal open/play space required for the proposed development has been calculated using guidance from the Fields in Trust as set out earlier in this chapter (Table 6.6). Table 6.26 presents the resulting open/play space requirement.

Table 6.26: Open/play Space Requirements from Proposed Development

Open Space Typology	Type	Hectares
Playing pitches	Formal	3.6
All outdoor sports	Formal	3.8
Equipped/designated play areas	Formal	0.6
Other outdoor provision (MUGAs and skateboard parks)	Formal	0.7
Parks and gardens	Informal	1.9
Amenity open space	Informal	1.4
Natural and semi-natural	Informal	4.3

6.122 Baseline evidence established that there is a range of public open/play space within the required radial catchment of the application site according to RBC's Open Space Strategy.

6.123 The parameter plans for the proposed development identify that 10 % of the overall site area (equivalent to 1,770 m^2 or 0.177 ha) would be provided as publicly accessible open space including hard and soft landscaping, public realm and the provision of amenity spaces, including play space provision. The proposed development would therefore provide on-site delivery of open/play space which RBC are looking for where possible.

6.124 The overall provision of open space within the proposed development would: provide a net increase in open/play space provision in RBC; would help to create a high quality and attractive landscape; and make an important significant contribution towards the quality of life of local residents.

6.125 However, despite the proposed development increasing the quantum of open/play space provision in RBC, the proposed development's open/play space requirements (Table 6.26) cannot all be met by the 0.177 ha of open/play space being provided on-site. The proposed development is therefore likely to place additional demand on existing open/play space. On this basis, it is considered that the proposed development would have a **Negligible** effect on open/play space at the local and borough level, for which mitigation is not required.

Deprivation

6.126 Baseline evidence established that the application site is located within the LSOA of Reading 011F which is the 32nd most deprived LSOA in the RBC area (out of 97) and within the 4th decile nationally. However, Reading 011F is within the top 10% deprived nationally (1st decile) on the Barriers to Housing Services domain and the top 20% nationally (2nd decile) on the Crime and Disorder domain but is relatively less deprived in respect of Employment (7th decile) and Education, Skills and Training (6th decile).

6.127 The development parameters have been designed to be flexible and therefore the provision of any new homes would have the potential to improve deprivation related to housing. As identified in the baseline conditions, the Barriers to Housing and Services domain measures the physical and financial accessibility of housing, including household overcrowding and homelessness. The provision of 1,000 dwellings, 30 % of which would be affordable in accordance with Policy H3 of the adopted Reading Borough Local Plan, would provide homes across a range of tenures for 2,430 people.

6.128 However, to assess a worst-case scenario in respect of deprivation it has been assumed that no residential units would be delivered by the proposed development and that all of the proposed development's uses would be employment related. Given the existing use of the application site is employment related, the provision of new employment floorspace by the proposed development is not considered to the change the deprivation levels in respect of employment and therefore the proposed development is considered to have a **Negligible** effect (not significant) on deprivation at the local level for which mitigation is not required.

Crime

6.129 Baseline conditions identified that the rate of crime in the study area is higher than the average for the RBC area (27 compared to 10 incidents per 1,000 population). Incidents of shoplifting and bicycle theft are higher in the study area than in comparison to the RBC area, likely to be as a result of the railway station and retail units located within the study area.

6.130 The provision of 1,000 new homes by the proposed development would increase the resident population by 2,430 people and would naturally increase the opportunities for additional crime. However, an increase in population numbers and dwellings can also have a beneficial effect on levels of local safety, and on a perceived fear of crime, through an increase in footfall and through natural surveillance, particularly in an area where minimal footfall will have been present in the past.

6.131 However, given the development parameters have been designed to be flexible, the proposed development may not deliver any new housing and all of the uses may be employment related. The provision of office (B1a), hotel (C1) and leisure (D1-D2) floorspace has the potential to reduce incidents of shoplifting, but there is the potential for other types of crime to increase.

6.132 Nonetheless, the design of the proposed development would incorporate design measures that would assist in detracting anti-social behaviour. Design measures include landscaping and change in materials through paving, texture and colour which act as psychological barriers to prevent access in areas which

are private. A careful lighting strategy would be produced to ensure open visibility and prevent anti-social behaviour. Windows would be designed to maximise overlooking, whilst also protecting privacy.

6.133 Overall, it is considered that the proposed development would have a **Negligible** effect (not significant) on crime at the local level for which mitigation measures are not required.

Assessment of Residual Effects

Additional Mitigation

6.134 A **Moderate Adverse** (significant) effect on GP provision has been assessed at the local level for which mitigation is required. Effects can be mitigated via on-site provision (subject to market take up) or CIL payment, which can be used towards the extension of, or new provision of a GP service in the local area.

Enhancement Measures

6.135 There are no enhancement measures proposed in respect of socio-economics.

Demolition and Construction Residual Effects

6.136 No mitigation measures have been identified and therefore residual effects with respect to employment/economic output would remain temporary, **Major Beneficial**.

Completed Development Residual Effects

6.137 Once the proposed development has reached completion and following the implementation of the additional mitigation measures (CIL payment), there would be:

- **Major Beneficial** residual effects on:
  - Local expenditure;
- **Moderate Beneficial** residual effects on:
  - Economic output;
- **Negligible** residual effects on:
  - Housing;
  - Early years/primary/secondary education;
  - GP provision (following mitigation);
  - Open/play space;
  - Deprivation; and
  - Crime
- **Minor Adverse** residual effects on:
  - Employment; and
  - Dental provision.

Summary of Residual Effects

6.138 Table 6.27 presents the residual socio-economic effects of the proposed development.

Table 6.27: Summary of Residual Socio-Economic Effects

Receptor	Residual Effect	Additional Mitigation	Nature of Residual Effect*					
			Scale of Effect **	+ -	D I	P T	R IR	St Mt Lt
Demolition and Construction								
Employment	Generation of construction employment	None required	Major	+	D/I	T	R	St
Economic output	Local expenditure	None required	Major	+	D/I	T	R	St
Completed Development								
Housing	No residential dwellings delivered	None required	Negligible	+	D	P	IR	Lt
Local expenditure	Increased spending from new employees	None required	Major	+	D	P	IR	Lt
Employment	Net loss of employment on-site	None required	Minor	-	D/I	P	IR	Lt
Economic output	Local expenditure	None required	Moderate	+	D/I	P	IR	Lt
Primary healthcare – GP provision	Demand for GP provision	CIL payment	Negligible	-	D	P	IR	Lt
Primary healthcare – Dental provision	Demand for dentist provision	None required	Minor	-	D	P	R	Lt
Education – early years	Demand on early years school places	None required	Negligible	+	D	P	IR	Lt
Education – primary	Demand on primary school places	None required	Negligible	+	D	P	IR	Lt
Education – secondary	Demand on secondary school places	None required	Negligible	+	D	P	IR	Lt
Open/Play space	Demand for open space	None required	Negligible	+	D	P	IR	Lt
Deprivation	Impact on levels of deprivation	None required	Negligible	+	D	P	IR	Lt
Crime	Impact on crime	None required	Negligible	+	D	P	IR	Lt

Notes:
* - = Adverse/ + = Beneficial/ +/- Neutral; D = Direct/ I = Indirect; P = Permanent/ T = Temporary; R=Reversible/ IR= Irreversible; St- Short term/ Mt –Medium term/ Lt –Long term.
**Negligible/Minor/Moderate/Major

6.139 The likely significant effects, i.e. those residual effects which are moderate or major in scale are as follows:

- Economic output during demolition and construction - **Moderate Beneficial** at the borough level; and
- Local expenditure - **Major Beneficial** at the local level.

Cumulative Effects

6.140 Table 6.28 provides a summary of the likely cumulative effects resulting from the proposed development and the inter-project cumulative developments identified.

Table 6.28: Inter-Project Cumulative Effects

Cumulative Development	Demolition and Construction		Completed Development	
	Cumulative Effects Likely?	Reason	Cumulative Effects Likely?	Reason
Former BMW Site – Thames Quarter (162166)	Yes	Demolition and construction stages overlap and therefore effects considered likely. 760 construction jobs created.	Yes	The development would provide 315 apartments introducing an additional 765 people to the area increasing demand for education and primary healthcare. 13 operational jobs would be created in supporting services.
Station Hill (151426 and 151427/allocation CR11c)	Yes	Demolition and construction stages overlap and therefore effects considered likely. 370 construction jobs created.	Yes	The mixed-use development would provide 475 residential units introducing 1,154 people to the area increasing demand for education and primary healthcare. Retail uses (A1-A5) proposed would provide between 4,900 and 8,845 operational jobs.
Toys R Us (170509)	Yes	Demolition and construction stages overlap and therefore effects considered likely.	Yes	The development would provide 765 residential units introducing an additional 1,859 people to the area increasing demand for education and primary healthcare. Retail (A1-A5) and leisure (D1-D2) uses would provide employment opportunities.
Land between Weldale Street and Chatham Street Reading (170326/allocated CR12b)	Yes	Demolition and construction stages overlap and therefore effects considered likely.	Yes	The development would provide 427 residential units introducing an additional 1,037 people to the area increasing demand for education and primary healthcare. Retail uses (A1-A3) would provide employment opportunities.
Network Rail Thames Valley Area site office/ Former Royal Mail site (182252/validated allocation CR11e)	Yes	Demolition and construction stages overlap and therefore effects considered likely.	Yes	The development would provide 1,599 residential units introducing an additional 4,797 people to the area increasing demand for education and primary healthcare. Retail (A1-A3) and Leisure (D1) would provide employment opportunities and the Health Centre (D1) would provide new primary healthcare.
Former Scottish and Southern Energy site (Awaiting application/allocation CR11e)	Yes	Demolition and construction stages overlap and therefore effects considered likely.	Yes	The development would provide 210 residential units introducing an additional 510 people to the area increasing demand for education and primary healthcare.
29 Station Road Reading, RG1 1LG (181930)	Yes	Demolition and construction stages overlap and therefore effects considered likely. 190 construction jobs created.	Yes	Provision of retail (A1-A5) and office (B1a) uses and a 135-bed hotel (C1) providing 124 direct operational jobs.
Broad Street Mall Broad Street Reading, RG1 7QG (182137/allocated CR12c)	Yes	Demolition and construction stages overlap and therefore effects considered likely. 632 demolition and construction jobs created.	Yes	The development would provide 493 residential units introducing an additional 1,198 people to the area increasing demand for education and primary healthcare. Retail uses (A1-A3) would provide 4 direct operational jobs.

Demolition and Construction Cumulative Effects

6.141 Demolition and construction effects are focused on employment.

6.142 For a number of the inter-projects, the application sites are currently occupied by existing retail/ employment floorspace. Details are not available as to the existing number of jobs on each site which would be lost through development of each of the inter-projects. However, employment would be created throughout both the demolition and construction stage across a range of disciplines from ground workers to construction management.

6.143 A minimum of 1,952 jobs would be created by the inter-projects and a further 544 by the proposed development during the demolition and construction stage. However, this is considered to provide a conservative estimate as detail on the number of demolition/construction jobs is not available for all projects.

6.144 Nonetheless, the creation of at least 2,496 jobs during the demolition and construction stage is considered to have a temporary, **Major Beneficial** effect (significant) at the Borough level for which mitigation is not required.

Completed Development Cumulative Effects

6.145 The inter-projects presented in Table 6.28 would cumulatively provide 3,343 additional residential units. When combined with the proposed development the total number of residential units that could cumulatively be delivered is 4,343 generating a population of 10,553 people. The worst-case assessment would assume that all of these people are new to the area and therefore would need to register with a local GP and dentist. Baseline conditions identified that local GP provision is currently operating over-capacity and therefore the cumulative schemes would have a **Major Adverse** effect on primary healthcare at the local level for which mitigation is required. However, it is noted that the cumulative scheme on the Network Rail Thames Valley Area site office/ Former Royal Mail site is proposing a new Health Centre. If delivered, this has the potential to reduce the effects on primary healthcare to **Negligible**.

6.146 The population accommodating the 4,343 residential units would also increase demand for education services within the local area. In the absence of detailed information for all of the inter-projects on the size of units to be provided, it has been assumed (to assess worst-case as the yields are higher) that all of the units would be 3+ bed flats/apartments. Applying the RBC pupil yield multipliers it is calculated that cumulatively the inter-projects and proposed development would generate a need for 674 (=602+72) early year places; 837 (=735+102) primary places; and 598 (=568+30) secondary places. The cumulative demand cannot be accommodated in the existing education provision (early years, primary and secondary) and therefore the cumulative schemes would have a **Major Adverse** effect on education for which mitigation is required. Effects can be mitigated via a CIL payment which can be used towards the extension of an existing, or provision of a new school(s) in the local area to be advised by Reading LEA.

6.147 Employment opportunities would be created by the cumulative schemes. Information available for the inter-projects report that between 5,041 and 8,986 operational jobs could be created by the proposed employment floorspace of the inter-projects with a further 76 jobs generated by the proposed development. However, the number of jobs created by the inter-projects is considered to provide a conservative estimate as detail on the number of operational jobs is not available for all projects. Furthermore, it is noted, for a number of the inter-projects, that the application sites are currently occupied by existing retail/employment floorspace which would be lost through development of the cumulative schemes. It is not possible to determine the net employment generation from the information available, or to calculate economic output.

6.148 The new population generated by the cumulative schemes (whether that be residential or employees) has the potential to generate local expenditure. Given the addition of up to 4,343 new homes to the area and the provision of employment floorspace, it is considered that the cumulative schemes would have a **Moderate Beneficial** effect on local expenditure at the local level.

6.149 All of the cumulative schemes provide hard and soft landscaping, public realm and open space to some degree which is considered to have a **Minor Beneficial** effect on open/play space in comparison to the existing uses on the application sites currently.

6.150 The cumulative schemes provide the potential to improve deprivation levels and whilst the schemes may be designed to reduce crime levels, details are not available from publicly accessible material. Therefore, it is considered that the cumulative schemes would have a **Negligible** effect on deprivation and crime in the local area.

7 AIR QUALITY

Introduction

7.1 This chapter of the ES considers the potential impacts and likely effects of the proposed development on air quality. The assessment includes a review the existing air quality within the study area; considers the suitability of the application site for the proposed development; and assesses the impact of the demolition and construction stage and completed development stage of the proposed development on air quality in the surrounding study area. Potential sources of emissions have been identified and assessed in the context of existing air quality and the nature and location of receptors.

7.2 The main air pollutants of concern are dust and particulate matter with an aerodynamic diameter of less than 10 µm (PM_{10}), typically generated during demolition and construction activities, and nitrogen dioxide (NO_2), PM_{10} and particulate matter with an aerodynamic diameter of less than 2.5 µm ($PM_{2.5}$), which are generated by road traffic and rail emissions.

7.3 The chapter provides a description of the methodology used in the assessment. This is followed by a description of the relevant baseline conditions at the application site and surrounding study area, and an assessment of the likely significant effects of the proposed development on air quality taking into account embedded mitigation. Additional mitigation measures are identified where appropriate to avoid, reduce or offset any significant adverse effects identified, and an overview provided of the nature and significance of residual effects. A cumulative scheme assessment has also been undertaken which considers the in-combination effects from the proposed development and other cumulative schemes.

7.4 The chapter is accompanied by the following technical appendices in ES Volume 3:

- Appendix 7.1: Consultation with the Environmental Health Officer; and
- Appendix 7.2: Air Quality Technical Appendix.

Methodology

7.5 The assessment has been informed by the following legislation, policies and published guidance:

- International Legislation including:
  - The European Air Quality Framework Directive and Daughter Directives[1, 2];
- National Legislation including:
  - Part IV of the Environment Act 1995 (as amended)[3];
  - NPPF[4];
  - PPG [5];
- Regional Policy including:
  - Reading Borough Local Plan [6];
  - RBC Air Quality Action Plan (as revised) [7];
- National guidance and industry standards, including:
  - Air Quality Strategy for England, Scotland, Wales and Northern Ireland[8], which implements the European Union's Directives and sets out the air quality objectives (AQOs) and government policy on achieving these objectives;
  - Air Quality Standards (Amendment) Regulations 2016[9] which amended the Standard Regulations 2010[10];
  - Local Air Quality Management Technical Guidance 2016 (LAQM.TG(16))[11], which provides advice as to where the national AQOs apply and support to local authorities in carrying out their duties under the Environment Act 1995[12] and subsequent regulations;
  - IAQM guidance on the Assessment of Dust from Demolition and Construction[13]; and
  - IAQM guidance on Land-Use Planning and Development Control: Planning for Air Quality[14].

7.6 Further details of the relevant guidance is included in ES Volume 3: Technical Appendix 7.2.

Consultation

7.7 At the time of undertaking the assessment, the EIA Scoping Opinion remains outstanding.

7.8 In addition to the formal EIA Scoping Process, consultation with the RBC environmental health officer (EHO) was undertaken regarding the Scoping Report and the assessment methodology. Table 7.1 summarises the consultation that was undertaken with respect to the air quality assessment.

Table 7.1: Summary of Consultation

Consultee and Form/Date of Consultation	Summary of Comments	Action Taken
RBC EHO. Consultation e-mail sent 16 December 2019 to confirm the Air Quality Assessment Methodology (Volume 3: Technical Appendix 7.1). A response was received from EHO on 19 December 2019.	Qualitative assessment of the potential impact on local air quality from demolition and construction activities to be scoped into assessment.	A construction dust assessment has been undertaken and reported in the Assessment of Effects Section.
	Potential impacts on local air quality from the proposed development associated traffic emissions to be scoped into the assessment.	The proposed methodology has been agreed and followed. An assessment of potential on- and off-site impacts from road traffic and rail emissions has been undertaken and reported in the Assessment of Effects Section.
	Potential impacts from existing road traffic and rail emissions on the	

[1] European Commission. Directive 2008/50/EC. Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.
[2] European Air Quality Directive 2004/107/EC. European Air Quality Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004 relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.
[3] Secretary of State, 1995.The Environment Act 1995 part IV Air Quality, HMSO
[4] Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework. HMSO.
[5] https://www.gov.uk/government/collections/planning-practice-guidance.
[6] Reading Borough Council, 2019. Reading Borough Local Plan.
[7] Reading Borough Council, 2009. Air Quality Action Plan.
[8] Department of the Environment, Transport and the Regions (DETR) in Partnership with the Welsh Office, Scottish Office and Department of the Environment for Northern Ireland, 2007. The Air Quality Strategy for England, Scotland, Wales, Northern Ireland. HMSO, London.
[9] Statutory Instrument, 2016. No. 1184, The Air Quality Standards (Amendment) Regulations 2016. HMSO, London.
[10] Statutory Instrument, 2010. No. 1001, The Air Quality Standards Regulations 2010. HMSO, London.
[11] Department of the Environment, Food and Rural Affairs (Defra) in partnership with the Scottish Executive, The National Assembly for Wales and the Department of the Environment for Northern Ireland, 2016. Local Air Quality Management Technical Guidance, LAQM.TG(16). HMSO, London.
[12] Environment Act 1995, Part IV.
[13] Holman et al, 2014. IAQM Guidance on the Assessment of Dust from Demolition and Construction, Institute of Air Quality Management, London.
[14] Moorcroft and Barrowcliffe. et al., 2017. Land-use Planning & Development Control: Planning for Air Quality. v1.2. Institute of Air Quality Management, London.

Table 7.1: Summary of Consultation		
Consultee and Form/Date of Consultation	**Summary of Comments**	**Action Taken**
	proposed development to be scoped into the assessment.	
	No heating plant is being proposed as part of the proposed development.	Energy Plant emissions impacts have been scoped out of the assessment.
	No off-site industrial emissions in close proximity to the proposed development identified.	No action required.
	Modelled concentrations compared against the closest local monitoring data in order to verify the model output.	The ADMS model outputs have been verified as detailed in ES Volume 3: Technical Appendix 7.2.

Assessment Scope

7.9 The assessment has been based on a series of development parameters, assumptions and commitments, as described in Chapter 2: EIA Process and Methodology, in Chapter 4: Proposed Development Description, and in Chapter 5: Demolition and Construction Environmental Management. Due to the flexibility being sought in respect of land use classes, the air quality assessment has been undertaken based on a worst-case interpretation of the minimum and maximum land use schedule presented in Chapter 4: Proposed Development Description.

7.10 Therefore, the vehicle trip generation has been calculated based on the use classes with the highest trip generation and it has been assumed that the proposed development would be for residential use as that represents the most air quality sensitive receptor. The assessment therefore provides a 'worst-case scenario' for both the existing receptors and the proposed development regardless of use.

Technical Scope

7.11 The technical scope of the assessment has considered the following:

- Demolition and construction stage activities dust emissions following the IAQM Dust Guidance, identifying appropriate construction mitigation measures based on the identified level of risk;
- Demolition and construction traffic on the main road network, transporting materials and the workforce to and from the application site;
- Operational road traffic emissions generated by residents, workers and visitors to the proposed development;
- Assessment of impacts in relation to IAQM Guidance on Planning for Air Quality for existing receptors; and
- The potential exposure of future occupants of the proposed development to poor air quality including that from railway emissions generated by rail lines passing through Reading Railway Station.

7.12 Information regarding the demolition and construction works for the proposed development, specific activities and predicted traffic movements, is presented in Chapter 5: Demolition and Construction Environmental Management.

7.13 Vehicle movements associated with access, demolition and construction would vary through the construction programme, with short periods of peak heavy-duty vehicles (HDVs) movements mainly associated with excavation works and the delivery of materials. However, when the HDV movements are averaged over a full year period (Annual Average Daily Traffic - AADT), these would be significantly lower than peak movements. The maximum annual average number of HDV movements would be associated with the demolition, piling and earthworks, with an average of 140 two-way movements per week (in and out) during the standard demolition and construction working hours. When averaged over 24 hours and 7-day period the demolition and construction HDV daily movements would be below the threshold of 25 daily movements within an Air Quality Management Area (AQMA) for an assessment to be necessary according to IAQM guidance. Further mitigation would be provided through the implementation of the CEMP. Accordingly, the effects of demolition and construction related vehicle emissions would be negligible and have not been considered further within this chapter.

Spatial Scope

7.14 The study area for the demolition and construction stage assessment is defined as up to 350 m from the application site boundary for the assessment of demolition and construction dust emissions, as per the Institute of Air Quality Management's (IAQM) Dust Guidance.

7.15 For the completed development stage assessment, the study area for human health receptors for road traffic and rail emissions is defined as roads within 250 m of the application site, existing receptors and those roads which experience a significant increase in development traffic leading to adverse effects on local air quality, as per IAQM guidance[2] and Local Air Quality Management Technical Guidance. The approximate extent of the study area is shown in Figure 7.1.

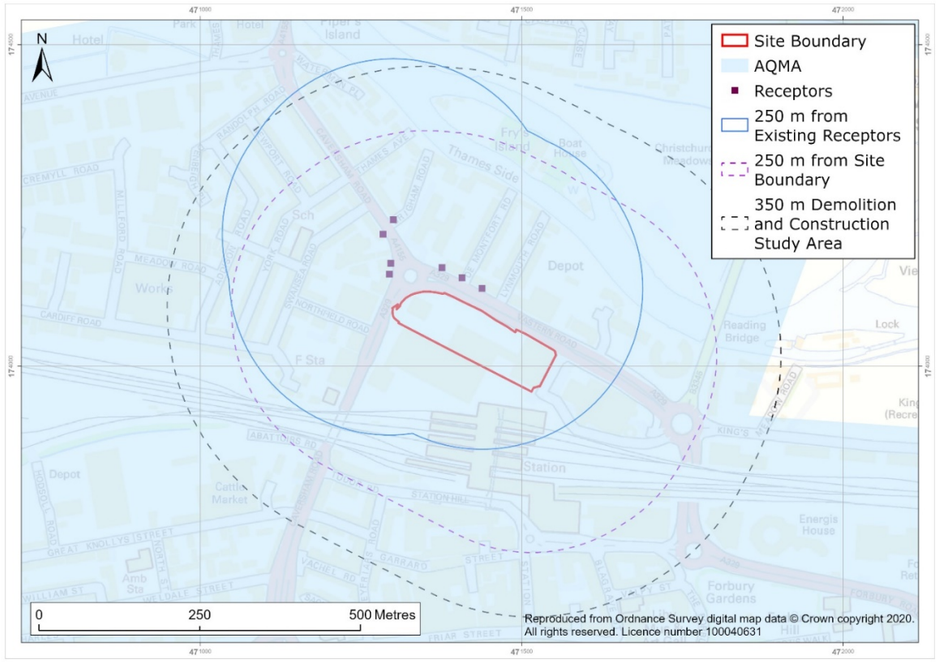


Figure 7.1: Spatial Scope

7.16 No designated ecological sites or other sensitive ecological receptors have been identified within the study area.

7.17 No existing off-site sources of industrial emissions have been identified within the study area that could have a potentially significant impact on the proposed development.

Temporal Scope

7.18 The baseline has been informed by continuous and passive air quality monitoring conducted by RBC covering up to 2018 and by traffic flow data provided by the transport consultant, Cole Easdon

Consultants, from surveys undertaken in 2019. As the change in traffic volume is considered negligible in the study area between 2018 and 2019, the baseline year has been assessed as 2018.

7.19 The anticipated year of opening for the completed development is 2025, with an earliest year of occupation in 2022. As road traffic emissions are predicted to decline with time, and to enable a more robust assessment approach, 2022 emission factors and background concentrations have been used to inform the air quality assessment. Predicted traffic flows for 2025 have been used as this represents the worst case in terms of the full extent of traffic generation from the proposed development.

7.20 In carrying out the assessment of completed development stage traffic impacts, the following temporal scope for the assessment scenarios has been assessed:

- Existing baseline 2018 (2019 traffic flows with 2018 air quality data to allow verification of the model predictions);
- Future baseline 2025 (using 2022 emission factors and background concentrations, as detailed above) + cumulative schemes;
- Future baseline 2025 + cumulative schemes + proposed development.

Baseline Characterisation Method

Desk Study

7.21 In order to establish baseline air quality at and within the vicinity of the application site, relevant monitoring data was reviewed and assessed. Data was obtained from the following sources:

- Continuous and passive air quality monitoring conducted by RBC covering up to 2018 and reported in the 2019 Air Quality Annual Status Report (ASR)[15]; and
- National pollution maps published by Defra. These cover the whole country on a 1x1 km grid[16].

Field Study

7.22 No site-specific field study was undertaken at the application site as the data obtained during the desk study was deemed to be adequate and representative of the application site conditions.

Assessment Method

Methodology

7.23 Full details of both demolition and construction and completed development stages assessment methodology, data and modelling parameters are provided in ES Volume 3: Technical Appendix 7.2.

Demolition and Construction Stage

7.24 During the demolition and construction stage, the main potential effects are dust annoyance and locally elevated concentrations of PM_{10}. The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when dust generating activities coincide with dry, windy conditions, and where sensitive receptors are located downwind of the dust source. Separation distance is also an important factor as significant dust annoyance is usually limited to within a few hundred metres of its source. This is due to the rapid decrease in concentrations with distance from the source due to dispersion.

7.25 The assessment of potential construction dust impacts follows the guidance published by the IAQM on the assessment of the impacts of construction on air quality[11]. The guidance recommends that the risk of dust emission magnitude is combined with the sensitivity of the area surrounding the site to determine the risk of dust impacts from construction and demolition activities. The risk of dust arising in sufficient quantities to cause annoyance and/or health impacts is determined using four risk categories: high, medium, low or negligible. Depending on the level of risk for each activity, appropriate mitigation is selected.

7.26 The assessment has been carried out in a number of steps:

- Step 1, the need for a construction assessment was screened, based on the proximity of receptors;
- Step 2, the risk of dust impacts was assessed taking into account the level of activity and the proximity of sensitive receptors;
- Step 3, site specific mitigation integral to/embedded within the development proposals was reviewed and supplemented where necessary; and
- Step 4, the significance of the dust effects, after applying the application site-specific mitigation, was assessed.

7.27 The guidance recommends that no assessment of the significance of effects is made without mitigation in place, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations.

Completed Development Stage

7.28 The changes to air quality due to local traffic emissions have been predicted using the ADMS Roads[17] (version 4.1.1) dispersion model. This model has been extensively validated against both field and laboratory data sets and against monitoring data in cities throughout the UK.

7.29 The model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the proportion of HDV, road characteristics (including road width and street canyon height, where applicable), and the vehicle speed. AADT flows and the proportions of HDVs, for roads within 250 m of the application site, and the extension of the modelled area, are presented in ES Volume 3: Technical Appendix 7.2.

7.30 In carrying out the assessment of operational traffic impacts, the three scenarios described in the temporal scope section above, have been assessed.

7.31 The model was run using 2018 meteorological data from Farnborough Station, which is considered to be the most representative meteorological monitoring station to the application site.

7.32 Traffic emissions were calculated using the Emission Factor Toolkit (EFT) v9, which utilises nitrogen oxides (NO_x), PM_{10} and $PM_{2.5}$ emission factors from the European Environment Agency COPERT 5 emission tool[18]. The traffic data were entered into the ADMS roads model, along with speed data to provide combined emission rates for each of the modelled road links.

7.33 Rail emissions were obtained from National Atmospheric Emissions Inventory[19] 1 km^2 resolution maps for rail subsector and directly added to the model.

7.34 The predicted concentrations of roadside NO_x were converted to roadside NO_2 using the LAQM conversion calculator available from the Defra air quality website[20].

7.35 Concentrations were predicted at several monitoring locations using 2018 monitoring data and 2019 traffic data in order to verify the modelled results.

[15] Reading Borough Council,2019. 2019 Air Quality Annual Status Report.
[16] Department of the Environment, Food and Rural Affairs (Defra),2019. 2017 Based Background Maps for NO_x, NO_2, PM_{10} and $PM_{2.5}$.
[17] https://www.cerc.co.uk/environmental-software/ADMS-Roads-model.html.
[18] Department for Environment Food and Rural Affairs. Emissions Factors Toolkit. https://laqm.defra.gov.uk/review-and-assessment/tools/emissions-factors-toolkit.htm.
[19] https://naei.beis.gov.uk/emissionsapp/
[20] Department for Environment Food and Rural Affairs. NO_x to NO_2 calculator. https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html#NOxNO2calc

7.36 To present a robust assessment and take account of uncertainties relating to future vehicle emissions, the future modelling scenarios have utilised 2022 emission factors and background levels (as earliest potential occupation year) combined with 2025 traffic data.

Assessment Criteria

7.37 The criteria used to assess if an effect is significant or not, is set out in subsequent sub-sections. This is determined by consideration of the sensitivity of the receptor, magnitude of impact, duration of the effect, geographical extent of the effect and application of professional judgement.

Receptor Sensitivity Criteria

Demolition and Construction

7.38 The sensitivity of receptors has been classified as low, medium or high, in line with the IAQM guidance criteria set out in Table 7.2.

Table 7.2: Receptor Sensitivity Criteria – Demolition and Construction Stage

Sensitivity	Criteria
Low	• The enjoyment of amenity would not reasonably be expected; or • Property would not reasonably be expected to be diminished in appearance, aesthetics or value by soiling; or • There is transient exposure, where the people or property would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. • Indicative examples include playing fields, farmland (unless commercially-sensitive horticultural), footpaths, short term car parks and roads.
Medium	• Users would expect to enjoy a reasonable level of amenity, but would not reasonably expect to enjoy the same level of amenity as in their home; • First occupants moving into residential dwellings on a large phased housing development; • The appearance, aesthetics or value of their property could be diminished by soiling; or • The people or property wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. • Indicative examples include parks and places of work.
High	• Users can reasonably expect enjoyment of a high level of amenity; or • The appearance, aesthetics or value of their property would be diminished by soiling; and • The people or property would reasonably be expected to be present continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. • Indicative examples include dwellings, museums and other culturally important collections, medium- and long-term car parks and car showrooms.

Completed Development

Human Health Air Quality Objectives

7.39 The AQOs are the concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects on human health (including sensitive sub groups) or ecosystems. In general, these are concentration limits, above which sensitive members of the public (e.g. children, the elderly and the unwell) might experience adverse health effects. Objectives are policy targets often expressed as maximum concentrations not to be exceeded either without exception or with a limited number of exceedances within a specified timescale.

7.40 For some pollutants, there is both a long-term (e.g. annual mean) objectives and a short-term (e.g. one hour mean) objectives. These periods reflect the varying impacts on health of differing exposures to pollutants. Long-term objectives are generally lower than short-term objectives owing to the chronic health effects associated with exposure to low concentrations of pollutants for longer periods of time.

7.41 The AQOs relevant for this assessment are presented in Table 7.3.

Table 7.3: Human Health Air Quality Objectives

Pollutant	Time Period	Objective
Nitrogen Dioxide (NO_2)	Annual Mean	40 µg/m^3
	1-hour mean	200 µg/m^3 not to be exceeded more than 18 times a year
Fine Particulate Matter (PM_{10})	Annual mean	40 µg/m^3
	24-hour mean	50 µg/m^3 not to be exceeded more than 35 times a year
Fine Particulate Matter ($PM_{2.5}$)	Annual Mean	25 µg/m^3 (to be achieved by 2020)

7.42 The sensitivity of existing receptors surrounding the application site and the roads affected by the proposed development and proposed receptors introduced by the proposed development is dictated by the land use at that location. The relevance of the land use to specific air quality objectives is specified by LAQM.TG (16)[21]. No ecological receptors have been identified in close proximity to the application site which would be impacted from air quality during the operational stage. The sensitivity of receptors has been classified by which objective applies at that location, as set out in Table 7.4.

Table 7.4: Receptor Sensitivity Criteria – Completed Development Stage

Sensitivity	Criteria
Medium - where exposure would be short term and the 1 hour mean objective applies	All locations where the annual mean apply and: • hotels and gardens of residential properties; • kerbside sites (for example, pavements of busy shopping streets); • those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more; and • any outdoor locations where members of the public might reasonably expect to spend one hour or longer.
High - where exposure may be longer and the annual mean objective applies	• All locations where members of the public might be regularly exposed to pollutants for extended periods. Building façades of residential properties, schools, hospitals, care homes etc.

Impact Magnitude Criteria

Demolition and Construction Stage

7.43 The criteria provided in the guidance produced by the IAQM was used to assess the potential risk of impacts to air quality from demolition and construction activity in the absence of mitigation during the demolition and construction stage of the proposed development as outlined in ES Volume 3: Technical Appendix 7.2. The methodology combines the magnitude of dust emissions together with the sensitivity of the receptor to identify low, medium or high risk of dust impacts in the absence of mitigation for the four stages of construction; demolition, earthworks, construction and trackout (the movement of dust and dirt from a construction/demolition site onto the public road network).

[21] Department of the Environment, Food and Rural Affairs in partnership with the Scottish Executive, The National Assembly for Wales and the Department of the Environment for Northern Ireland, 2016. Local Air Quality Management Technical Guidance, LAQM.TG(16). HMSO, London.

Completed Development Stage

7.44 The assessment of the proposed development impacts on local air quality has used the approach developed by the IAQM and Environmental Protection UK (EPUK) guidance, which considers the change in air quality as a result of a proposed development on existing receptors. The guidance has produced a matrix which is to be used to calculate the impacts at individual receptor locations, as shown in Table 7.5. It takes into account both the magnitude of change at each receptor and the resulting overall concentration. The absolute concentration of the receptor is also taken into consideration i.e. if the receptor is close to or above the UK air quality objective level, marginal changes in magnitude may be determined to be moderate, however if the receptor is less than 75 % of the UK air quality objective level marginal changes in magnitude may be determined to be negligible.

Table 7.5: EPUK/IAQM Impact Descriptors for Individual High Sensitivity Receptors

Long-term average concentration at receptor with development	**Percentage (%) Change in Concentration Relative to Annual Mean Air Quality Objective (AQO)**			
	<1	**2 – 5**	**6 – 10**	**>10**
75 % or less of AQO	Negligible	Negligible	Slight	Moderate
76 – 94 % of AQO	Negligible	Slight	Moderate	Moderate
95 – 102 % of AQO	Slight	Moderate	Moderate	Substantial
103 – 109 % of AQO	Moderate	Moderate	Substantial	Substantial
110 % of more of AQO	Moderate	Substantial	Substantial	Substantial

Notes:
Where concentrations increase, the impact is described as adverse, and beneficial where it decreases.
*% change rounded to nearest whole number. Where the % change is less than 0.5% the impact will be Negligible.

7.45 Similar criteria have not been provided for medium sensitivity receptors where the short term air quality objectives would apply i.e. amenity and commercial locations. In urban areas, particularly where residential receptors are widespread, it is generally accepted that the annual mean objectives applicable at high sensitivity receptors are the most reliable for evaluating the severity of impacts.

7.46 Furthermore, it is difficult to predict impacts on short term objectives from traffic impacts as the air quality model (as set up for the assessment) does not provide reliable prediction of one-hour mean NO_2 concentrations. However, research has concluded that exceedances of the one-hour mean objective are unlikely to occur where annual mean concentrations do not exceed 60 µg/m^3 [22,23]. This relationship has been used to assess whether exceedances of the hourly mean objective are likely. Similarly, PM_{10} annual mean concentrations below 32 µg/m^3 are used to screen the 24 hour PM_{10} mean objective.

Significance Criteria

Demolition and Construction Stage

7.47 Using the IAQM assessment methodology to identify the appropriate level of mitigation, and on the assumption that the identified mitigation measures are applied and are commensurate with the risk of potential dust impacts, the IAQM guidance indicates that that the potential for residual effects to arise during the demolition and construction stage would be at worst 'slight adverse' and would be temporary in nature.

7.48 Residual effects during the demolition and construction stage would either be short term i.e. less than a year in duration.

Completed Development Stage

7.49 The IAQM guidance states that the overall significance of the effect on air quality should be based on professional judgement, taking into account the predicted impacts at the modelled receptor locations and "*…will need to take into account such factors as:*

- *The existing and future air quality in the absence of the development;*
- *The extent of current and future population exposure to the impacts; and*
- *The influence and validity of any assumptions adopted when undertaking the prediction of impacts."*

7.50 The overall significance of the effect on local air quality, however, is a binary judgement, i.e. the overall effect is either significant or it is not significant, and there are no degrees of significance of the overall effect. Moderate or substantial impacts may be considered to be a significant environmental effect, whereas negligible or slight impacts would not be considered significant.

7.51 In the case of air quality, completed development effects are expected to be long term i.e. to persist for more than five to ten years.

Assumptions and Limitations

7.52 There are many components that contribute to the uncertainty in predicted concentrations. Although the model has been extensively validated against field data sets and their use has gained wide acceptance throughout the UK, no computer-based model is able to totally replicate actual conditions as it is required to simplify real-world conditions into a series of algorithms. The model used in this assessment also is dependent upon several sources of data which will have inherent uncertainties associated with them. The model uncertainty has been estimated using the root mean square error and is presented in ES Volume 3: Technical Appendix 7.2.

7.53 The assessment has relied on data provided by the RBC and Defra to characterise baseline conditions on the application site. It has been assumed that these data have been reported correctly.

7.54 The assessment of the air quality effects is based on a worst-case interpretation of the development parameters. The proposed development traffic impacts have been assessed using predicted traffic flows provided by the Applicant and its Transport Consultant, Cole Easton Consultants.

7.55 The traffic modelling has used 2018 background data, monitoring data, meteorological data and 2019 traffic data to verify the model. 2018 was the latest year with full monitoring results available.

7.56 The modelling has assumed a level site and has not taken terrain impacts into account.

7.57 The completed development modelling has been based on 2022 emission factors and background concentrations, whilst utilising traffic flows for 2025. This is considered to provide an appropriately conservative assessment taking into account the uncertainties regarding future vehicle emission factors. Traffic emissions were calculated using the latest Emission Factor Toolkit (EFT) v9, which utilises emission factors from the European Environment Agency COPERT 5 emission tool.

Baseline Conditions

Existing Baseline

Local Air Quality Monitoring

[22] A, Cook, 2008. Analysis of the relationship between annual mean nitrogen dioxide concentration and exceedances of the one-hour mean.

[23] Marner, D Laxen and B,2003. Analysis of the relationship between one-hour and annual mean nitrogen dioxide at UK roadside and kerbside monitoring sites

7.58 RBC has declared one AQMA covering Reading City Centre and major radial routes into Reading due to exceedances of the NO_2 annual mean objective. The application site is located within Reading AQMA.

7.59 RBC operate both continuous automatic monitoring and passive diffusion tube monitoring of air quality at a number of locations within the borough. A summary of the closest and most representative monitoring locations is presented in Table 7.6 to Table 7.8 and the location shown in Figure 7.2.

Table 7.6: Measured NO_2 Concentrations (µg/m³)

Site ID	Location	Type	Distance to Application Site (m)	Annual mean (µg/m³)				
				2014	2015	2016	2017	2018
Automatic								
RD1	Caversham Road	R	360	41	38	39	37	40
Diffusion Tubes								
DT51	108 Caversham Road	R	126	48	41	41	40	42
DT52	31a Vastern Road	R	33	40	36	37	38	33
DT53	131 Caversham Road	R	133	47	40	36	36	35
Objective				40				

Notes:
Exceedances highlighted in **bold.**
R: Roadside.

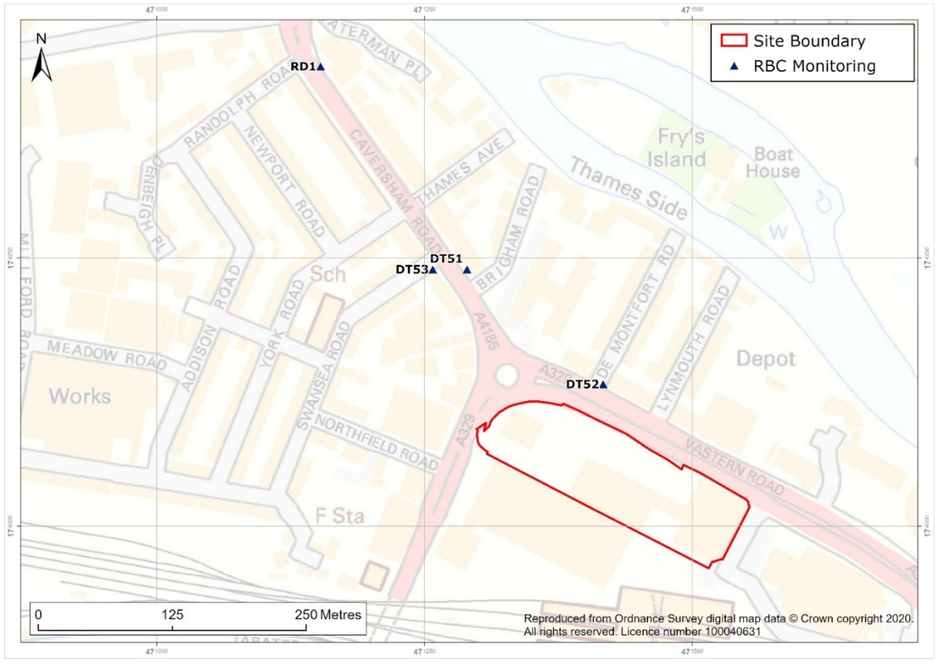


Figure 7.2: Air Quality Monitoring Locations

7.60 The results of NO_2 hourly mean (short-term) measured exceedances are presented in Table 7.7.

Table 7.7: Measured Exceedances of Hourly Mean NO_2 Objective

Site ID	Number of Hours >200 (µg/m³)				
	2014	2015	2016	2017	2018
RD1	0	1	0	0	7
Objective	**18 (200)**				

7.61 The results of the PM_{10} monitoring at RD1 monitoring site are shown in Table 7.8. There is no $PM_{2.5}$ monitoring undertaken in close proximity to the application site.

Table 7.8: Measured PM_{10} concentrations

Site ID	2014	2015	2016	2017	2018
Annual mean (µg/m³)					
RD1	33	28	20	23	24
Objective	40				
Number of 24-hours exceeding 50 (µg/m³)					
RD1	31(51)	8(41)	5	7	3
Objective	35				

Notes:
If the period of valid data is less than 85 %, the 90.4th percentile of 24-hour means is provided in brackets.

Assessment of Monitoring Data

7.62 Measured NO_2 concentrations at the closest monitoring site to the application site, DT52 Vastern Road, have been below the objectives between 2015-2018.

7.63 Measured NO_2 concentrations at the automatic site RD1 Caversham Road have been above or within 10 % of the annual mean objective for the past five years. No exceedances of the 1-hour mean objective have been reported in the past five years. NO_2 concentrations at DT51 Caversham Road have been above the objective for the past five years, while at DT53 (across the road) concentrations have been below the objective between 2016-2018. The variation in measured concentrations along Caversham Road is likely to be due to the prevailing wind direction and the canyon effect created by the building arrangements, which creates recirculation regions and limits pollutant dispersion.

7.64 Measured PM_{10} concentrations have been well below the annual and 24 hour mean objectives.

7.65 There is no clear trend in concentrations over time for both NO_2 and PM_{10} concentrations. However, for all monitoring sites, lower annual mean concentrations were recorded in 2018 compared with those recorded in 2014.

7.66 NO_2 concentrations at the application site would be expected to be similar to measured concentrations at DT52, i.e. the application site is likely to meet the relevant air quality objectives. Measured concentrations along Caversham Road are expected to be higher than the anticipated concentrations at the application site and measured concentrations along Vastern Road due to higher traffic flows and building configurations. Some variation in NO_2, PM_{10} and $PM_{2.5}$ concentrations would be expected across the application site, with the highest concentrations close to the road links due to the emissions from road traffic.

Background Maps

7.67 Background concentrations are those levels that would be observed away from specific sources such as roads and industry. Defra provides modelled predictions of background concentrations of air pollutants over the whole of the UK with a grid resolution of 1 km^2. Table 7.9 details the NO_2, PM_{10} and $PM_{2.5}$ background levels at the application site for 2018.

7.68 Mapped background concentrations were calibrated against background concentrations measured at the Reading New Town Automatic Urban and Rural (AURN)[24] monitoring site (see ES Volume 3: Technical Appendix 7.2 for more details).

7.69 The background concentrations are all well below the relevant objectives.

Table 7.9: DEFRA 2018 Background Mapping (µg/m^3)

Year	Grid Reference (x, y)	NO_2	PM_{10}	$PM_{2.5}$
2018	471500, 174500[a]	25.8	13.1	7.1
	471500, 173500[b]	30.7	12.6	6.7
Objective		40	40	25

Notes:
a: Monitoring sites, existing receptors and application site (excluding b);
b: south-west corner of the application site.

Future Baseline

7.70 Despite the Department of Transport[25] estimated traffic growth on the transport network between 2019-2025 (without the proposed development in place), air quality at background and roadside locations is expected to gradually improve in future years due to the renewal of the vehicle fleet with lower emission factors. National policies, such as the intention to ban new combustion engine private vehicle sales by 2040, would hasten and enforce this process.

7.71 As per the Temporal Scope (paragraph 7.18), construction of the first plot is expected to be to be completed in 2022. Based on the above, the future baseline air quality at this date in the absence of the proposed development would be expected to be broadly similar or slightly improved when compared with the existing situation.

7.72 Table 7.10 presents details the NO_2, PM_{10} and $PM_{2.5}$ background levels at the application site for 2022. The background concentrations are all well below the relevant objectives and confirm a predicted decrease in background concentrations between 2018 and 2022.

Table 7.10: DEFRA 2022 Background Mapping (µg/m^3)

Year	Grid Reference (x, y)	NO_2	PM_{10}	$PM_{2.5}$
2022	471500, 174500[a]	22.7	12.5	6.8
	471500, 173500[b]	26.7	12.0	6.3
Objective		40	40	25

Notes:
a: Monitoring sites, existing receptors and application site (excluding b);
b: south-west corner of the application site.

Existing Sensitive Receptors

7.73 The application site is located in a populated area, with numerous sensitive receptors located in the immediate vicinity of the application site. Sensitive receptors were chosen to reflect places where members of the public would receive relevant exposure to annual mean and hourly pollutant concentrations from vehicle emissions. When identifying these receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of several road links. The receptors identified as being sensitive to the proposed development and which have been 'scoped-in' to the assessment are summarised Table 7.11 and displayed on Figure 7.3. Receptor locations were modelled at a height of 1.5 m representing exposure at ground floor level.

Table 7.11: Summary of Sensitive Receptors

Receptor ID	Location	X (m)	Y(m)	Sensitivity
R1	106 Caversham Road	471300	174228	High (residential)
R2	119 Caversham Road	471284	174205	
R3	Flat Above 99-113 Caversham Road	471296	174160	
R4	Flat above 97-111 Caversham Road	471294	174143	
R5	17 Vastern Road	471376	174154	
R6	31-51 Vastern Road	471438	174121	
R7	29 Vastern Road	471407	174137	

[25] Department of Transport (2019). Trip End Model Presentation Program (TEMPro).

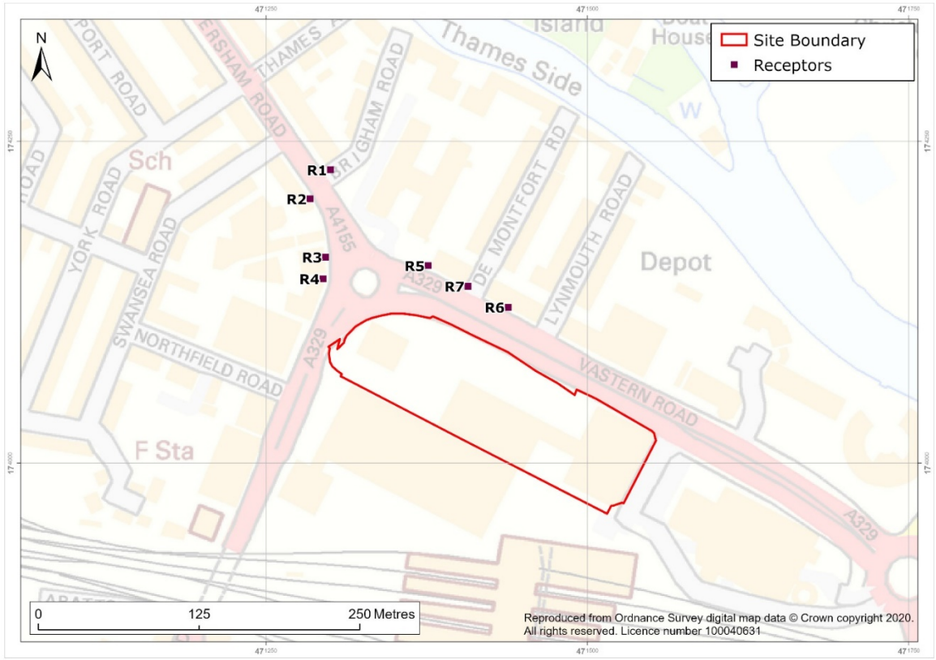


Figure 7.3 Air Quality Receptor Locations

Future Sensitive Receptors

7.74 The proposed development would be sequenced across the application site. Therefore it is likely that Building A could be occupied in advance of the completion of Buildings B, C and D. Were this to occur, Buildings B and C would be at an advanced stage of construction/ fit out such that significant dust emissions would be unlikely. These buildings would also by virtue of their massing, provide protection and screening from on-going works at Building D, which would be delivered in the final phase. Likewise, occupants of Buildings B and C would not be significantly affected by Building D works as these would be at an advanced stage, limiting the potential for significant dust effects. Accordingly, on-site residential receptors have not been considered within the demolition and construction assessment.

7.75 To assess the application site suitability for the proposed development, concentrations were predicted for a regular grid resolution of 10 x 10 m across the study area in order to present a contour of the annual mean concentrations geographically on a map (shown in Figure 7.4). The contours were modelled at a height of 1.5 m and 4.5 m representing exposure at ground floor and first floor level.

Assessment of Effects

Demolition and Construction Effects

7.76 In the absence of mitigation, there are three potential significant sources of emissions that could affect air quality during demolition and construction stage:

- coarse and fine dust from construction activities including:
  - demolition of existing structures;
  - earthworks and site preparation;
  - construction of building structures, including foundations, which may include piling;
  - materials handling such as storage of materials in stockpiles and spillage;
  - construction of on and off-site highway improvements; and
  - hard and soft landscaping and open space. demolition, excavation, earthmoving, materials storage and movement of construction vehicles.
- exhaust emissions from demolition and construction related traffic; and
- construction plant, both mobile and stationary (e.g. cranes and generators), which emit a mixture of exhaust gases.

7.77 There are numerous off-site residential properties within 350 m of the application site and within 50 m of the routes proposed to be used by construction traffic, thus using the IAQM guidance, a detailed assessment of demolition and construction dust impacts is required.

7.78 Dust impacts would be greatest in dry weather following long periods without rain and with the wind blowing towards sensitive receptors. Depending on wind speed and turbulence it is likely that the majority of dust will be deposited within 100 m of the source. Meteorological data from Farnborough Station (Volume 3 Technical Appendix 7.2), suggests that prevailing winds are typically south-westerly.

7.79 Using the evaluation criteria within the IAQM's Guidance, the potential dust emission magnitude has been identified for each stage of the proposed development as shown in Table 7.12 based on information presented in ES Chapter 5: Demolition and Construction Environmental Management.

Table 7.12: Dust Emission Impact Magnitude for Proposed Development Works

Activity	Dust Emission Magnitude	Justification
Demolition	Small	Demolition works are anticipated to be delivered in four phases with total building volume per phase expected to be less than 20,000 m^3.
Earthworks	Large	Total site area greater than 10,000 m^2.
Construction	Large	The development would have a total estimated construction volume of over 100,000 m^3.
Trackout	Medium	It is assumed that maximum HDV movements over the course of the development would be between 10-50 HDV outward movements per day. This range is typical for a development of this size. Unpaved road length would be between 50-100 m.

7.80 The closest sensitive receptors to construction activity within 350 m of the application site would be residential properties along Vastern Road and Caversham Road. The residential properties are considered to be a high sensitivity receptor.

7.81 The next stage of the process is to define the sensitivity of the assessment area to dust soiling and human health impacts. This process combines the sensitivity of the receptor with the distance from the source to determine the overall sensitivity. The sensitivity of the area to dust impacts (taking into account distance to construction activity) is provided in Table 7.13.

Table 7.13: Sensitivity of Study Area to Dust Impacts

Sensitivity to Dust Soiling	Sensitivity to Human Health Impacts
Medium: between 10 - 100 existing residential receptors located within 50 m of the application site; partial operating retail park during phased demolition works; and first occupants within the application site overlapping with demolition and construction phases.	Low: 10 - 100 residential properties within 20 m of the site boundary and its trackout routes. PM_{10} concentrations from local roadside monitoring was 24 µg/m^3 in 2018 (RD1, see Table 7.8). However, concentrations at the application site are expected to be lower at the time phase 1 demolition begins and during construction (Q2 of 2021 to 2022; see Figure 7.4).

Table 7.13: Sensitivity of Study Area to Dust Impacts	

7.82 The dust emission magnitude determined in Table 7.12 has been combined with the sensitivity assessment in Table 7.13 to define the risk of impacts for each stage of the proposed development works in the absence of mitigation, as shown in Table 7.14.

Table 7.14: Risk of Dust Impacts in the Absence of Mitigation at Proposed Development

Sensitivity of Study Area	Dust Emission Magnitude for Each Stage			
	Demolition (Small)	Earthworks (Large)	Construction (Large)	Trackout (Medium)
Dust Soiling (Medium)	Low Risk	Medium Risk	Medium Risk	Low Risk
Human Health (Low)	Negligible	Low Risk	Low Risk	Low Risk

7.83 Overall, without mitigation, the highest risk of dust soiling impacts is likely to be medium for earthworks and construction activities. The risk of human health effects from PM_{10} is likely to be low for earthworks, construction and trackout activities. In accordance with the IAQM guidance, mitigation measures associated with the highest level of risk should be applied, i.e. a medium-risk site.

Embedded Mitigation and Standard Good Practice

7.84 The control of dust and construction traffic emissions from a construction site relies upon good site management and mitigation techniques to reduce emissions of dust and limit dispersion. A summary of the mitigation measures recommended in the IAQM guidance to reduce impacts from high risk sites is provided in Table 7.15 and in Chapter 5: Demolition and Construction Management (Table 5.7), which also includes mitigation measures to minimise impacts from HDV traffic and non-road mobile machinery (NRMM) associated with the construction works on the application site. The mitigation measures for both direct impacts and those from traffic would be detailed within the application site's CEMP, which would be secured by means of an appropriately worded planning condition.

Table 7.15: Recommended Dust Mitigation Measures for Medium Risk Sites

Phase	Mitigation Measure
Communications	• Develop and implement a stakeholder communications plan. • Display the name and contact details of persons accountable on the site boundary. • Display the head or regional office information on the site boundary.
Management	• Develop and implement a dust management plan. • Record all dust and air quality complaints, identify causes and take measures to reduce emissions. • Record exceptional incidents and action taken to resolve the situation. • Carry out regular site inspections to monitor compliance with the dust management plan and record results. • Increase site inspection frequency during prolonged dry or windy conditions and when activities with high dust potential are being undertaken. • Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible. • Erect solid screens or barriers around dusty activities or the site boundary at least as high as any stockpile on site.
	• Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period. • Avoid site run off of water or mud. • Keep site fencing, barriers and scaffolding clean using wet methods. • Remove potentially dusty materials from site as soon as possible. • Cover, seed or fence stockpiles to prevent wind whipping. • Ensure all vehicles switch off engines when stationary. • Avoid the use of diesel or petrol powered generators where possible. • Produce a Construction Logistics Plan to manage the delivery of goods and materials. • Only use cutting, grinding and sawing equipment with dust suppression equipment. • Ensure an adequate supply of water on site for dust suppressant. • Use enclosed chutes and conveyors and covered skips. • Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use water sprays on such equipment where appropriate. • Ensure equipment is readily available on site to clean up spillages of dry materials. • No on-site bonfires and burning of waste materials on site.
Demolition	• Incorporate soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust). • Ensure water suppression is used during demolition. • Avoid explosive blasting, using appropriate manual and mechanical alternatives. • Bag and remove any biological debris or damp down such material before demolition.
Earthworks	• Re-vegetate earthworks and exposed areas /soil stockpiles to stabilise surfaces as soon as practicable. • Only remove the cover in small areas during work and not all at once.
Construction	• Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process. • Ensure bulk cement and other fine powder materials are delivered in enclosed tankers and stored silos with suitable emissions control systems.
Trackout	• Use water assisted dust sweepers on the site access and local roads. • Avoid dry sweeping of large areas. • Ensure vehicles entering and leaving the site are covered to prevent escape of materials. • Record inspection of on-site haul routes and any subsequent action, repairing as soon as reasonably practicable. • Install hard surfaced haul routes which are regularly damped down. • Install a wheel wash with a hard-surfaced road to the site exit where site layout permits. • The site access gate to be located at least 10 m from receptors where possible.

Significance of Demolition and Construction Stage Effects

7.85 The IAQM guidance recommends that no assessment of the significance of demolition and construction stage effects is made without mitigation in place. With the implementation of the CEMP and Chapter 5: Demolition and Construction Management measures, the construction and demolition dust and vehicle emissions effects in the area are considered to be temporary and not significant.

Completed Development Effects

Embedded Mitigation

7.86 As part of the Applicant's commitment to ensure an appropriate development response, the Applicant and the design team have developed a number of measures within the development proposals to ensure that the potential for adverse effects are avoided.

7.87 An Energy Statement is submitted accompanying the application, demonstrating how the proposed development would reduce the energy consumption, and related emissions, incorporating energy efficiency measures. The proposed development's heating system is a water to water based heat pump system and no combustion plant being proposed as part of the development.

7.88 The proposed development would provide 10 % of the application site area for open space ensuring that the landscape strategy delivers a high quality public realm. The landscape masterplan would provide green infrastructure which would assist in reducing particulate concentrations.

7.89 The proposed development has been set-back approximately 6 m from Caversham and Vastern Road kerbside, which is the main source of air pollution for the potential future residents.

Existing Sensitive Receptors

7.90 Emissions from road traffic are the major contributor to poor air quality in urban areas within the UK and contribute to exceedance of the AQOs in close proximity to the application site.

7.91 The results of the dispersion modelling at existing receptors as a result of the completed proposed development are shown in Table 7.16 to Table 7.18.

Table 7.16: Predicted Annual Mean NO_2 at Existing Receptors (µg/m³)

Receptor	Future Base + Cumulative	Future Base + Cumulative + Proposed Development	Development Traffic Contribution	% Change in concentration relative to Assessment Level (AQAL)	Impact Descriptor
R1	32.3	32.1	-0.2	-0.5%	Negligible
R2	33.2	33.0	-0.3	-0.6%	Negligible
R3	31.1	30.8	-0.3	-0.8%	Negligible
R4	32.1	31.7	-0.4	-0.9%	Negligible
R5	31.7	32.7	1.0	2.5%	Slight Adverse
R6	30.5	31.6	1.1	2.7%	Slight Adverse
R7	31.0	31.8	0.8	1.9%	Slight Adverse
Objective	**40**		-		

Table 7.17: Predicted Annual Mean PM_{10} at Existing Receptors (µg/m³)

Receptor	Future Base + Cumulative	Future Base + Cumulative + Proposed Development	Development Traffic Contribution	% Change in concentration relative to Assessment Level (AQAL)	Impact Descriptor
R1	14.4	14.4	0.0	-0.1%	Negligible

Table 7.17: Predicted Annual Mean PM_{10} at Existing Receptors (µg/m³)

Receptor	Future Base + Cumulative	Future Base + Cumulative + Proposed Development	Development Traffic Contribution	% Change in concentration relative to Assessment Level (AQAL)	Impact Descriptor
R2	14.6	14.5	-0.1	-0.1%	Negligible
R3	14.2	14.1	-0.1	-0.2%	Negligible
R4	14.3	14.3	-0.1	-0.2%	Negligible
R5	14.3	14.4	0.2	0.5%	Negligible
R6	14.0	14.2	0.2	0.5%	Negligible
R7	14.1	14.3	0.1	0.3%	Negligible
Objective	**40**		-		

Table 7.18: Predicted Annual Mean $PM_{2.5}$ at Existing Receptors (µg/m³)

Receptor	Future Base + Cumulative	Future Base + Cumulative + Proposed Development	Development Traffic Contribution	% Change in concentration relative to Assessment Level (AQAL)	Impact Descriptor
R1	7.7	7.7	-0.03	-0.1%	Negligible
R2	7.8	7.8	-0.03	-0.1%	Negligible
R3	7.5	7.5	-0.04	-0.2%	Negligible
R4	7.6	7.6	-0.04	-0.2%	Negligible
R5	7.6	7.7	0.1	0.4%	Negligible
R6	7.5	7.6	0.1	0.5%	Negligible
R7	7.5	7.6	0.1	0.3%	Negligible
Objective	**25**		-		

7.92 The predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations in 2025 without and with the proposed development in place are below the relevant objectives at all assessed existing receptor locations.

7.93 The changes in annual mean NO_2 range from a maximum reduction of approximately 0.9 % along Caversham Road (receptor R4) to a maximum increase of approximately 2.7 % along Vastern Road (receptor R6). The changes in annual mean PM_{10} and $PM_{2.5}$ would be ±1 % for all receptors.

7.94 The proposed development would replace the current existing retail park triggering a net reduction of vehicle flows on the road network surrounding the proposed development and causing a pollutant concentrations reduction along Caversham Road. The proposed development massing and height may create a localised canyon like effect at Vastern Road which would affect pollutant dispersion and is predicted to cause a pollutant concentration increase at the assessed receptors along Vastern Road.

7.95 The predicted annual mean NO_2 concentrations for all receptors are predicted to be well below 60 µg/m³. This indicates that the hourly mean objective is unlikely to be exceeded at outdoor locations of these receptors where the hourly mean would apply. None of the predicted annual mean PM_{10} concentrations exceed 32 µg/m³ and therefore the 24-hour mean PM_{10} objective is not predicted to be exceeded.

7.96 The impact on annual mean NO_2 concentrations is described as **Slight Adverse** at receptors along Vastern Road (R5 to R7), as outlined in Table 7.5. The impact on annual mean NO_2 concentrations is described as **Negligible** at receptors along Caversham Road (R1 to R4), as outlined in Table 7.5, with an overall improvement in air quality along this road. Overall, considering the conservative nature of the assessment, combining 2022 emission factors and backgrounds with 2025 traffic data, and the IAQM criteria for assessing significance, the air quality effects of the proposed development on existing receptors is considered to be permanent and **Not Significant**.

Proposed Development Future Receptors

7.97 Existing (or projected) air quality could impact the occupants of the proposed development, through the introduction of new sensitive receptors into an area of poor air quality.

7.98 The suitability of the application site for the proposed development and the need for mitigation has been assessed against the annual mean NO_2 objective of 40 µg/m^3 as this is the objective most likely to be breached. Figure 7.4 shows the annual mean NO_2 contour for 40 µg/m^3 and 36 µg/m^3 (within 10 % of the objective) for the completed development modelled at 1.5 m height to represent ground floor exposure. The 40 µg/m^3 contour is limited to the road and only intersects the application site boundary on the western site access on Caversham Road, where there would be no residential receptors. The 36 µg/m^3 contour intersects the application site boundary and the façade of the plots along Vastern Road.

7.99 The application site is compliant with the PM_{10} and $PM_{2.5}$ AQOs and therefore these have not been shown.

7.100 The predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations at the application site with proposed development in place are below the relevant objectives at all floor levels. The application site is suitable for the proposed development without the need for mitigation.

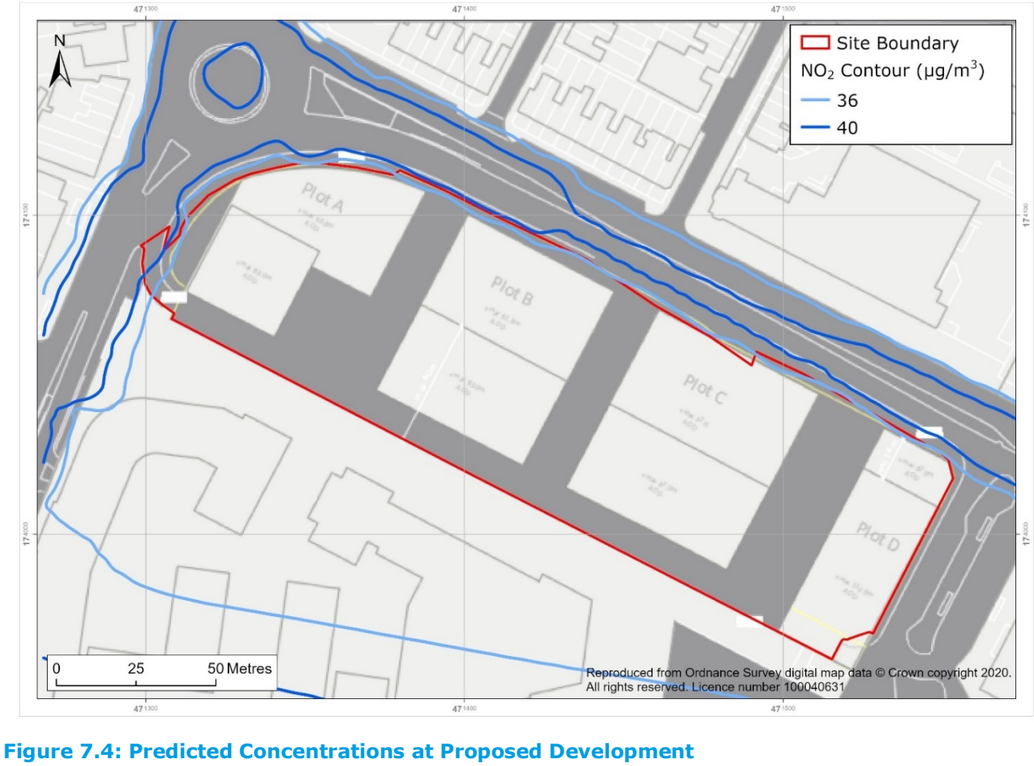


Figure 7.4: Predicted Concentrations at Proposed Development

Assessment of Residual Effects

Additional Mitigation

7.101 No additional mitigation is required.

Enhancement Measures

7.102 No enhancement measures are proposed in respect of air quality.

Demolition and Construction Residual Effects

7.103 With appropriate mitigation in place the residual effect of demolition and construction effects remain as reported in the assessment of effects section; Negligible and not significant.

Completed Development Residual Effects

7.104 At existing receptors the proposed development results in a **Slight Adverse** effect on air quality which is direct and permanent, but which is overall considered to be not significant.

7.105 Air quality objectives are expected to be met at on-site sensitive receptors during operation of the proposed development and therefore result in a direct and permanent negligible effect on air quality which is not significant.

Summary of Residual Effects

7.106 The residual air quality effects are summarised in Table 7.19.

Table 7.19: Summary of Residual Air Quality Effects

Receptor	Residual Effect	Additional Mitigation	Nature of Residual Effect*					
			Scale of Effect **	+ -	D I	P T	R IR	St Mt Lt
Demolition and Construction								
Existing Off-site Human Health and Amenity	Dust Soiling and PM_{10} due to demolition and construction works	None required	Negligible	+/-	D	T	R	Mt
Existing Off-site Human Health	NO_2, PM_{10} and $PM_{2.5}$ due to vehicle emissions	None required	Negligible	+/-	D	T	R	Mt
Completed Development								
Existing Off-site Human Health	NO_2, PM_{10} and $PM_{2.5}$ effects due to vehicle emissions	None required	Slight Adverse	-	D	P	IR	Lt
Future On-site Human Health and Amenity	NO_2, PM_{10} and $PM_{2.5}$ effects due to local air quality	None required	Negligible	+/-	D	P	IR	Lt

Notes:
* - = Adverse/ + = Beneficial/ +/- Neutral; D = Direct/ I = Indirect; P = Permanent/ T = Temporary; R=Reversible/ IR= Irreversible; St- Short term/ Mt –Medium term/ Lt –Long term.
**Negligible/Minor/Moderate/Major

7.107 None of the reported residual air quality effects would be significant.

Cumulative Effects

7.108 A review of potential cumulative schemes has been undertaken with reference to criteria listed in Chapter 2: EIA Process and Methodology. Table 7.20 provides a summary of the likely cumulative effects resulting from the proposed development and the cumulative developments.

7.109 Potential cumulative demolition and construction effects could occur should construction of cumulative schemes occur at the same time as the proposed development. Demolition and construction stages of approved cumulative schemes within 350 m of the proposed development are not expected to overlap with the demolition and construction stage of the proposed development.

7.110 Moreover, significant cumulative effects are unlikely to occur as each scheme is anticipated to employ similar dust mitigation techniques such that the individual construction stage effects are not significant, alone or in combination.

7.111 The future year traffic data included in the air quality model has taken into account future predicted traffic growth, as well as cumulative schemes in the area. The assessment has therefore predicted the cumulative concentrations arising from cumulative schemes in the area in 2025. No significant effects on air quality are anticipated as a result of the operation of the proposed development in combination with other cumulative schemes.

Table 7.20: Inter-Project Cumulative Effects

Cumulative Development	Demolition and Construction		Operation / Completed Development	
	Cumulative Effects Likely?	Reason	Cumulative Effects Likely?	Reason
Approved Projects (including Resolution to Approve)				
Former BMW Site – Thames Quarter	No.	No overlapping demolition and construction stages expected. Scheme anticipated to employ similar dust mitigation techniques as the proposed development.	No	Cumulative concentrations predicted and considered not significant.
Station Hill	No.	No overlapping demolition and construction stages expected. Scheme anticipated to employ dust mitigation techniques as the proposed development.	No	Cumulative concentrations predicted and considered not significant.
Kenavon Drive; Land between Weldale Street and Chatham Street, Reading; and 52 to 55 Friar Street and 12 Greyfriars Road, Reading RG1 1DX	No.	Considerable distance between the proposed development and the cumulative schemes (over 350 m)	No	Cumulative concentrations predicted and considered not significant.
29 Station Road Reading, RG1 1LG	No.	No overlapping demolition and construction stages expected. Scheme anticipated to employ dust mitigation techniques as the proposed development.	No	Cumulative concentrations predicted and considered not significant.
Reasonably Foreseeable Schemes				
Network Rail Thames Valley Area site office/ Former Royal Mail site	Unknown	The timeframes are unknown and there is potential for demolition and construction phases to overlap.	No	Proposed residential scheme with minimal traffic expected.

Table 7.20: Inter-Project Cumulative Effects

Cumulative Development	Demolition and Construction		Operation / Completed Development	
	Cumulative Effects Likely?	Reason	Cumulative Effects Likely?	Reason
		Nevertheless, the scheme is anticipated to employ dust mitigation techniques similar to the proposed development and cumulative effects are unlikely.		
Former Scottish and Southern Energy site	Unknown	The application has not yet been submitted. The timeframes are unknown and there is potential for demolition and construction phases to overlap. Nevertheless, the scheme is anticipated to employ dust mitigation techniques similar to the proposed development and cumulative effects are unlikely.	Unknown	The application has not yet been submitted.
Broad Street Mall Broad Street Reading, RG1 7QG	No	Considerable distance between the proposed development and the cumulative schemes (over 350 m)	No	Cumulative concentrations predicted and considered not significant.

Technical Appendix 9.1: Wind

Wind Microclimate
Technical Appendix 9.1

Reading Station Park

Presented to Ramboll

Issue Date: 13/02/2020

Document No: RMB 201 Wind Microclimate Technical Appendix 9.1

Xi Engineering Consultants, CodeBase, Argyle House, 3 Lady Lawson Street, Edinburgh, EH3 9DR, United Kingdom
T +44 (0)131 290 2250 **E** hello@xiengineering.com, Company no. SC386913, **xiengineering.com**

Document Summary

This technical appendix supports the Reading Park Development Wind Microclimate Environmental Chapter. It contains additional discussion on method, results and mitigation as well as further technical details. Additional figures and images are provided to show effects of unique wind speeds and further clarifications of modelling process and results. Results can be used to help inform the detailed design process and mitigation requirements.

		Date	Version	Amendment
Originator	D Black, M Snaith, G Paschakis	11th Feb 2020	Draft	Document Development
Checked by	D Black	12th Jan 2020	v1	Content Update
Checked by	D Black	13th Jan 2020	v2	Clarification and Corrections

Matters relating to this document should be directed to:

Donald Black MEng CEng MIMechE, MInstLM

E: donaldblack@xiengineering.com

T: 0131 290 2253

Commercial In Confidence ©2020 Xi Engineering Consultants Ltd.

CONTENTS

Contents 3

1 Introduction 4

2 Legislation and PLanning Policy COntext 4

2.1 National Legislation 4

2.2 National Planning Policy 4

2.3 Regional Planning Policy 5

2.4 Local Planning Policy 6

4 Site Description 7

5 Assessment Methodology 8

5.1 Computational Analysis 8

5.2 Geometry Models 9

5.2.1 Detailed Model Geometries 9

5.4 Future development Reference plans 11

5.5 Reference Drawings and Models 11

6 Meteorological Data 11

6.1 Topography and Wind Exposures 11

6.2 Meteorological Data 12

7 CFD Computational Results 14

7.2 Isometric view of Comfort criteria 17

8 Strong Winds 19

8.2 Isometric view of Safety criteria 22

9 Modelled Wind Speeds for each wind direction 24

9.1 Baseline Geometry Averaged Wind Speed 24

9.2 New Development Geometry Averaged Wind Speed 33

9.3 Cumulative Development Geometry Averaged Wind Speed 41

©2020 Xi Engineering Consultants Ltd.

1 INTRODUCTION

This technical appendix provides some further detail around policies and the method used for developing the wind microclimate CFD models. It also includes some additional results to aid understanding and to help inform mitigation and the detailed design stages. Notably averaged wind velocities from individual directions are provided which will help provide an understanding of where mitigation measures should be placed to disrupt airflow to provide mitigation.

2 LEGISLATION AND PLANNING POLICY CONTEXT

2.1 National Legislation

There is no national legislation which specifically covers wind microclimate planning policy.

2.2 National Planning Policy

The National Planning Policy Framework, re-issued February 2019

Paragraph 127 of the National Planning Policy Framework states:

“Planning policies and decisions should ensure that developments:

a) will function well and add to the overall quality of the area, not just for the short term but over the lifetime of the development;

b) are visually attractive as a result of good architecture, layout and appropriate and effective landscaping;

c) are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change (such as increased densities);

d) establish or maintain a strong sense of place, using the arrangement of streets, spaces, building types and materials to create attractive, welcoming and distinctive places to live, work and visit;

e) optimise the potential of the site to accommodate and sustain an appropriate amount and mix of development (including green and other public space) and support local facilities and transport networks; and

f) create places that are safe, inclusive and accessible and which promote health and well-being, with a high standard of amenity for existing and future users; and where crime and disorder, and the fear of crime, do not undermine the quality of life or community cohesion and resilience.”

National Planning Policy Framework (2012):

The National Planning Policy Framework does not specifically reference wind or microclimate.

Planning Practice Guidance (2015) (paragraphs 025 and 026) states:

“Design: How should buildings and the spaces between them be considered? Consider Form: Some forms pose specific design challenges, for example how taller buildings meet the ground and how they affect local wind [...] patterns should be carefully considered. Consider Scale: Account should be taken of local climatic conditions, including [...] wind”.

©2020 Xi Engineering Consultants Ltd.

2.3 Regional Planning Policy

The London Plan – Spatial Development Strategy for Greater London (2016)

Policy 7.6B 'Architecture' states:

"buildings and structures should: […] not cause unacceptable harm to the amenity of surrounding land and buildings, particularly residential buildings, in relation to privacy, overshadowing, wind and microclimate. This is particularly important for tall buildings; […] provide high quality indoor and outdoor spaces and integrate well with the surrounding streets and open spaces; be adaptable to different activities and land uses, particularly at ground level."

Policy 7.7 'Location and Design of Tall and Large Buildings' states:

"Tall and large buildings should be part of a plan-led approach to changing or developing an area by the identification of appropriate, sensitive and inappropriate locations. Tall and large buildings should not have an unacceptably harmful impact on their surroundings. Applications for tall or large buildings should include an urban design analysis that demonstrates the proposal is part of a strategy that will meet the criteria below. This is particularly important if the site is not identified as a location for tall or large buildings in the borough's LDF. […] Tall buildings: a. should not affect their surroundings adversely in terms of microclimate, wind turbulence […]".

The Sustainable Design and Construction Supplementary Planning Guidance (2014) states:

"Large buildings have the ability to alter their local environment and affect the micro-climate. For example, not only can particularly tall buildings cast a long shadow affecting buildings several streets away, they can influence how wind travels across a site, potentially making it unpleasant at ground level or limiting the potential to naturally ventilate buildings. One way to assess the impact of a large building on the comfort of the street environment is the Lawson Comfort Criteria. This tool sets out a scale for assessing the suitability of wind conditions in the urban environment based upon threshold values of wind speed and frequency of occurrence. It sets out a range of pedestrian activities from sitting through to crossing the road and for each activity defines a wind speed and frequency of occurrence. Where a proposed development is significantly taller than its surrounding environment, developers should carry out an assessment of its potential impact on the conditions at ground level, and ensure the resulting design of the development provides suitable conditions for the intended uses".

Draft London Plan - consolidated changes version July 2019

Policy D1B 'Optimising site capacity through the design-led approach' states:

"Buildings should be of high quality and enhance, activate and appropriately frame the public realm. Their massing, scale and layout should help make public spaces coherent and should complement the existing streetscape and surrounding area. Particular attention should be paid to the design of the parts of a building or public realm that people most frequently see or interact with in terms of its legibility, use, detailing, materials and location of entrances. Creating a comfortable pedestrian environment with regard to levels of sunlight, shade, wind, and shelter from precipitation is important."

Policy D7 'Public realm' states:

"ensure that appropriate shade, shelter, seating and where possible areas of direct sunlight are provided, with other microclimatic considerations, including temperature and wind, taken into account in order to encourage people to spend time in a place."

©2020 Xi Engineering Consultants Ltd.

Policy D8 'Tall Buildings' states:

"wind, daylight, sunlight penetration and temperature conditions around the building(s) and neighbourhood must be carefully considered and not compromise comfort and the enjoyment of open spaces, including water spaces, around the building."

As well as:

"The middle of a tall building has an important effect on how much sky is visible from surrounding streets and buildings, as well as on wind flow, privacy and the amount of sunlight and shadowing there is in the public realm and by surrounding properties."

The Sustainable Design and Construction Supplementary Planning Guidance (2014) states:

"Large buildings have the ability to alter their local environment and affect the micro-climate. For example, not only can particularly tall buildings cast a long shadow affecting buildings several streets away, they can influence how wind travels across a site, potentially making it unpleasant at ground level or limiting the potential to naturally ventilate buildings. One way to assess the impact of a large building on the comfort of the street environment is the Lawson Comfort Criteria. This tool sets out a scale for assessing the suitability of wind conditions in the urban environment based upon threshold values of wind speed and frequency of occurrence. It sets out a range of pedestrian activities from sitting through to crossing the road and for each activity defines a wind speed and frequency of occurrence. Where a proposed development is significantly taller than its surrounding environment, developers should carry out an assessment of its potential impact on the conditions at ground level, and ensure the resulting design of the development provides suitable conditions for the intended uses".

2.4 Local Planning Policy

The Reading Borough Local Plan Adopted November 2019 CC3 Adaption to climate change states:

"Wherever possible, new buildings shall be orientated to maximise the opportunities for reducing exposure to wind and other elements."

As well as section 5.3.47 which states:

"Tall buildings can adversely affect the environmental quality of surrounding areas, particularly through the diversion of high speed winds to ground level and through overshadowing of other areas. However, good design and siting can successfully mitigate these impacts. A building, or grouping of buildings, should be modelled and simulated within its surrounding context, to examine environmental performance at an early design stage to highlight any potential issues that need to be addressed. Wind should be assessed against the Lawson Criteria."

The Reading Council Emerging Policy CC8 (2018) Safeguarding Amenity states:

"To ensure that new developments will not cause detrimental impact on the living environment of existing residential properties in terms of wind"

©2020 Xi Engineering Consultants Ltd.

4 SITE DESCRIPTION

The development site is situated in the city of Reading. The site is north of the Reading Railway Station and South of the River Thames and is immediately bounded by Vastern Road to the North, Inner Distribution Road/Caversham Road to the West and Trooper Potts Way to the East. The Ordnance Survey Landranger series grid reference is SU 714740.

The development is to be mixed use. The surrounding area is composed of a mixture of residential and commercial buildings comprising low and medium rise buildings. Figure 1 shows an aerial photograph of the existing site highlighted. Figure 2 shows the location (red highlight) on a street map. The yellow marking donates the 300 m boundary where buildings were modelled.

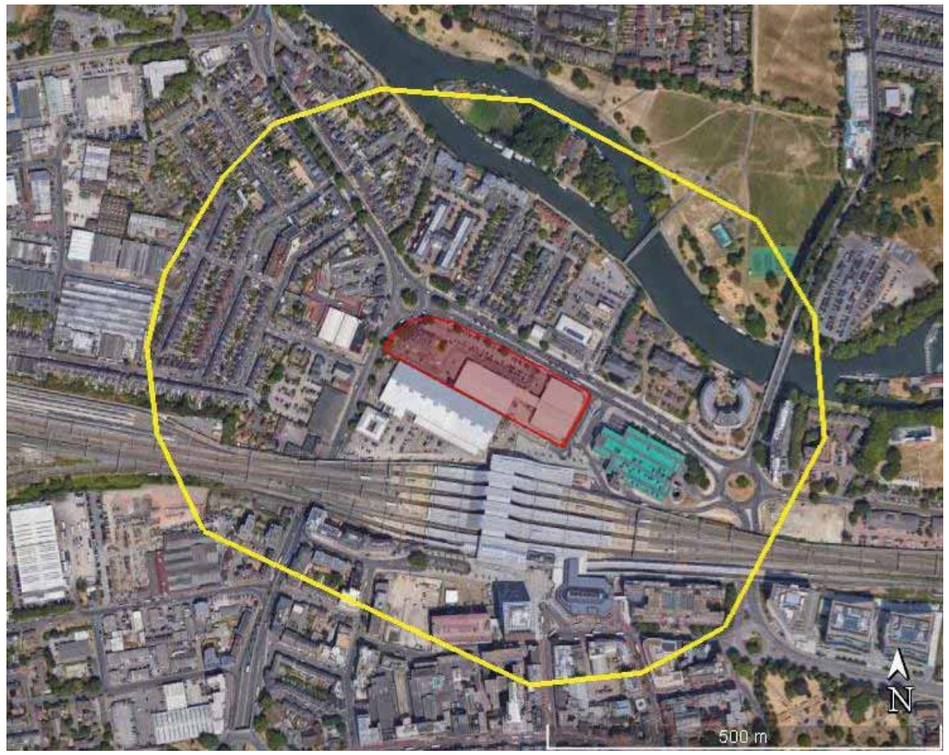


Figure 1 - Aerial image of the existing site (red) and the 300 m extent (yellow) where building geometries were included for modelling.

©2020 Xi Engineering Consultants Ltd.



Figure 2 – Street map showing the site, the bounding roads and railway line [Open Street Map 2020] Development area highlighted in red

5 ASSESSMENT METHODOLOGY

5.1 Computational Analysis

The wind microclimate analysis for the Reading Station Park development was performed using SimScale Computational Fluid Dynamics (CFD) simulation software. The mathematical solver employed by SimScale is the LBM (Lattice Boltzmann) method. This LBM solver is a relatively recent technique in CFD analysis and allows very complex geometries to be computed in much shorter timescales to traditional methods. Using LBM, a full assessment of all wind directions for a given site can be undertaken. In comparison, the large computational resources required for traditional CFD methods may have only afforded only a limited number of wind directions to be resolved. The LBM solver has been extensively validated and provides robust, reliable results. CFD works by constructing a 'virtual wind tunnel' in this instance the wind tunnel was 1800 m long 1100 m wide and 350 m high (Figure 3). The wind tunnel was then rotated for every wind direction. The wind tunnel and model domain are then broken into a series of small elements "cells" which form part of a wider "mesh". A series of fluid dynamic calculations are performed on these cells to establish the wind flow around the target. The model set-ups for all configurations were allowed three fluid passes (one pass refers to the time it takes for a given air particle to enter the virtual wind tunnel at the inlet and for it to exit at the outlet). This allows sufficient time for the solution to converge on a stable result. Mesh information for the three configurations are given in Table 5-1.

Configuration	Min Cell Size (m)	Max Cell Size (m)	No. Cells
Baseline	0.78	25.0	16392320
Completed Development	0.78	25.0	19553408
Future Baseline	0.78	25.0	23958720

Table 5-1 – Mesh information for the three modelled configurations

©2020 Xi Engineering Consultants Ltd.

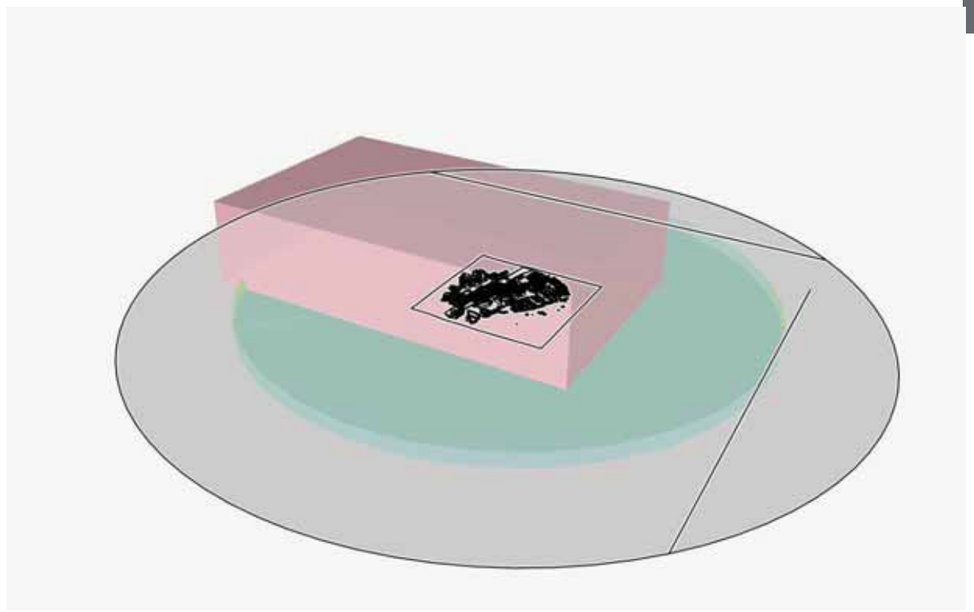


Figure 3 – Wider simulation model including virtual wind tunnel geometry depicted as the red cuboid.

5.2 Geometry Models

5.2.1 DETAILED MODEL GEOMETRIES

The following three images depict Configuration 1: Baseline (Figure 4), Configuration 2: the Completed Development (Figure 5) and Configuration 3: the Cumulative Development schemes (Figure 6) respectively.

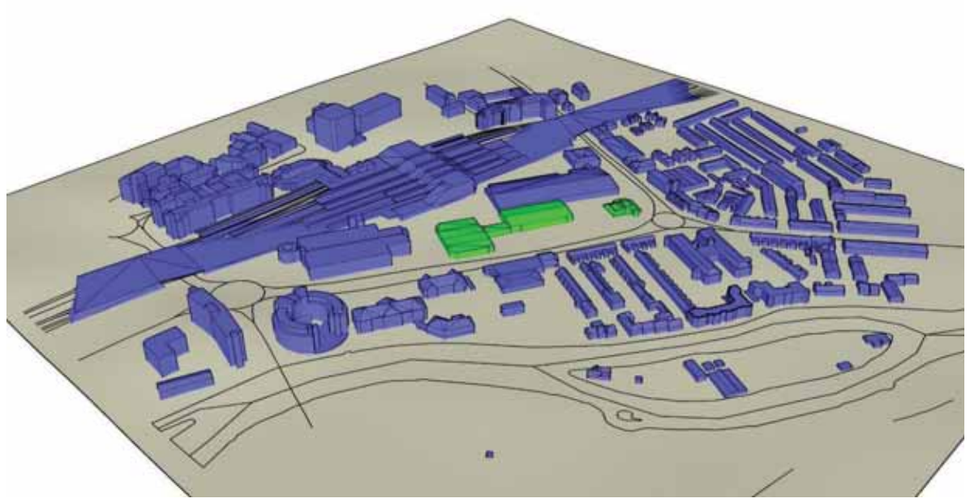


Figure 4 – Configuration 1: Baseline geometry, green highlighted buildings represent buildings which will be demolished.

©2020 Xi Engineering Consultants Ltd.



Figure 5 – Configuration 2: Completed Development geometry, green highlighted buildings represent the proposed development



Figure 6 – Configuration 3: Cumulative developments within 300m of the development site. Light green buildings represent the proposed New Development

©2020 Xi Engineering Consultants Ltd.

5.4 Future development Reference plans

Scheme	Name	Planning App Ref	Other Documentation
1	Thames Quarter	190809	
2	Station Hill	151426 and 151427	
5	29 Station Road	181930	
7	80 Caversham Road	182252	
8	Vastern Road	allocation CR11e	http://www.vasternroad.co.uk/

Table 5-2 – Reference details for future developments

5.5 Reference Drawings and Models

The following documents were supplied and used to construct the wind microclimate model

- Area 3D model: 19127 – Parameters Plans_3D – combined.skp
- Development Site Drawing: PP-105 – Parameter Plan – Plot Heights Mixed Use.pdf
- Proposed Development Model: PP103 Buildings.skp
- Future Scheme 7 3d model: 20-01-07_amended zmap-for information.dwg

6 METEOROLOGICAL DATA

6.1 Topography and Wind Exposures

In addition to considering the wind speed and direction for an area it is necessary to consider ground roughness, terrain and topology. Wind conditions for open terrain will be different from an urban environment and so these effects are taken into account. The region around the development site was assessed for ground roughness using BREVe software with the resulting wind exposures applied to the wind data within SimScale using wind engineering standard EN 1991-1-4. The surrounding terrain was classified as either Suburban (III) or Urban (IV) Table 6-1 describes the terrain classification given to each individual wind direction, Table 6-2 provides details on terrain classifications. Section 6.2 Meteorological Data provides definition of the 16 direction wind direction segments and topography outputs from BREVe analysis.

Accurate terrain topography has been included in the model geometry for a 300 m radius around the development, beyond this the topography effects have been simplified to a flat plane as there are no significant variations in ground elevation around the development.

Direction	Classification	Direction	Classification
0.00° (N)	Urban Area (IV)	180.00° (S)	Urban Area (IV)
22.50° (NNE)	Urban Area (IV)	202.50° (SSW)	Urban Area (IV)
45.00° (NE)	Suburban Area (III)	225.00° (SW)	Urban Area (IV)
67.50° (ENE)	Suburban Area (III)	247.50° (WSW)	Urban Area (IV)
90.00° (E)	Suburban Area (III)	270.00° (W)	Suburban Area (III)
112.50° (ESE)	Urban Area (IV)	292.50° (WNW)	Urban Area (IV)
135.00° (SE)	Urban Area (IV)	315.00° (NW)	Urban Area (IV)
157.50° (SSE)	Urban Area (IV)	337.50° (NNW)	Urban Area (IV)

Table 6-1 – Terrain classification for each wind direction. A full breakdown of classifications can be found in Appendix B – Meteorological Data.

©2020 Xi Engineering Consultants Ltd.

Category	Type	Description
0	Coastal	Sea or coastal area exposed to open sea
I	Flat Terrain	Lakes or flat and horizontal area with negligible vegetation and without obstacles
II	Open Terrain	Area with low vegetation such as grass and isolated obstacles (trees, buildings) with separations of at least 20 obstacle heights
III	Suburban Area	Area with regular cover of vegetation or buildings or with isolated obstacles with separations of maximum 20 obstacle heights (such as villages, suburban terrain, permanent forest)
IV	Urban Area	Area in which at least 15 % of the surface is covered with buildings and their average height exceeds 15 m.

Table 6-2 – Terrain classification for defining wind exposure

6.2 Meteorological Data

The 16 directional segments used for individual wind speed assessments (Figure 7).

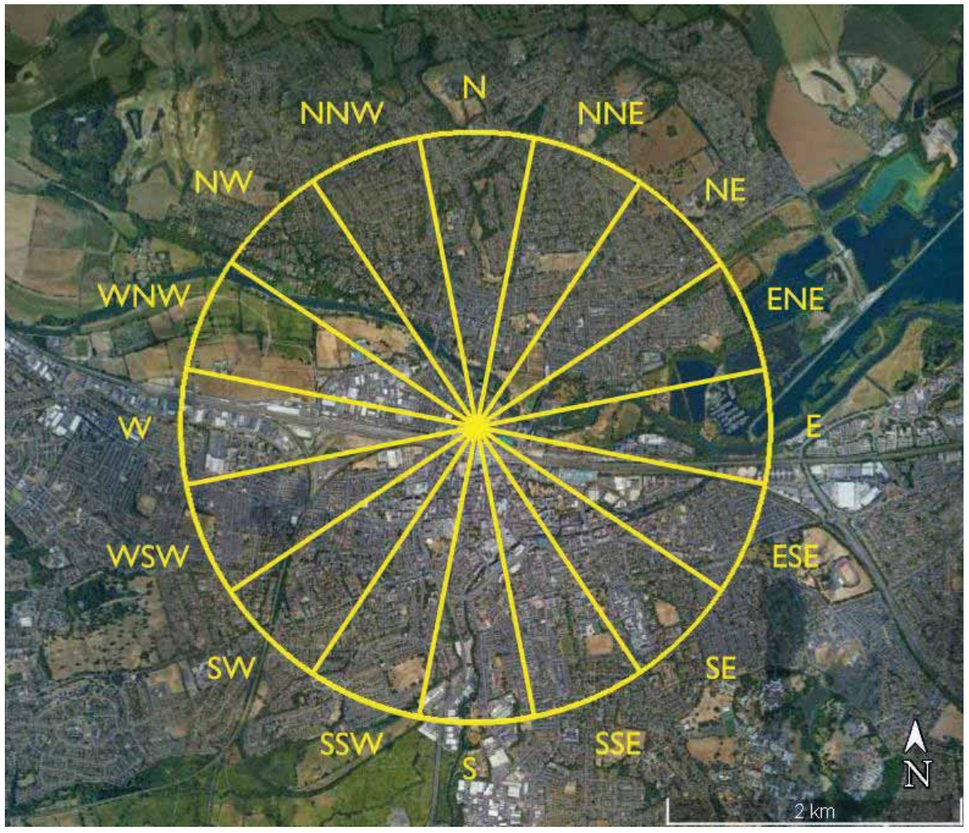


Figure 7 – 16 wind segments around the target development location.

©2020 Xi Engineering Consultants Ltd.

Figure 8 and Figure 9 describe the outputs from BREVe software used to define the surface topography and roughness around the proposed development site.

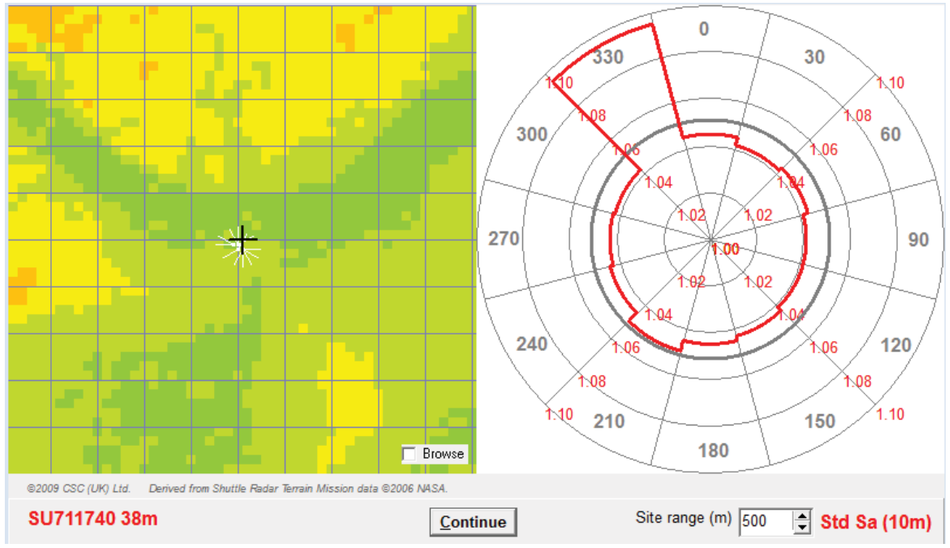


Figure 8 – Topography Analysis for the site as calculated using BREVe

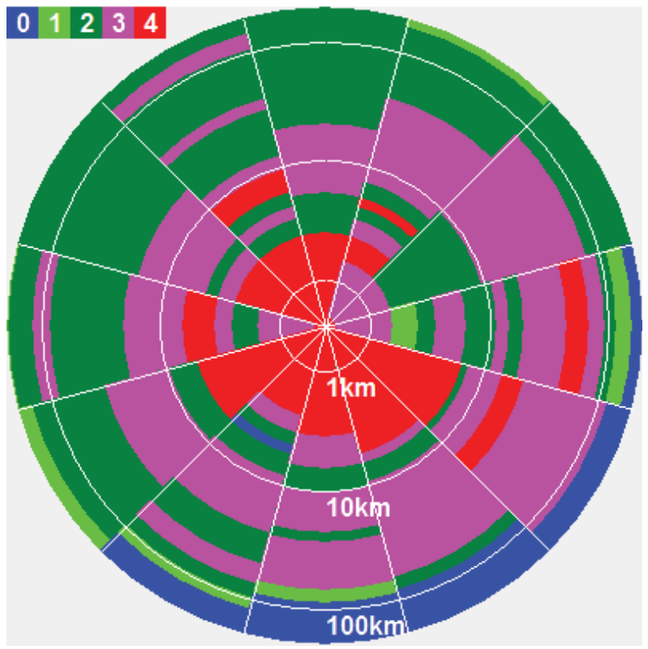


Figure 9 – Roughness analysis as performed using BREVe software

©2020 Xi Engineering Consultants Ltd.

7 CFD COMPUTATIONAL RESULTS

The three model geometries; baseline, new development, and future developments were run in SimScale for all 16 wind directions. SimScale computes transient wind flow for all scenarios across their geometries including gusting. Averaged wind velocities for all model scenarios and directions are given in Section 9 Modelled Wind Speeds For Each Wind Direction. Following calculation of the wind speeds for each wind direction a statistical surface solution representing the Lawson Comfort Criteria for all wind speeds could be produced on a single plot for each geometry scenario. Figure 10, Figure 11 and Figure 12 show the Lawson comfort criteria plot at 1.5 m above ground level for the Baseline, Completed Development and Cumulative Future Developments respectively for the full CFD assessment area.

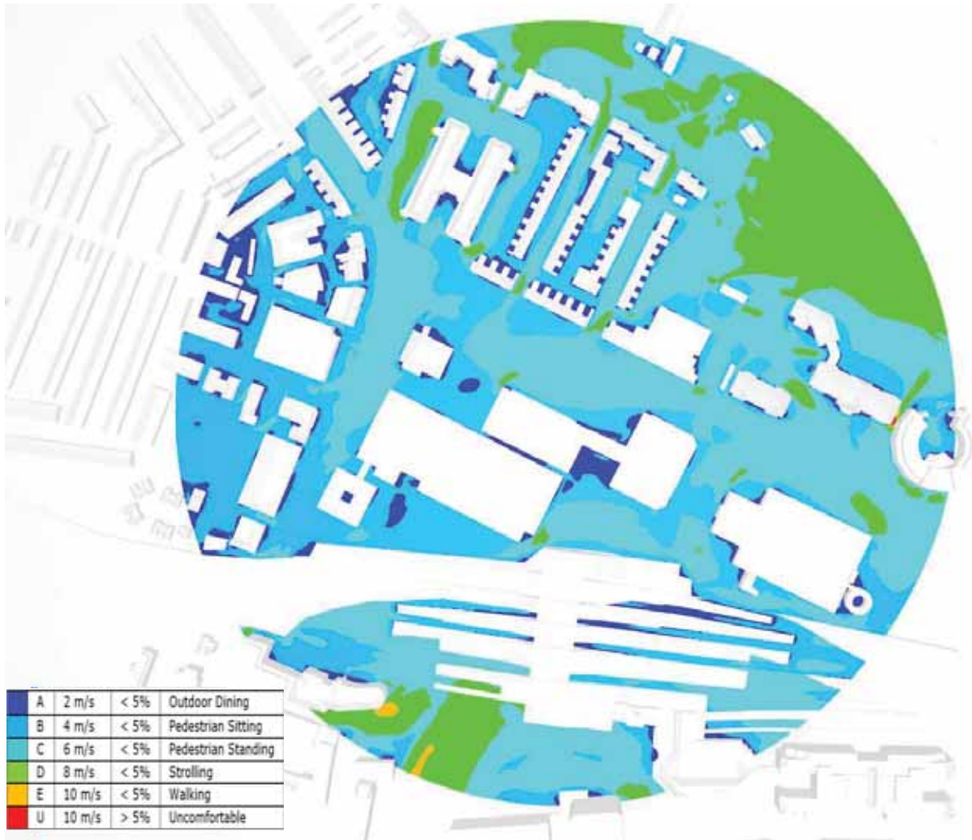


Figure 10 – Ground Level Lawson Comfort Criteria plot for Configuration 1: Baseline

©2020 Xi Engineering Consultants Ltd.



Figure 11 - Ground Level Lawson Comfort Criteria plot for Configuration 2: Completed Development

©2020 Xi Engineering Consultants Ltd.



Figure 12 – Ground Level Lawson Comfort Criteria plot for Configuration 3: Cumulative Development

©2020 Xi Engineering Consultants Ltd.

7.2 Isometric view of Comfort criteria

Figure 13 and Figure 14 provide an isometric view of Configuration 2 and Configuration 3. This helps to provide the scale of the proposed and cumulative developments and more clearly highlights the comfort effects on the different roof top levels.

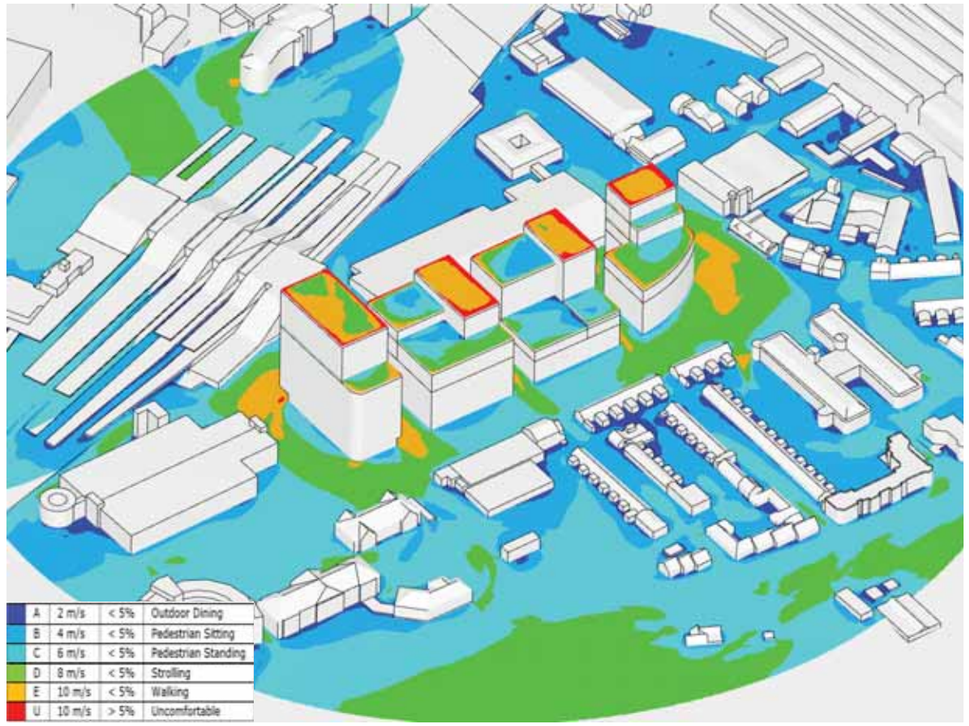


Figure 13 – Isometric view of the configuration 2 arrangement with Lawson comfort criteria mapped.

©2020 Xi Engineering Consultants Ltd.

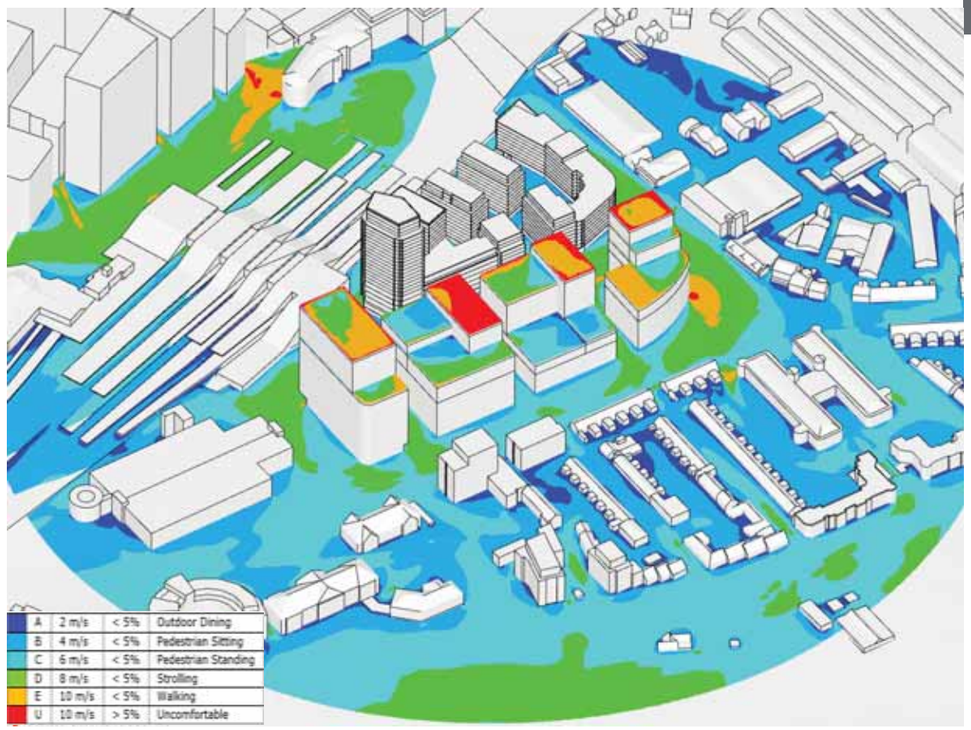


Figure 14 - Isometric view of the configuration 3 arrangement with Lawson comfort criteria mapped.

©2020 Xi Engineering Consultants Ltd.

8 STRONG WINDS

Strong winds are winds with the potential to harm and cause injury. The wind data sets were processed applying the Lawson LDDC criteria which provides an unsafe classification when windspeeds exceed 15 m/s for 0.022% of the time (2 hours of the year). Figure 15, Figure 16 and Figure 17 provide the plots of the strong wind analysis for the baseline, Completed Development, and Cumulative Development Configurations respectively, the results show the full CFD assessment area.

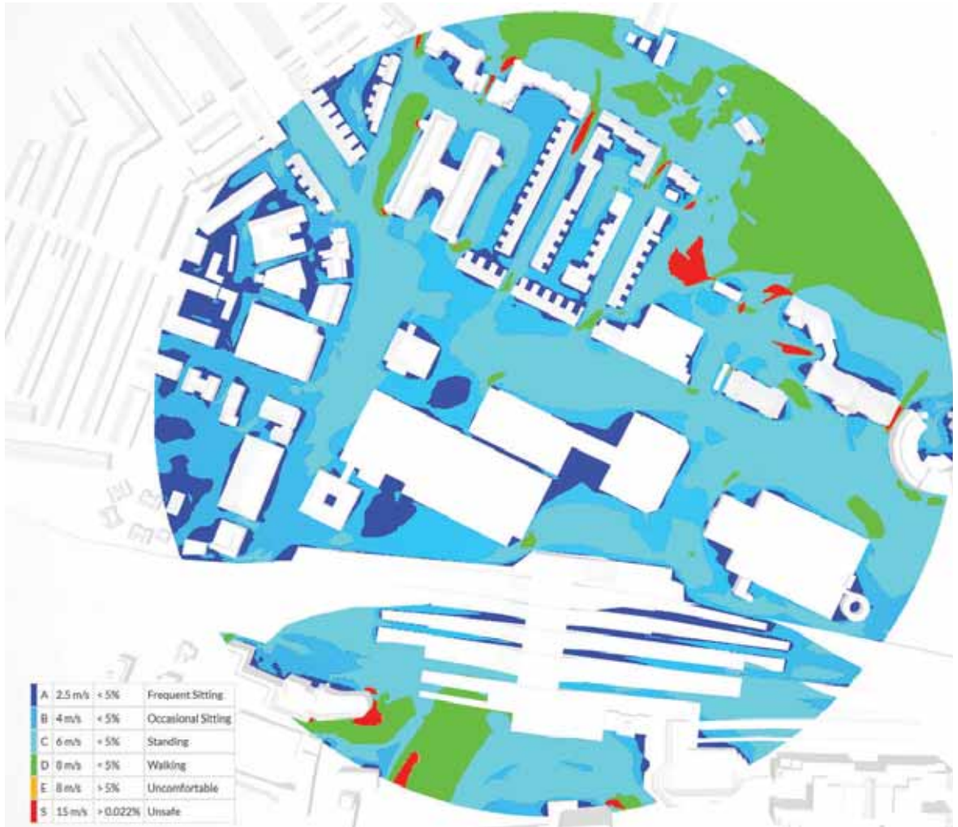


Figure 15 – Lawson LDDC unsafe Strong Wind classification for Configuration 1: Baseline

©2020 Xi Engineering Consultants Ltd.

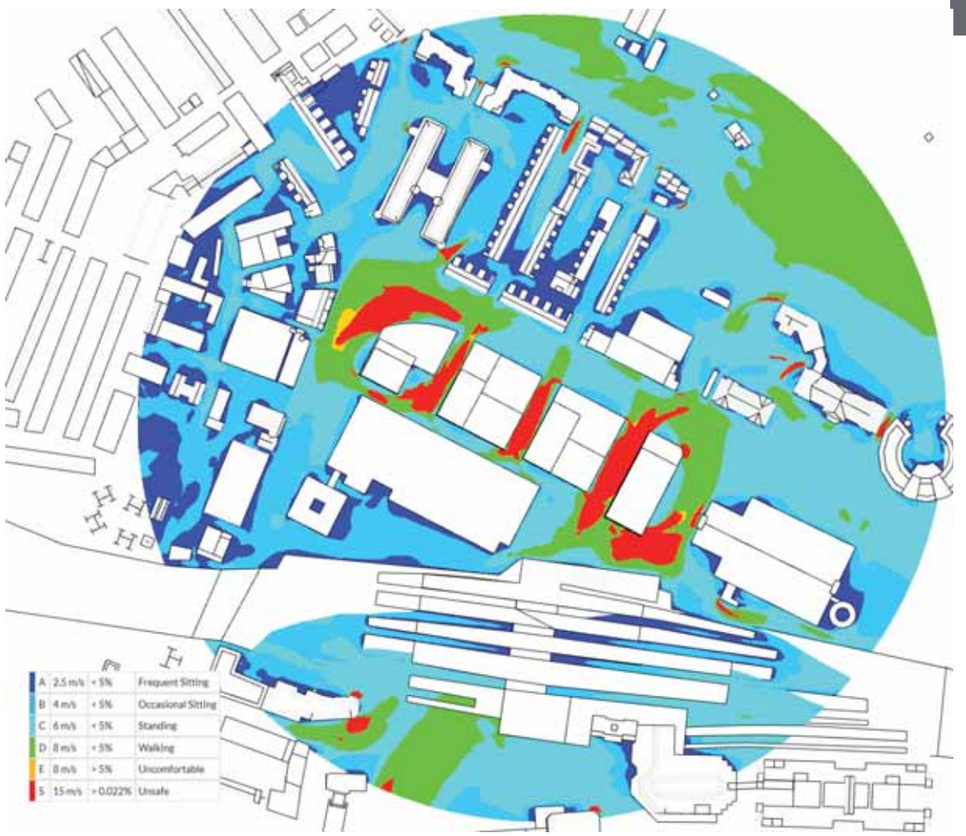


Figure 16 – Lawson LDDC unsafe Strong Wind classification for Configuration 2: Completed Development

©2020 Xi Engineering Consultants Ltd.

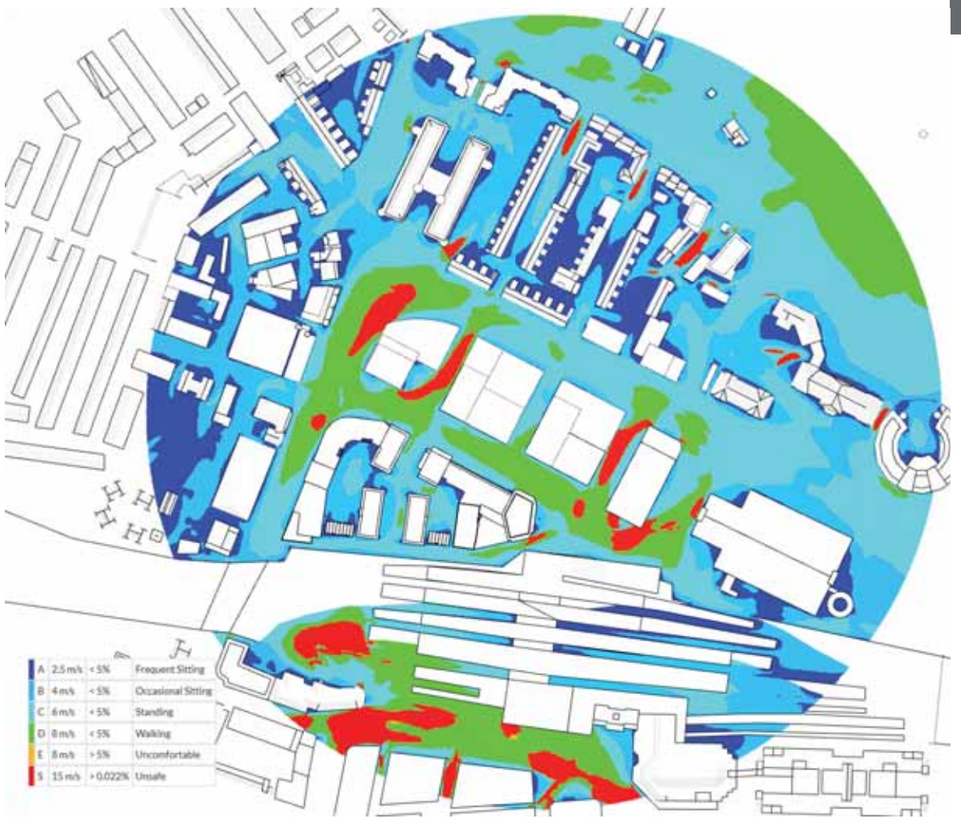


Figure 17 - Lawson LDDC unsafe Strong Wind classification for Configuration 3: Cumulative Developments

©2020 Xi Engineering Consultants Ltd.

8.2 Isometric view of Safety criteria

Figure 18 and Figure 19 provide an isometric view of the safety criteria for Configuration 2 and Configuration 3. This helps to provide the scale of the proposed and cumulative developments and more clearly highlights the safety effects on the different roof top levels.



Figure 18 - Isometric view of the configuration 2 arrangement with Lawson safety criteria mapped.

©2020 Xi Engineering Consultants Ltd.

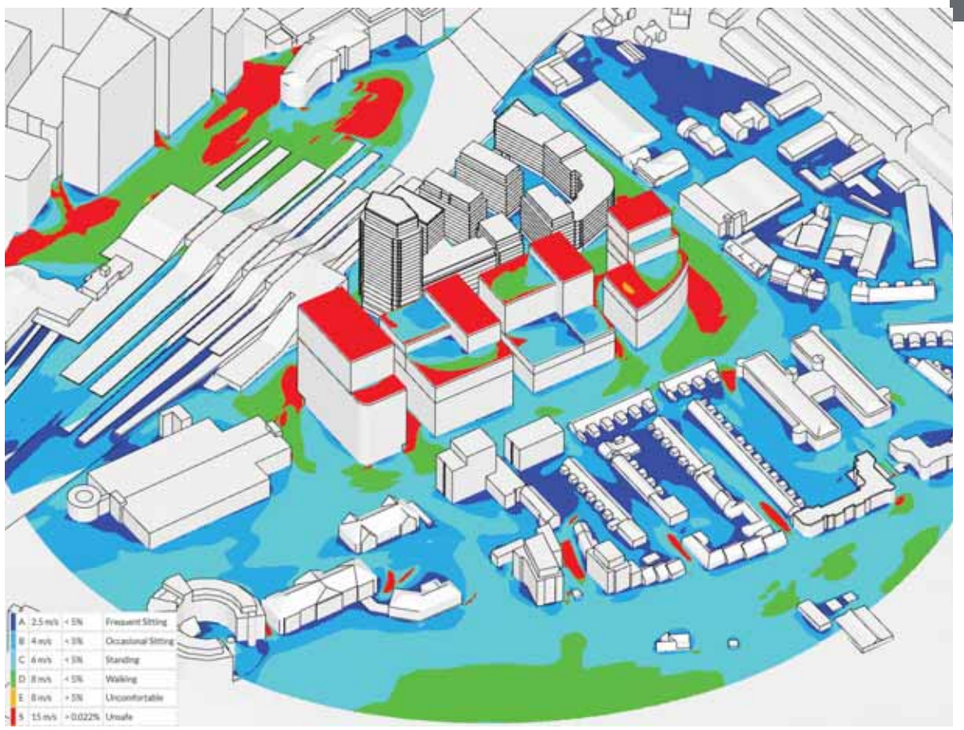


Figure 19 – Isometric view of the configuration 3 arrangement with Lawson safety criteria mapped.

©2020 Xi Engineering Consultants Ltd.

9 MODELLED WIND SPEEDS FOR EACH WIND DIRECTION

The following figures provide velocity profiles for individual wind directions. All 16 wind directions for all three configurations are provided.

9.1 Configuration 1: Baseline Geometry Averaged Wind Speed

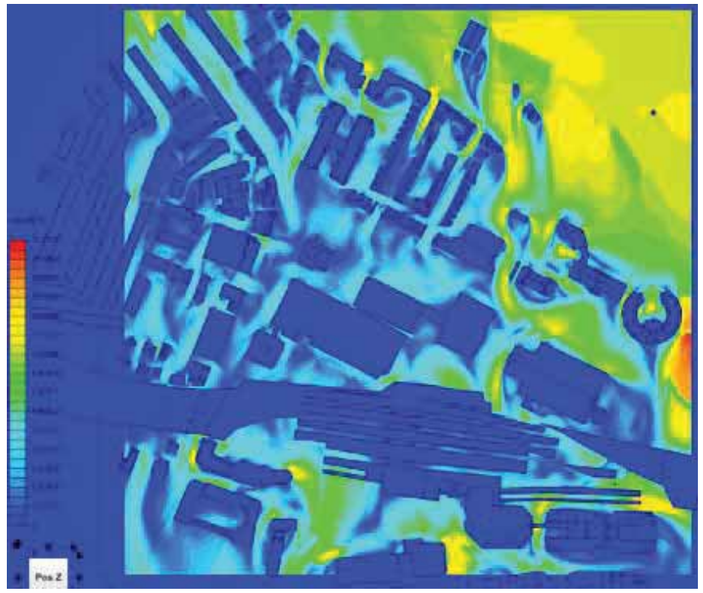


Figure 20 – Averaged wind velocity for 0.0° wind direction. Baseline Geometry.

©2020 Xi Engineering Consultants Ltd.

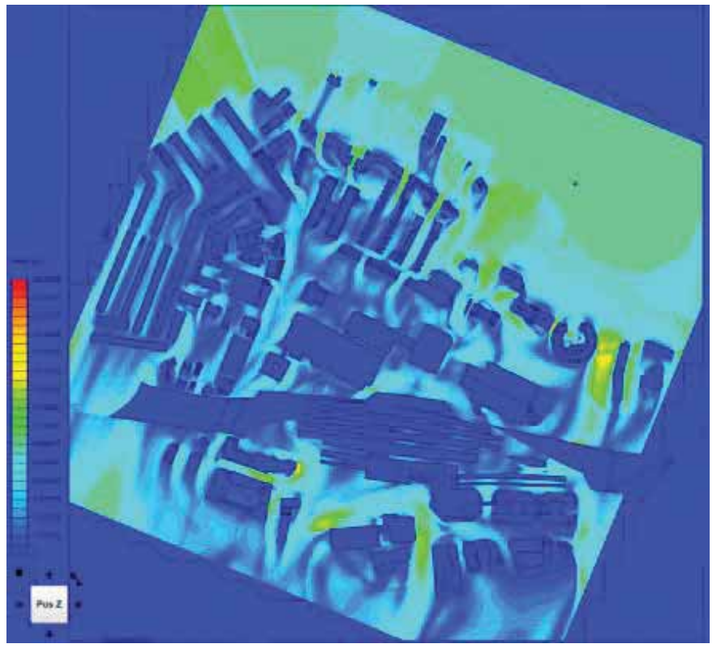


Figure 21 – Averaged wind velocity for 22.5° wind direction. Baseline Geometry.

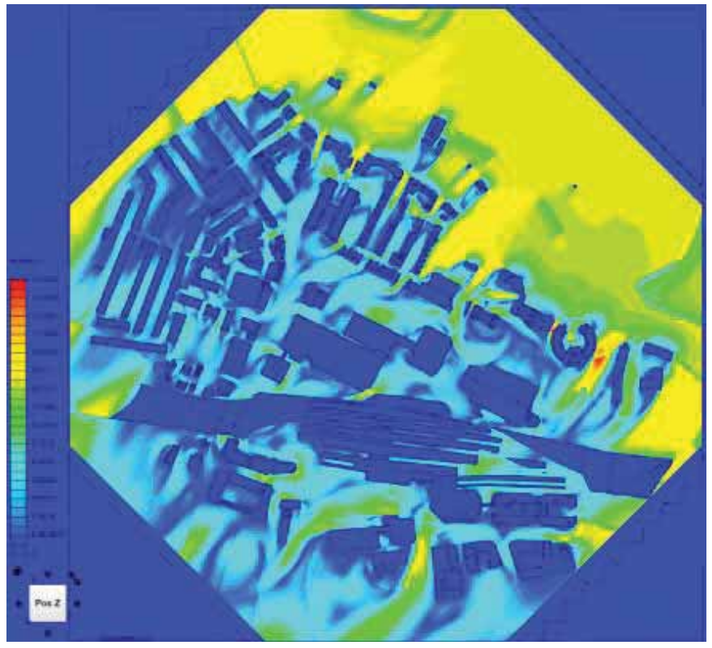


Figure 22 – Averaged wind velocity for 45.0° wind direction. Baseline Geometry.

©2020 Xi Engineering Consultants Ltd.

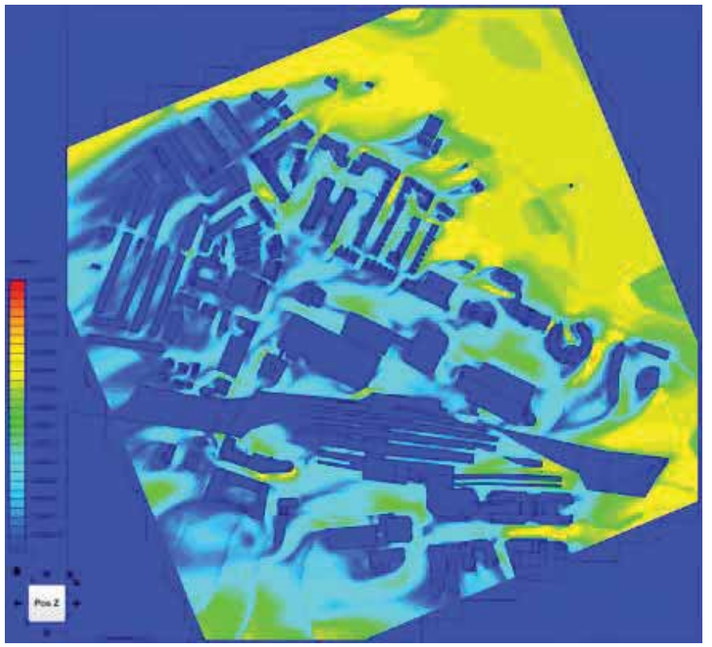


Figure 23 – Averaged wind velocity for 67.5° wind direction Baseline Geometry.

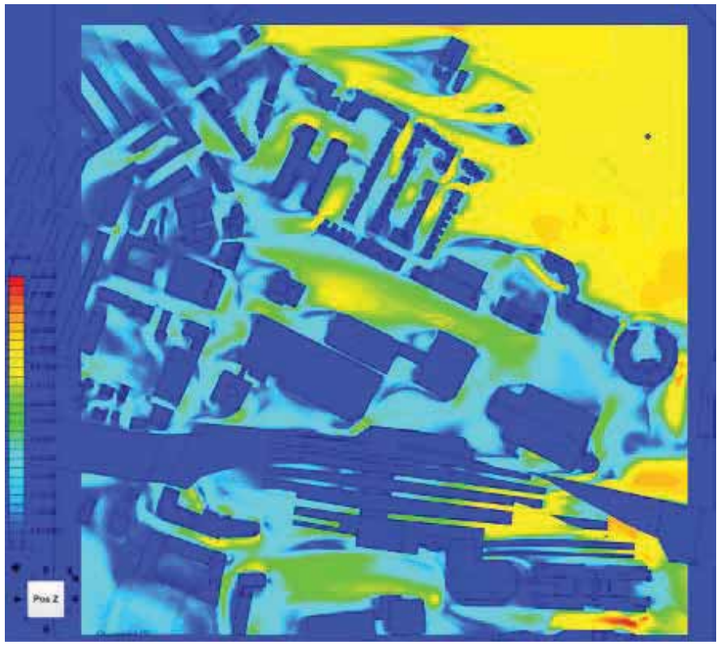


Figure 24 – Averaged wind velocity for 90.0° wind direction. Baseline Geometry.

©2020 Xi Engineering Consultants Ltd.

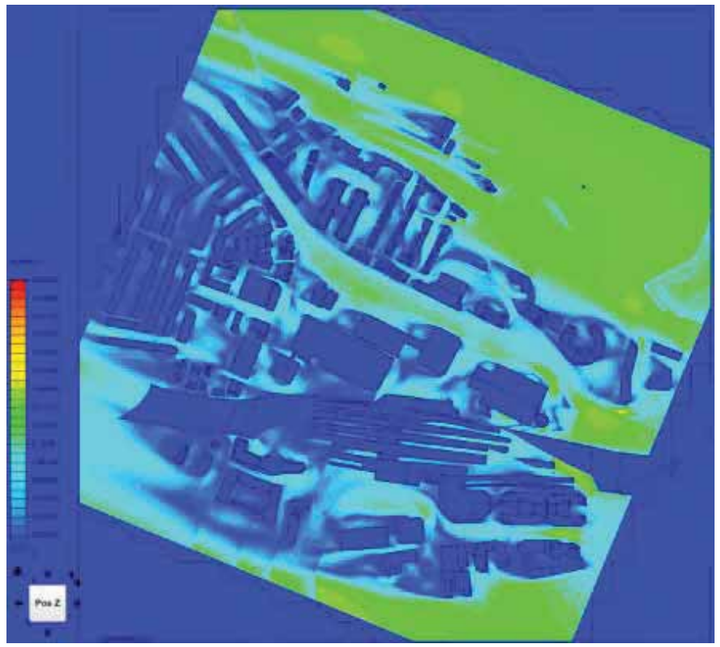


Figure 25 – Averaged wind velocity for 112.5° wind direction. Baseline Geometry.

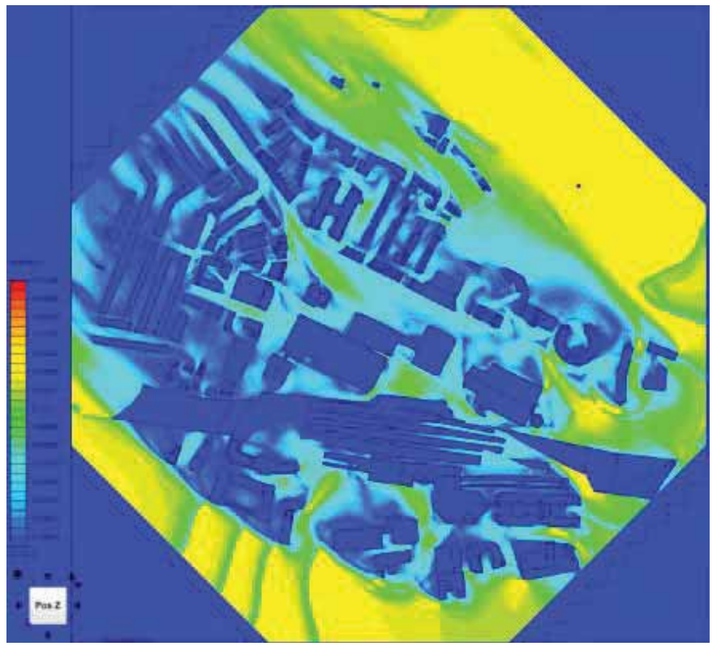


Figure 26 – Averaged wind velocity for 135.0° wind direction. Baseline Geometry.

©2020 Xi Engineering Consultants Ltd.

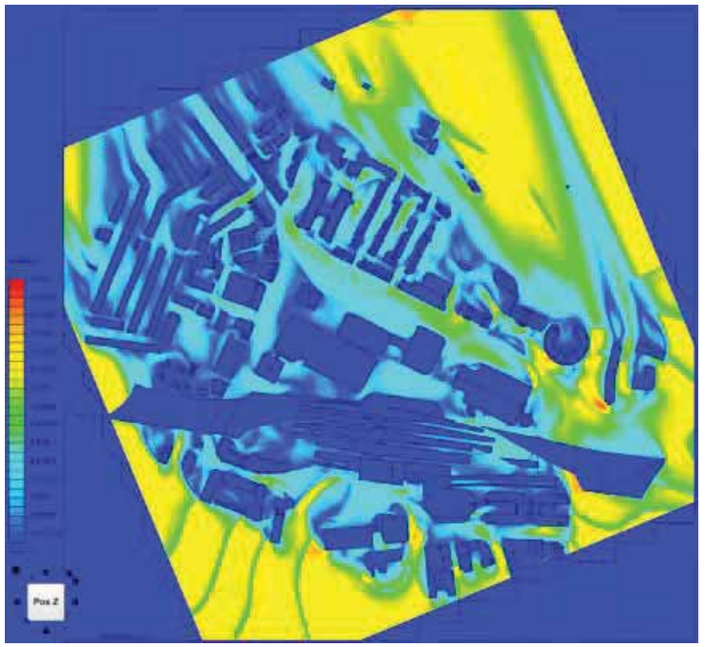


Figure 27 – Averaged wind velocity for 157.5° wind direction. Baseline Geometry.

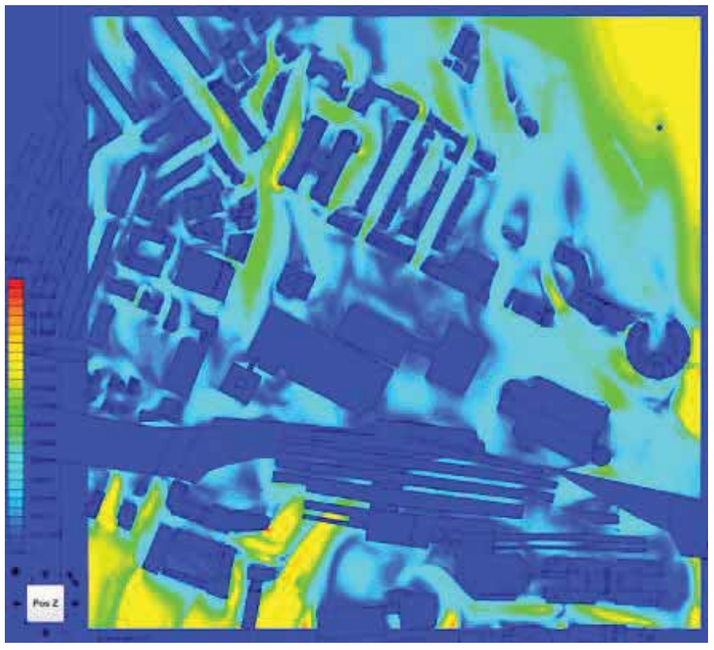


Figure 28 – Averaged wind velocity for 180.0° wind direction. Baseline Geometry.

©2020 Xi Engineering Consultants Ltd.

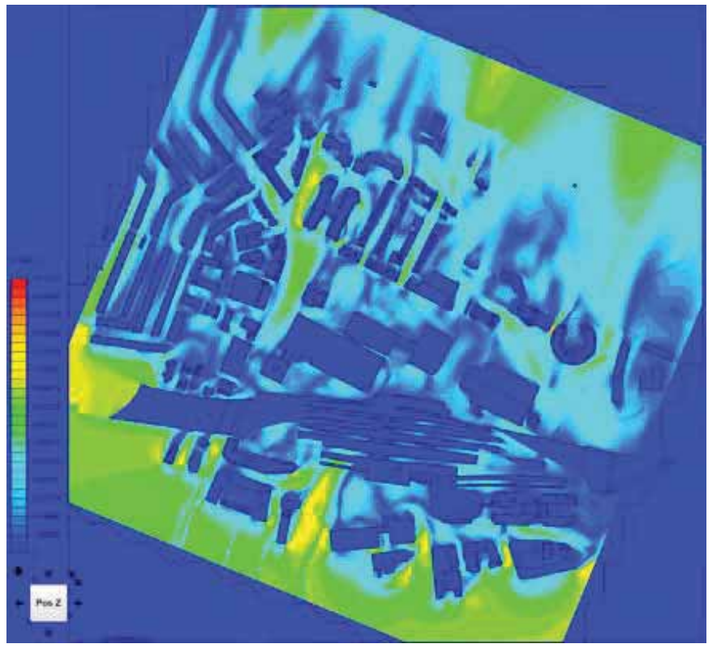


Figure 29 – Averaged wind velocity for 202.5° wind direction. Baseline Geometry.

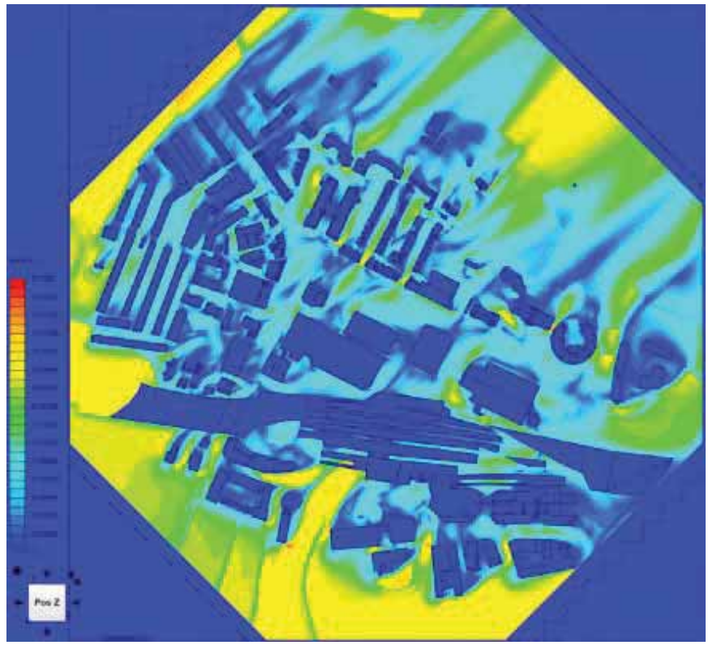


Figure 30 – Averaged wind velocity for 225.0° wind direction. Baseline Geometry.

©2020 Xi Engineering Consultants Ltd.

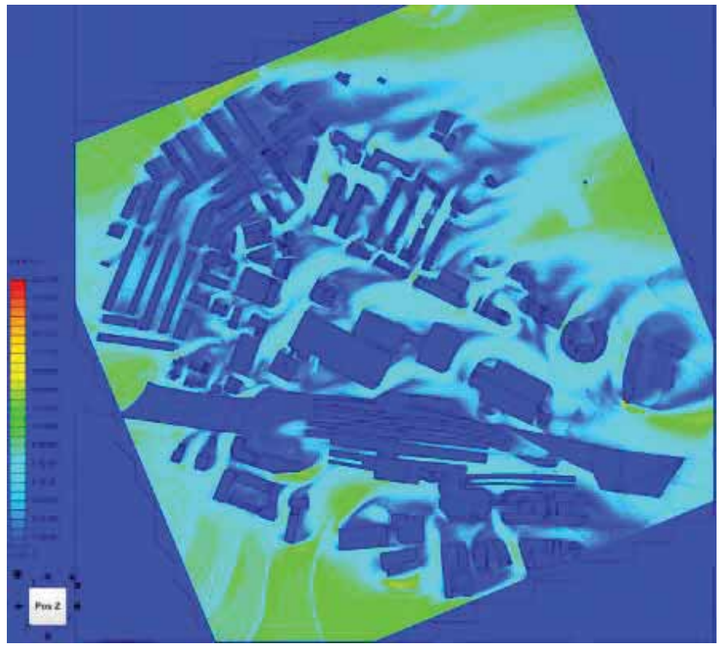


Figure 31 – Averaged wind velocity for 247.5° wind direction. Baseline Geometry.

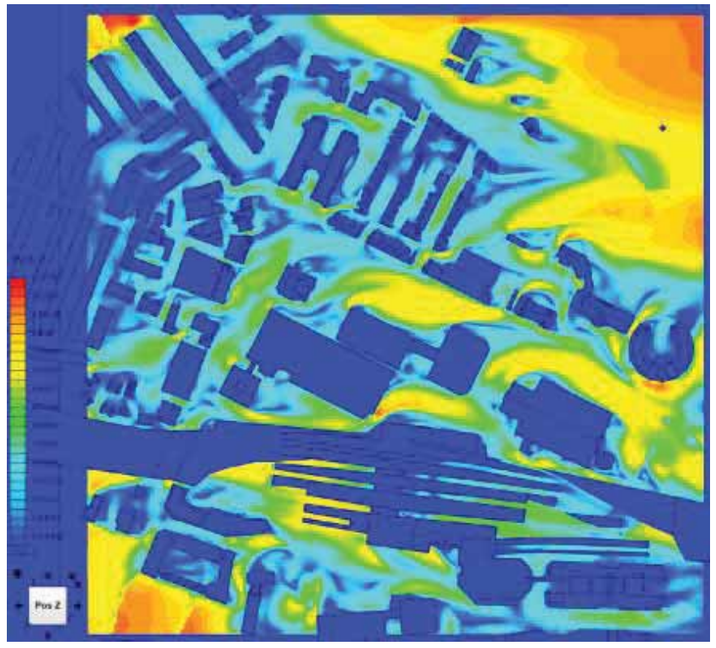


Figure 32 – Averaged wind velocity for 270.0° wind direction. Baseline Geometry.

©2020 Xi Engineering Consultants Ltd.

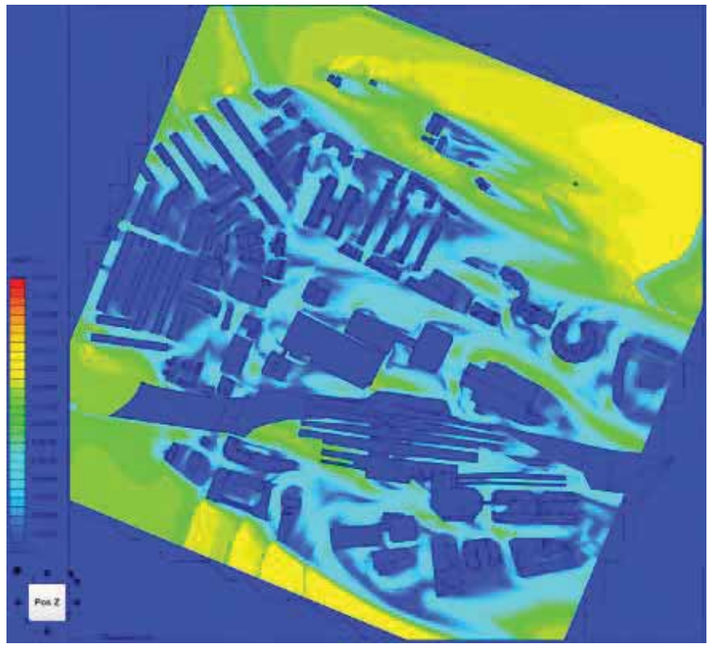


Figure 33 – Averaged wind velocity for 292.5° wind direction. Baseline Geometry.

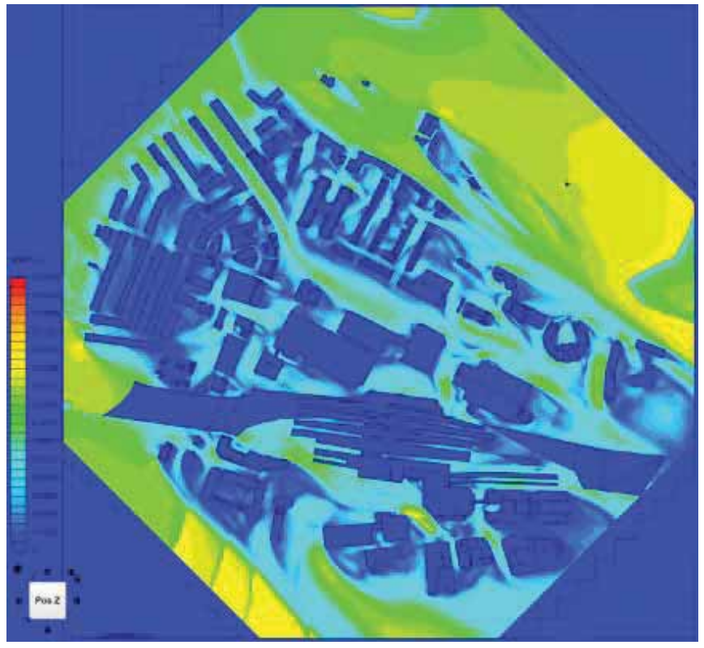


Figure 34 – Averaged wind velocity for 315.0° wind direction. Baseline Geometry.

©2020 Xi Engineering Consultants Ltd.

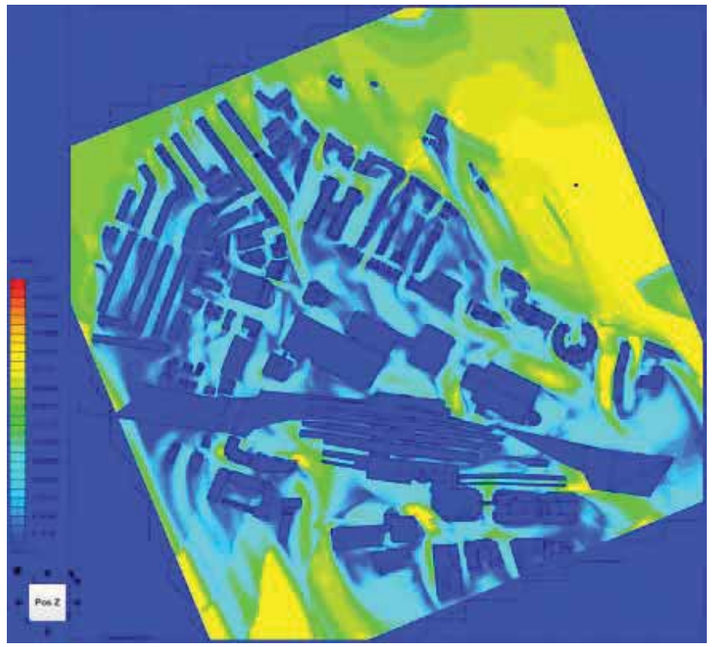


Figure 35 – Averaged wind velocity for 337.5° wind direction. Baseline Geometry.

©2020 Xi Engineering Consultants Ltd.

9.2 Configuration 2: Completed Development Geometry Averaged Wind Speed

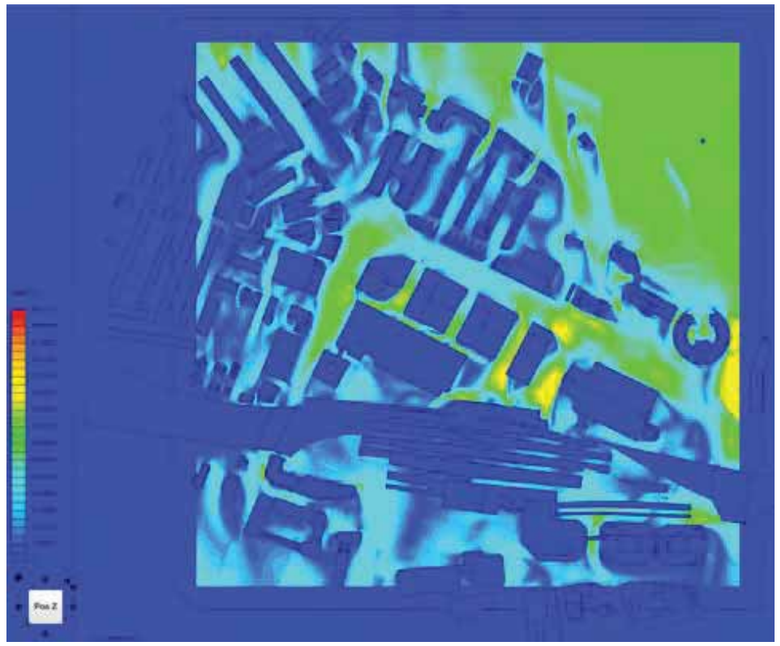


Figure 36 – Averaged wind velocity for 0.0° wind direction. New Development Geometry.



Figure 37 – Averaged wind velocity for 22.5° wind direction. New Development Geometry.

©2020 Xi Engineering Consultants Ltd.



Figure 38 – Averaged wind velocity for 45.0° wind direction. New Development Geometry.



Figure 39 – Averaged wind velocity for 67.5° wind direction. New Development Geometry.

©2020 Xi Engineering Consultants Ltd.

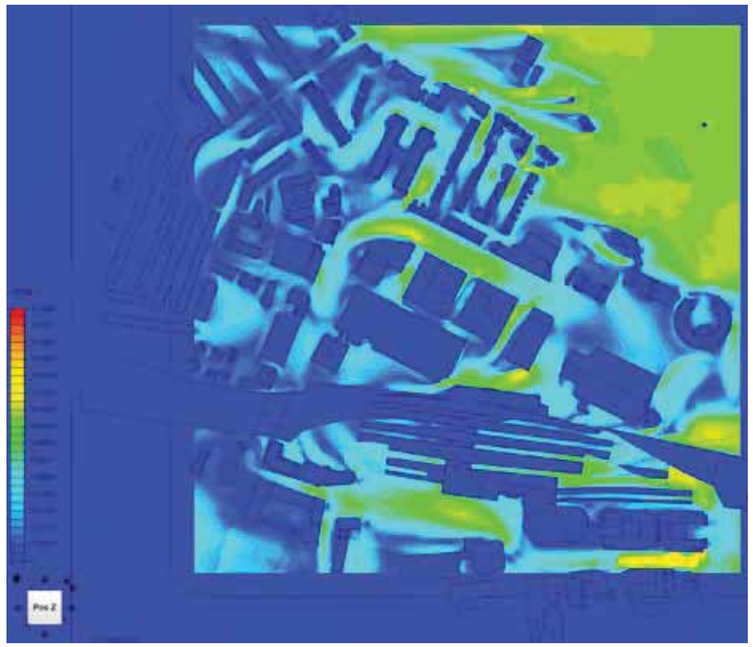


Figure 40 – Averaged wind velocity for 90.0° wind direction. New Development Geometry.

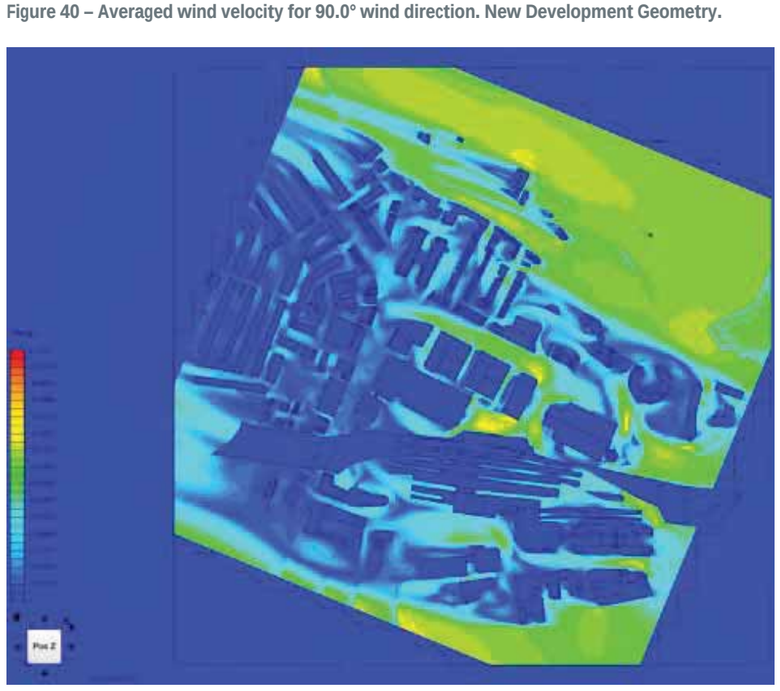


Figure 41 – Averaged wind velocity for 112.5° wind direction. New Development Geometry.

©2020 Xi Engineering Consultants Ltd.

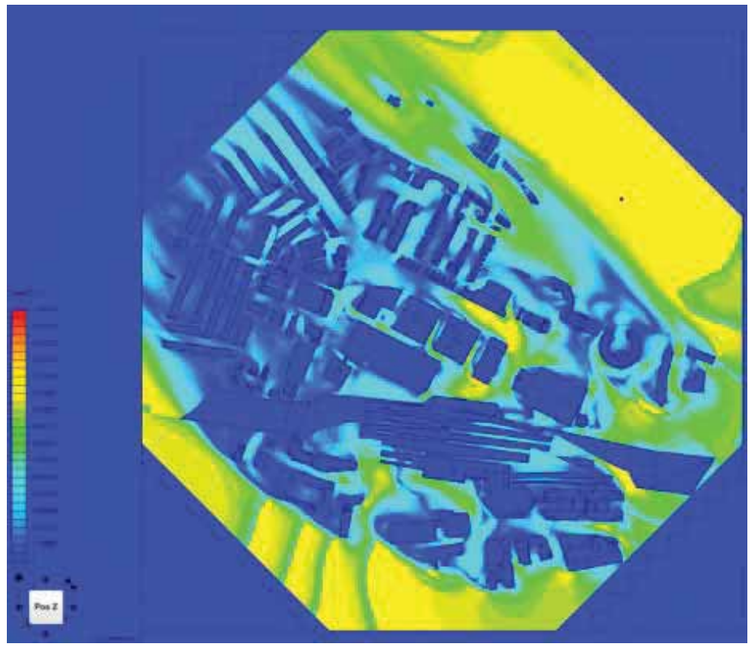


Figure 42 – Averaged wind velocity for 135.0° wind direction. New Development Geometry.

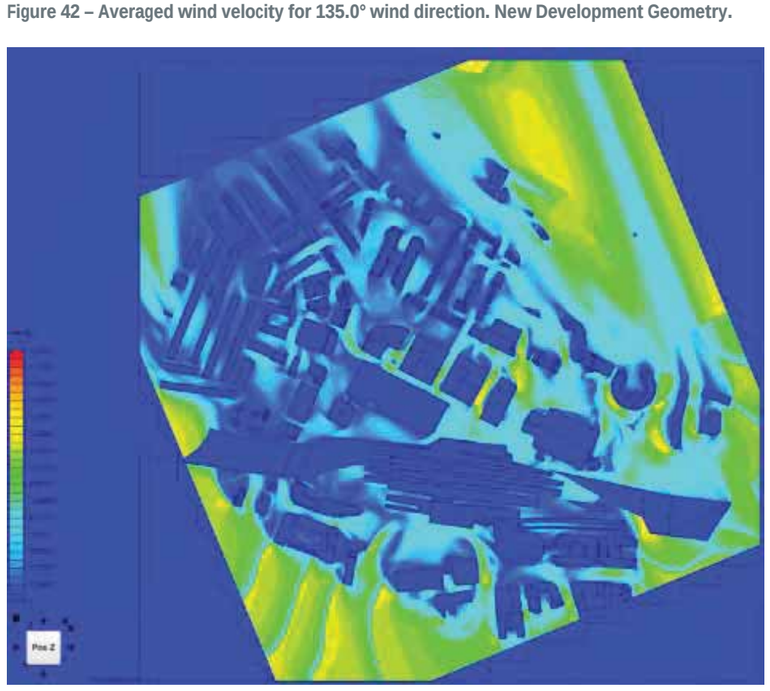


Figure 43 – Averaged wind velocity for 157.5° wind direction. New Development Geometry.

©2020 Xi Engineering Consultants Ltd.

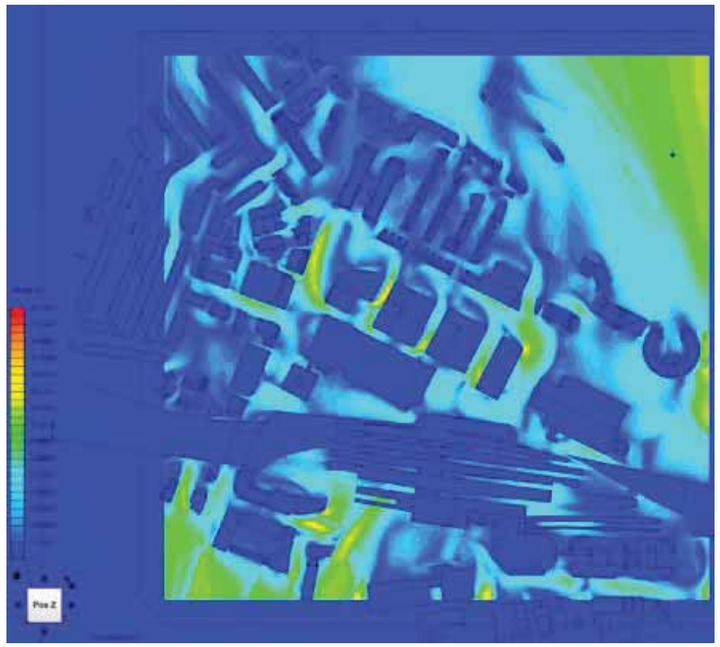


Figure 44 – Averaged wind velocity for 180.0° wind direction. New Development Geometry.

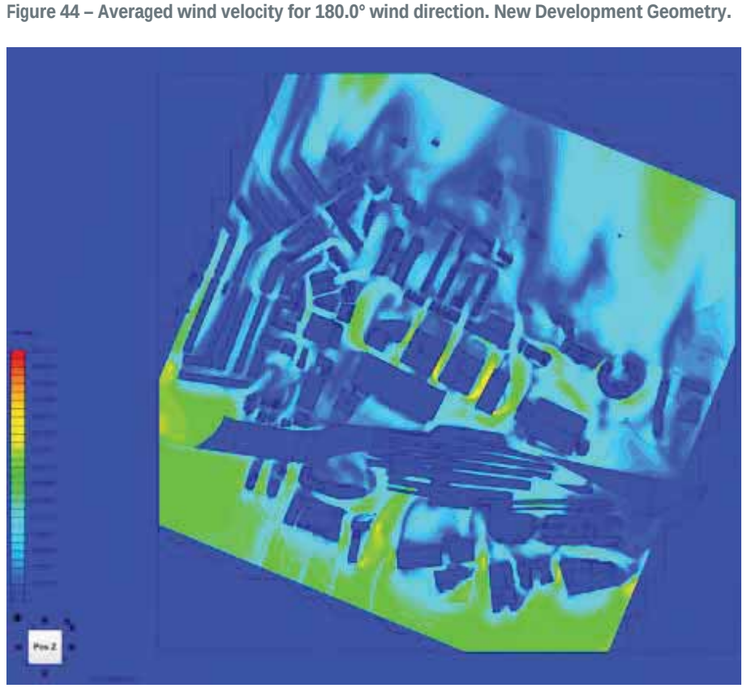


Figure 45 – Averaged wind velocity for 202.5° wind direction. New Development Geometry.

©2020 Xi Engineering Consultants Ltd.

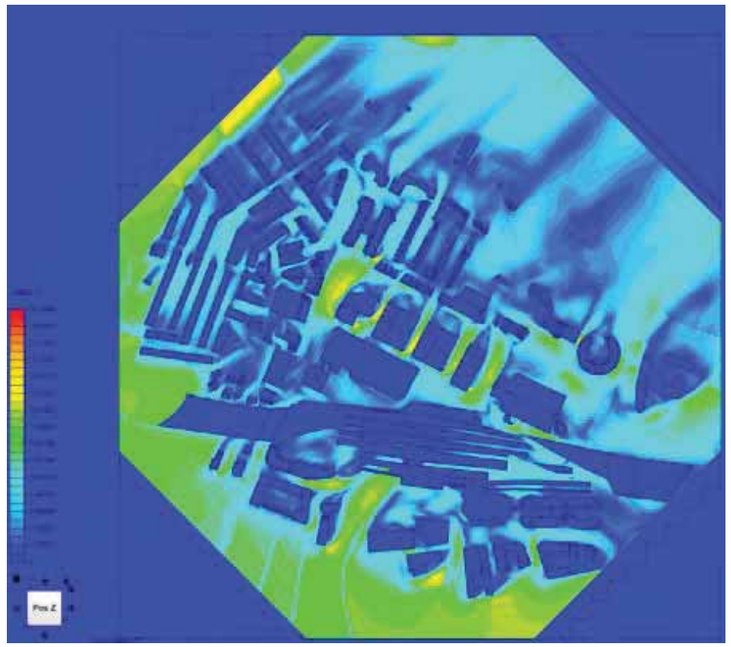


Figure 46 – Averaged wind velocity for 225.0° wind direction. New Development Geometry.

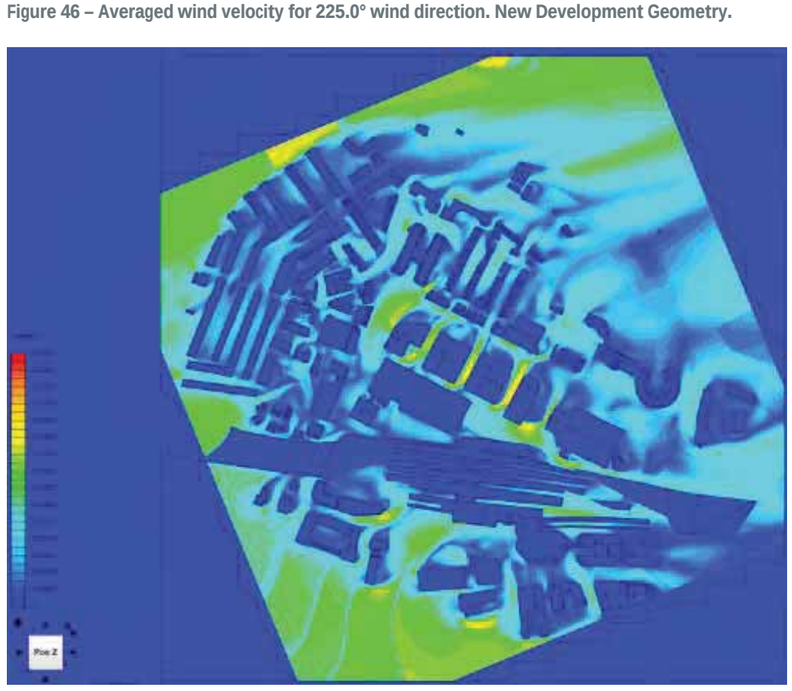


Figure 47 – Averaged wind velocity for 247.5° wind direction. New Development Geometry.

©2020 Xi Engineering Consultants Ltd.

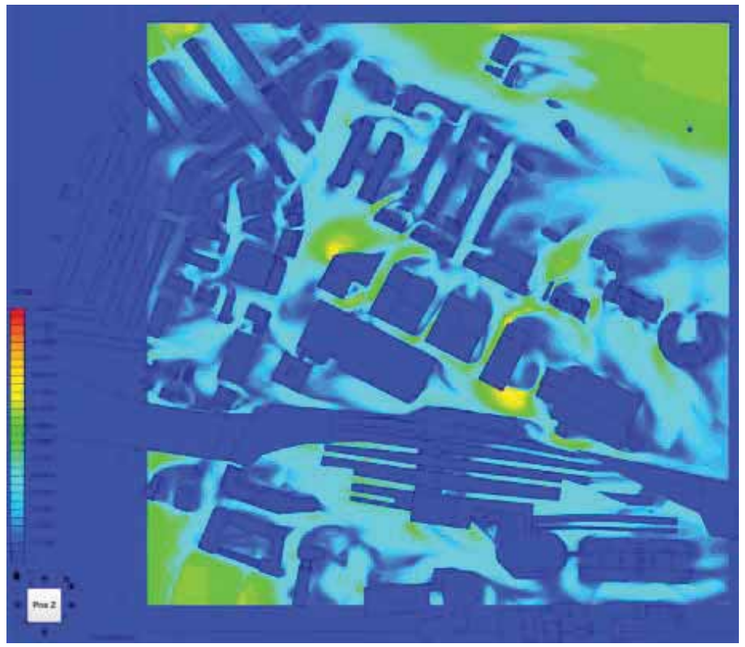


Figure 48 – Averaged wind velocity for 270.0° wind direction. New Development Geometry.

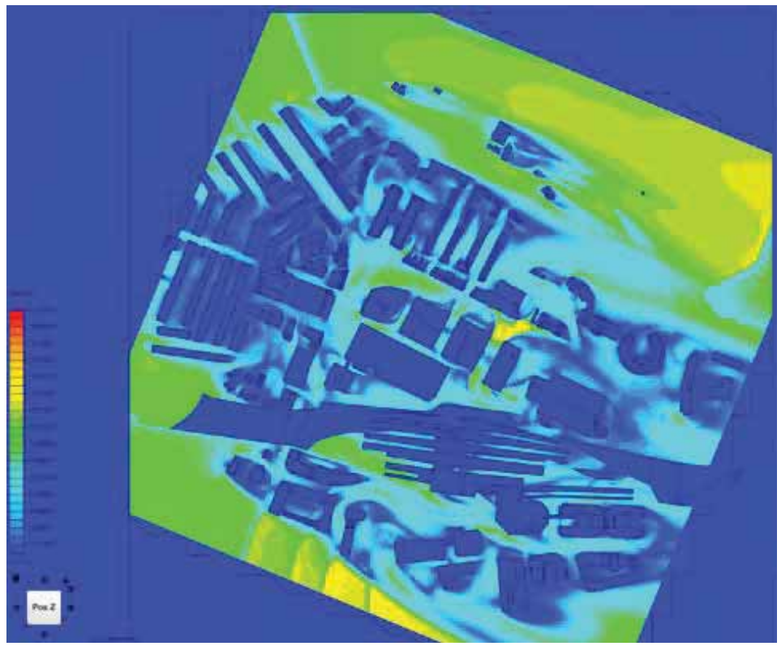


Figure 49 – Averaged wind velocity for 292.5° wind direction. New Development Geometry.

©2020 Xi Engineering Consultants Ltd.

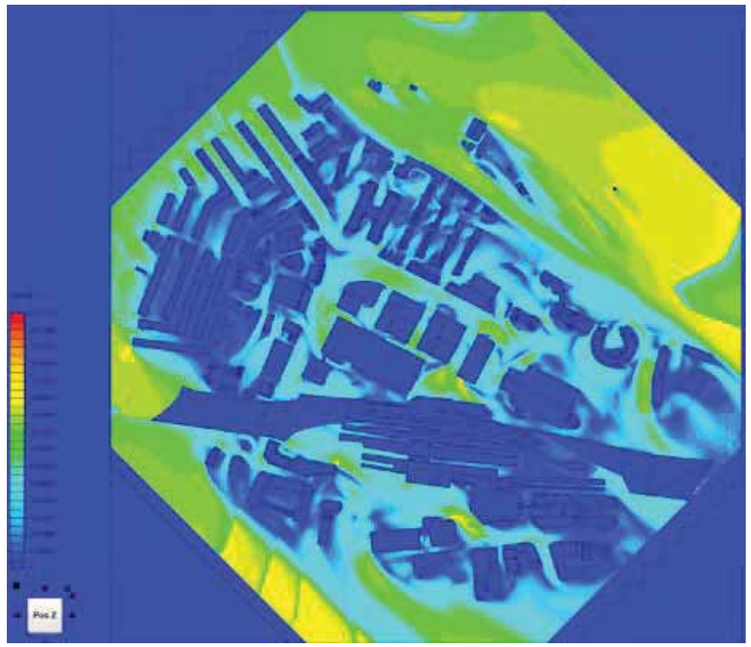


Figure 50 – Averaged wind velocity for 315.0° wind direction. New Development Geometry.

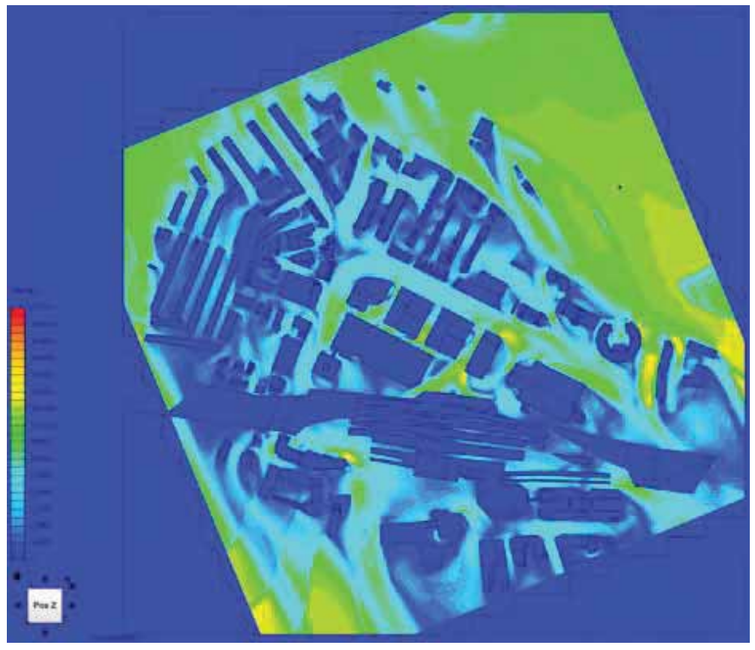


Figure 51 – Averaged wind velocity for 337.5° wind direction. New Development Geometry.

©2020 Xi Engineering Consultants Ltd.

9.3 Configuration 3: Cumulative Development Geometry Averaged Wind Speed

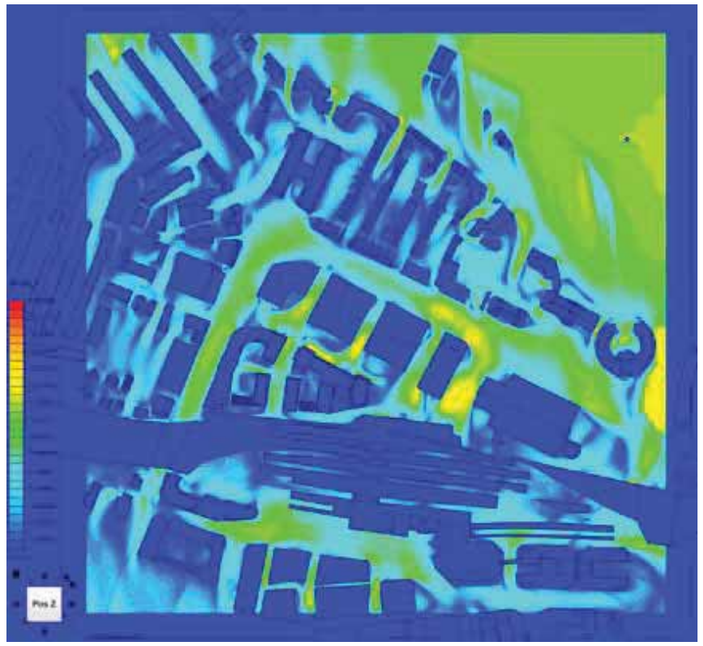


Figure 52 – Averaged wind velocity for 0.0° wind direction. Cumulative Development Geometry.

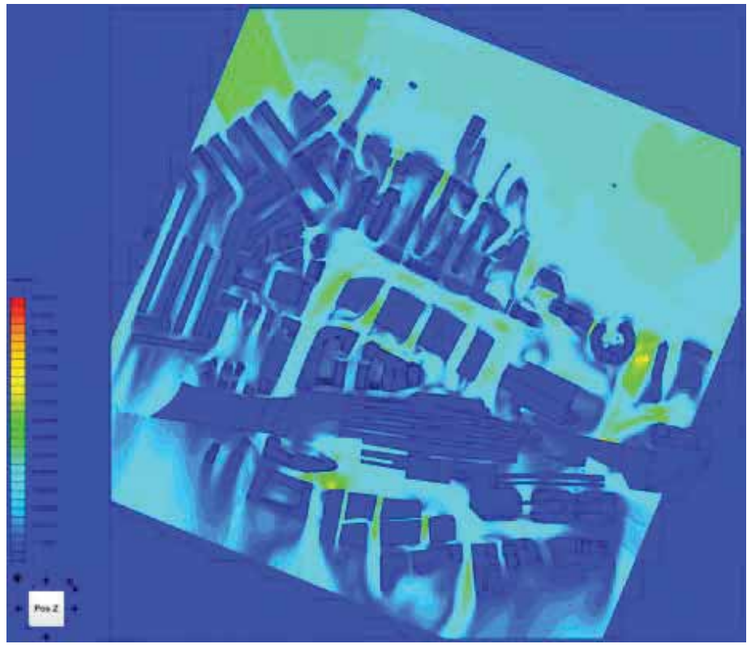


Figure 53 – Averaged wind velocity for 22.5° wind direction. Cumulative Development Geometry.

©2020 Xi Engineering Consultants Ltd.



Figure 54 – Averaged wind velocity for 45.0° wind direction. Cumulative Development Geometry.



Figure 55 – Averaged wind velocity for 67.5° wind direction. Cumulative Development Geometry.

©2020 Xi Engineering Consultants Ltd.

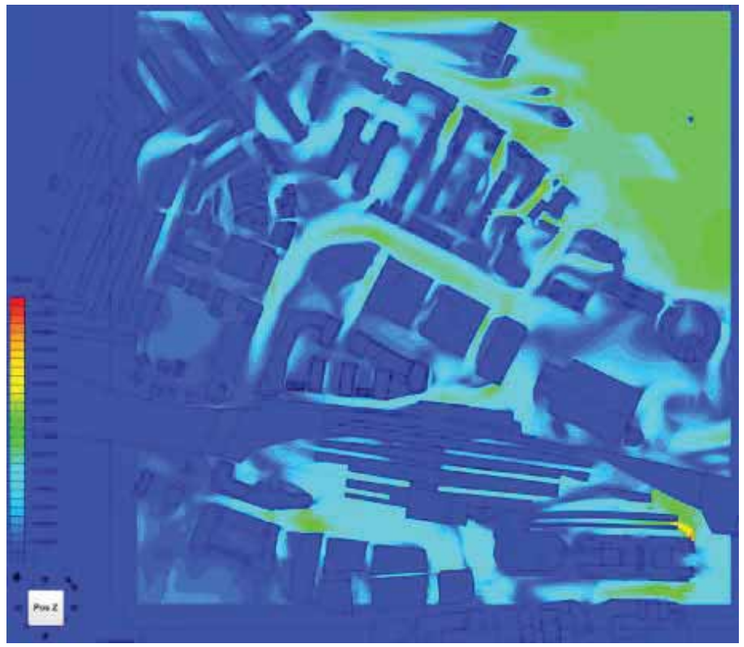


Figure 56 – Averaged wind velocity for 90.0° wind direction. Cumulative Development Geometry.

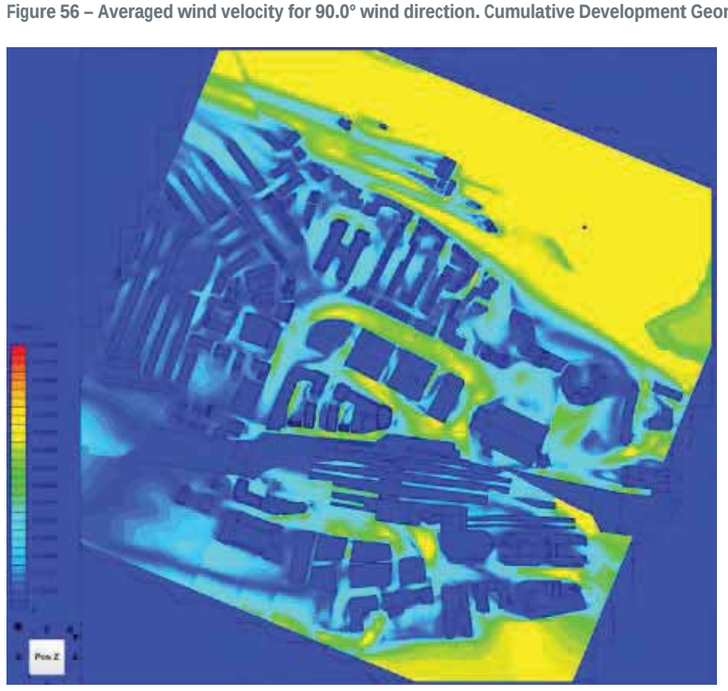


Figure 57 – Averaged wind velocity for 112.5° wind direction. Cumulative Development Geometry.

©2020 Xi Engineering Consultants Ltd.

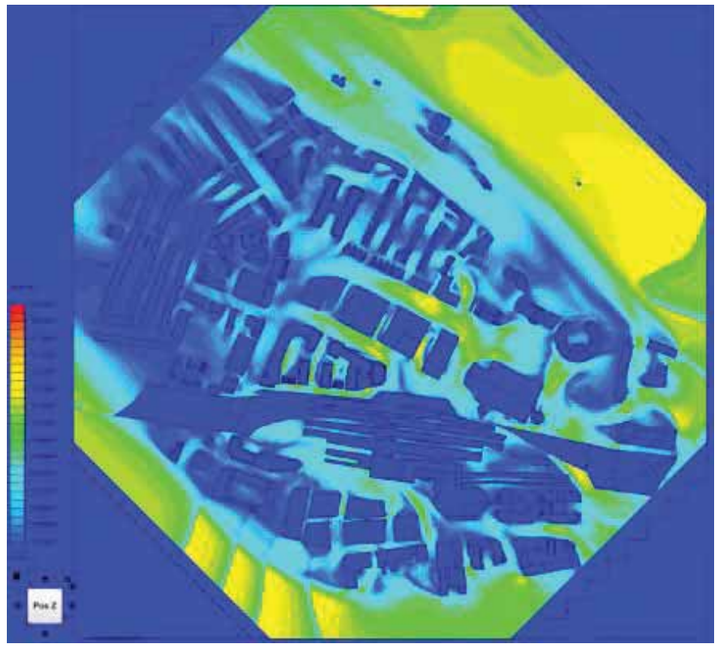


Figure 58 – Averaged wind velocity for 135.0° wind direction. Cumulative Development Geometry.

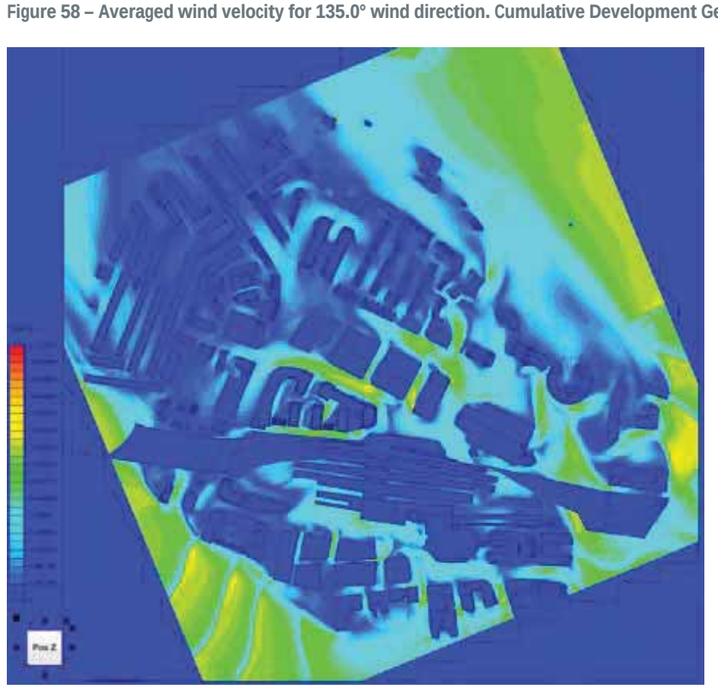


Figure 59 – Averaged wind velocity for 157.5° wind direction. Cumulative Development Geometry.

©2020 Xi Engineering Consultants Ltd.

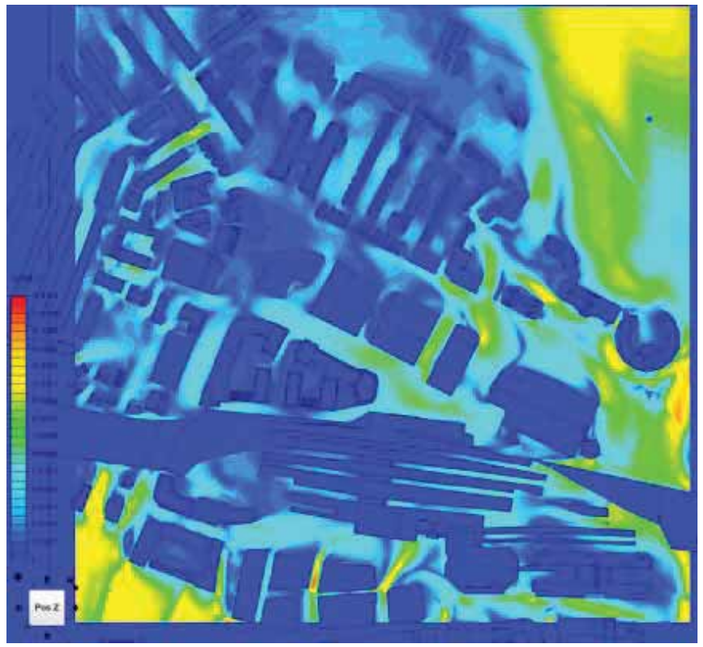


Figure 60 – Averaged wind velocity for 180.0° wind direction. Cumulative Development Geometry.



Figure 61 – Averaged wind velocity for 202.5° wind direction. Cumulative Development Geometry.

©2020 Xi Engineering Consultants Ltd.

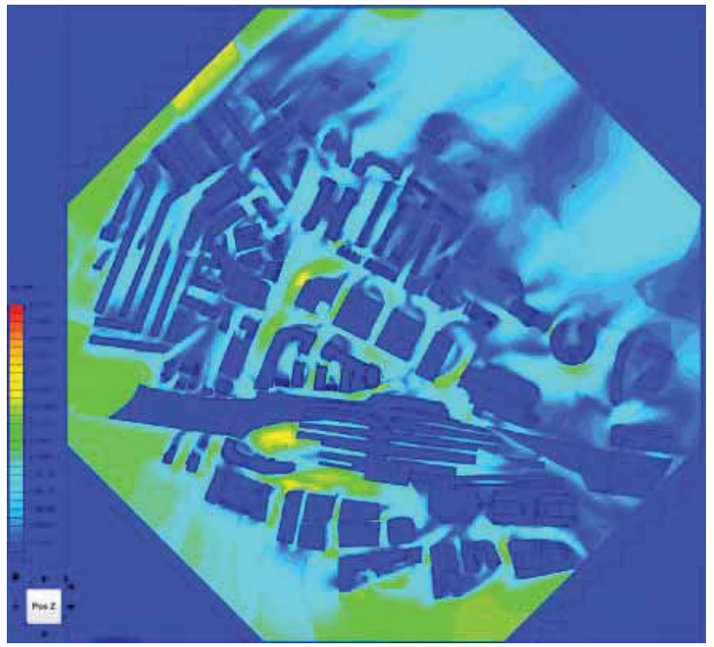


Figure 62 – Averaged wind velocity for 225.0° wind direction. Cumulative Development Geometry.



Figure 63 – Averaged wind velocity for 247.5° wind direction. Cumulative Development Geometry.

©2020 Xi Engineering Consultants Ltd.

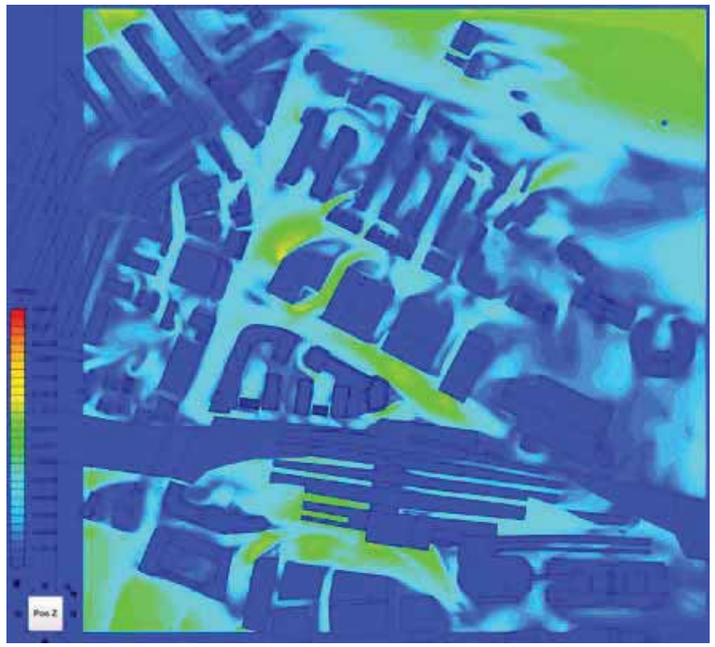


Figure 64 – Averaged wind velocity for 270.0° wind direction. Cumulative Development Geometry.

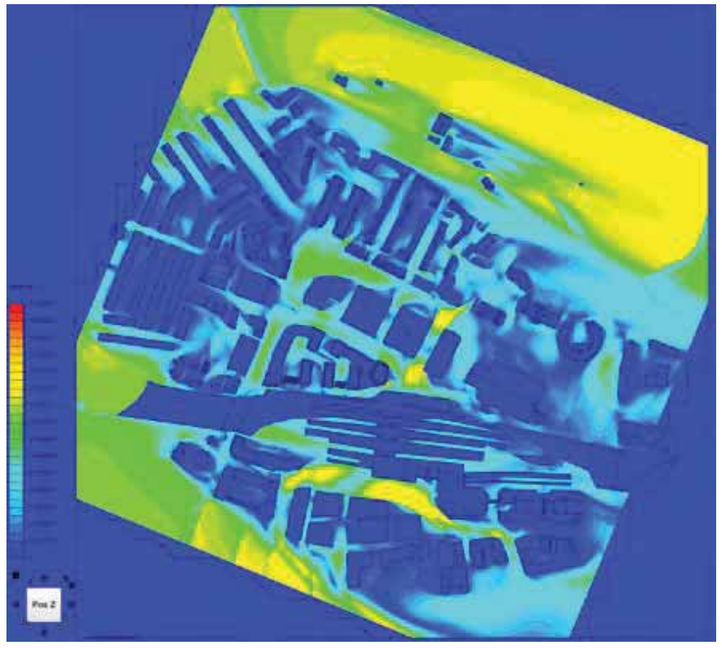


Figure 65 – Averaged wind velocity for 292.5° wind direction. Cumulative Development Geometry.

©2020 Xi Engineering Consultants Ltd.

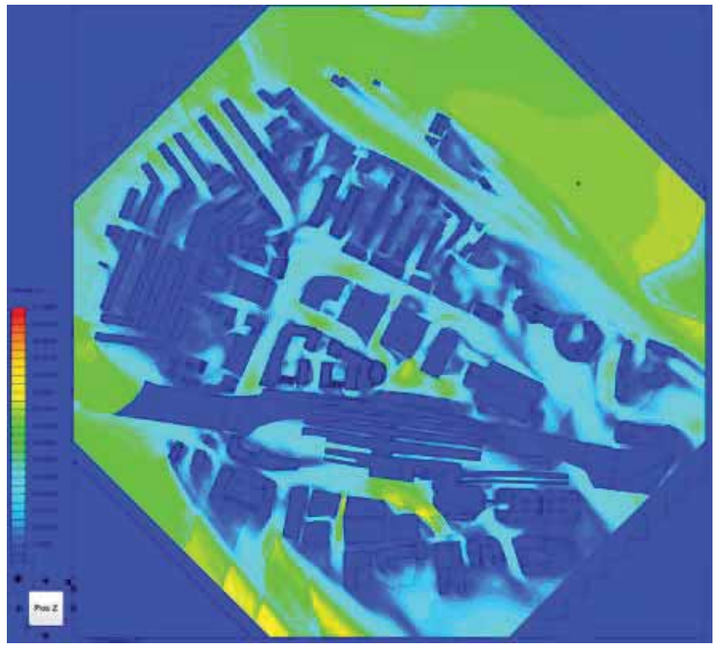


Figure 66 – Averaged wind velocity for 315.0° wind direction. Cumulative Development Geometry.

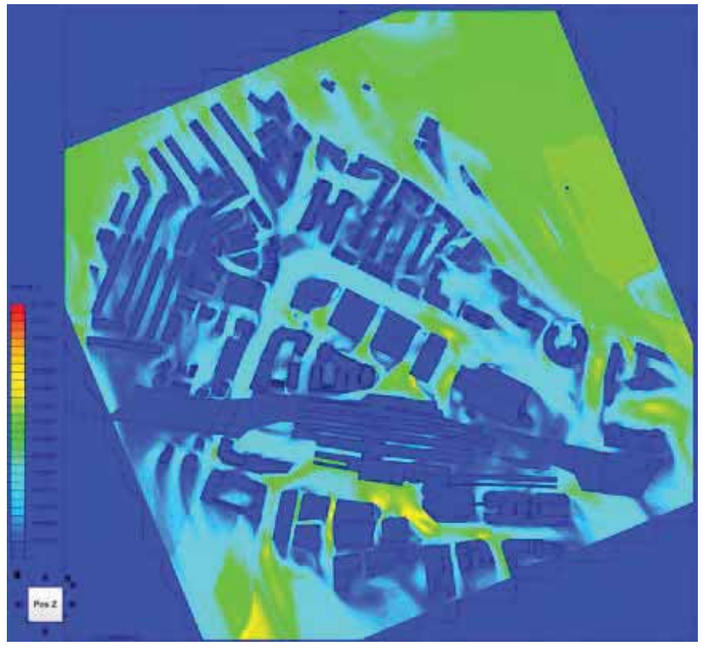


Figure 67 – Averaged wind velocity for 337.5° wind direction. Cumulative Development Geometry.

©2020 Xi Engineering Consultants Ltd.

Technical Appendix 10.1:Drawings of Baseline, Proposed Development and the Cumulative Scenario

Technical Appendix 10.2:Daylight and Sunlight Results

Technical Appendix 10.3:Overshadowing Assessment

Technical Appendix 10.4: Solar Glare Assessment

Technical Appendix 10.1

Drawings of Baseline, Proposed Development and the Cumulative Scenario



Sources

KEY

CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp-plc.com

PROJECT TITLE
Reading Station

DRAWING TITLE
Existing Plan View

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_100	-



Sources

KEY

CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chpsgb.com

PROJECT TITLE
Reading Station

DRAWING TITLE
Existing 3D View

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_101	-



Sources

KEY

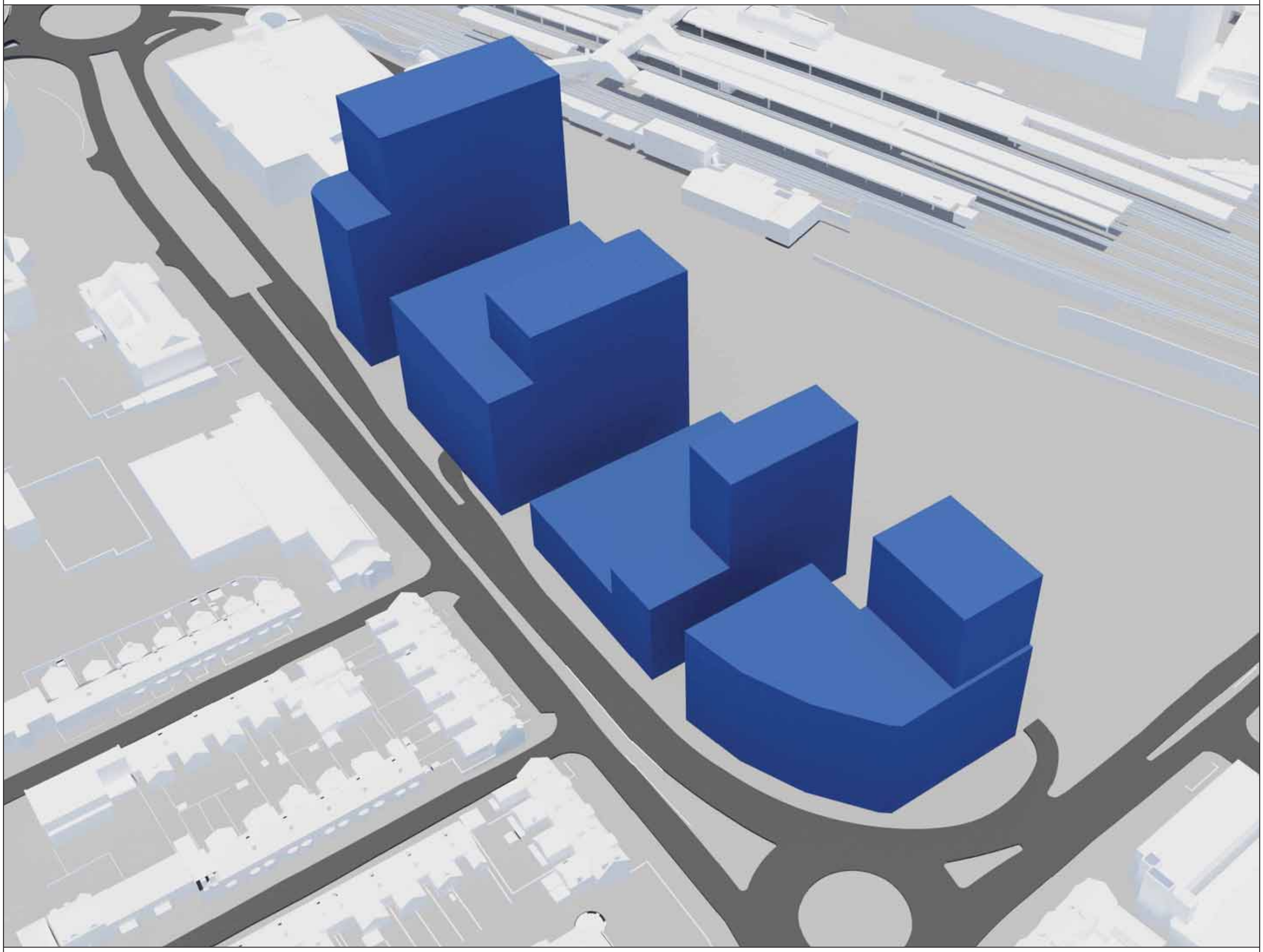
CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp.gb.com

PROJECT TITLE
Reading Station

DRAWING TITLE
Proposed Plan View
Residential Scheme

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_102	-



Sources

KEY

CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp.gb.com

PROJECT TITLE
Reading Station

DRAWING TITLE
Proposed 3D View
Residential Scheme

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_103	-



Sources

KEY

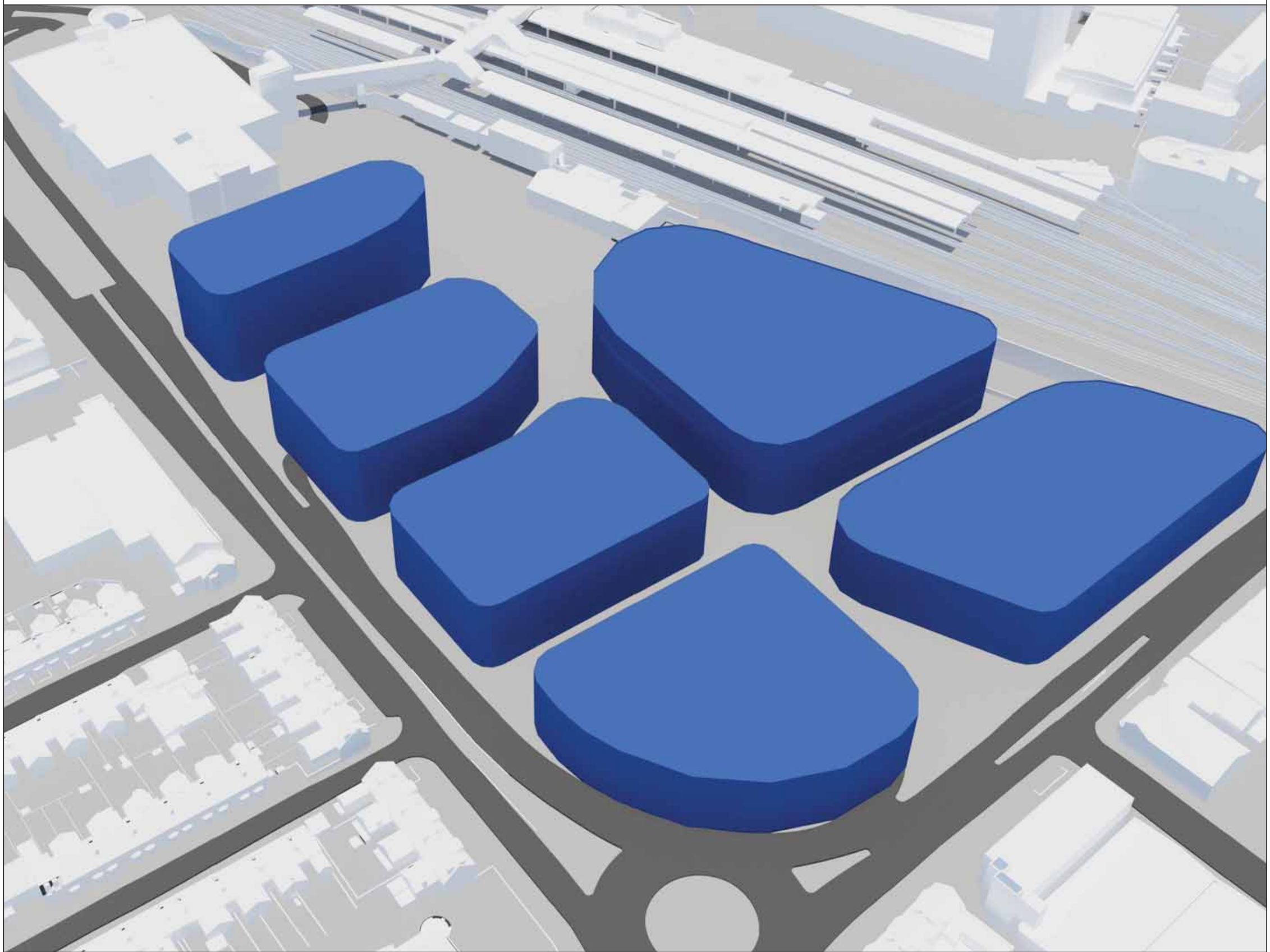
CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp-plc.com

PROJECT TITLE
Reading Station

DRAWING TITLE
Proposed Plan View
RSAF Scheme

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_104	-



Sources

KEY

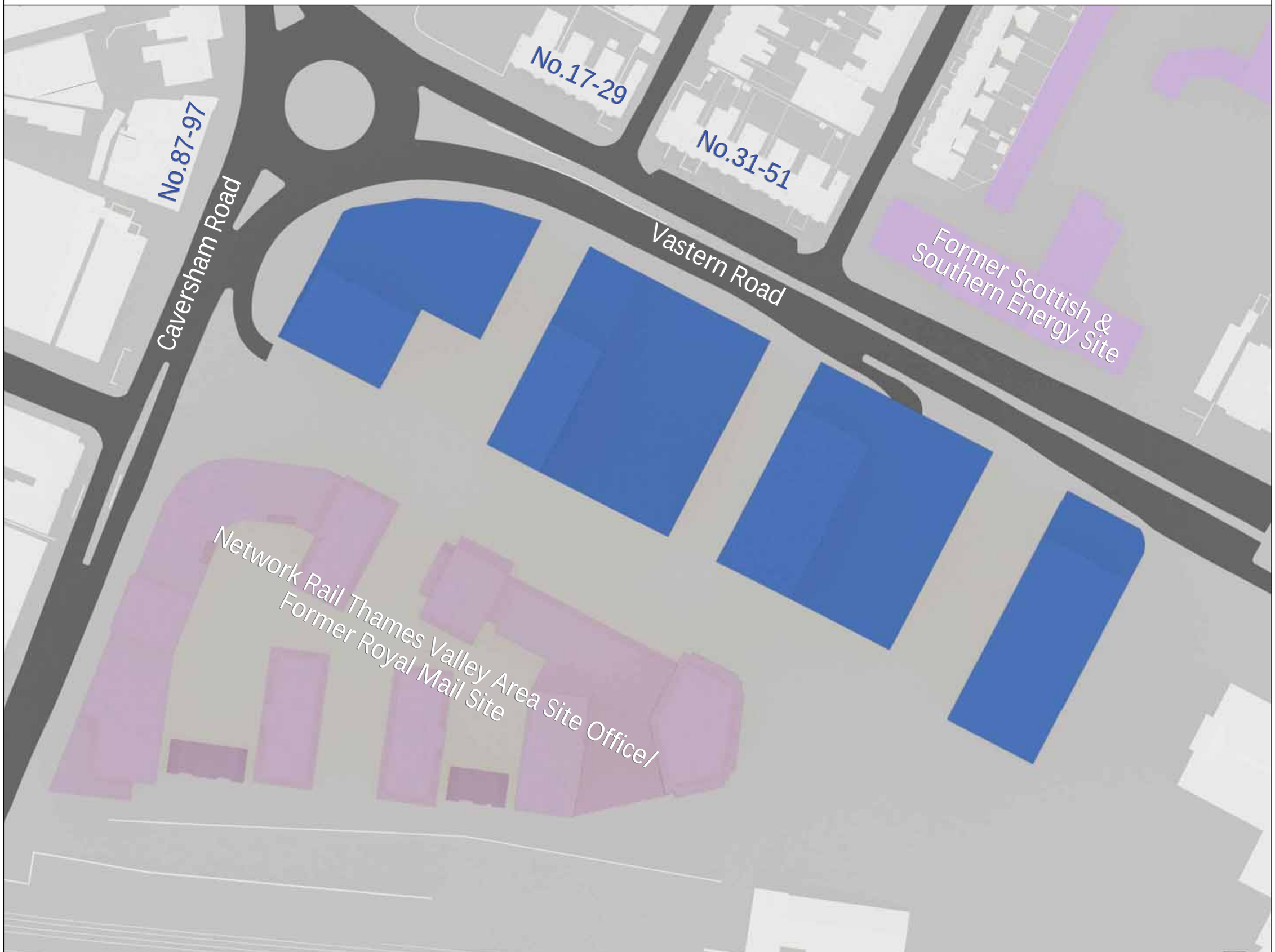
CHP Surveyors Ltd
2-4 Boundary Row, London, SE1 8HP www.chp.gb.com

PROJECT TITLE
Reading Station

DRAWING TITLE
Proposed 3D View
RSAF Scheme

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_105	-



Sources

KEY

CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp.gb.com

PROJECT TITLE
Reading Station

DRAWING TITLE
Proposed Plan View
Former Scottish and Southern Energy
Network Rail Thames Valley Site Office/
Former Royal Mail Site

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_106	-



Sources

KEY

CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp-gis.com

PROJECT TITLE
Reading Station

DRAWING TITLE
Proposed 3D View
Former Scottish and Southern Energy
Network Rail Thames Valley Site Office/
Former Royal Mail Site

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_107	-



Sources

KEY

CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp-plc.com

PROJECT TITLE
Reading Station

DRAWING TITLE
No.17-29 Vastern Road
Window Maps

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_108	-



Sources

KEY

CHP Surveyors Ltd
2-4 Boundary Row, London, SE1 8HP www.chpsgb.com

PROJECT TITLE
Reading Station

DRAWING TITLE
No.31-51 Vastern Road
Window Maps

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_109	-



Sources

KEY

CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp.gb.com

PROJECT TITLE
Reading Station

DRAWING TITLE
No.87-97 Caversham Road
Window Maps

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_110	-

Technical Appendix 10.2

Daylight and Sunlight Results

LEVEL	WINDOW	ROOM	VSC		LOSS	% LOSS	NOSKY	
			EXISTING	PROPOSED			EXISTING	PROPOSED
87-89 Caversham Road								
First	W1	R1	38.0	26.6	11.5	30.1	>80%	>80%
	W2		38.0	26.7	11.3	29.7		
	W3	R2	38.0	26.9	11.1	29.3	>80%	>80%
	W4		38.0	27.1	10.9	28.8		
Second	W1	R1	38.3	27.4	10.9	28.4	64%	43%
	W2	R2	38.3	27.5	10.8	28.1	62%	25%
91 Caversham Road								
First	W1	R1	38.0	27.3	10.7	28.3	>80%	>80%
	W2		38.0	27.5	10.5	27.6		
Second	W3	R1	38.3	28.3	10.0	26.1	65%	51%
93-97 Caversham Road								
First	W1	R1	38.0	27.8	10.2	26.9	>80%	>80%
	W2		38.0	28.1	9.9	26.0		
	W3	R2	37.9	28.4	9.5	25.1	>80%	>80%
	W4		37.9	28.8	9.2	24.1		
	W5	R3	37.9	29.1	8.8	23.3	>80%	>80%
	W6		37.9	29.4	8.5	22.3		
Second	W1	R1	38.3	28.5	9.8	25.7	64%	27%
	W2	R2	38.2	29.5	8.8	22.9	60%	50%
	W3	R3	38.2	29.7	8.5	22.3	55%	26%
17 Vastern Road								
Ground	W2	R1	37.2	23.6	13.7	36.7	>80%	68%
First	W1	R1	37.8	24.3	13.6	35.8	>80%	79%
	W2		37.9	24.0	13.9	36.6		
Second	W1	R1	38.3	25.7	12.6	33.0	39%	9%
19 Vastern Road								
Ground	W2	R1	37.3	22.6	14.7	39.4	>80%	57%
First	W1	R1	37.8	24.3	13.6	35.8	>80%	74%
	W2		37.9	24.0	13.9	36.6		
Second	W1	R1	38.3	25.7	12.6	33.0	40%	9%
21 Vastern Road								
Ground	W2	R1	37.3	22.1	15.2	40.8	>80%	59%
First	W1	R1	37.9	23.6	14.3	37.7	>80%	73%
	W2		37.9	23.4	14.5	38.3		
Second	W1	R1	38.4	24.7	13.7	35.7	38%	8%
23 Vastern Road								
Ground	W2	R1	37.3	21.4	15.9	42.6	>80%	49%
First	W1	R1	37.9	23.1	14.8	39.2	>80%	69%
	W2		37.9	22.9	15.0	39.6		
Second	W1	R1	38.4	24.5	13.9	36.1	39%	8%
25 Vastern Road								
Ground	W2	R1	37.3	21.5	15.9	42.5	>80%	76%
First	W1	R1	37.9	23.0	15.0	39.5	>80%	>80%

Aviva Life Pensions UK Limited
Reading Station Park
Daylight Results for Proposed Scheme

Volume 3: Technical Appendices
Technical Appendix 10.2: Daylight and Sunlight Results

	W2		38.0	23.2	14.8	39.0		
Second	W1	R1	38.4	24.7	13.7	35.8	38%	20%
27 Vastern Road								
Ground	W2	R1	37.4	22.3	15.1	40.3	>80%	>80%
First	W1	R1	38.0	23.4	14.5	38.3	>80%	>80%
	W2		38.0	23.8	14.2	37.5		
Second	W1	R1	38.4	24.8	13.6	35.4	40%	18%
29 Vastern Road								
Ground	W2	R1	37.4	22.4	15.0	40.0	>80%	>80%
First	W1	R1	38.0	23.9	14.2	37.2	>80%	>80%
	W2		38.0	23.9	14.1	37.1		
31 Vastern Road								
Ground	W2	R1	37.5	22.8	14.7	39.2	>80%	>80%
First	W2		38.0	24.1	14.0	36.8	>80%	>80%
Second	W1	R1	38.4	25.5	12.9	33.6	>80%	>80%
33 Vastern Road								
Ground	W2	R1	37.5	22.2	15.3	40.8	>80%	>80%
First	W2	R1	38.0	23.6	14.5	38.0	>80%	>80%
Second	W1	R1	38.4	25.4	13.0	33.8	>80%	>80%
35 Vastern Road								
Ground	W2	R1	37.5	21.9	15.6	41.6	>80%	>80%
First	W2	R1	38.0	23.3	14.7	38.7	>80%	>80%
Second	W1	R1	38.4	25.1	13.3	34.7	74%	39%
37 Vastern Road								
Ground	W2	R1	37.5	21.7	15.8	42.1	>80%	76%
First	W2	R1	38.0	23.2	14.9	39.1	>80%	74%
Second	W1	R1	38.4	24.9	13.4	35.0	70%	39%
39 Vastern Road								
Ground	W2	R1	37.5	21.6	15.9	42.4	>80%	75%
First	W2	R1	38.0	23.1	15.0	39.4	>80%	74%
Second	W1	R1	38.4	24.8	13.5	35.3	64%	37%
41 Vastern Road								
Ground	W2	R1	37.5	21.4	16.1	42.9	>80%	73%
First	W2	R1	38.0	22.9	15.1	39.8	>80%	73%
Second	W1	R1	38.4	24.6	13.8	35.8	65%	40%
43 Vastern Road								
Ground	W2	R1	37.5	21.3	16.2	43.1	>80%	72%
First	W2	R1	38.0	22.8	15.3	40.1	>80%	72%
Second	W1	R1	38.4	24.5	13.9	36.1	65%	41%
45 Vastern Road								
Ground	W2	R1	37.4	21.1	16.4	43.7	>80%	71%
First	W2	R1	38.0	22.5	15.5	40.7	>80%	71%
Second	W1	R1	38.3	24.2	14.1	36.8	68%	44%

Daylight Results for Proposed Scheme

47 Vastern Road								
Ground	W2	R1	37.4	20.9	16.5	44.1	>80%	70%
First	W2	R1	38.0	22.3	15.7	41.2	>80%	70%
Second	W1	R1	38.3	24.0	14.3	37.3	65%	42%
49 Vastern Road								
Ground	W2	R1	37.3	20.6	16.7	44.8	>80%	74%
First	W2	R1	37.9	22.0	15.9	41.9	>80%	72%
Second	W1	R1	38.3	23.7	14.6	38.0	71%	46%

Sunlight Results for Proposed Scheme

LEVEL	ROOM	EXISTING			PROPOSED			% LOSS	
		SUMMER	WINTER	TOTAL	SUMMER	WINTER	TOTAL	WINTER	TOTAL
87-89 Caversham Road									
First	R1	40%	20%	60%	24%	14%	38%	30.00	36.67
	R2	40%	20%	60%	27%	14%	41%	30.00	31.67
Second	R1	40%	20%	60%	28%	14%	42%	30.00	30.00
	R2	40%	20%	60%	27%	14%	41%	30.00	31.67
91 Caversham Road									
First	R1	40%	20%	60%	30%	14%	44%	30.00	26.67
Second	R1	40%	20%	60%	31%	13%	44%	35.00	26.67
93-97 Caversham Road									
First	R1	40%	20%	60%	32%	12%	44%	40.00	26.67
	R2	39%	20%	59%	33%	11%	44%	45.00	25.42
	R3	39%	20%	59%	35%	10%	45%	50.00	23.73
Second	R1	39%	20%	59%	31%	12%	43%	40.00	27.12
	R2	39%	20%	59%	35%	11%	46%	45.00	22.03
	R3	39%	20%	59%	35%	11%	46%	45.00	22.03
17 Vastern Road									
Ground	R1	55%	27%	82%	54%	6%	60%	77.78	26.83
First	R1	54%	27%	81%	53%	7%	60%	74.07	25.93
Second	R1	54%	28%	82%	54%	10%	64%	64.29	21.95
19 Vastern Road									
Ground	R1	55%	27%	82%	53%	6%	59%	77.78	28.05
First	R1	54%	28%	82%	53%	7%	60%	75.00	26.83
Third	R1	54%	28%	82%	54%	8%	62%	71.43	24.39
21 Vastern Road									
Ground	R1	55%	27%	82%	51%	5%	56%	81.48	31.71
First	R1	54%	28%	82%	53%	7%	60%	75.00	26.83
Second	R1	54%	28%	82%	54%	9%	63%	67.86	23.17
23 Vastern Road									
Ground	R1	55%	28%	83%	52%	7%	59%	75.00	28.92
First	R1	54%	28%	82%	52%	9%	61%	67.86	25.61
Second	R1	54%	28%	82%	53%	9%	62%	67.86	24.39
25 Vastern Road									
Ground	R1	55%	28%	83%	51%	7%	58%	75.00	30.12
First	R1	54%	28%	82%	51%	8%	59%	71.43	28.05
Second	R1	54%	28%	82%	52%	10%	62%	64.29	24.39

Sunlight Results for Proposed Scheme

27 Vastern Road									
Ground	R1	55%	28%	83%	51%	10%	61%	64.29	26.51
First	R1	54%	28%	82%	51%	11%	62%	60.71	24.39
Second	R1	54%	28%	82%	52%	10%	62%	64.29	24.39
29 Vastern Road									
Ground	R1	58%	28%	86%	53%	10%	63%	64.29	26.74
First	R2	54%	28%	82%	51%	11%	62%	60.71	24.39
31 Vastern Road									
Ground	R1	53%	28%	81%	48%	9%	57%	67.86	29.63
First	R1	57%	28%	85%	53%	10%	63%	64.29	25.88
Second	R1	54%	28%	82%	50%	11%	61%	60.71	25.61
33 Vastern Road									
Ground	R1	52%	28%	80%	48%	10%	58%	64.29	27.50
First	R1	55%	28%	83%	52%	11%	63%	60.71	24.10
Second	R1	54%	28%	82%	51%	12%	63%	57.14	23.17
35 Vastern Road									
Ground	R1	53%	28%	81%	48%	9%	57%	67.86	29.63
First	R1	56%	28%	84%	53%	10%	63%	64.29	25.00
Second	R1	54%	28%	82%	50%	11%	61%	60.71	25.61
37 Vastern Road									
Ground	R1	52%	28%	80%	47%	8%	55%	71.43	31.25
First	R1	55%	28%	83%	51%	10%	61%	64.29	26.51
Second	R1	54%	28%	82%	51%	12%	63%	57.14	23.17
39 Vastern Road									
Ground	R1	53%	28%	81%	48%	8%	56%	71.43	30.86
First	R1	56%	28%	84%	51%	9%	60%	67.86	28.57
Second	R1	54%	28%	82%	50%	11%	61%	60.71	25.61
41 Vastern Road									
Ground	R1	52%	28%	80%	46%	7%	53%	75.00	33.75
First	R1	55%	28%	83%	50%	8%	58%	71.43	30.12
Second	R1	54%	28%	82%	50%	10%	60%	64.29	26.83
43 Vastern Road									
Ground	R1	53%	28%	81%	48%	7%	55%	75.00	32.10
First	R1	56%	28%	84%	53%	8%	61%	71.43	27.38
Second	R1	54%	28%	82%	51%	10%	61%	64.29	25.61
45 Vastern Road									
Ground	R1	52%	28%	80%	46%	7%	53%	75.00	33.75
First	R1	55%	28%	83%	50%	8%	58%	71.43	30.12

Aviva Life Pensions UK Limited
Reading Station Park
Volume 3: Technical Appendices
Technical Appendix 10.2: Daylight and Sunlight Results

Sunlight Results for Proposed Scheme

Second	R1	54%	28%	82%	51%	9%	60%	67.86	26.83
	R81	62%	30%	92%	49%	28%	77%	6.67	16.30
47 Vastern Road									
Ground	R1	53%	28%	81%	47%	6%	53%	78.57	34.57
First	R1	56%	28%	84%	52%	7%	59%	75.00	29.76
Second	R1	54%	28%	82%	52%	11%	63%	60.71	23.17
49 Vastern Road									
Ground	R1	52%	28%	80%	47%	5%	52%	82.14	35.00
First	R1	56%	28%	84%	52%	7%	59%	75.00	29.76
Second	R1	54%	28%	82%	51%	8%	59%	71.43	28.05

LEVEL	WINDOW	ROOM	VSC		LOSS	% LOSS	NOSKY	
			EXISTING	PROPOSED			EXISTING	PROPOSED
87-89 Caversham Road								
First	W1	R1	38.0	24.8	13.2	34.8	>80%	>80%
	W2		38.0	25.1	12.9	33.9		
	W3	R2	38.0	25.4	12.6	33.1	>80%	>80%
	W4		38.0	25.8	12.2	32.2		
Second	W1	R1	38.3	26.0	12.4	32.2	64%	43%
	W2	R2	38.3	26.2	12.1	31.7	62%	20%
91 Caversham Road								
First	W1	R1	38.0	26.1	11.9	31.3	>80%	>80%
	W2		38.0	26.4	11.6	30.5		
Second	W3	R1	38.3	27.3	11.0	28.7	65%	51%
93-97 Caversham Road								
First	W1	R1	38.0	26.7	11.2	29.6	>80%	>80%
	W2		38.0	27.1	10.8	28.5		
	W3	R2	37.9	27.5	10.4	27.5	>80%	>80%
	W4		37.9	27.9	10.0	26.4		
	W5	R3	37.9	28.3	9.6	25.3	>80%	>80%
	W6		37.9	28.7	9.2	24.2		
Second	W1	R1	38.3	27.5	10.8	28.1	64%	26%
	W2	R2	38.2	28.7	9.6	25.1	60%	49%
	W3	R3	38.2	28.9	9.3	24.3	55%	26%
17 Vastern Road								
Ground	W2	R1	37.2	23.6	13.7	36.7	>80%	67%
First	W1	R1	37.8	25.0	12.8	33.9	>80%	79%
	W2		37.9	24.7	13.2	34.9		
Second	W1	R1	38.3	25.8	12.5	32.6	39%	9%
19 Vastern Road								
Ground	W2	R1	37.3	22.6	14.7	39.4	>80%	57%
First	W1	R1	37.8	24.3	13.6	35.9	>80%	73%
	W2		37.9	24.0	13.9	36.7		
Second	W1	R1	38.3	25.6	12.7	33.1	40%	9%
21 Vastern Road								
Ground	W2	R1	37.3	22.1	15.2	40.8	>80%	59%
First	W1	R1	37.9	23.6	14.3	37.8	>80%	72%
	W2		37.9	23.3	14.5	38.4		
Second	W1	R1	38.4	24.6	13.8	36.0	38%	8%
23 Vastern Road								
Ground	W2	R1	37.3	21.4	15.9	42.6	>80%	49%
First	W1	R1	37.9	23.1	14.9	39.2	>80%	69%
	W2		37.9	22.9	15.0	39.6		
Second	W1	R1	38.4	24.4	13.9	36.3	39%	8%

Aviva Life Pensions UK Limited
Reading Station Park
Daylight Results - HERMES and SSE

Volume 3: Technical Appendices
Technical Appendix 10.2: Daylight and Sunlight Results

25 Vastern Road								
Ground	W2	R1	37.3	21.4	15.9	42.7	>80%	74%
First	W1	R1	37.9	22.9	15.1	39.7	>80%	>80%
	W2		38.0	23.0	14.9	39.3		
Second	W1	R1	38.4	24.5	13.9	36.2	38%	20%
27 Vastern Road								
Ground	W2	R1	37.4	22.1	15.3	40.9	>80%	>80%
First	W1	R1	38.0	23.3	14.7	38.6	>80%	>80%
	W2		38.0	23.6	14.4	38.0		
Second	W1	R1	38.4	24.6	13.8	35.9	40%	18%
29 Vastern Road								
Ground	W2	R1	37.4	22.1	15.3	40.8	>80%	>80%
First	W1	R1	38.0	23.6	14.5	38.0	>80%	>80%
	W2		38.0	23.5	14.5	38.2		
31 Vastern Road								
Ground	W2	R1	37.5	22.0	15.6	41.5	>80%	>80%
First	W2		38.0	26.2	11.9	31.3	>80%	>80%
Second	W1	R1	38.4	24.5	13.9	36.2	>80%	>80%
33 Vastern Road								
Ground	W2	R1	37.5	21.7	15.9	42.3	>80%	>80%
First	W2	R1	38.0	22.9	15.1	39.8	>80%	>80%
Second	W1	R1	38.4	24.4	14.0	36.4	>80%	>80%
35 Vastern Road								
Ground	W2	R1	37.5	21.5	16.0	42.7	>80%	>80%
First	W2	R1	38.0	22.8	15.2	40.1	>80%	>80%
Second	W1	R1	38.4	24.4	14.0	36.5	74%	37%
37 Vastern Road								
Ground	W2	R1	37.5	21.4	16.2	43.1	>80%	73%
First	W2	R1	38.0	22.7	15.3	40.3	>80%	71%
Second	W1	R1	38.4	24.3	14.1	36.7	70%	37%
39 Vastern Road								
Ground	W2	R1	37.5	21.3	16.3	43.4	>80%	71%
First	W2	R1	38.0	22.6	15.4	40.6	>80%	69%
Second	W1	R1	38.4	24.2	14.2	37.0	64%	36%
41 Vastern Road								
Ground	W2	R1	37.5	21.1	16.4	43.7	>80%	71%
First	W2	R1	38.0	22.5	15.6	40.9	>80%	70%
Second	W1	R1	38.4	24.0	14.3	37.4	65%	39%
43 Vastern Road								
Ground	W2	R1	37.5	21.0	16.5	43.9	>80%	69%
First	W2	R1	38.0	22.4	15.7	41.2	>80%	70%
Second	W1	R1	38.4	23.9	14.4	37.6	65%	40%

45 Vastern Road								
Ground	W2	R1	37.4	20.8	16.6	44.4	>80%	70%
First	W2	R1	38.0	22.2	15.8	41.6	>80%	69%
Second	W1	R1	38.3	23.8	14.6	38.1	68%	42%
47 Vastern Road								
Ground	W2	R1	37.4	20.7	16.7	44.7	>80%	69%
First	W2	R1	38.0	22.0	16.0	42.0	>80%	70%
Second	W1	R1	38.3	23.6	14.7	38.4	65%	40%
49 Vastern Road								
Ground	W2	R1	37.3	20.5	16.9	45.2	>80%	71%
First	W2	R1	37.9	21.8	16.1	42.5	>80%	71%
Second	W1	R1	38.3	23.4	14.9	39.0	71%	43%

LEVEL	ROOM	EXISTING			PROPOSED			% LOSS	
		SUMMER	WINTER	TOTAL	SUMMER	WINTER	TOTAL	WINTER	TOTAL
87-89 Caversham Road									
First	R1	40%	20%	60%	26%	11%	37%	45.00	38.33
	R2	40%	20%	60%	27%	11%	38%	45.00	36.67
Second	R1	40%	20%	60%	28%	13%	41%	35.00	31.67
	R2	40%	20%	60%	27%	14%	41%	30.00	31.67
91 Caversham Road									
First	R1	40%	20%	60%	30%	11%	41%	45.00	31.67
Second	R1	40%	20%	60%	31%	13%	44%	35.00	26.67
93-97 Caversham Road									
First	R1	40%	20%	60%	32%	11%	43%	45.00	28.33
	R2	39%	20%	59%	33%	10%	43%	50.00	27.12
	R3	39%	20%	59%	35%	10%	45%	50.00	23.73
Second	R1	40%	20%	60%	31%	12%	43%	40.00	28.33
	R2	40%	20%	60%	35%	11%	46%	45.00	23.33
	R3	40%	20%	60%	35%	11%	46%	45.00	23.33
17 Vastern Road									
Ground	R1	55%	27%	82%	54%	6%	60%	77.78	26.83
First	R1	54%	27%	81%	53%	7%	60%	74.07	25.93
Second	R1	54%	28%	82%	54%	10%	64%	64.29	21.95
19 Vastern Road									
Ground	R1	55%	27%	82%	53%	6%	59%	77.78	28.05
First	R1	54%	28%	82%	53%	7%	60%	75.00	26.83
Third	R1	54%	28%	82%	54%	8%	62%	71.43	24.39
21 Vastern Road									
Ground	R1	55%	27%	82%	51%	5%	56%	81.48	31.71
First	R1	54%	28%	82%	53%	7%	60%	75.00	26.83
Second	R1	54%	28%	82%	54%	8%	62%	71.43	24.39
23 Vastern Road									
Ground	R1	55%	28%	83%	52%	7%	59%	75.00	28.92
First	R1	54%	28%	82%	52%	9%	61%	67.86	25.61
Second	R1	54%	28%	82%	53%	8%	61%	71.43	25.61
25 Vastern Road									
Ground	R1	55%	28%	83%	51%	7%	58%	75.00	30.12
First	R1	54%	28%	82%	51%	8%	59%	71.43	28.05
Second	R1	54%	28%	82%	52%	9%	61%	67.86	25.61

27 Vastern Road									
Ground	R1	55%	28%	83%	51%	10%	61%	64.29	26.51
First	R1	54%	28%	82%	51%	11%	62%	60.71	24.39
Second	R1	54%	28%	82%	52%	9%	61%	67.86	25.61
29 Vastern Road									
Ground	R1	58%	28%	86%	53%	9%	62%	67.86	27.91
First	R2	54%	28%	82%	51%	11%	62%	60.71	24.39
31 Vastern Road									
Ground	R1	53%	28%	81%	48%	7%	55%	75.00	32.10
First	R1	57%	28%	85%	53%	8%	61%	71.43	28.24
Second	R1	54%	28%	82%	50%	10%	60%	64.29	26.83
33 Vastern Road									
Ground	R1	52%	28%	80%	48%	9%	57%	67.86	28.75
First	R1	55%	28%	83%	52%	10%	62%	64.29	25.30
Second	R1	54%	28%	82%	51%	11%	62%	60.71	24.39
35 Vastern Road									
Ground	R1	53%	28%	81%	48%	8%	56%	71.43	30.86
First	R1	56%	28%	84%	53%	9%	62%	67.86	26.19
Second	R1	54%	28%	82%	50%	10%	60%	64.29	26.83
37 Vastern Road									
Ground	R1	52%	28%	80%	47%	8%	55%	71.43	31.25
First	R1	55%	28%	83%	51%	10%	61%	64.29	26.51
Second	R1	54%	28%	82%	51%	12%	63%	57.14	23.17
39 Vastern Road									
Ground	R1	53%	28%	81%	48%	8%	56%	71.43	30.86
First	R1	56%	28%	84%	51%	9%	60%	67.86	28.57
Second	R1	54%	28%	82%	50%	10%	60%	64.29	26.83
41 Vastern Road									
Ground	R1	52%	28%	80%	46%	7%	53%	75.00	33.75
First	R1	55%	28%	83%	50%	8%	58%	71.43	30.12
Second	R1	54%	28%	82%	50%	9%	59%	67.86	28.05
43 Vastern Road									
Ground	R1	53%	28%	81%	48%	6%	54%	78.57	33.33
First	R1	56%	28%	84%	53%	7%	60%	75.00	28.57
Second	R1	54%	28%	82%	51%	8%	59%	71.43	28.05

Aviva Life Pensions UK Limited
Reading Station Park
Sunlight Results - HERMES and SSE

Volume 3: Technical Appendices
Technical Appendix 10.2: Daylight and Sunlight Results

45 Vastern Road									
Ground	R1	52%	28%	80%	46%	6%	52%	78.57	35.00
First	R1	55%	28%	83%	49%	7%	56%	75.00	32.53
Second	R1	54%	28%	82%	51%	8%	59%	71.43	28.05
47 Vastern Road									
Ground	R1	53%	28%	81%	47%	6%	53%	78.57	34.57
First	R1	56%	28%	84%	50%	7%	57%	75.00	32.14
Second	R1	54%	28%	82%	51%	9%	60%	67.86	26.83
49 Vastern Road									
Ground	R1	52%	28%	80%	47%	4%	51%	85.71	36.25
First	R1	56%	28%	84%	51%	6%	57%	78.57	32.14
Second	R1	54%	28%	82%	50%	7%	57%	75.00	30.49

LEVEL	WINDOW	ROOM	VSC		LOSS	% LOSS	NOSKY	
			EXISTING	PROPOSED			EXISTING	PROPOSED
87-89 Caversham Road								
First	W1	R1	38.0	29.0	9.0	23.7	>80%	>80%
	W2		38.0	29.4	8.7	22.8		
	W3	R2	38.0	29.7	8.3	21.8	>80%	>80%
	W4		38.0	30.1	7.9	20.8		
Second	W1	R1	38.3	31.1	7.3	19.0	64%	42%
	W2	R2	38.3	31.3	7.1	18.4	62%	20%
91 Caversham Road								
First	W1	R1	38.0	30.5	7.5	19.8	>80%	>80%
	W2		38.0	30.9	7.2	18.8		
Second	W3	R1	38.3	32.4	5.9	15.4	65%	53%
93-97 Caversham Road								
First	W1	R1	38.0	31.2	6.8	17.8	>80%	>80%
	W2		38.0	31.6	6.4	16.8		
	W3	R2	37.9	32.0	6.0	15.8	>80%	>80%
	W4		37.9	32.3	5.6	14.8		
	W5	R3	37.9	32.6	5.3	13.9	>80%	>80%
	W6		37.9	32.9	5.0	13.1		
Second	W1	R1	38.3	32.6	5.7	14.8	64%	30%
	W2	R2	38.2	33.5	4.7	12.4	60%	50%
	W3	R3	38.2	33.7	4.5	11.9	55%	28%
17 Vastern Road								
Ground	W2	R1	37.2	28.1	9.2	24.6	>80%	77%
First	W1	R1	37.8	30.1	7.7	20.4	>80%	>80%
	W2		37.9	29.9	7.9	20.9		
Second	W1	R1	38.3	31.9	6.5	16.9	39%	19%
19 Vastern Road								
Ground	W2	R1	37.3	27.5	9.7	26.1	>80%	76%
First	W1	R1	37.8	29.7	8.1	21.5	>80%	>80%
	W2		37.9	29.6	8.3	21.9		
Second	W1	R1	38.3	31.7	6.6	17.2	40%	20%
21 Vastern Road								
Ground	W2	R1	37.3	27.3	10.0	26.8	>80%	76%
First	W1	R1	37.9	29.4	8.5	22.4	>80%	>80%
	W2		37.9	29.3	8.6	22.7		
Second	W1	R1	38.4	31.3	7.1	18.5	38%	18%
23 Vastern Road								
Ground	W2	R1	37.3	27.1	10.2	27.5	>80%	>80%
First	W1	R1	37.9	29.2	8.7	23.0	>80%	>80%
	W2		37.9	29.1	8.8	23.2		
Second	W1	R1	38.4	31.2	7.2	18.6	39%	18%

Aviva Life Pensions UK Limited
Reading Station Park
Daylight Results - RSAF Massing

Volume 3: Technical Appendices
Technical Appendix 10.2: Daylight and Sunlight Results

25 Vastern Road								
Ground	W2	R1	37.3	27.0	10.3	27.7	>80%	>80%
First	W1	R1	37.9	29.1	8.9	23.4	>80%	>80%
	W2		38.0	29.1	8.9	23.5		
Second	W1	R1	38.4	31.0	7.3	19.1	38%	25%
27 Vastern Road								
Ground	W2	R1	37.4	27.0	10.4	27.7	>80%	>80%
First	W1	R1	38.0	29.0	9.0	23.6	>80%	>80%
	W2		38.0	29.0	9.0	23.6		
Second	W1	R1	38.4	31.0	7.4	19.2	40%	21%
29 Vastern Road								
Ground	W2	R1	37.4	27.1	10.3	27.5	>80%	>80%
First	W1	R1	38.0	29.1	8.9	23.5	>80%	>80%
	W2		38.0	29.1	9.0	23.6		
31 Vastern Road								
Ground	W2	R1	37.5	26.7	10.9	28.9	>80%	>80%
First	W2		38.0	28.4	9.7	25.4	>80%	>80%
Second	W1	R1	38.4	30.2	8.2	21.4	>80%	>80%
33 Vastern Road								
Ground	W2	R1	37.5	28.8	8.7	23.2	>80%	>80%
First	W2	R1	38.0	27.6	10.4	27.4	>80%	>80%
Second	W1	R1	38.4	30.0	8.4	22.0	>80%	>80%
35 Vastern Road								
Ground	W2	R1	37.5	25.4	12.2	32.4	>80%	>80%
First	W2	R1	38.0	27.2	10.9	28.5	>80%	>80%
Second	W1	R1	38.4	29.3	9.1	23.6	74%	39%
37 Vastern Road								
Ground	W2	R1	37.5	24.8	12.8	34.0	>80%	>80%
First	W2	R1	38.0	26.6	11.5	30.1	>80%	79%
Second	W1	R1	38.4	28.8	9.6	24.9	70%	25%
39 Vastern Road								
Ground	W2	R1	37.5	24.4	13.1	34.9	>80%	79%
First	W2	R1	38.0	26.3	11.8	30.9	>80%	74%
Second	W1	R1	38.4	28.6	9.8	25.6	64%	21%
41 Vastern Road								
Ground	W2	R1	37.5	24.1	13.4	35.6	>80%	77%
First	W2	R1	38.0	26.0	12.0	31.7	>80%	71%
Second	W1	R1	38.4	28.3	10.1	26.3	65%	22%
43 Vastern Road								
Ground	W2	R1	37.5	24.0	13.4	35.8	>80%	77%
First	W2	R1	38.0	25.9	12.1	31.9	>80%	71%
Second	W1	R1	38.4	28.2	10.2	26.6	65%	22%

45 Vastern Road								
Ground	W2	R1	37.4	24.1	13.3	35.6	>80%	>80%
First	W2	R1	38.0	25.9	12.1	31.8	>80%	79%
Second	W1	R1	38.3	28.2	10.2	26.5	68%	28%
47 Vastern Road								
Ground	W2	R1	37.4	24.2	13.2	35.2	>80%	>80%
First	W2	R1	38.0	26.0	12.0	31.5	>80%	>80%
Second	W1	R1	38.3	28.2	10.1	26.4	65%	33%
49 Vastern Road								
Ground	W2	R1	37.3	24.4	12.9	34.6	>80%	>80%
First	W2	R1	37.9	26.2	11.8	31.1	>80%	>80%
Second	W1	R1	38.3	28.3	10.0	26.1	71%	45%

LEVEL	ROOM	EXISTING			PROPOSED			% LOSS	
		SUMMER	WINTER	TOTAL	SUMMER	WINTER	TOTAL	WINTER	TOTAL
87-89 Caversham Road									
First	R1	40%	20%	60%	37%	13%	50%	35.00	16.67
	R2	40%	20%	60%	37%	13%	50%	35.00	16.67
Second	R1	40%	20%	60%	38%	14%	52%	30.00	13.33
	R2	40%	20%	60%	38%	14%	52%	30.00	13.33
91 Caversham Road									
First	R1	40%	20%	60%	39%	12%	51%	40.00	15.00
Second	R1	40%	20%	60%	39%	13%	52%	35.00	13.33
93-97 Caversham Road									
First	R1	40%	20%	60%	39%	13%	52%	35.00	13.33
	R2	39%	20%	59%	39%	12%	51%	40.00	13.56
	R3	39%	20%	59%	39%	12%	51%	40.00	13.56
Second	R1	39%	20%	59%	39%	13%	52%	35.00	11.86
	R2	39%	20%	59%	40%	14%	54%	30.00	8.47
	R3	39%	20%	59%	40%	13%	53%	35.00	10.17
17 Vastern Road									
Ground	R1	55%	27%	82%	55%	15%	70%	44.44	14.63
First	R1	54%	27%	81%	54%	16%	70%	40.74	13.58
Second	R1	54%	28%	82%	54%	21%	75%	25.00	8.54
19 Vastern Road									
Ground	R1	55%	27%	82%	55%	15%	70%	44.44	14.63
First	R1	54%	28%	82%	54%	17%	71%	39.29	13.41
Third	R1	54%	28%	82%	54%	21%	75%	25.00	8.54
21 Vastern Road									
Ground	R1	55%	27%	82%	55%	15%	70%	44.44	14.63
First	R1	54%	28%	82%	54%	17%	71%	39.29	13.41
Second	R1	54%	28%	82%	54%	20%	74%	28.57	9.76
23 Vastern Road									
Ground	R1	55%	28%	83%	55%	15%	70%	46.43	15.66
First	R1	54%	28%	82%	54%	18%	72%	35.71	12.20
Second	R1	54%	28%	82%	54%	21%	75%	25.00	8.54
25 Vastern Road									
Ground	R1	55%	28%	83%	55%	15%	70%	46.43	15.66
First	R1	54%	28%	82%	54%	20%	74%	28.57	9.76
Second	R1	54%	28%	82%	54%	22%	76%	21.43	7.32

27 Vastern Road									
Ground	R1	55%	28%	83%	55%	14%	69%	50.00	16.87
First	R1	54%	28%	82%	54%	17%	71%	39.29	13.41
Second	R1	54%	28%	82%	54%	22%	76%	21.43	7.32
29 Vastern Road									
Ground	R1	58%	28%	86%	57%	14%	71%	50.00	17.44
First	R2	54%	28%	82%	54%	16%	70%	42.86	14.63
31 Vastern Road									
Ground	R1	53%	28%	81%	52%	15%	67%	46.43	17.28
First	R1	57%	28%	85%	56%	18%	74%	35.71	12.94
Second	R1	54%	28%	82%	54%	18%	72%	35.71	12.20
33 Vastern Road									
Ground	R1	52%	28%	80%	51%	13%	64%	53.57	20.00
First	R1	55%	28%	83%	55%	17%	72%	39.29	13.25
Second	R1	54%	28%	82%	54%	18%	72%	35.71	12.20
35 Vastern Road									
Ground	R1	53%	28%	81%	52%	12%	64%	57.14	20.99
First	R1	56%	28%	84%	56%	15%	71%	46.43	15.48
Second	R1	54%	28%	82%	54%	17%	71%	39.29	13.41
37 Vastern Road									
Ground	R1	52%	28%	80%	51%	11%	62%	60.71	22.50
First	R1	55%	28%	83%	55%	13%	68%	53.57	18.07
Second	R1	54%	28%	82%	54%	14%	68%	50.00	17.07
39 Vastern Road									
Ground	R1	53%	28%	81%	53%	10%	63%	64.29	22.22
First	R1	56%	28%	84%	56%	12%	68%	57.14	19.05
Second	R1	54%	28%	82%	54%	14%	68%	50.00	17.07
41 Vastern Road									
Ground	R1	52%	28%	80%	51%	11%	62%	60.71	22.50
First	R1	55%	28%	83%	55%	13%	68%	53.57	18.07
Second	R1	54%	28%	82%	54%	16%	70%	42.86	14.63
43 Vastern Road									
Ground	R1	53%	28%	81%	52%	10%	62%	64.29	23.46
First	R1	56%	28%	84%	56%	13%	69%	53.57	17.86
Second	R1	54%	28%	82%	54%	16%	70%	42.86	14.63

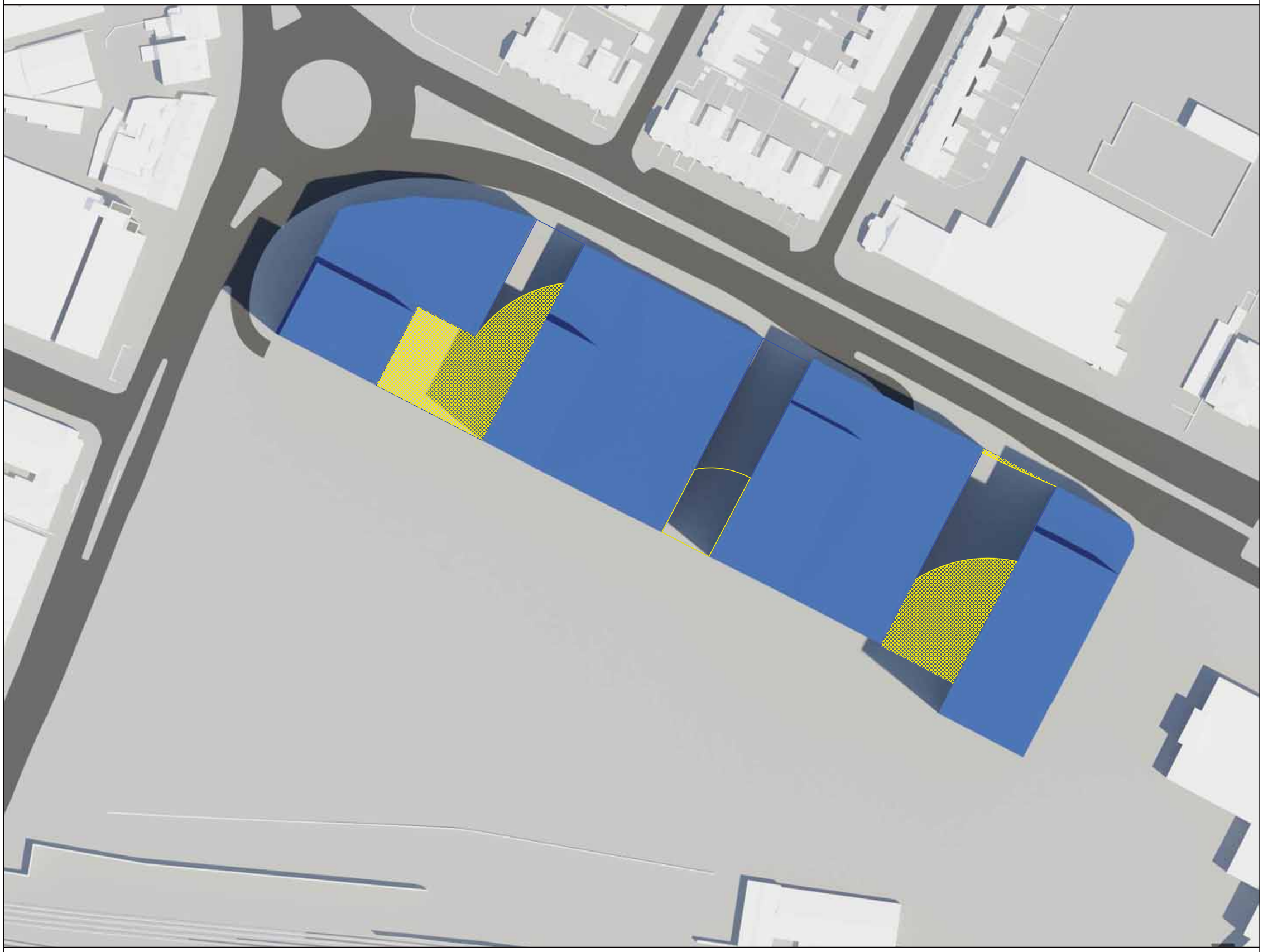
Aviva Life Pensions UK Limited
Reading Station Park
Sunlight Results - RSAF Massing

Volume 3: Technical Appendices
Technical Appendix 10.2: Daylight and Sunlight Results

45 Vastern Road									
Ground	R1	52%	28%	80%	51%	11%	62%	60.71	22.50
First	R1	55%	28%	83%	55%	12%	67%	57.14	19.28
Second	R1	54%	28%	82%	54%	16%	70%	42.86	14.63
47 Vastern Road									
Ground	R1	53%	28%	81%	50%	12%	62%	57.14	23.46
First	R1	56%	28%	84%	54%	13%	67%	53.57	20.24
Second	R1	54%	28%	82%	53%	17%	70%	39.29	14.63
49 Vastern Road									
Ground	R1	52%	28%	80%	49%	13%	62%	53.57	22.50
First	R1	56%	28%	84%	54%	15%	69%	46.43	17.86
Second	R1	54%	28%	82%	53%	17%	70%	39.29	14.63

Technical Appendix 10.3

Overshadowing Assessment



Sources

KEY

- Proposed sun on ground

CHP Surveyors Ltd
2-4 Boundary Row, London, SE1 8HP www.chpsurveyors.com

PROJECT TITLE
Reading Station

DRAWING TITLE
Proposed Amenity Space
Access to Direct Sunlight

SCALE	DATE	ISSUE
NTS	10-02-2020	-

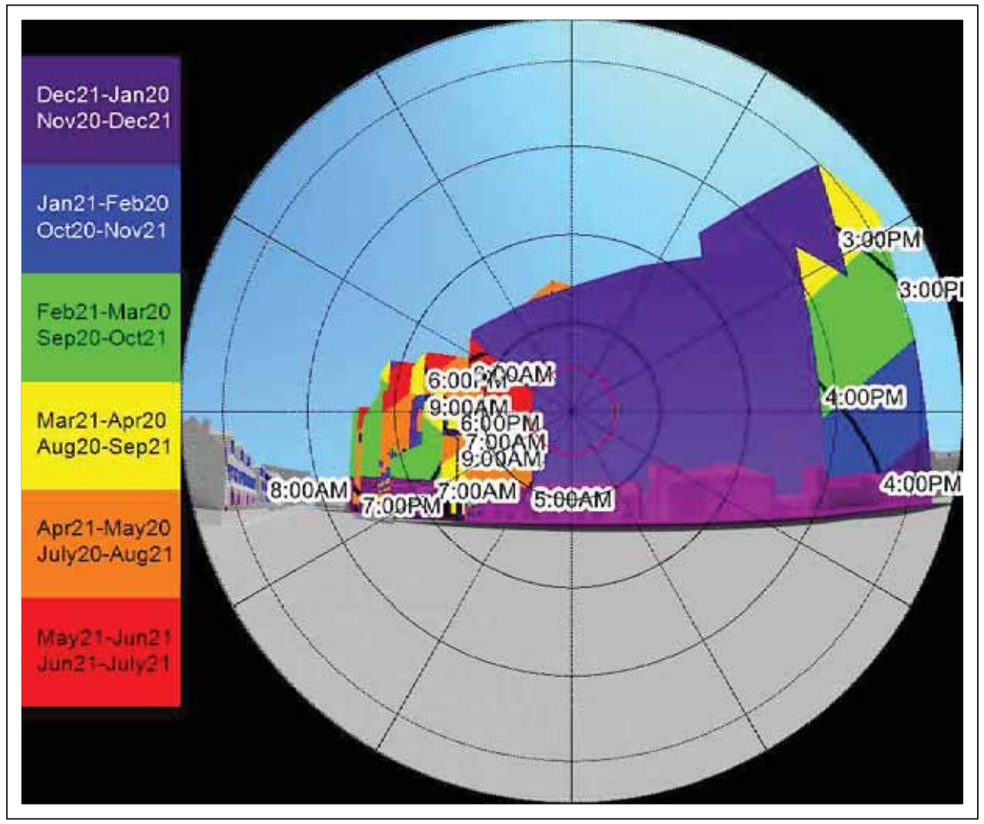
DWG NO	REV
2271_111	-

Technical Appendix 10.4

Solar Glare Assessment







Sources

KEY

CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp.gb.com

PROJECT TITLE
Reading Station

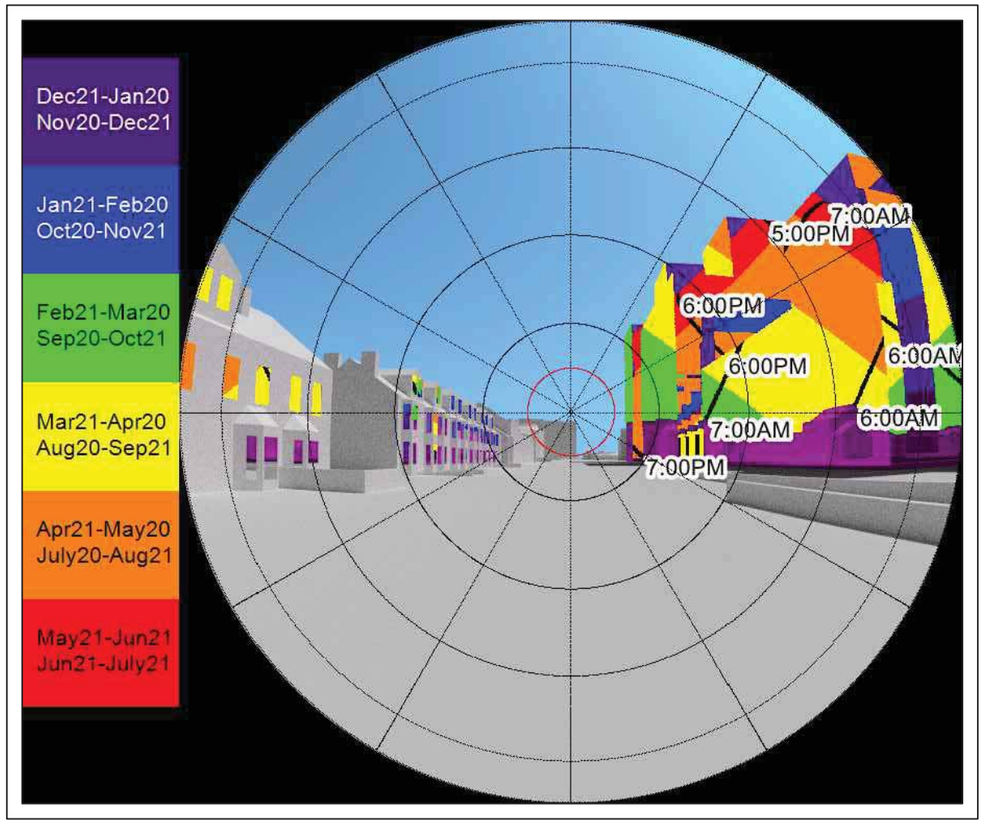
DRAWING TITLE
Solar Glare Analysis
View: 1

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_112	-







Sources

KEY

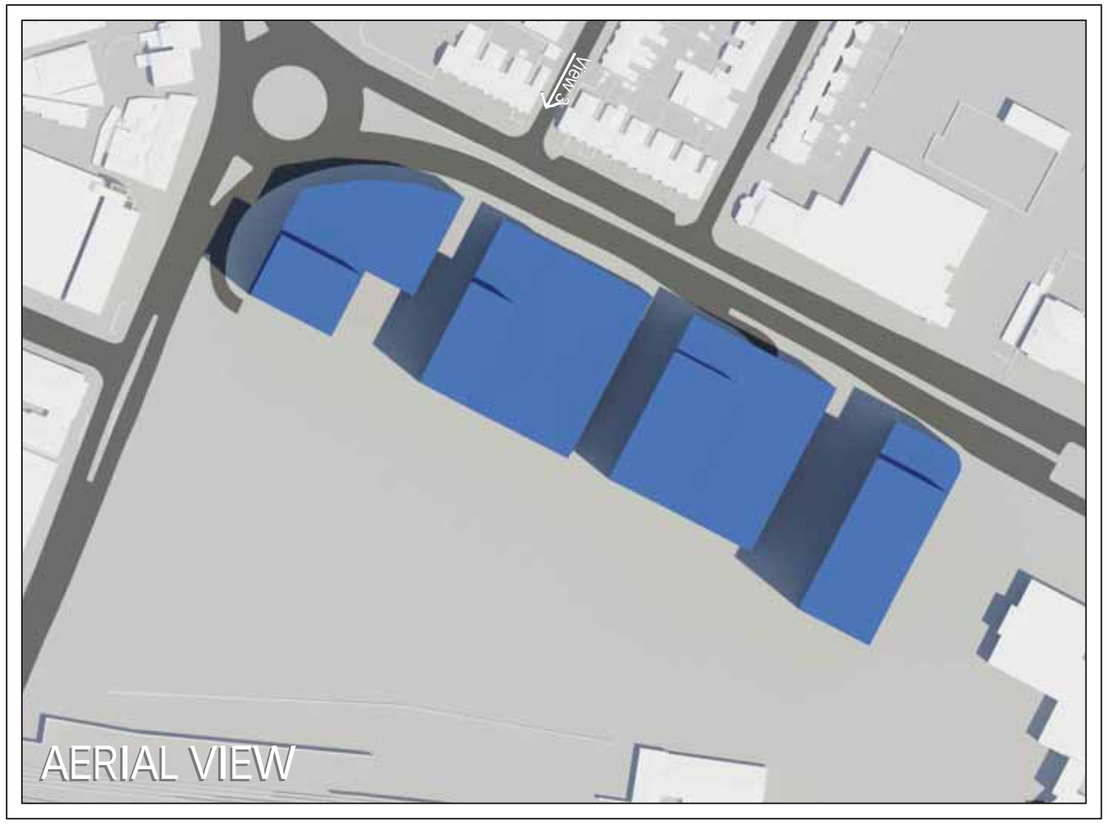
CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp.gb.com

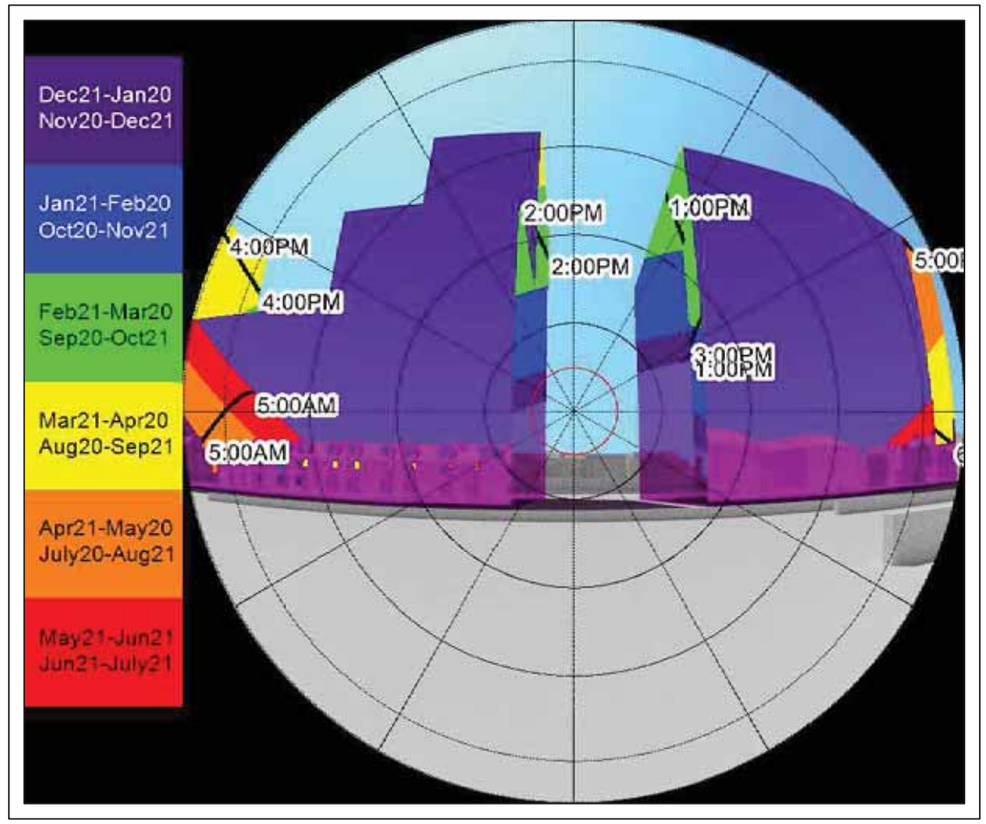
PROJECT TITLE
Reading Station

DRAWING TITLE
Solar Glare Analysis
View: 2

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_113	-







Sources

KEY

CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp.gb.com

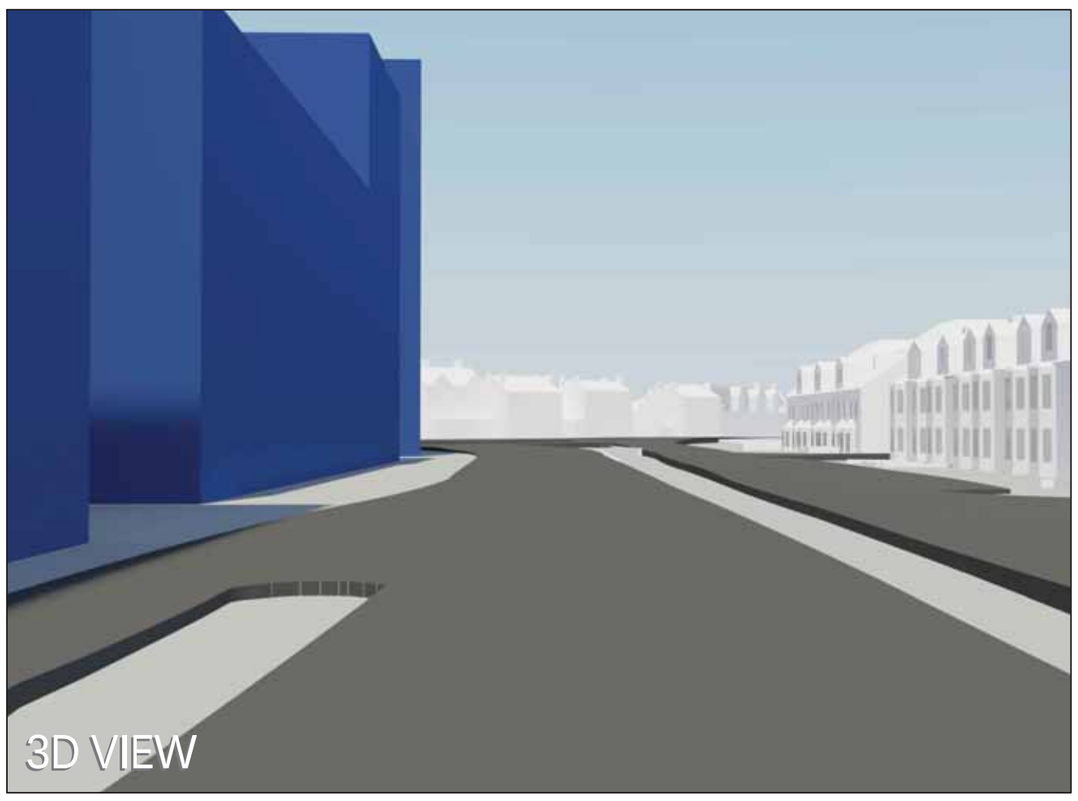
PROJECT TITLE
Reading Station

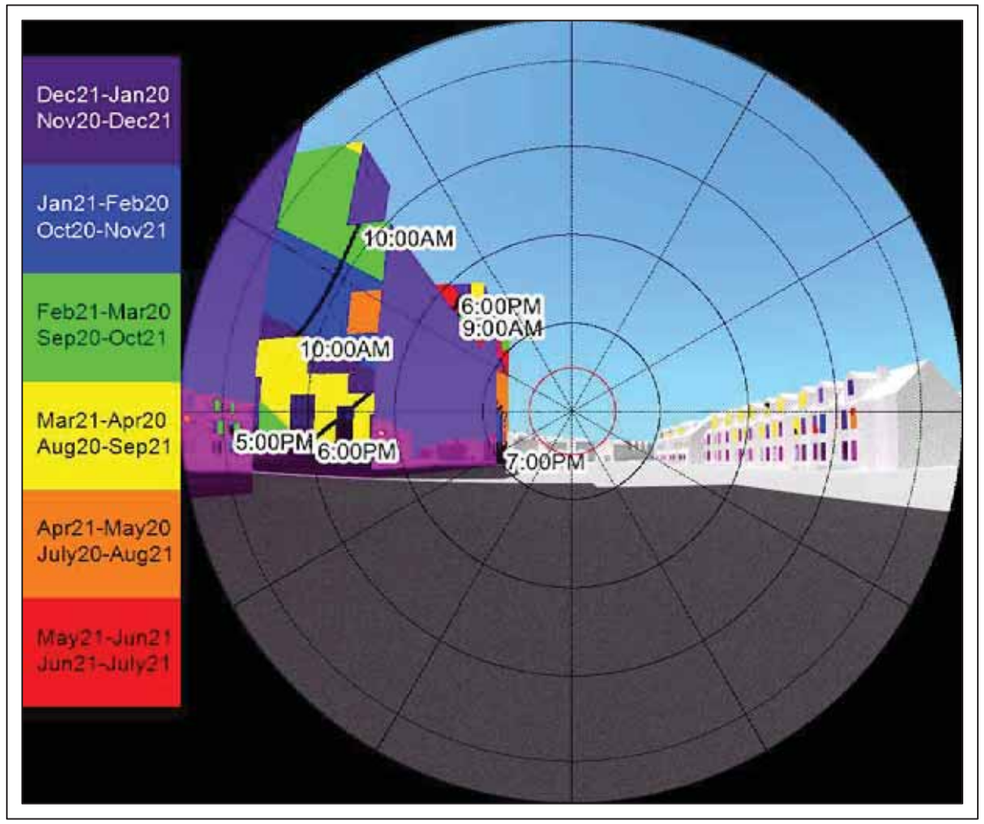
DRAWING TITLE
Solar Glare Analysis
View: 3

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_114	-







Sources

KEY

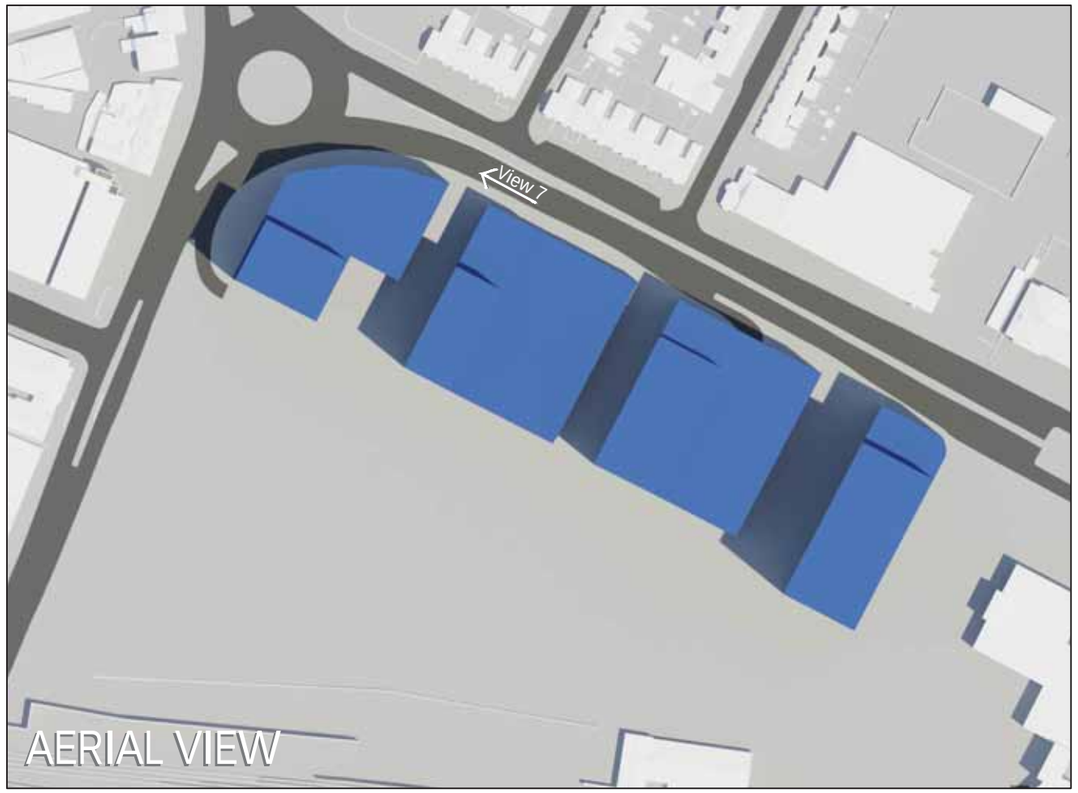
CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp-gp.com

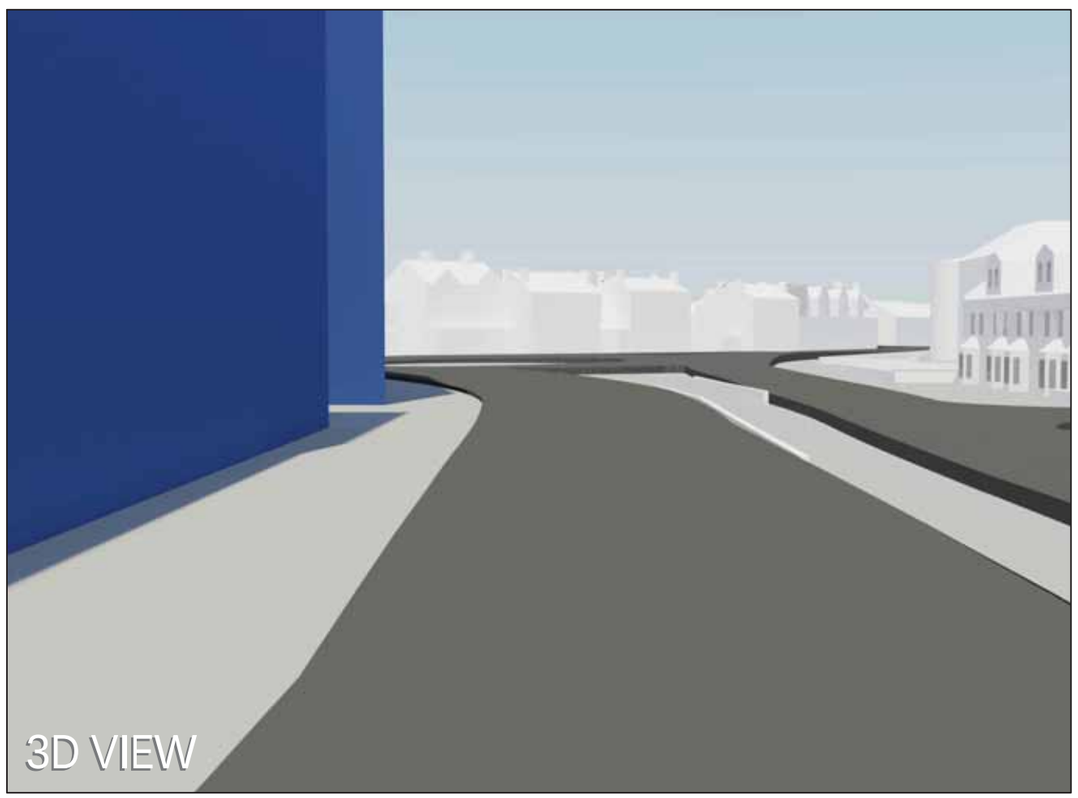
PROJECT TITLE
Reading Station

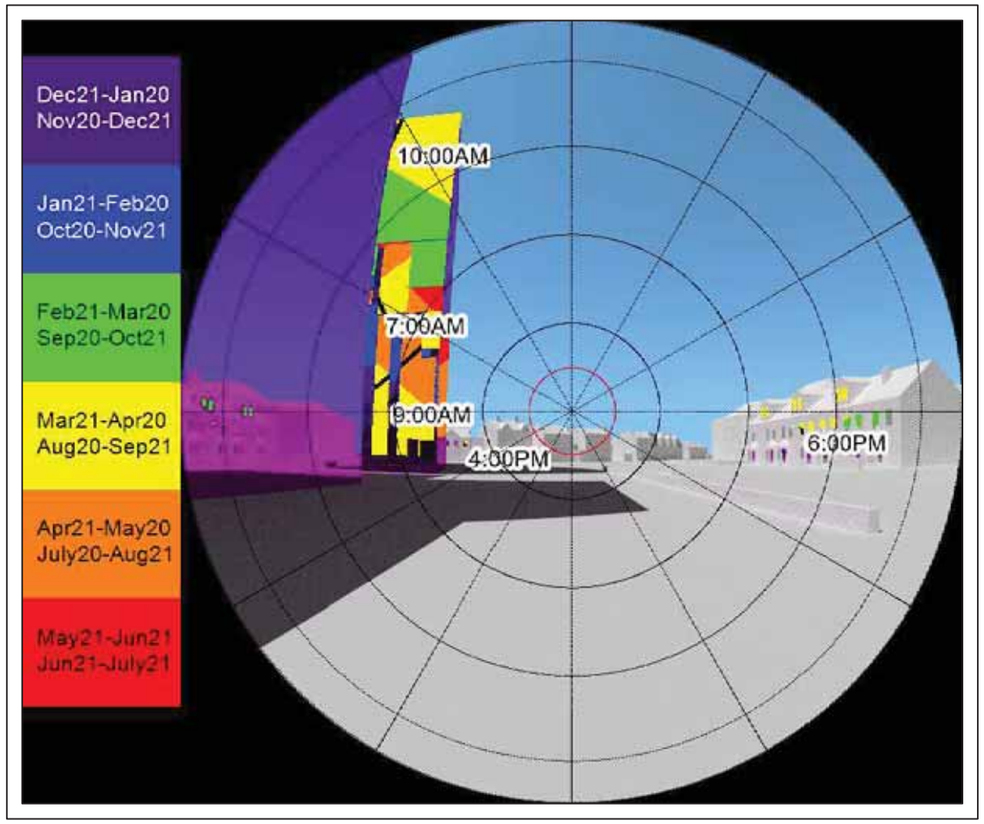
DRAWING TITLE
Solar Glare Analysis
View: 5

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_115	-







Sources

KEY

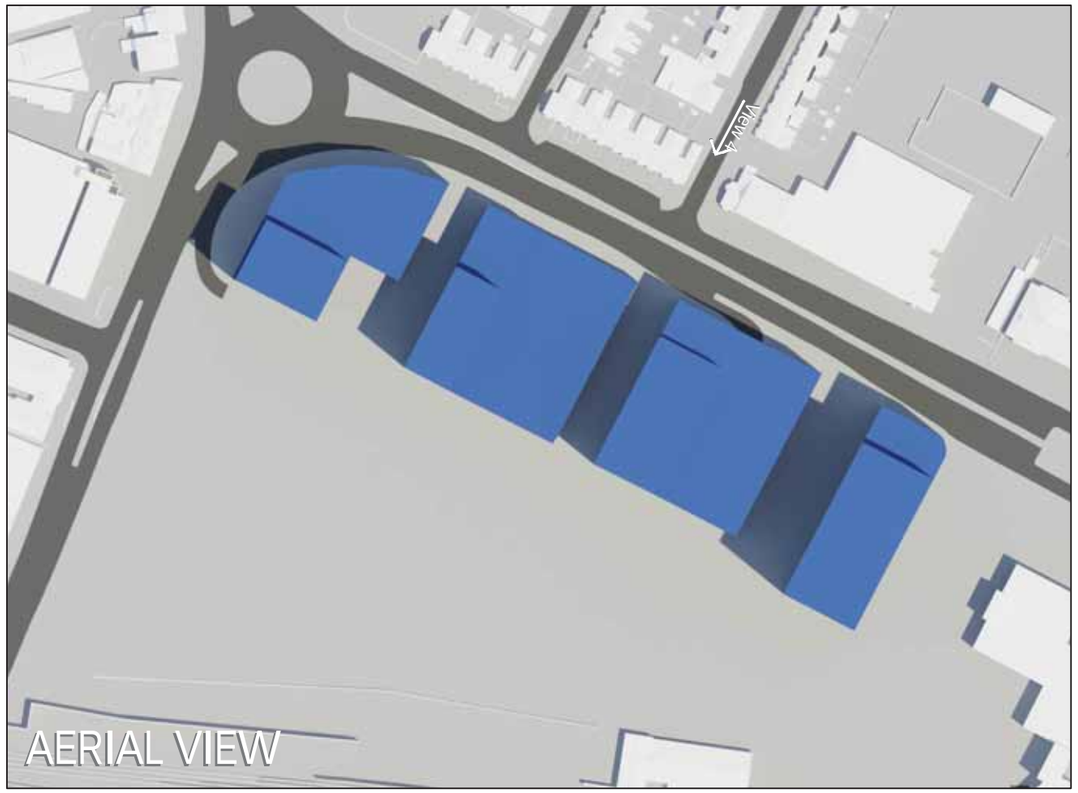
CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp.gb.com

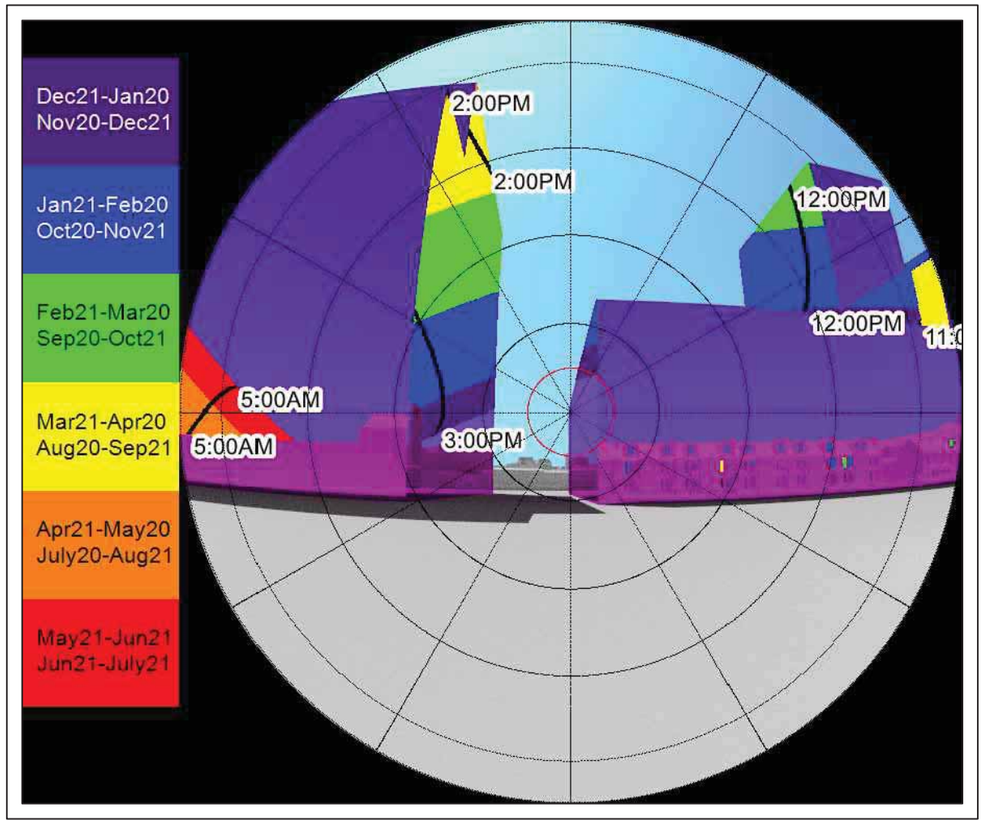
PROJECT TITLE
Reading Station

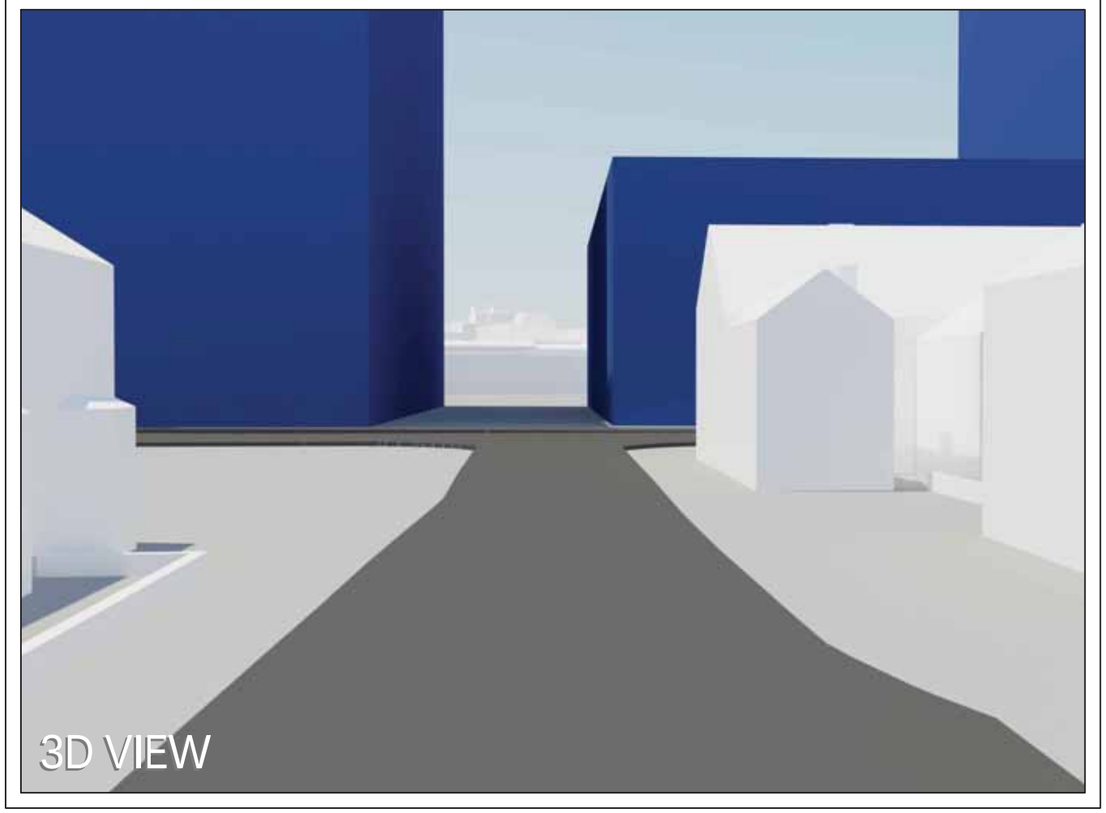
DRAWING TITLE
Solar Glare Analysis
View: 7

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_116	-







Sources

KEY

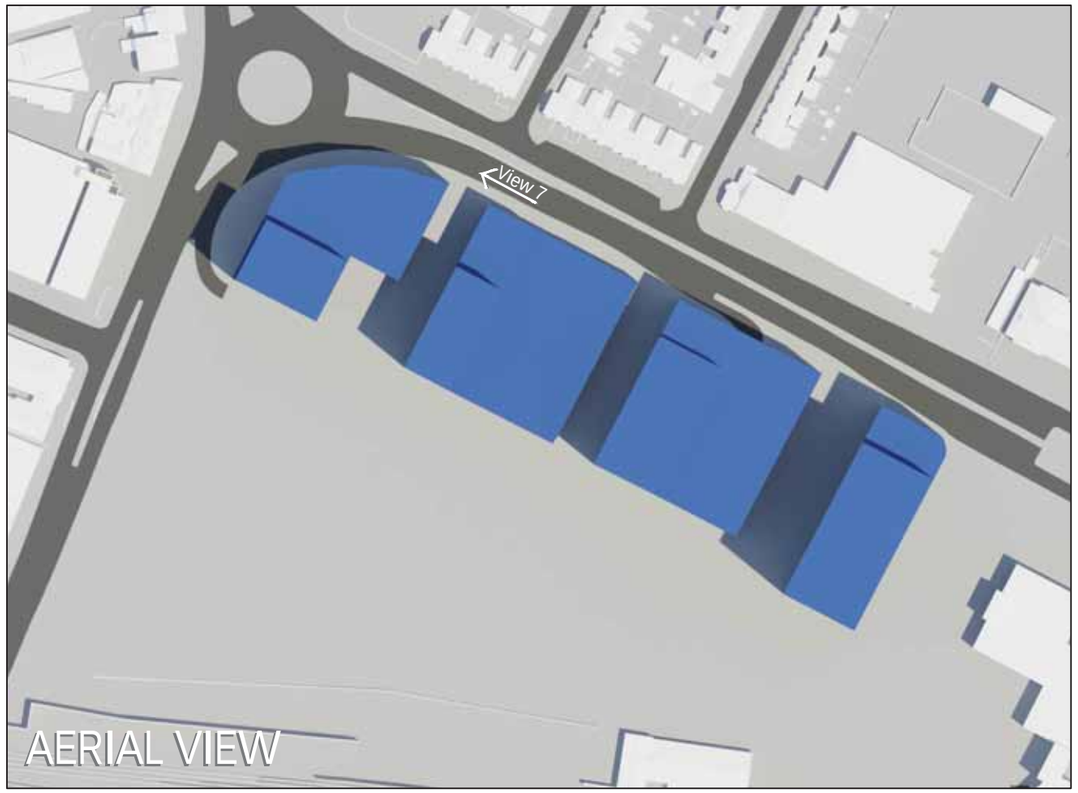
CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp.gb.com

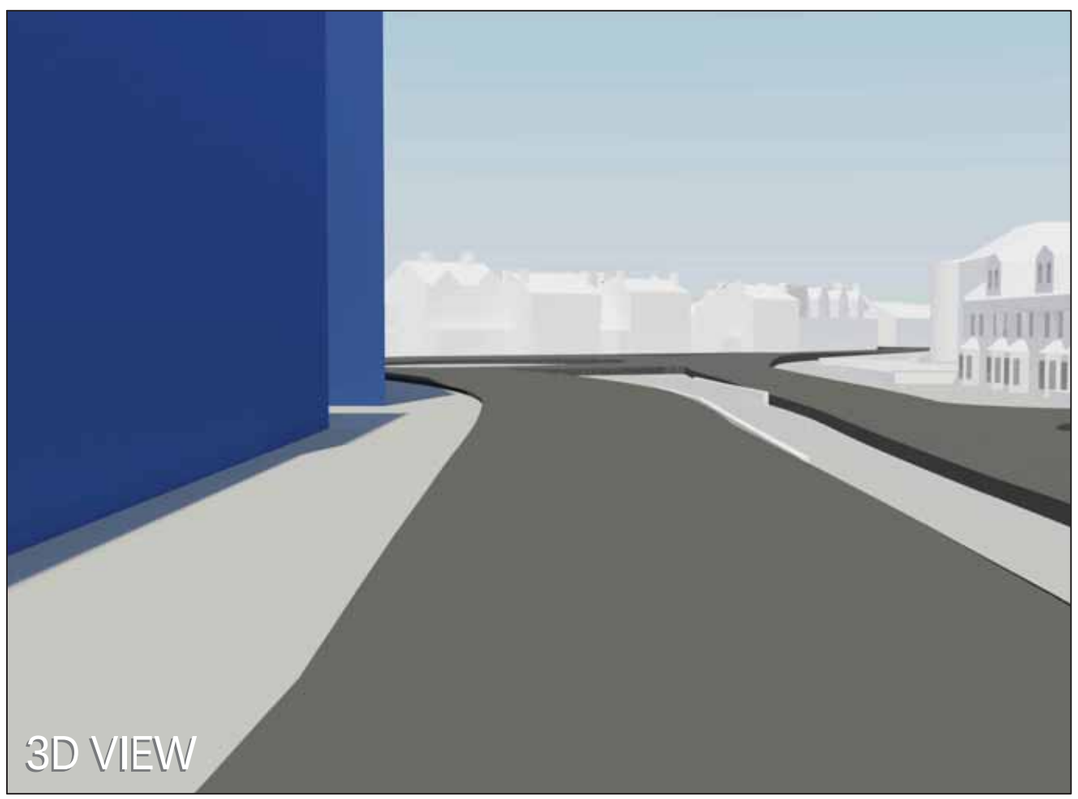
PROJECT TITLE
Reading Station

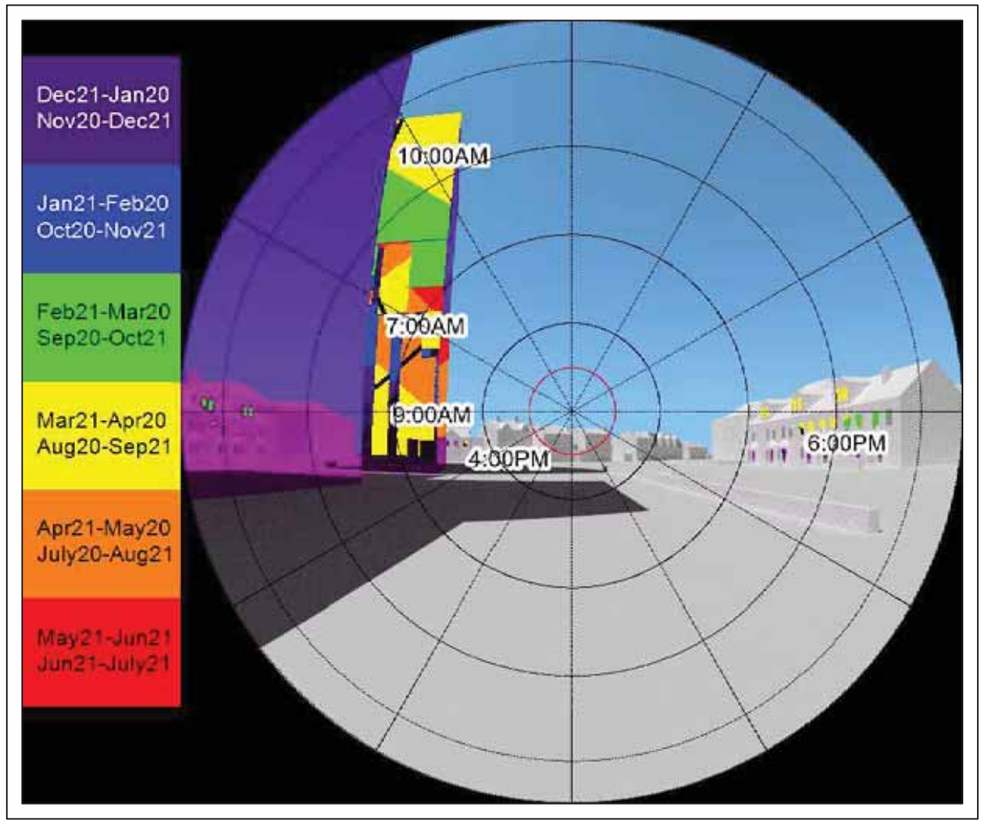
DRAWING TITLE
Solar Glare Analysis
View: 4

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_117	-







Sources

KEY

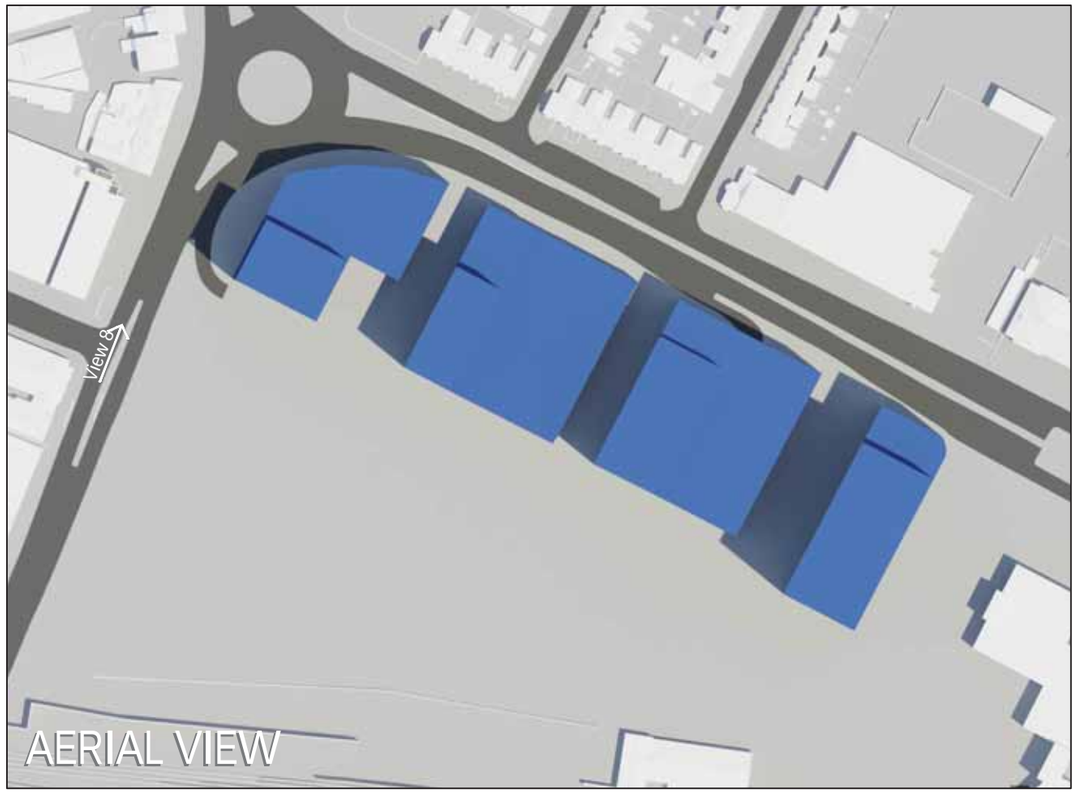
CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp.gb.com

PROJECT TITLE
Reading Station

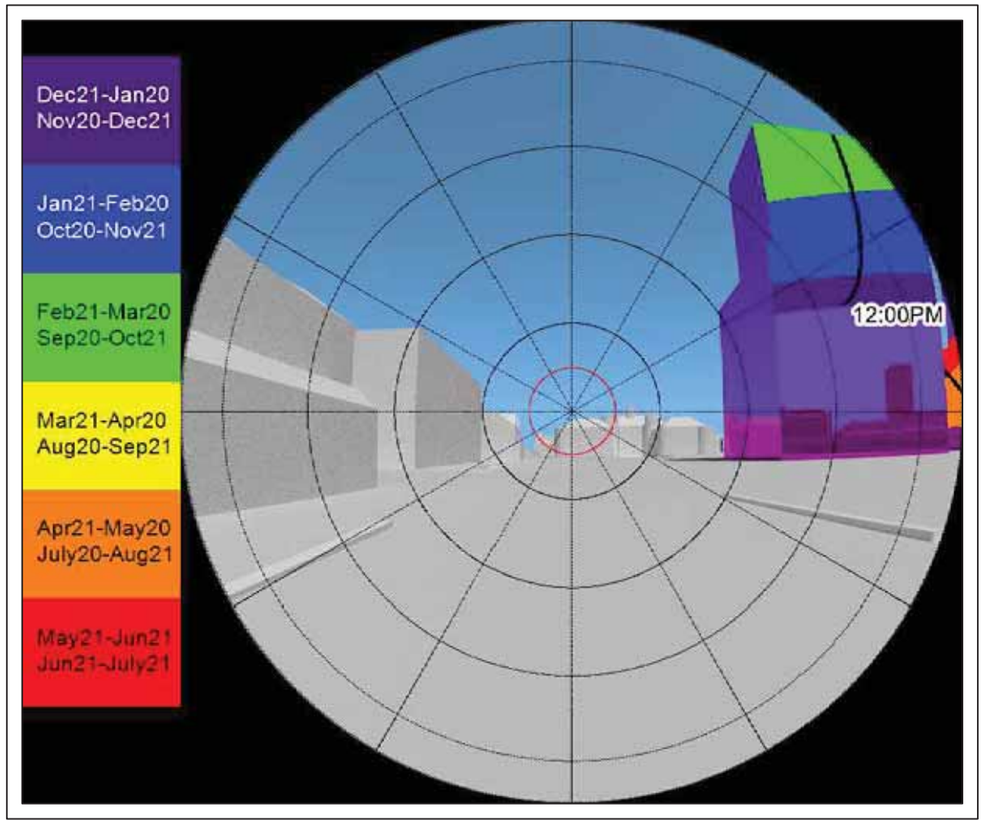
DRAWING TITLE
Solar Glare Analysis
View: 7

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_118	-







Sources

KEY

CHP Surveyors Ltd
2-6 Boundary Row, London, SE1 8HP www.chp.gb.com

PROJECT TITLE
Reading Station

DRAWING TITLE
Solar Glare Analysis
View: 8

SCALE	DATE	ISSUE
NTS	10-02-2020	-

DWG NO	REV
2271_119	-

8 NOISE AND VIBRATION

Introduction

8.1 This chapter of the ES presents an assessment of the potential impacts and the likely significant effects with respect to noise and vibration associated with the demolition and construction stage, and the completed development/operational stage of the proposed development.

8.2 In the context of this assessment, noise is defined as unwanted or undesirable sound derived from sources such as construction activities, road traffic and building services plant.

8.3 The chapter provides a summary of the existing baseline conditions at the application site; the methods used to assess the potential impacts and effects arising from the proposed development during the construction stage and the completed development stage; the assessment of potential impacts and likely effects; and the residual effects following consideration of any required mitigation measures. The assessment is based on a baseline noise survey undertaken on 26 - 27 June 2019; prediction methods and guidance set out in industry standards; and modelled predictions undertaken using proprietary noise modelling software.

8.4 This chapter is supported by the following technical appendices in ES Volume 3:

- Technical Appendix 8.1: Legislation and Policy;
- Technical Appendix 8.2: Baseline Noise Survey;
- Technical Appendix 8.3: Construction Noise Calculations and Embedded Mitigation; and
- Technical Appendix 8.4: Site Suitability Assessment.

Methodology

8.5 The assessment has been informed by the following legislation, policies and published guidance:

- Control of Pollution Act, 1974, Part III – Noise;[1]
- The Environmental Protection Act, 1990 (as amended); [2]
- NPPF; [3]
- PPG[4];
- Noise Policy Statement for England, 2010[5];
- Reading Borough Local Plan 2019[6];
- Reading Station Area Framework (RSAF)[7];
- Revised Sustainable Design and Construction: Adopted Supplementary Planning Document 2011[8];
- BS 4142:2014[9] – 'Methods for Rating and Assessing Industrial and Commercial Sound': used to assess plant noise including fixed plant installations;
- BS 5228:2009+A1:2014[10] – 'Code of Practice for Noise and Vibration Control on Construction and Open Sites': used to assess construction noise impact on receptors;
- BS 7385-2:1993[11] - 'Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Groundborne Vibration': used to assess vibration impact on buildings;
- BS 8233:2014[12] – 'Guidance on Sound Insulation and Noise Reduction for Buildings': used to assess site suitability including internal ambient noise levels and noise levels in external amenity spaces;
- BS 6472-1:2008[13] – 'Guide to Evaluation of Human Exposure to Vibration in Buildings. Vibration Sources Other Than Blasting': used to assess vibration impact on receptors;
- Calculation of Road Traffic Noise (CRTN), 1988[14]: used to calculate road traffic noise levels;
- The Design Manual for Roads and Bridges (DMRB), 2011[15]: used to assess traffic noise impacts both long and short-term;
- Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment, 2004[16];
- WHO Guidelines for Community Health, 1999[17]: used to assess site suitability;
- ProPG: Planning & Noise: Professional Practice Guidance on Planning & Noise (2017)[18]; and
- European Commission EIA Directive Module 3 on Impact Assessment[19].

Consultation

8.6 At the time of undertaking the assessment, the EIA Scoping Opinion remains outstanding.

8.7 In addition to the formal EIA Scoping Process, consultation with RBC environmental health officer (EHO) has been undertaken regarding the Scoping Report and the assessment methodology as summarised in Table 8.1.

Table 8.1: Summary of Consultation

Consultee and Form/Date of Consultation	Summary of Comments	Action Taken
RBC EHO Pre-app feedback received on 13 August 2019	• Site suitability to be assessed in accordance with BS8233:2014 (plus limit on L_{Amax} 45 dB internally) and where opening the window	• Site suitability (Appendix 8.4) and delivery noise (paragraphs 8.76-8.82) assessed.

[1] Secretary of State, 1974, Control of Pollution Act, HMSO. Available: http://www.legislation.gov.uk/ukpga/1974/40/contents
[2] Secretary of State, 1990. Environmental Protection Act 1990, The Stationary Office. Available: http://www.legislation.gov.uk/ukpga/1990/43/contents
[3] Secretary of State for Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework.
[4] https://www.gov.uk/government/collections/planning-practice-guidance.
[5] Department of Environment, Food and Rural Affairs, 2010. Noise Policy Statement for England.
[6] Reading Borough Council, 2019. Reading Borough Local Plan. RBC.
[7] Reading Borough Council, 2010. Reading Station Area Framework. RBC.
[8] Reading Borough Council, 2019. Revised Sustainable Design and Construction. Supplementary Planning Document. RBC.
[9] British Standards Institution, 2014. British Standard 4142:2014 Method for Rating and Assessing Industrial and Commercial Sound. BSI.
[10] British Standards Institution, 2014. BS 5228:2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites, BSI.
[11] British Standards Institution, 1993. British Standard 7385-2:1993 Evaluation and Measurement for Vibration in Buildings – Part 2: Guide to Damage Levels from Groundborne Vibration. BSI.
[12] British Standards Institution, 2014. BS 8233 2014 Guidance on sound insulation and noise reduction for buildings, BSI.
[13] British Standards Institution, 2008. BS 6472:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting, BSI.
[14] Department of Transport and the Welsh Office, 1988. Calculation of Road Traffic Noise, DoT & Welsh Office.
[15] Highways Agency, 2011. Design Manual for Roads and Bridges Volume 11 Section 3 Part 7, HA.
[16] Institute of Environmental Management & Assessment (IEMA), 2014, Guidelines for Environmental Noise Impact Assessment.
[17] World Health Organisation. 1999. Guidelines for Community Noise. Geneva. WHO.
[18] The Association of Noise Consultants (ANC), Institute of Acoustics (IoA), Chartered Institute of Environmental Health, 2017, Professional Practice Guidance on Planning & Noise (ProPG): New Residential Development.
[19] European Commission, 2019. Nature Protection and Environmental Impact Assessment. Module 3: Environmental Impact Assessment (EIA) Directive – EIA procedure.

Table 8.1: Summary of Consultation		
Consultee and Form/Date of Consultation	**Summary of Comments**	**Action Taken**
	causes an exceedance of >5 dB then alternative ventilation e.g. Mechanical Ventilation Heat Recovery (MVHR) should be provided. • Delivery noise to be assessed • Plant specific sound level to be at least 10 dB below the measured background level and for the plant noise rating level to not exceed the measured background level. • Sound insulation should be in compliance with Approved Document Part E.	• Plant noise limits set in accordance with the criteria proposed by RBC. • Sound insulation to be specified during detailed design.
Consultation with EHO via email regarding noise survey methodology	The proposed survey and assessment methodology was sent to RBC on 29 November 2019 via email. No response was received.	

Assessment Scope

8.8 The assessment has been based on a series of development parameters, assumptions and commitments, as described in Chapter 2: EIA Process and Methodology, in Chapter 4; Proposed Development Description, and in Chapter 5: Demolition and Construction Environmental Management. Due to the flexibility being sought in respect of land use classes, the noise and vibration assessment has been undertaken based on a worst-case interpretation of the minimum and maximum land use schedule presented in Chapter 4: Proposed Development Description.

8.9 Therefore, the vehicle trip generation has been calculated based on the use classes with the highest trip generation and it has been assumed that the proposed development would be for residential use as that represents the most noise sensitive receptor. The assessment therefore provides a 'worst-case scenario' for both the existing receptors and the proposed development regardless of use.

8.10 It should be noted; however, that despite assuming a worst case in terms of traffic generation, a net reduction in traffic is still predicted compared with existing baseline.

Technical Scope

8.11 The technical scope considers the following:

- Demolition and construction noise and vibration from works being undertaken at existing off-site receptors;
- Demolition and construction road traffic noise at existing off-site residential receptors;
- Operational road traffic noise at off-site residential receptors;
- Site suitability for on-site residential use; and
- Operational noise from plant, servicing and operation at existing off-site residential receptors.

8.12 Operational vibration impacts have been scoped out of the assessment as there are no major sources of vibration within 50 m of the application site (the railway line is elevated and >50 m from the application site) and no vibration generating sources are proposed at the application site.

Spatial Scope

8.13 The study area incorporates the application site and the nearest existing noise-sensitive receptors.

8.14 The nearest noise-sensitive receptors that have been assessed are shown in Figure 8.1. It should be noted that R13 has been assessed as a cumulative scheme.

Temporal Scope

8.15 The following scenarios have been assessed:

- Scenario 1: Existing baseline (includes the existing 2019 baseline traffic flows);
- Scenario 2: Future baseline + cumulative schemes; and
- Scenario 3: Future baseline + cumulative schemes + proposed development (Year 2025).

Baseline Characterisation Method

Field Study

8.16 The existing noise environment was characterised by a baseline noise survey undertaken in accordance with BS7445-1:2003. This was undertaken in and around the application site to quantify the prevailing ambient and background noise levels during daytime and night-time periods. Attended measurements were taken over 1 day and 1 night-time period as outlined in Appendix 8.2 as no secure location could be found for longer term monitoring. The ambient and background noise levels have been used to inform the assessment criteria for plant noise emissions, building envelope and ventilation strategies and construction noise effects.

8.17 A noise model was created using the traffic data provided and calibrated to the measured baseline survey. The future baseline was updated using the traffic predictions provided.

8.18 Further information relating to the baseline noise survey methodology is presented within Technical Appendix 8.2.

Assessment Method

Methodology

8.19 A noise model of the proposed development and the study area was developed using the CadnaA® version 2019, a proprietary noise modelling software. The software implements the standard noise prediction methodology detailed in ISO in 9613:1996[20]. This model was used to assess the likely effects of noise sources within the study area. The software utilises standard acoustic principles in conjunction with approved prediction methodologies and is a tried and tested method for accurately predicting and assessing the impact of noise from a variety of sources. This was calibrated to the existing noise climate and adjusted to reflect the future traffic flows.

8.20 Existing mapping and topography for the application site were obtained from OS mapping and provided by the design team. The 3D massing was based on the whole site being use for residential purposes (residential premises being more sensitive to noise than other proposed uses).

8.21 Demolition and construction noise, construction traffic and operational plant have been assessed against the existing baseline. Operational traffic and servicing have been assessed against the future baseline by including the cumulative development in both development scenarios, the effect of external

[20] International Organization for Standardization, 1996. ISO 9613: 1996 Part 2 Attenuation of sound during propagation outdoors, ISO.

noise sources remains constant and the effect of the proposed development itself is accurately reported.

Assessment Criteria

8.22 The criteria used to assess if an effect is significant or not, is set out in subsequent sub-sections. This is determined by consideration of the sensitivity of the receptor, magnitude of impact, duration of the effect, geographical extent of the effect and application of professional judgement.

Receptor Sensitivity Criteria

8.23 The sensitivity of receptors has been classified as low, medium or high, in accordance with the criteria set out in Table 8.2.

Table 8.2: Receptor Sensitivity Criteria

Sensitivity	Criteria
Low	Commercial
Medium	Offices, Fire station
High	Residential

Impact Magnitude Criteria

8.24 The magnitude of impact has been classified as very low, low, medium, or high, in accordance with the criteria set out in Tables 8.3 – 8.8.

Demolition and Construction Noise

8.25 In order to determine the likely effect of noise during demolition and construction of the proposed development, noise predictions have been carried out in accordance with the procedures presented in BS5228, taking full account of Best Practicable Means (BPM) to be adopted by the proposed development (see Chapter 5: Demolition and Construction Environmental Management).

8.26 It is understood that construction would take place on weekdays (0800-1800) and Saturdays (0800-1300), with no noisy working on Sundays or bank holidays. The construction traffic flows provided are based upon a 10-hour working day which represents a 'worst-case scenario'.

8.27 The '5 dB change method', as described in BS5228-1:2014, has been applied. The resulting criteria to all receptors are set out in Table 8.3.

Table 8.3: Magnitude of Impact – Demolition and Construction Noise

Description	Adverse Effect Level	Magnitude of Impact
> 10 dB change in noise level between total level and pre-existing ambient noise level	SOAEL	High
5 – 10 dB change in noise level between total level and pre-existing ambient noise level	LOAEL	Medium
< 5 dB change in noise level between total level and pre-existing ambient noise level	NOAEL	Low

8.28 Typical plant equipment and representative period of operation have been used to predict the expected noise levels for each activity during demolition and construction. This has been carried out in accordance with BS5228:2009+A1:2014, which accounts for the following variables:

- Distance attenuation between source and receiver;
- Percentage operating time of the plant;
- Any relevant barrier attenuation effects;
- Ground absorption; and
- Façade corrections.

8.29 Sound power levels for each item of equipment have been taken from BS 5228:2009+A1:2014.

8.30 No attenuation from site hoardings has been allowed for as the majority of receptors are several storeys high and therefore would have direct line of sight to the demolition and construction works.

Demolition and Construction Traffic Noise

8.31 Demolition and construction traffic to and from the application site has been assessed using the haul route method defined in BS 5228-1:2009+A1:2014.

8.32 The magnitude of the predicted change in noise levels has used the scale shown in Table 8.4. The criteria are based on the current guidance on short-term changes in traffic noise levels in the DMRB.

Table 8.4: Magnitude of Impact - Road Traffic Noise Changes (short term)

Change in Traffic Basic Noise Level $L_{A10,18h}$ dB	Adverse Effect Level	Magnitude of Impact
≥ 5	SOAEL	High
3 to 4.9	LOAEL	Medium
1 to 2.9	NOAEL	Low
<1	NOEL	Very Low

Demolition and Construction Vibration

8.33 BS 5228 states that for the majority of people, vibration levels between 0.14 and 0.3 mm/s PPV are just perceptible. A vibration level of 1.0 mm/s is sufficient to cause complaint, but tolerable with prior warning, whereas a level of 10 mm/s is intolerable for anything more than a very brief exposure. Vibration levels exceeding 15 mm/s PPV are sufficient to result in minor cosmetic damage in light/unreinforced buildings. This magnitude of vibration is not considered likely as a result of the proposed construction activities being undertaken, and therefore an assessment of building damage has not been undertaken.

8.34 Table 8.5 presents the magnitude of impact for levels of demolition and construction vibration.

Table 8.5: Magnitude of Impact - Demolition and Construction Vibration

Effect: Annoyance	Continuous Vibration Level ppv mms^{-1}	Adverse Effect Level	Magnitude of Impact
Vibration is likely to be intolerable for any more than a very brief exposure to this level.	10	SOAEL	High
It is likely that vibration of this level in residential environments will cause complaints, but can be tolerated if prior warning and explanation has been given to residents.	1.0	LOAEL	Medium
Vibration might be just perceptible in residential environments.	0.3	NOAEL	Low
Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	0.14	NOEL	Very Low

8.35 BS 5228:2009 Part 2 provides historical data of continuous flight auger (CFA) piling at various distances, as summarised in Table 8.6. This data can be used to provide an indicative assessment of the distance at which significant vibration impacts could occur. However, the ground conditions on-site would affect the propagation and piling methods employed and therefore this method is suitable for initial estimates only.

Table 8.6: Ranges of PPV for Piling

Piling Method	Distance from source (m)		
	10	20	30
CFA	0.38 mms-1	0.3 mms-1	0.03 mms-1

Site Suitability – Noise

8.36 The site suitability assessment for residential use (methodology and results) is detailed in Technical Appendix 9.4: Site Suitability.

8.37 This assesses the noise levels as modelled on the building facades and gives outline guidance on the façade and ventilation strategy required to meet the BS8223:2014 internal ambient noise level criteria and WHO Guidelines for Community Noise (based on the parameter plans).

Operational Noise from Proposed Plant

8.38 The type, quantity and location of fixed mechanical and electrical (M&E) plant associated with the proposed development has not been finalised at this stage in the design and hence it is not possible to fully quantify the building services plant noise impact at the nearest noise sensitive receptors (NSRs).

8.39 As is standard good practice, the design of appropriate noise mitigation for each individual plant item would be undertaken during the detailed design stage. Noise emissions from plant associated with the proposed development would, therefore, be controlled via a suitably worded planning condition to ensure the appropriate details are provided at reserved matters stage.

8.40 Suitable criteria for determining the magnitude of the impact have been based on the guidance in BS4142: 2014. The basis of BS 4142 is a comparison between the existing background noise level at the façade of the nearest NSRs and the plant noise rating level of all new fixed plant sources associated with the proposed development. The relevant parameters in this instance are as follows:

- Background Sound Level – $L_{A90,T}$ – defined in the Standard as the 'A' weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, and quoted to the nearest whole number of decibels;
- Specific Sound Level – $L_{Aeq,Tr}$ – the equivalent continuous 'A' weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T;
- Residual Sound Level - $L_{Aeq,T}$ – the equivalent continuous 'A' weighted sound pressure level at the assessment location in the absence of the specific sound source under consideration, over a given time interval, T; and
- Rating Level – $L_{Ar,Tr}$ – the specific sound level plus any adjustment made for the characteristic features of the noise.

8.41 The background level and the rating levels are compared and the standard states that:

- *"Typically, the greater the difference, the greater the magnitude of impact;*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context;*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending upon the context; and*
- *The lower the rating level is to the measured background sound level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon the context."*

8.42 The requirements of RBC, as outlined in the pre-application feedback (plant noise rating level 10 dB below background noise level and specific level less than or equal to background), form the governing criteria. However, the magnitude of impact is classified in accordance with BS4142:2014, as outlined in Table 8.7. The criteria are applicable to the nearest NSRs, thereby forming a worst-case scenario as more distant receptors will be subject to lower levels of noise from the proposed development.

Table 8.7: Magnitude of Impact - Operational Noise

Rating level – background level (dB)	BS 4142 Descriptor	Adverse Effect Level	Magnitude of Impact
≥10	Indication of significant adverse effect, depending on context	SOAEL	High
5 to 9	Indication of adverse effect, depending on context	SOAEL	Medium
0 to 5	Indication of adverse effect, depending on context	LOAEL	Low
≤0	Indication of low impact	NOAEL	Low

Operational Road Traffic Noise

8.43 Operational road traffic has been assessed by updating the baseline noise model with the future baseline predicted traffic flows, including the proposed development.

8.44 The results have been compared with the baseline noise levels and the assessed using the current guidance on long-term changes in traffic noise levels in the DMRB. The magnitude of the predicted change in noise levels was determined by using the scale shown in Table 8.8.

Table 8.8: Magnitude of Impact - Road Traffic Noise Changes (long term)

Change in Traffic Basic Noise Level $L_{A10,18h}$ dB	Adverse Effect Level	Magnitude of Impact
≥ 10	SOAEL	High
5 to 9.9	LOAEL	Medium
3 to 4.9	NOAEL	Low
<3	NOEL	Very Low

Operational Noise from Servicing

8.45 The delivery traffic has been assessed in accordance with Design Manual for Roads and Bridges[21] and therefore has compared with the future baseline ambient noise levels.

8.46 The delivery vehicle idling and unloading has been treated as a plant noise assessment in accordance with BS4142:2014 'Methods for Rating and Assessing Industrial and Commercial Sound'. Thus, the rating noise level from the vehicle idling has been compared with the existing baseline background noise levels, taking into consideration the site context.

Operational Noise from Cumulative Plant

8.47 The BS4142:2014 methodology has been used to assess the plant noise from cumulative schemes.

[21] [21] Highways Agency, 2011. Design Manual for Roads and Bridges Volume 11 Section 3 Part 7, HA.

Significance Criteria

8.48 The scale of an effect has been derived from the magnitude of the impact and the sensitivity of the affected receptor, as detailed in Table 8.9.

Table 8.9: Scale of Effects

Sensitivity of Receptor	Magnitude of Impact			
	High	**Medium**	**Low**	**Very Low**
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	Negligible
Low	Minor	Negligible	Negligible	Negligible
Very Low	Negligible	Negligible	Negligible	Negligible

8.49 In line with the guidance contained within PPG-Noise:

- Major adverse effects are considered to be significant and should be prevented;
- Moderate adverse effects are significant and should be mitigated, where possible;
- Minor adverse effects are not significant but should be mitigated where possible; and
- Negligible adverse effects are not significant and should not require mitigation.

8.50 For this assessment, major and moderate effects are considered significant.

8.51 Duration of effect has been described as short, medium or long-term, in accordance with the criteria set out in Table 8.10. This is based on the European Commission EIA Directive Module 3 on Impact Assessment which classifies short-term impact after completion of the project for impacts between 3 and 9 years.

Table 8.10 Duration of Effects Criteria

Duration	Criteria
Low	< 3 years
Medium	> 3 years
High	> 9 years

Assumptions and Limitations

8.52 Demolition and construction noise and vibration calculations have been made based on the plant items, percentage on-times and programme provided; however, demolition and construction requirements may be subject to change by the contractor.

8.53 Solid site hoarding up to 2.4 m high around the perimeter of the proposed development has been included in the calculations.

Baseline Conditions

Existing Baseline

8.54 As secure locations were not available to carry out un-attended noise measurements, the baseline survey comprised attended noise measurements around the application site (ST1 on Caversham Road and ST2 on Vastern Road). The baseline noise and vibration climate was dominated by road traffic with noise levels of up to 74 dB L_{Aeq} in the daytime and 61 – 68 dB L_{Aeq} at night. Full details can be found in Appendix 8.2.

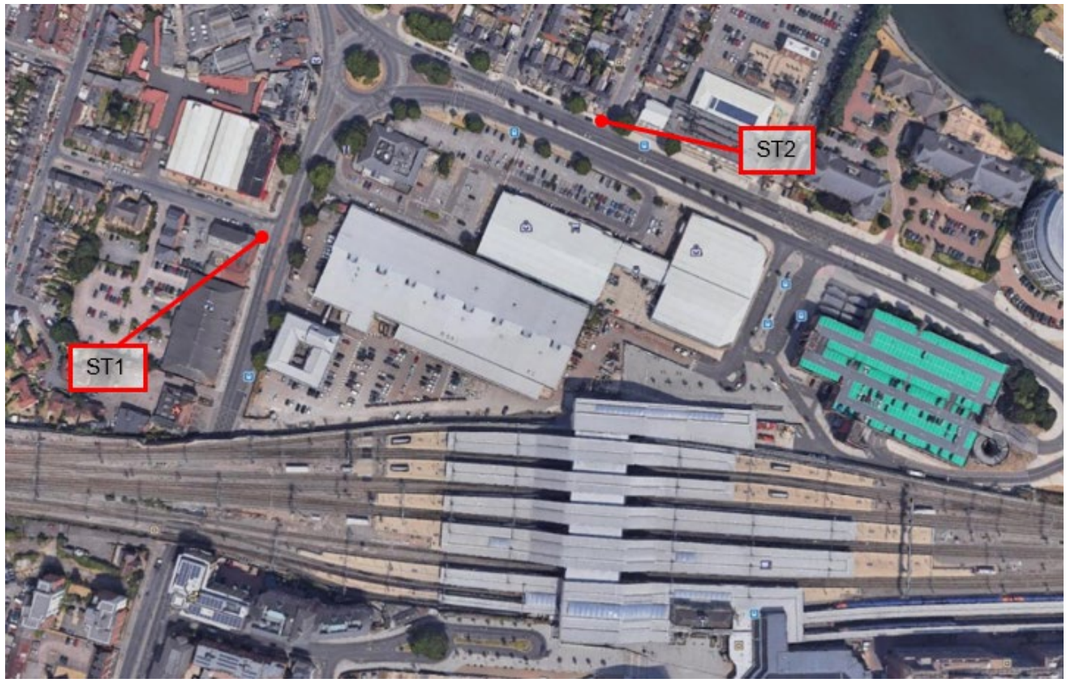


Figure 8.1: Noise Survey Measurement Locations

8.55 For this assessment, the noise levels presented in Table 8.11 have been used to assess the site suitability and set plant noise emission limits:

Table 8.11: Key Noise Measurements used in the Assessment

Measurement Location	Period	Highest Ambient Noise Level / dB L_{Aeq}	Highest Maximum Noise Level / dB L_{AFmax}	Lowest Background Noise Level / dB L_{A90}
ST1 (representative of receptors R1 – R6)	Daytime (07.00-23.00)	74	96	63
	Night-time (23.00-07.00)	68	89	44
ST2 (representative of receptors R7 - R12)	Daytime (07.00-23.00)	70	91	60
	Night-time (23.00-07.00)	66	92	42

8.56 Demolition and construction noise thresholds have been set according to the baseline noise model, which has been calibrated to the measured ambient noise levels using the shortened CRTN methodology.

Future Baseline

8.57 The future baseline has been modelled based on the calibrated existing baseline model with traffic flows updated to reflect the data provided by the traffic consultant for the future baseline including the cumulative schemes.

Existing Sensitive Receptors

8.58 The impacts of all demolition and construction noise/vibration/traffic, and operational plant noise has been considered for the existing sensitive receptors closest to the application site.

8.59 The receptors identified as being sensitive to the proposed development and which have been 'scoped-in' to the assessment are summarised in Table 8.12 and shown in Figure 8.2. R13 is the Former Royal Mail site and a cumulative scheme and have been assessed as such.

Table 8.12: Summary of Sensitive Receptors

Receptor	Sensitivity
R1 – County Borough of Reading Fire Station	Medium
R2 – 65-69 Caversham Road – commercial	Low
R3 – 71-73 Caversham Road - commercial	Low
R4 – Shurgard Self-Storage - commercial	Low
R5 – 87-98 Caversham - residential	High
R6 – 99-113 Caversham Road - residential	High
R7 – Great Brighams Mead – offices	Medium
R8 – 29-29 Vastern Road - residential	High
R9 – 31-51 Vastern Road - residential	High
R10 – SSE - offices	Medium
R11 – Sovereign House - offices	Medium
R12 – Reading Station Car park - industrial	Very low



Figure 8.2: Existing Site and Surrounding Noise-Sensitive Receptors (not to scale)

New Sensitive Receptors

8.60 The proposed development would be sequenced across the application site. Therefore it is likely that Building A could be occupied in advance of the completion of Buildings B, C and D. Were this to occur, Buildings B and C would be at an advanced stage of construction/ fit out such that significant noise and vibration emissions would be unlikely. These buildings would also by virtue of their massing, provide protection and screening from on-going works at Building D, which would be delivered in the final phase. Likewise, occupants of Buildings B and C would not be significantly affected by Building D works as these would be at an advanced stage, limiting the potential for significant noise and vibration effects. Accordingly on-site residential receptors have not been considered within the demolition and construction assessment.

Assessment of Effects

Demolition and Construction Effects

Demolition and Construction Noise

8.61 The predicted construction noise levels for each NSR are reported in Table 8.13. The medium and high impacts have been determined in accordance with Table 8.9. The significance of effect has been established on the basis of the receptor sensitivity in Table 8.9. The moderate adverse effects are highlighted in orange and the major adverse effects are highlighted in red. As a result, all highlighted cells are considered to be significant and non-significant results remain unshaded.

Table 8.13: Predicted Demolition and Construction Noise Levels Per Activity / dB $L_{Aeq,1hour}$

Receptors	Existing Ambient Noise Level	Plot A					Plot B					Plot C					Plot D					Concurrent Works*				
		Enabling and Demolition	Substructure	Superstructure	Envelope	Fit-out	Enabling and Demolition	Substructure	Superstructure	Envelope	Fit-out	Enabling and Demolition	Substructure	Superstructure	Envelope	Fit-out	Enabling and Demolition	Substructure	Superstructure	Envelope	Fit-out	S1	S2	S3	S4	S5
R1 – County Borough of Reading Fire Station	71	68	66	64	61	63	67	65	63	60	62	65	63	61	58	60	64	62	60	57	59	70	69	68	68	66
R2 – 65-69 Caversham Road	72	72	70	68	65	67	69	67	65	62	64	66	64	62	59	61	65	63	61	58	60	72	71	71	69	68
R3 – 71-73 Caversham Road	72	74	72	70	67	69	70	68	66	63	65	67	65	63	60	62	65	63	61	58	60	73	73	72	69	68
R4 – Shurgard Self-Storage	71	72	70	68	65	67	71	69	67	64	66	67	65	63	60	62	65	63	61	58	60	73	72	72	70	69
R5 – 87-98 Caversham	73	73	71	69	66	68	66	64	62	59	61	63	61	59	56	58	60	58	56	53	55	70	70	70	65	64
R6 – 99-113 Caversham Road	74	71	69	67	64	66	66	64	62	59	61	62	60	58	55	57	60	58	56	53	55	69	69	68	65	64
R7 – Great Brighams Mead	70	70	68	66	63	65	68	66	64	61	63	64	62	60	57	59	62	60	58	55	57	70	70	69	67	66
R8 – 29-29 Vastern Road	69	71	69	67	64	66	71	69	67	64	66	67	65	63	60	62	64	62	60	57	59	73	72	71	70	69
R9 – 31-51 Vastern Road	69	68	66	64	61	63	72	70	68	65	67	72	70	68	65	67	67	65	63	60	62	75	74	74	73	71
R10 – SSE	70	66	64	62	59	61	70	68	66	63	65	73	71	69	66	68	73	71	69	66	68	75	74	74	75	73
R11 – Sovereign House	69	61	59	57	54	56	64	62	60	57	59	68	66	64	61	63	71	69	67	64	66	70	69	69	72	70
R12 – Reading Station Car park	69	65	63	61	58	60	68	66	64	61	63	72	70	68	65	67	78	76	74	71	73	74	73	73	79	77

* S1 = Building A envelope, Plotg B demolition, Plot C Demolition
S2 = Building A fit out, Building B envelope and fit out, Building C substructure and superstructure
S3 = Building A fit out, Building B fit out, Building C superstructure and fit out
S4 = Building B fit out, Building C envelope, fit out, Building D demolition
S5 = Building B fit out, Building C fit out, Building D substructure

8.62 The above assessment is based on the proposed demolition and construction programme as presented in Chapter 5 of this ES. It should be noted that the construction of one building would effectively provide screening to some receptors from later phases of construction. This has not been allowed for in the modelling as the precise massing has not yet been determined (dependent on final usage); thus, the above levels provide a 'worst-case scenario'.

8.63 Solid site hoarding up to 2.4 m high on all sides (except the boundary with Reading sorting office) has been included in the calculations.

8.64 The results show that receptors 9, 10 and 12 would have 5 – 10 dB change in the period of concurrent works. These have sensitivities of high, medium and very low respectively. The resulting significance of effect is, therefore:

- Receptor 9 = **Moderate Adverse** (significant);
- Receptor 10 = **Minor Adverse** (not significant); and
- Receptor 12 = **Negligible** (not significant).

Temporary **Minor Adverse – Negligible** effects (not significant) are predicted at all other receptors.

8.65 However, it should be noted that these are initial estimates only. A detailed management strategy would be developed by the contractor, particularly for any period of noisy works. For any noisy works it is recommended that the Contractor applies for consent for the works under Section 61 of the Control of Pollution Act 1974.

Demolition and Construction Traffic Noise

8.66 Table 8.14 summarises the predicted worst-case noise levels for demolition and construction traffic at 1 m from the façade of each NSR based on up to 7 Heavy Goods Vehicles (HGVs) per hour. This is taken from the peak scenario of 185 trips (370 movements) per 55-hour week, as calculated by construction advisor. The HGVs have been modelled with a speed of 15 mph.

Table 8.14: Demolition and Construction Traffic Noise Levels

Receptor	Baseline ambient noise levels / dB $L_{Aeq,18hour}$	Predicted Noise Levels at receptor from construction traffic only / dB $L_{Aeq,18hour}$	Change in noise level / dB
R1 – County Borough of Reading Fire Station	70	58	0.3
R2 – 65-69 Caversham Road	71	61	0.4
R3 – 71-73 Caversham Road	72	62	0.4
R4 – Shurgard Self-Storage	71	65	1.0
R5 – 87-98 Caversham	73	60	0.2
R6 – 99-113 Caversham Road	73	62	0.3
R7 – Great Brighams Mead	70	59	0.3
R8 – 29-29 Vastern Road	69	59	0.4
R9 – 31-51 Vastern Road	69	60	0.5
R10 – SSE	69	61	0.6
R11 – Sovereign House	69	59	0.4
R12 – Reading Station Car park	69	57	0.3

8.67 The predicted levels show that the magnitude of impact would be very low at all receptors, except R4 which would be low. Due to sensitivity of the receptors, the significance of effect would be temporary **Negligible Adverse** (not significant) at all receptors.

Construction Vibration

8.68 All receptors (R1-R12) are at least 30 m away from potential piling activities, thus the vibrations are unlikely to significantly exceed 0.03mms^{-1} and a low magnitude of impact is considered to arise. This would have a temporary **Negligible Adverse** effect (not significant).

Completed Development Effects

8.69 All operational effects are considered to be direct and permanent.

8.70 The following embedded mitigation forms part of the completed and operational proposed development:

- Suitable façade and ventilation design; and
- Suitable fixed plant design to control plant noise emissions.

Operational Road Traffic Noise

8.71 The traffic noise has been modelled in accordance with the data provided by the traffic consultant. This shows that the proposed development would result in no increase of road traffic noise levels at any of the NSRs when compared with the future baseline. As a result, the would be **No** effect at existing NSRs. The noise maps showing the modelled scenarios are presented in Appendix 8.5.

Operational Plant Noise

Fixed Plant Installations

8.72 In accordance with pre-application advice provided by RBC (see Table 8.1), the specific sound level from fixed plant installations should be 10 dB below the lowest prevailing background noise level (L_{A90}) and the rating level should not exceed the background noise level. The lowest background noise level and the corresponding plant noise limit at each of the nearest NSRs has been outlined in Table 8.15. The rating noise level is the specific noise level, plus any corrections for intermittency or other sound characteristics outlined in BS4142:2014. It should be noted that this plant noise rating level applies to the cumulative noise levels from all plant installed as part of the proposed development.

Table 8.15: Fixed Plant Noise Limits

Receptors	Period	Lowest Measured Background Noise Level Db L_{A90}	Specific Noise Level Limit / Db L_{aeq}	Noise Rating Level Limit / Db L_{ar}
R1-R6	Daytime (0700-2300)	63	63	53
	Night-time (2300-0700)	44	44	34
R7-R8	Daytime (0700-2300)	60	60	50
	Night-time (2300-0700)	42	42	32

8.73 Suitable units should be chosen so as to meet the above criteria. This applies to the MVHR (mechanical ventilation heat recovery) units, FCUs (fan coil units), the proposed ASHP (air source heat pump) on the roof and all other plant associated with the proposed development.

8.74 Providing the above limits are met, the noise effect of fixed plant installations is predicted to be **Negligible**, which is not considered significant.

Operational Servicing Noise

Vehicle Movements

8.75 At peak times, up to four vehicle movements are proposed per hour with ingress and egress points as shown in Chapter 5: Demolition and Construction Management, Figure 5.3. Based on a lorry with a sound pressure level of 80 dBA at 10 m (based on the maximum passby sound pressure level given in BS5228-1 Table C.2 no. 34) travelling at 20 mph off-site and 15 mph on-site; this would result in a noise level of up to 52 dB $L_{Aeq,1hour}$ at 1 m from the façade of the nearest offsite noise-sensitive receptors. Thus, the increase in noise level is predicted to be < 1 dB in both the day and night-time period. Therefore, in accordance with the DMRB long-term impacts, the effect is considered to be **Negligible** (not significant) at the NSRs.

8.76 The noise levels predicted at 1 m from the façade of the proposed development are up to 61 dB $L_{Aeq,1hour}$. This would increase the ambient noise levels by up to 1 dB during the night-time period and by less than 1 dB during the day. Thus, in accordance with the DMRB long-term impacts, the effect is considered to be **Negligible Adverse** (not significant) at the proposed development.

Idling Vehicles on Proposed Development

8.77 The exact loading bay location has not been determined. However, idling HGV noise was modelled at 5 m from the façade and 0.5 m above the ground (receptor at 5 m above ground level) between Plots B and C to provide a reasonable 'worst-case' assessment based on the ingress and egress routes to the site. The HGV was modelled using the commercial software CadnaA as a point source with a sound pressure level of 68 dBA at 10 m (based on BS5228-1 Table C.2 no. 20).

8.78 The results of the modelling are presented in Table 8.16, which compares the idling HGV noise at the façade of the proposed development to the pre-existing background noise level using the methodology set out in BS4142:2014. A 3 dB feature correction has been applied for intermittency and a 4 dB feature correction has been applied for tonality in accordance with BS4142:2014. Thus, a total of 7 dB has been added to the specific noise level to calculate the rating noise level.

Table 8.16: HGV Delivery Noise Assessment to Proposed Devvelopment

Assessment Period	Rating Sound Level (including 7 dB feature correction) at Development Façade L_{Ar} / dB	Modal Average Background Noise Level at Proposed Residential Façades $L_{A90,T}$ / dB	Difference between Rating Sound Level and Background Noise Level / dB
Daytime (07.00-23.00)	82	60	+22
Night-time (23.00-07.00)	82	42	+40
* based on pre-existing background noise levels			

8.79 The difference between the idling noise and the existing background noise levels is 22 dB and 40 dB in the daytime and night-time respectively; resulting in a **Major Adverse** effect (significant) at the proposed Building B receptors. A similar result would be calculated to the other residential buildings if adjacent to a loading bay. As a result, signage should be erected to remind service vehicles that idling is not permitted at any time. By eliminating idling, a **Negligible Adverse** effect is predicted (not significant).

Idling Vehicles on NSRs

8.80 The same principle has been applied to predict the noise impact on the existing NSRs. This is presented in Table 8.17.

Table 8.17: HGV Delivery Noise Assessment to NSRs

Assessment Period	Rating sound level (including 7dB feature correction) at development façade L_{Ar} / dB	Modal average background noise level at proposed residential façades $L_{A90,T}$ / dB	Difference between rating sound level and background noise level / dB
Daytime (07.00-23.00)	59	60	-1
Night-time (23.00-07.00)	59	42	+17
* based on pre-existing background noise levels			

8.81 The difference between the idling noise and the existing background noise levels is -1 dB and 17 dB in the daytime and night-time respectively; resulting in a **Major Adverse** effect during the night (significant). As a result, signage would be erected to remind service vehicles that idling is not permitted at any time. By eliminating idling a **Negligible Adverse** effect is predicted (not significant).

Operational Activity Noise – Noise Breakout from Proposed Gym

8.82 Under the development parameters, the proposed development could include the provision of a gym; however, the operational hours and exact location are unknown at this stage. Therefore, as is standard practice, in order to mitigate potential noise break-out it is anticipated that a suitably worded planning condition would be imposed to ensure that noise levels do not exceed existing background noise levels at the nearest noise-sensitive receptors.

Assessment of Residual Effects

Additional Mitigation

8.83 All fixed plant installations would be fitted with standard attenuation and acoustic screening, as required to meet the noise emissions limits. No additional mitigation would be required beyond this.

8.84 In order to minimise the impact of idling delivery vehicles on the closest residential premises, signage indicating that no vehicle idling is permitted, would be erected.

Demolition and Construction Residual Effects

8.85 Despite the adoption of embedded mitigation in the form of BPM and as proposed within Chapter 5: Demolition and Construction Environmental Management, which would be expected to be secured by a suitably worded planning condition requiring submission of a CEMP, temporary significant adverse effects are predicted at R9 during the demolition and construction of the proposed development during concurrent work periods. It should be noted that this would occur for relatively short-periods within the overall programme. The construction plant noise at all other receptors would not be significant.

8.86 The residual demolition and construction effects would therefore be as follows:

- Demolition and construction noise: direct, temporary **Moderate Adverse** effect at R9, **Minor-Negligible Adverse** effect at R1-8 and R10-12.
- Construction Vibration: indirect, temporary, **Negligible Adverse** vibration effects at existing noise-sensitive receptors; and
- Demolition and construction traffic noise: direct, temporary, **Negligible Adverse** effect at existing noise-sensitive receptors.

Completed Development Residual Effects

8.87 The residual completed development effects would therefore be as follows:

- Fixed plant installations: direct, permanent **Negligible Adverse** effect;
- Operational traffic: **No** effect;
- Operational servicing vehicle movements: direct, permanent **Negligible Adverse** effect; and
- Operational servicing idling noise: direct, permanent **Negligible Adverse** effect.

Summary of Residual Effects

8.88 The residual noise and vibration effects are summarised in Table 8.18.

Table 8.18: Summary of Residual Significance of Effects

Receptor	Residual Effect	Additional Mitigation	Nature of Residual Effect*					
			Scale of Effect **	+ -	D I	P T	R IR	St Mt Lt
Demolition and Construction								
R9	Demolition and construction noise	N/A	Moderate	-	D	T	R	Mt
R1-8, R10-12		N/A	Minor-Negligible	-	D	T	R	Mt
All	Construction traffic noise	N/A	Negligible	-	D	T	R	Mt
All	Demolition and construction vibration	N/A	Negligible	-	D	T	R	Mt
Completed Development								
All	Changes in traffic noise	N/A	None	N/A	I	P	IR	Lt
All	Noise from fixed plant installations	Suitable selection and attenuation of plant	Negligible	-	D	P	IR	Lt
All	Noise from servicing vehicle movements	N/A	Negligible	-	D	P	IR	Lt
Proposed development		N/A	Negligible	-	D	P	IR	Lt
All	Noise from servicing vehicle idling	Signage stating no idling permitted	Negligible	-	D	P	IR	Lt
Proposed development		Signage stating no idling permitted	Negligible	-	D	P	IR	Lt

Notes:
* - = Adverse/ + = Beneficial/ +/- Neutral; D = Direct/ I = Indirect; P = Permanent/ T = Temporary; R=Reversible/ IR= Irreversible; St- Short term/ Mt –Medium term/ Lt –Long term.
**Negligible/Minor/Moderate/Major

8.89 The likely significant effects, i.e. those residual effects which are moderate or major in scale are as follows:

- Receptor 9, 31-51 Vastern Road - **Moderate Adverse** during demolition and construction.

Cumulative Effects

8.90 Table 8.19 provides a summary of the likely cumulative effects resulting from the proposed development and the cumulative developments.

Table 8.19: Inter-Project Cumulative Effects

Cumulative Development	Demolition and Construction		Operation / Completed Development	
	Cumulative Effects Likely?	Reason	Cumulative Effects Likely?	Reason
Thames Quarter (1) / Station Hill (2) / Land between Weldale-Chatham Street (4) / 29 Station Road (5) / 52-55 Friar Street (6) / Broad Street Mall (9)	No	High Existing ambient noise level means construction noise from other side of railway line unlikely to result in cumulative effect.	No	High Existing ambient noise level means operational noise from other side of railway line unlikely to result in cumulative effect.
Kenavon Drive (3)	No	Considerable distance between this development and assessed noise-sensitive receptors	No	Considerable distance between this development and assessed noise-sensitive receptors
Former Scottish and Southern Energy Site (8)	Unknown	The application has not yet been submitted so the timeframes are unknown. However, there is potential for construction phases to overlap. Nevertheless, the high pre-existing ambient noise levels on Vastern Road mean that significant deviation from the effects already predicted are unlikely.	No	Proposed residential scheme with minimal traffic expected. Plant noise is expected to be controlled by suitably worded planning condition in accordance with RBC recommendations.
Network Rail Thames Valley Area site office and Former Royal Mail site (7)	Yes	As outlined below	Yes	As outlined below

8.91 The Former Royal Mail site has been assessed below.

Demolition and Construction Cumulative Effects

8.92 The Noise and Vibration Chapter from the Environmental Statement undertaken for the Former Royal Main Site (80 Caversham Road planning application number 182252 as available on RBC planning portal) predicts that typical construction noise from this site alone would be up to 70 dB at receptors on Caversham Road and 73 dB at receptors on Vastern Road. If the works at the Former Royal Mail site are undertaken concurrently with the proposed development, there would be a change of up to 5 dB. This would result in **Minor Adverse** effect (not significant) and is applicable to the non-concurrent works (excluding scenarios 1-5 in Table 8.13).

8.93 However, if works at the Former Royal Mail Site were to be undertaken concurrent with construction of multiple buildings at the proposed development, a medium magnitude of impact would occur at receptors R7-R12. This would have the following temporary effects:

- R7, R10, R11: **Minor Adverse** effect (not significant);
- R8, R9: **Moderate Adverse** effect (significant); and
- R12: **Negligible Adverse** effect (not significant).

Thus, only R8 and R9 would experience significant effects. This is provided as a 'worst-case' scenario and may only occur for a short period, if it all.

8.94 Construction traffic noise assessment for the site at the Former Royal Mail Site has not been provided; however, it is considered that in the context of the existing ambient noise levels; a temporary **Minor-Negligible** effect (not significant) would result from cumulative construction traffic noise.

8.95 It is considered that demolition and construction vibration from adjacent cumulative sites would be controlled by BPM and that the resulting cumulative vibration effect at the receptors would not be in excess of the levels predicted for the proposed development alone; thus there would be a temporary **Negligible Adverse** effect.

Completed Development Cumulative Effects

8.96 Due to the net reduction in vehicle movements associated with the proposed development, the in combination road traffic noise effects from the proposed development cumulative developments would be **None**.

8.97 The plant noise rating limits for the development immediately south of the proposed development (80 Caversham Road) have been set at equal to background and the specific noise limits set at 10 dB below background (as detailed in the ES submission for planning application number 182252). Therefore, as a 'worst-case' scenario the cumulative plant noise from both developments would result in 1 dB increase in the specific noise level and up to 5 dB increase in the rating level. This is considered to be a low magnitude of impact and, therefore, a **Minor Adverse** effect (not significant).

8.98 The cumulative effect of servicing noise (both movements and idling) would be controlled in order to meet the on-site requirements by minimising idling at the proposed development. As the existing off-site receptors are at a greater distance from the proposed movements and loading bays, no cumulative effects are predicted as a result of servicing noise.

9 WIND MICROCLIMATE

Introduction

9.1 This chapter of the ES assesses the potential impacts and associated likely effects of the proposed development on the local wind microclimate within and around the application site. In particular, it considers the likely effects of wind upon pedestrian comfort and safety and summarises the findings of a Computation Fluid Dynamics (CFD) assessment.

9.2 The chapter describes the methods used to assess the potential impacts; the baseline conditions currently existing at the application site and the study area; as well as the potential impacts and likely effects on wind microclimate during construction and at the completed development stage, taking into consideration embedded mitigation measures. Where appropriate, additional mitigation measures required to prevent, reduce, or offset the likely effects, are identified and the chapter concludes with a summary of the likely residual effects.

9.3 This chapter is accompanied by the following technical appendices in ES Volume 3:

- Technical Appendix 9.1: Wind Microclimate Results.

Methodology

9.4 There is no published guidance for wind microclimate assessment in EIA. Accordingly, the assessment has been informed by the following legislation, policies and published guidance:

- NPPF[1];
- PPG[2]; and
- Reading Borough Local Plan 2019[3].

9.5 In addition, professional judgment has been applied.

Consultation

9.6 No consultations have been undertaken in addition to the formal EIA scoping process. At the time of undertaking this assessment, the EIA Scoping Opinion remains outstanding.

Assessment Scope

9.7 The assessment has been based on a series of development parameters, commitments and assumptions, as described in Chapter 2: EIA Process and Methodology; Chapter 4: Proposed Development Description; and Chapter 5: Demolition and Construction Environmental Management. Due to the flexibility being sought in respect of land use classes and associated development scenarios, the wind microclimate assessments has been undertaken of the worst-case massing proposals represented by parameter plan PP-105 (mixed-use scheme).

Technical Scope

9.8 The wind microclimate assessment quantifies the expected wind microclimate in pedestrian areas at ground level and at roof top level. The measured wind speed statistics have been benchmarked against the Lawson Comfort Criteria[4] to determine the suitability of the proposed development for different pedestrian activities. Strong winds have also been considered.

9.9 Existing pedestrian receptor locations around the application site, have been assessed for wind conditions against both their intended use and against the baseline wind conditions. New pedestrian receptor locations introduced by the proposed development have been assessed against their intended use.

9.10 For both existing and new receptor locations, where changes to conditions have been measured, the significance of effect for each location have been defined.

Spatial Scope

9.11 The study area included existing and cumulative surrounding buildings and terrain covering a 300 m radius from the application site boundary. The extent of the virtual wind tunnel was 1,800 m long by 1,100 m wide by 350 m tall and was rotated with wind direction.

Temporal Scope

9.12 The assessment has considered the following three configurations:

- Existing baseline;
- Existing baseline + proposed development; and
- Existing baseline + proposed development + cumulative schemes.

Baseline Characterisation Method

Desk Study

Meteorological Data

9.13 Wind data for the Reading area was sourced from MeteoBlue via SimScale. MeteoBlue data is based upon over 30 years of historical weather simulation data assembled in continuous hourly resolution.

Field Study

9.14 A field study was not required to inform the assessment.

Assessment Method

Methodology

Demolition and Construction

9.15 Typically for a wind microclimate assessment, the likely effects during demolition and construction would be assessed using the professional judgement of an experienced wind engineer. The assessment is based on the background wind climate at the application site and on an understanding of the effects of wind in the built environment. This approach is taken on the basis that the on-site activity during this time (i.e. construction activity) is less sensitive to wind conditions than when the proposed development is completed and occupied (which would include entrance and amenity space, for example).

[1] Secretary of State for Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework.
[2] https://www.gov.uk/government/collections/planning-practice-guidance
[3] Reading Borough Council, 2019. Reading Borough Local Plan. RBC.
[4] Lawson TV (2001). Building Aerodynamics. Imperial College Press.

9.16 A qualitative assessment of the wind microclimate during demolition and construction has therefore been undertaken and has been based on professional judgement (informed by an assessment of the background wind microclimate in the area, the results of the tested configurations for the baseline and completed development scenarios, and the wind specialist's experience of assessing wind in the built environment).

Completed Development

9.17 To predict the local wind environment associated with the completed development and to determine the resulting pedestrian comfort within and immediately surrounding the application site (the study area), testing using SimScale Computational Fluid Dynamics Software (CFD) of the proposed development has been undertaken.

9.18 The mathematical solver employed by SimScale is the Lattice Boltzman method (LBM). The LBM solver is very well suited to wind microclimate assessments allowing for the accurate resolution of complex geometries in an efficient time frame.

9.19 CFD simulation is a well-established means of assessing the pedestrian wind microclimate. It has been used to assess conditions within, and immediately surrounding, the proposed development. CFD enables the turbulent wind conditions at the application site to be quantified and classified in accordance with the widely accepted Lawson Comfort Criteria, as described below.

9.20 Three 3D computer geometry models were constructed representing the following three configurations:

- Configuration 1: Existing baseline;
- Configuration 2: Existing baseline + proposed development; and
- Configuration 3: Existing baseline + proposed development + cumulative schemes.

9.21 The proposed development is expected to alter the pedestrian use of spaces and so a direct comparison of the existing wind conditions with those on the developed site may not be suitable. For example, it may be considered a negligible change where conditions suitable for walking in the existing climate remain suitable for walking following the completed development. However, mitigation would be required should the use of the space have changed to a building entrance and standing conditions would be more appropriate. The new pedestrian activities for a developed site should therefore be considered.

9.22 For each of the configurations, the model also included ground topography such that local wind effects are accurately represented. Minor geometrical details (such as street furniture, foliage, rooftop plant, etc.) were not included in the CFD models. This simplified model geometry provides a worst-case scenario.

9.23 In total 16 wind directions were used to assess wind microclimate in terms of pedestrian comfort. Strong winds, defined as wind speeds in excess of 15 m/s for more than two hours have also been included in this assessment and are discussed at the end of the results.

9.24 The methodology used to quantify the pedestrian level wind environment for the above configurations comprised the following:

- Step 1: The geometry of the study area, proposed development, and cumulative schemes were assembled in the 3D computer models of the three configurations.
- Step 2: The meteorological data for the application site was used and appropriate wind exposure classifications for each direction were applied.
- Step 3: The wind speed, direction and frequency at pedestrian level were modelled for all wind directions.
- Step 4: The wind speed results were compared with respect to the Lawson Comfort criteria and a statistical summary of all wind directions was produced as a single plot for the application site and study area.
- Step 5: Strong winds were analysed using Lawson LDDC criteria for assessing unsafe conditions.

9.25 The prevailing wind direction for the application site is south-westerly (SW) to south-south-westerly (SSW). Additionally, during spring time, a strong north-easterly (NE) to east-north-easterly (ENE) wind results in a smaller secondary peak in the wind rose, as shown in Figure 9.1.

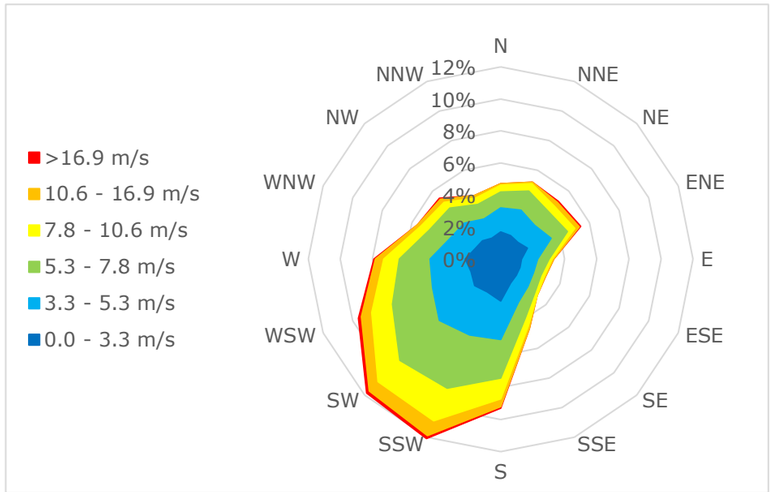


Figure 9.1: Annual Average Wind Rose for Reading, UK[5].

9.26 The region around the application site was assessed for ground roughness using BREVe software with the resulting wind exposures applied to the wind data within SimScale using wind engineering standard EN 1991-1-4. The surrounding terrain was classified as either Suburban (III) or Urban (IV) as appropriate.

9.27 The wind profile for Reading is dominated by south-south-westerly and south-westerly winds, 191° to 236° on the cardinal coordinate system, which is common for much of the south of England. The wind levels are generally higher during the winter months than the summer months. However, the wind rose is largely the same for all seasons. There are periods where north-easterly wind and westerly winds are the prominent wind direction. These directions typically result in a colder wind, so it is important that at least 12 wind directions are considered for detailed assessment and not just south-westerly winds. Therefore, 16 equally distributed wind directions were resolved for this assessment.

9.28 Throughout this assessment the wind data used is for an annual average. All Lawson plots account for 16 wind directions which include prevailing winds from summer and winter season conditions combining all seasons in one result. This provides a worst-case result, combining the strongest winds from all seasons. The combination of data combining a high resolution of wind directions with wind data directly for the Reading area, provides a robust wind data set for undertaking wind microclimate assessment and planning for this stage of development.

9.29 The CFD simulations were run across the three geometries, each for 16 unique wind directions using the wind data defined for the application site and direction. The simulation provides transient flow results including gusts. These results were then averaged at a 1.5 m height above ground level (and roof

[5] Compiled from MeteoBlue simulated data for Reading

top level) for velocity. A statistical surface solution, representing a single result which combines all wind directions was then derived, and the Lawson Assessment Criteria applied to this result.

9.30 The results of the assessment criteria are displayed on coloured "heat" maps. With blues representing calm wind conditions (suitable for sitting), and red colours representing strong wind conditions (suitable for walking). The colour plots allow easy identification of wind microclimate conditions across the application site and proposed development.

9.31 Traditional wind tunnel wind microclimate assessments rely upon many sensors positioned across the model to measure wind speed at these discrete sensor positions. The effects at these individual points are then reported on. CFD simulation is not limited by individual sensor points. Rather the results are contour mapped allowing results to be observed at any point in the test area. However, a "measurement location" approach is often expected and can be helpful to describe areas. As such, a series of measurement locations (1-50) have been defined across and around the application site and proposed development to assist with analysis and discussion as shown in Figure 9.2. These measurement locations are considered to give an accurate representation of the wind conditions across the application site and proposed development to reflect key receptor locations. Further details including images of the models used are provided in Technical Appendix 9.1.



Figure 9.2: Wind Assessment Measurement Locations

Lawson Comfort Criteria

9.32 The Lawson Comfort Criteria (LCC) has been established and industry recognised for over 30 years as a way to assess wind conditions and measurements. The LCC seeks to define the reaction of an average pedestrian to the wind, as described below. If the measured wind conditions exceed the threshold wind speed for more than 5 % of the time, then they are unacceptable for the stated pedestrian activity and the expectation is that there may be complaints of nuisance or people would not use the area for its intended purpose.

9.33 The LCC sets out six pedestrian activities and reflect the fact that less active pursuits require more benign wind conditions. The six categories presented in Table 9.2 are; outdoor dining, sitting, standing, strolling, walking and uncomfortable, in ascending order of activity level. In other words, the wind conditions in an area for sitting need to be 'calmer' than a location that people merely walk past. Strolling can be considered a more "leisurely" walking pace, for example a park amenity space where the user would like to spend time. The walking classification can be considered more of a "business" walking pace, for example along a main road where the user may not want to dwell for long. The coloured key in Table 9.2 corresponds to the presentation of CFD test results described later in this chapter.

Table 9.2: Receptor Sensitivity Criteria

Key	Comfort Category	Threshold	Description
A	Outdoor Dinning	0-2 m/s	Light breezes desired for outdoor restaurants
B	Sitting	0-4 m/s	Light breezes seating areas where one can read a paper or comfortably sit for long periods
C	Standing	4-6 m/s	Gentle breezes acceptable for main building entrances, pick up / drop-off points and bus stops
D	Strolling	6-8 m/s	Moderate breezes that would be appropriate for strolling along a city / town centre street, plaza or park
E	Walking	8-10 m/s	Relatively high speeds that can be tolerated if one's objective is to walk, run or cycle without lingering
U	Uncomfortable	>10 m/s	Winds of this magnitude are considered a nuisance for most activities, and wind mitigation is typically recommended

Target Conditions

9.34 Given the mixed-use nature of the proposed development, the desired wind microclimate would be expected to have areas acceptable for sitting, standing and strolling use. A description of the required comfort categories for the intended use in accordance with Table 9.2 is given in Table 9.3.

Table 9.3: Target Wind Conditions for Intended Uses

Intended Use	Target Wind Condition Summer	Target Wind condition Winter
Building Entrances	Standing	Standing
Public Amenity Areas	Sitting / Standing	N/A (seasonal use and weather dependent)
Balconies and Roof Terraces	Sitting / Standing	N/A (seasonal use and weather dependent)
Thoroughfares	Strolling	Strolling
Pedestrian Crossings	Walking	Walking
Bus Stops	Standing	Standing

9.35 For public amenity spaces, the target wind condition is sitting during the summer months. However, as use is expected to be seasonal for these spaces, there is no specific target for the winter months. If the amenity area is large with many different locations for pedestrians to gather, then a mixture of sitting and standing will be acceptable. However, seating areas will require the sitting classification. Balconies

and roof terraces are considered to have weather dependant use and therefore do not have a specific winter target.

9.36 Given the outline nature of the application, the intended use for the areas of interest from a wind microclimate perspective within the proposed development have not been defined. However, Figure 9.3 describes typical criteria that have been assumed to enable assessment. In summary, standing classification would be expected around buildings where entrances could be delivered; strolling classification would be expected in thoroughfares; sitting classification for amenity spaces; and sitting and standing for roof terraces.



	A	2 m/s	< 5%	Outdoor Dining
	B	4 m/s	< 5%	Pedestrian Sitting
	C	6 m/s	< 5%	Pedestrian Standing
	D	8 m/s	< 5%	Strolling
	E	10 m/s	< 5%	Walking
	U	10 m/s	> 5%	Uncomfortable

Figure 9.3: Proposed Development Assumed Intended Pedestrian Use

Strong Winds

9.37 Lawson also specifies a lower limit strong wind threshold when winds exceed 15 m/s for more than 2 hours of the year (Lawson LDDC Criteria). Exceedance of this threshold may indicate a need for mitigation measures or a careful assessment of the expected use of that location.

9.38 Strong winds are generally associated with areas which would be classified as acceptable for walking or as uncomfortable. Walking and uncomfortable conditions would not usually form part of the 'target' wind environment and would usually require mitigation due to pedestrian comfort and safety considerations. This mitigation would also reduce the frequency of, or even eliminate, any strong winds. Strong wind classification for the Lawson LDDC Criteria is given in Table 9.4.

Table 9.4: Lawson LDDC Criteria for Strong Wind Conditions

Key		Wind Speed	% Time	Description
	A	2.5 m/s	< 5%	Frequent Sitting
	B	4.0 m/s	< 5%	Occasional Sitting
	C	6.0 m/s	< 5%	Standing
	D	8.0 m/s	< 5%	Walking
	E	8.0 m/s	> 5%	Uncomfortable
	S	15.0 m/s	> 0.022%	Unsafe

Significance Criteria

9.39 The significance criteria used in the assessment is based upon the relationship between the desired pedestrian use of a particular area of the proposed development, using the categories defined by the LCC, and the predicted wind conditions at that location. This allows for the assessment to take into account any change in pedestrian activity that might arise as a result of the proposed development.

9.40 A seven point scale has been used within this assessment to assess the significance of effects, as shown in Table 9.5.

Table 9.5: Significance Criteria

Modelled Wind Microclimate Criteria	Scale of Effect
Wind Conditions are three categories calmer than desired	Major Beneficial
Wind Conditions are two categories calmer than desired	Moderate Beneficial
Wind Conditions are one category calmer than desired	Minor Beneficial
Wind Conditions are similar to those desired	Negligible
Wind Conditions are one category windier than desired	Minor Adverse
Wind Conditions are two categories windier than desired	Moderate Adverse
Wind Conditions are three categories windier than desired	Major Adverse

9.41 The adopted scale for the significance criteria is a logical comparison of the measured wind environment with the desired wind environment. An adverse effect implies that a location has a wind environment that is unsuitable for its intended use and mitigation should therefore be considered.

9.42 The minor, moderate and major categories indicate the scale of the difference between the desired microclimate and the actual microclimate. As an example, if the desired wind conditions at a particular location is required to be suitable for standing, but the predicted wind conditions are suitable for strolling, the difference between the desired and predicted wind condition is one category windier than desired. In this case, the significance of the effect would be identified as minor adverse. Any adverse

effect would be material to the planning decision process because it implies that a location, or area, has a wind microclimate that is unsuitable for the desired use of that area. Accordingly, minor to major adverse effects would be considered to be significant.

9.43 Wind effects due to development are usually 'felt' within the application site boundary or the immediate surrounding streets and are due to the building massing and orientation. Consequently, all reported effects are considered to be direct, local and long-term/irreversible unless there is a change in the massing or climate.

Assumptions and Limitations

9.44 Computational simulations have limitations to the scale and detail that can be represented in the computer model geometry. Building geometry is simplified such that footprint, height and only major features are represented. Similarly, smaller details such as trees, fencing, and street furniture were not included in the geometry model. With fewer obstructions to the air flow, this provides a "worst-case" wind scenario.

9.45 Care is needed when interpreting computationally derived wind data as the simulation methods have limitations. However, the SimScale LBM solver has been extensively validated against other simulation solvers and against wind tunnel and real-world measurements.

9.46 Meteoblue weather data is comprised of simulated data that can provide very accurate wind predictions for any given area. Though simulated, Meteoblue's weather data has been compiled from hourly averages over a 30 year period and is regularly verified and tested against measured data. Alternatively, measured data can be very accurate but relies upon nearby weather stations for that to be the case. For example, Heathrow airport data is very complete but is 36 km from the application site which leads to significant regional calibration.

9.47 It is the authors' opinion that the assumptions followed here represent a robust and thorough method of assessment.

Baseline Conditions

Existing Baseline

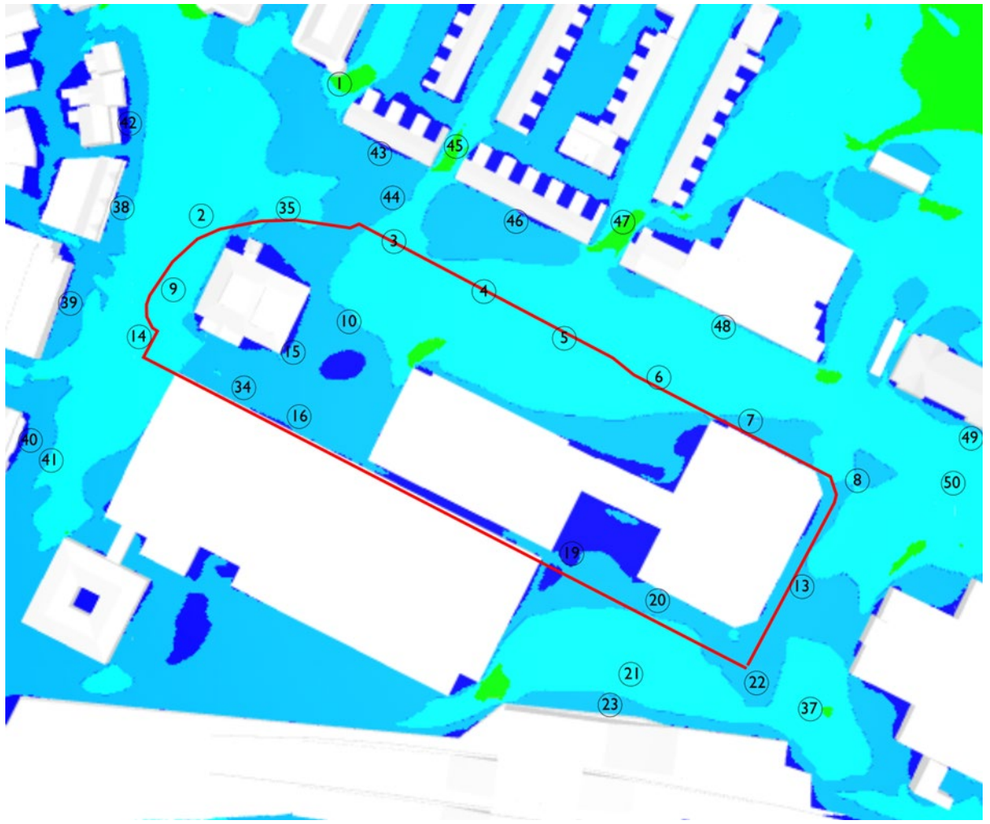
Configuration 1: Existing Baseline

9.48 The existing application site is characterised by two buildings. The smaller of the two buildings is single storey with a pitched roof, the larger building is formed of two interconnected structures approximately two storeys in height with a shallow pitched roof. The surrounding area is characterised by low rise residential and commercial development, typically of one to two storeys with pitched roofs. The existing on-site buildings are commercial and much of the outdoor space is allocated for car parking with some thoroughfares for access and areas around building entrances.

9.49 Wind conditions on the site are currently largely suitable for sitting or standing as shown in Figure 9.4. There are smaller areas suitable for outdoor dining and strolling. Detailed assessment of induvial sensitive receptors is provided in the next section.

Strong Winds

9.50 There are no instances of winds exceeding 15 m/s for more than 0.025 % of the time in this configuration within or close to the application site.



	A	2 m/s	< 5%	Outdoor Dining
	B	4 m/s	< 5%	Pedestrian Sitting
	C	6 m/s	< 5%	Pedestrian Standing
	D	8 m/s	< 5%	Strolling
	E	10 m/s	< 5%	Walking
	U	10 m/s	> 5%	Uncomfortable

Figure 9.4: Configuration 1: Existing Baseline Pedestrian Comfort

Sensitive Receptors

Existing Sensitive Receptors

9.51 The existing sensitive receptors that could be affected by the proposed development are:

- pedestrians using thoroughfares around the application site (measurement locations 1,2,9 and 14 on Caversham Road, 35, 3-7 on Vastern Road, 8 and 13 on Troopers Port Way, 45 on De Montfort Road, and 47 on Lynmouth Road);
- pedestrians using existing bus stop (measurement location 37);

- pedestrians using outdoor amenity spaces at the railway station entrance and drop off area (measurement location 21);
- entrances to residential buildings adjacent to the application site (measurement locations 38, 39, 40, 42, 43, 46, 48 and 49); and
- Pedestrians using pedestrian crossings (measurement locations 41, 44, and 50).

New Sensitive Receptors

9.52 The new sensitive receptors resulting from the introduction of proposed development would be: people entering and exiting the proposed development buildings; pedestrians using the new thoroughfares; and the users of the newly introduced open space and amenity area, both at ground level and at roof level.

9.53 The measurement locations presented in Figure 9.2 cover both existing receptors and new receptor locations.

Assessment of Effects

Demolition and Construction Effects

9.54 The proposed development would comprise the demolition of all existing buildings on-site. Demolition and construction works would be undertaken on a phased basis, as described in ES Chapter 5: Demolition and Construction Environmental Management.

9.55 Based upon professional judgement, the demolition and construction works are not anticipated to give rise to any significant change to the existing (relatively calm) wind microclimate both on and off-site.

9.56 The likely effect is therefore judged to be temporary **Negligible** and wind conditions both on and off-site would remain acceptable for their intended pedestrian uses. As construction of the proposed development proceeds, the wind conditions of the application site and its surrounds would gradually adjust to those described below for the completed development.

Completed Development Effects

Configuration 2: Existing Baseline + Proposed Development

9.57 The proposed development would deliver new buildings ranging in height from 93 m to 113 m. At ground level, areas of public realm and amenity space and four new thoroughfares would be delivered. New thoroughfares created by the proposed development plots are labelled as 1,2,3, and 4 in Figure 9.5.

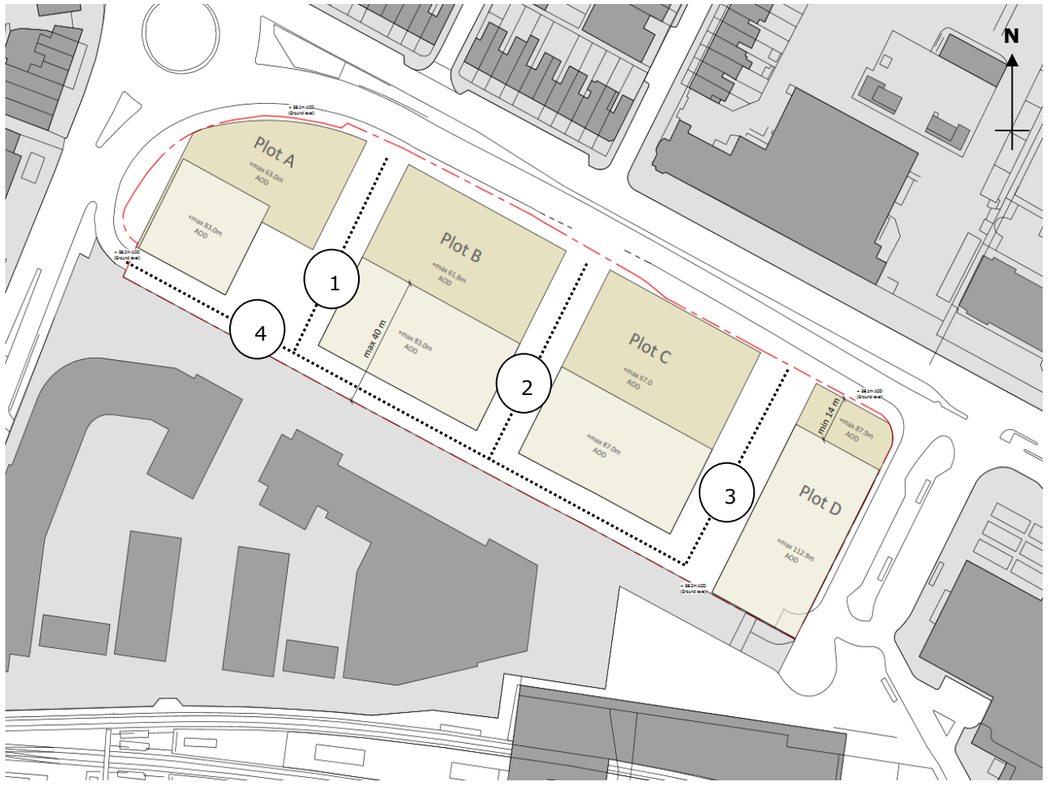
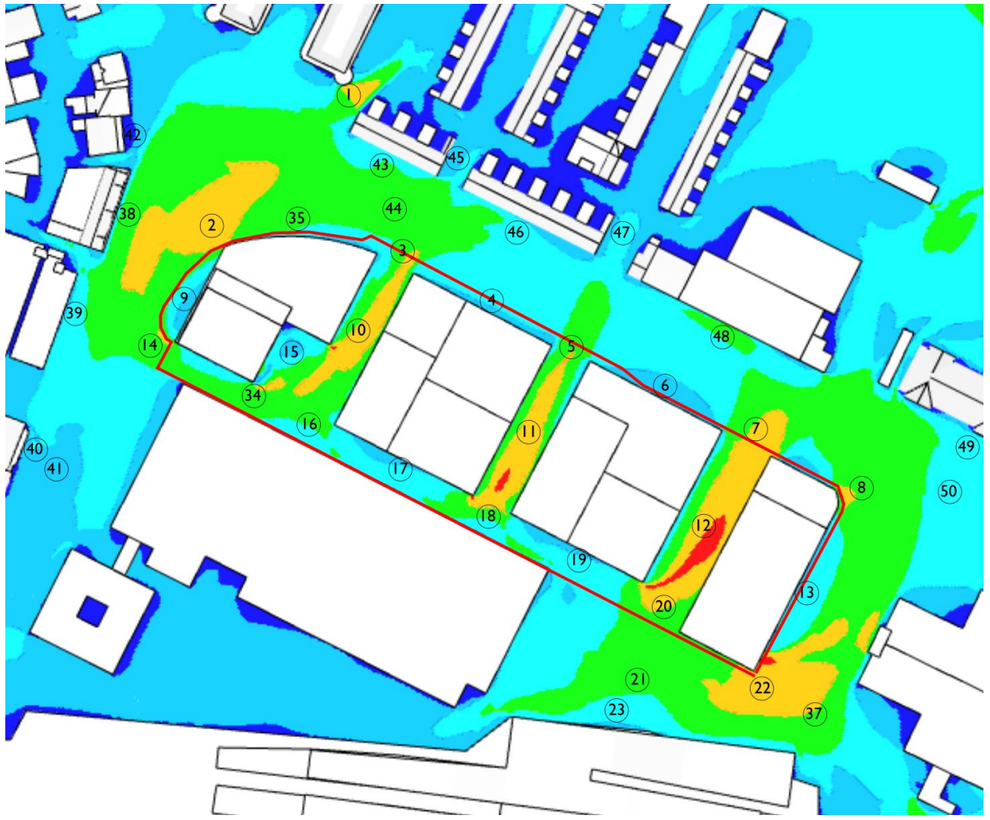


Figure 9.5: Configuration 2 - Proposed Development Thoroughfares

Pedestrian Comfort

9.58 For Configuration 2, the modelled wind comfort conditions at ground level is shown in Figure 9.6.



	A	2 m/s	< 5%	Outdoor Dining
	B	4 m/s	< 5%	Pedestrian Sitting
	C	6 m/s	< 5%	Pedestrian Standing
	D	8 m/s	< 5%	Strolling
	E	10 m/s	< 5%	Walking
	U	10 m/s	> 5%	Uncomfortable

Figure 9.6: Configuration 2 – Ground Level (Pedestrian Comfort)

9.59 Wind conditions would range from being suitable for outdoor dining to being uncomfortable.

9.60 Specific receptor locations are discussed in more detail below.

Existing Off-Site Thoroughfares

9.61 Thoroughfares should typically be expected to have target conditions suitable for strolling/walking.

9.62 Measurement locations 3, 4, 6, 7 and 35 on Vastern Road would achieve the target wind conditions or better. Locations 3 and 5 would be windier than the baseline conditions (Configuration 1) and achieve wind conditions suitable for walking, which is one category higher than the target. Therefore, the effects would range from **Negligible** to **Minor Adverse**.

9.63 At Troopers Port Way measurement locations 13 and 22 would achieve wind conditions for strolling/walking and therefore the effect would be **Negligible** to **Minor Adverse.**

9.64 Measurement locations 2, 9 and 14 along Caversham Road would achieve winds conditions of strolling/walking and therefore the effect would be **Negligible to Minor Adverse.**

9.65 At Brighams Mead, measurement location 1 the wind conditions would be suitable for walking and therefore the effect would be **Minor Adverse.**

9.66 At De Montfort Road, measurement location 45, the wind conditions would be suitable for walking and the effect would be **Minor Adverse**.

9.67 At Lynmouth Road, measurement location 47, the wind conditions would be suitable for walking and the effect would be **Minor Adverse**.

Proposed Development Thoroughfares

9.68 Measurement location 10 is on Thoroughfare 1. The wind conditions would range from being suitable for strolling/walking to being uncomfortable. Accordingly, the effect would range from **Negligible to Moderate Adverse**.

9.69 Measurement location 11 is on Thoroughfare 2. The wind conditions would be suitable for strolling/walking to being uncomfortable. Accordingly, the effect would range from **Negligible to Moderate Adverse.**

9.70 Measurement location 12 is on Thoroughfare 3. The wind conditions would be suitable for strolling/walking to being uncomfortable. Accordingly, the effect would range from **Negligible to Moderate Adverse.**

9.71 Measurement locations 34, 16, 17, 18, 19 and 20 are along Thoroughfare 4, the wind conditions at these locations would range from being suitable for standing to walking. Accordingly, the effect would range from **Minor Beneficial** to **Minor Adverse**.

Pedestrian Crossings

9.72 The target for pedestrian crossings would be to have conditions suitable for walking.

9.73 The pedestrian crossing at measurement location 41 on Caversham Road achieves sitting wind conditions, which is calmer than the target use and is a one category improvement against the baseline (Configuration 1) therefore a **Minor Beneficial** effect.

9.74 There are two pedestrian crossings on Vastern Road. The first is at measurement location 44 where wind conditions are suitable for strolling, which is two categories higher than the baseline conditions (Configuration 1), but one category lower than the target conditions and therefore suitable for its intended use. Accordingly, on balance, the effect is considered to be **Negligible**.

9.75 The second pedestrian crossing on Vastern Road is at measurement location 50, where wind conditions are suitable for standing, which is consistent with the baseline conditions and is suitable for the intended use. Accordingly, the effect would be **Negligible**.

Existing Off-Site Entrances

9.76 Entrances should typically provide shelter for pedestrians leaving a building and should have wind conditions suitable for standing.

9.77 There are four entrances to buildings on Caversham road (measurement locations 38, 39 and 40 and 42). Measurement location 38 would experience wind conditions suitable for strolling, which is a change from the baseline and one category higher that the target. Accordingly, the effect would be **Minor Ad-**

verse. Measurement location 39 would have wind conditions suitable for standing, which is a one category increase from the baseline conditions, but still appropriate for the intended use. The effect is therefore **Negligible**. Measurement location 40 would have wind conditions suitable for sitting, which is suitable for the intended use and consistent with the baseline conditions and therefore the effect would be **Negligible**. Measurement location 42 would have wind conditions suitable for outdoor dining, which is suitable for the intended use and consistent with the baseline conditions and therefore the effect would be **Negligible**.

9.78 On Vastern Road, the entrances at measurement location 43 would have wind conditions suitable for standing, which is a one category increase from the baseline conditions, but still appropriate for the intended use. The effect is therefore **Negligible**. The conditions for entrances at measurement location 45 would range from being suitable for sitting to standing, which is a one-two category improvement against the baseline and therefore the effect range from **Minor** to **Moderate Beneficial**. The entrance at measurement location 48 would have wind conditions suitable for strolling, which is a one category increase against the baseline and one category higher than the target. Therefore, the effect would be **Minor Adverse**. The entrance at measurement location 49 would have wind conditions suitable for standing, which is suitable for the intended use and consistent with the baseline conditions and therefore the effect would be **Negligible**

9.79 The entrance to the railway station at measurement location 23 experiences would experience wind conditions suitable for standing, which represents a **Negligible** effect.

Proposed Development Entrances

9.80 Entrances locations for the proposed development have not yet been defined. Modelled wind conditions at measurement locations 4, 6, 9, 13, 15, and 19 would be most suitable for entrances as they would achieve sitting to standing wind conditions which would be suitable for this use. Accordingly, the effect at these locations would be **Negligible**.

9.81 In the event that entrances are located along Thoroughfares 1, 2 and 3, or to the north of Building A and south of Building D, wind conditions would range from being suitable for strolling (measurement locations 16 and 35) to uncomfortable (measurement location 22). Accordingly, the effect would range from **Minor Adverse** to **Major Adverse**.

Off-site Bus Stops

9.82 The target wind conditions for a bus top should be standing.

9.83 The bus stop at measurement location 37 at the railway station would experience conditions suitable for walking, which is a change from the baseline and one category higher than the target. Accordingly, the effect would be **Minor Adverse**.

Off-Site Amenity Area

9.84 Target wind conditions for amenity spaces vary according to the intended use, but would be expected to range from sitting to standing.

9.85 The wind conditions at the sitting and pick-up area outside the railway station at measurement location 21 would experience conditions suitable for walking, which is a change from the baseline and is one to two categories higher than the target range. Accordingly, the effect would range from **Minor Adverse** to **Moderate Adverse**.

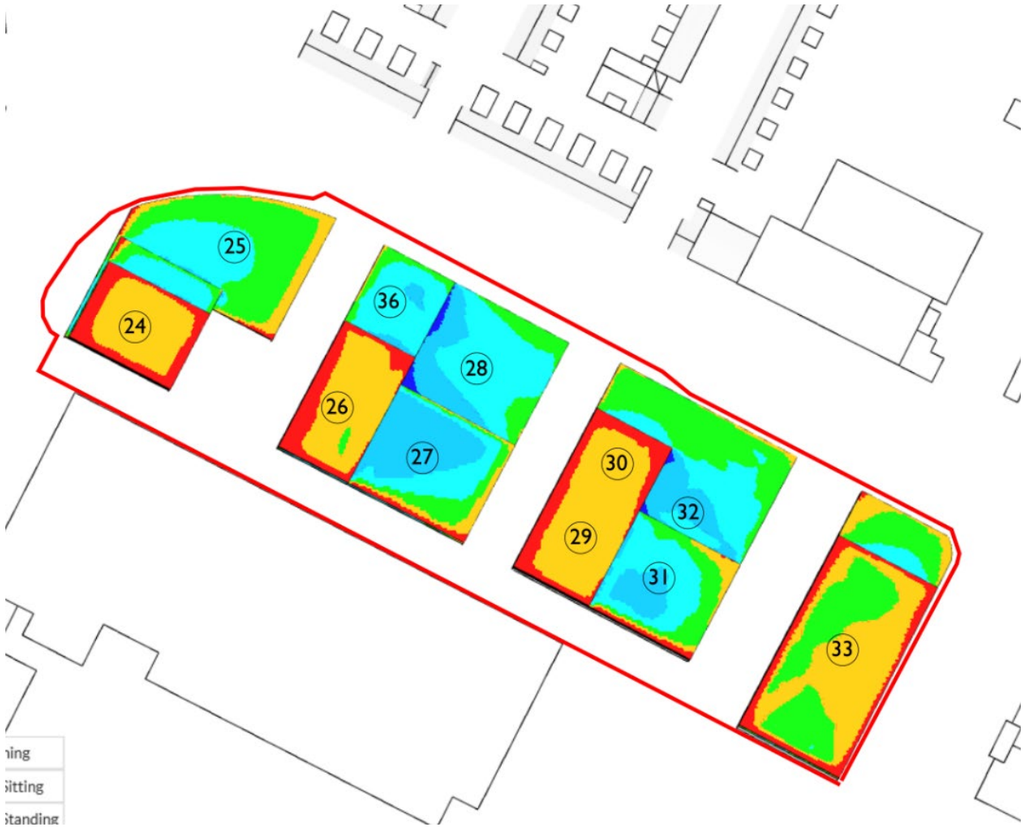
Proposed Development Ground Floor Amenity

9.86 The ground floor amenity areas and intended uses for the proposed development are not defined at this stage. Therefore, amenity space could come forward anywhere within the application site that is not covered by the footprints of Plots A-D. The wind conditions for this area would range from being suitable for outdoor dining (measurement location 15) to being uncomfortable (measurement location 12). When compared against the assumed target condition range of sitting to standing, the effect would range from **Minor Beneficial** to **Major Adverse**. It is assumed that at the detailed design stage, the landscape strategy would design the amenity spaces such that the intended use accounts for the reported wind conditions and that mitigation measures, such as porous screening, would be employed in order to reduce wind conditions to the target levels.

9.87 At roof level, wind conditions would range from being suitable for outdoor dining use to being uncomfortable.

Proposed Development Roof Top Amenity

9.88 Wind conditions at the roof top level are shown in Figure 9.7. The wind conditions range from being suitable for outdoor dining to being uncomfortable. When compared against the assumed target condition range of sitting to standing, the effect would range from **Minor Beneficial** to **Major Adverse**.

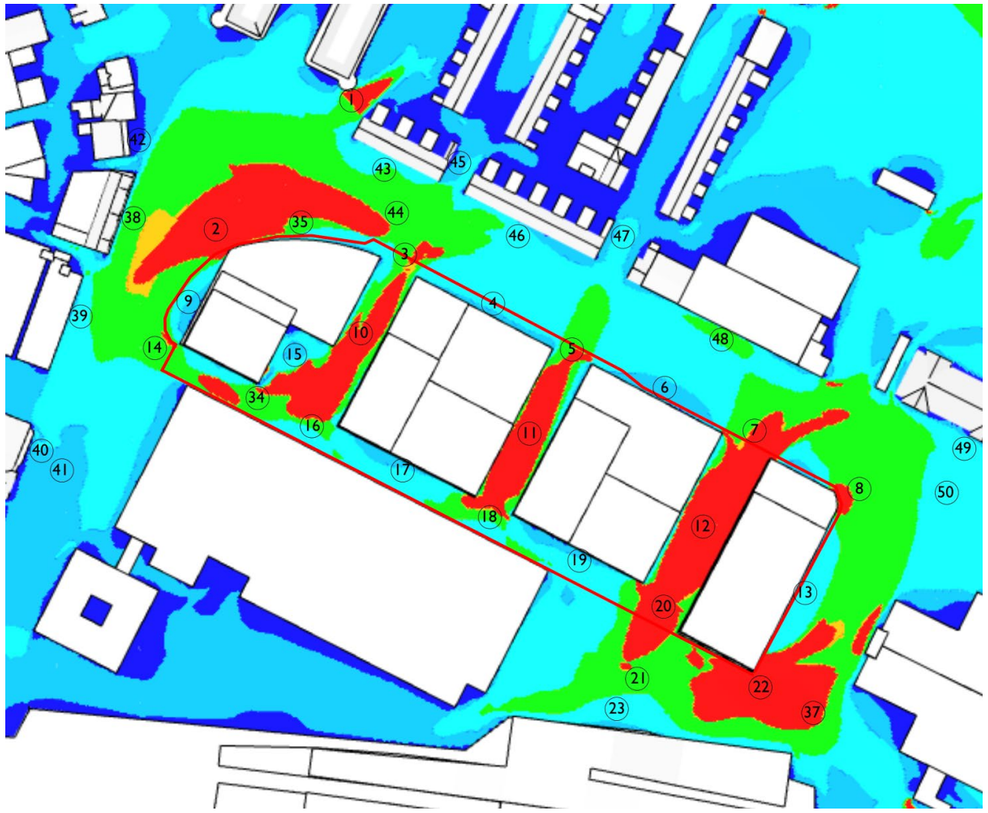


	A	2 m/s	< 5%	Outdoor Dining
	B	4 m/s	< 5%	Pedestrian Sitting
	C	6 m/s	< 5%	Pedestrian Standing
	D	8 m/s	< 5%	Strolling
	E	10 m/s	< 5%	Walking
	U	10 m/s	> 5%	Uncomfortable

Figure 9.7: Configuration 2 – Roof Level (Pedestrian Comfort)

Strong Winds

9.89 The Lawson safety criteria plot for strong winds at ground level is shown in Figure 9.8.



	A	2.5 m/s	< 5%	Frequent Sitting
	B	4.0 m/s	< 5%	Occasional Sitting
	C	6.0 m/s	< 5%	Standing
	D	8.0 m/s	< 5%	Walking
	E	8.0 m/s	> 5%	Uncomfortable
	S	15.0 m/s	> 0.022%	Unsafe

Figure 9.8: Configuration 2 – Ground Level (Strong Winds)

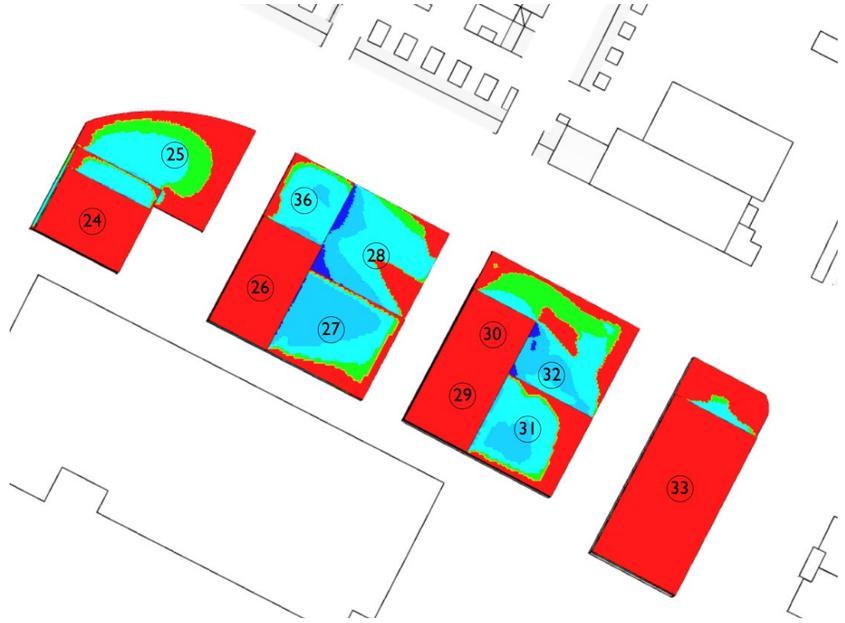
9.90 Unsafe, strong winds feature prominently at ground level within and surrounding the proposed development and at roof level. The new thoroughfares, 1, 2 and 3 are particularly affected, as demonstrated at measurement locations 10, 16, 3, 34, 11, 5, 18, 7, 12, 20 and 21, as well as the northern corner of Building A at measurement locations 2 and 35 and the southern corner of Building D at measurement locations 22 and 37. The north-east corner of Building D at location 8 is also expected to have unsafe strong winds.

9.91 The proposed development also introduces unsafe strong winds at the offsite thoroughfare at measurement location 1.

9.92 At roof level, strong winds would also occur, as shown in Figure 9.9. The upper roofs, measurement locations 24, 26, 29, 30, and 33 are the most severely affected. However, lower roofs, locations 25, 27, 28, 31, 32, and 36 feature rapid transitions from sitting and standing conditions to unsafe conditions at the building edges.

9.93 Mitigation is required to reduce the occurrence of 15 m/s or greater winds at these locations.

9.94 All instances of strong winds are considered to be **Major Adverse**.



	A	2.5 m/s	< 5%	Frequent Sitting
	B	4.0 m/s	< 5%	Occasional Sitting
	C	6.0 m/s	< 5%	Standing
	D	8.0 m/s	< 5%	Walking
	E	8.0 m/s	> 5%	Uncomfortable
	S	15.0 m/s	> 0.022%	Unsafe

Figure 9.9: Configuration 2 – Roof Level (Strong Winds)

Assessment of Residual Effects

Additional Mitigation

Demolition and Construction

9.95 No additional mitigation measures are required during the demolition and construction stage over and above those described in ES Chapter 5: Demolition and Construction Environment Management.

Completed Development

9.96 CFD testing of Configuration 2 highlights several locations which would experience conditions that would be windier than the assumed intended uses and target conditions and, therefore, would require mitigation in order to achieve the required wind conditions.

9.97 In addition, strong winds were recorded at 22 measurement locations throughout the proposed development. These locations would require measures to reduce the time winds exceed 15 m/s to less than 0.025 % of the time.

9.98 Given the outline nature of the proposals, and as is standard practice, during the detailed design consideration would be given to the following mitigation measures which would be explored and incorporated as part of the design:

- Building form, scale and massing: Mitigation could be achieved by means of the articulation of the building scale, footprint and mass of the developments.
- Elevational treatment: Fins, canopies, balustrades, arcades, screens can be used on buildings to slow and redirect wind flow preventing vertical flow down the building reaching pedestrian areas at ground level. Options would consider the potential for low-level ground winds being "trapped" under canopies preventing the air from escaping.
- Recessed building entrances: Entrances can be recessed into buildings or built with screening nearby to provide an area of shelter for building users entering and exiting the buildings. Pedestrians are particularly sensitive when leaving a controlled environment so a sheltered region will allow time to acclimatise.
- Screening: Screening in the form of sculptures which may be particularly useful to provide pedestrian shelter at sensitive areas such as entrances and seating areas. Porous screens allow some wind to penetrate but reduce the energy the wind contains, while solid screens can deflect the wind.
- Landscaping: Landscaping can be a valuable tool to provide shelter. Raised and lowered terrain features can provide shelter and reduce exposure to the wind and break up air flow.
- Planting: Planting should be relatively dense for maximum impact otherwise benefits will be relatively local. Semi-mature planting will provide some shelter from an early stage as the plants gain maturity. Whilst deciduous plants offer maximum shelter in summer months, this is greatly reduced to be negligible during windier winter months when the plant has shed its leaves. Trees and planting can provide not only fluctuations in airflow but also decrease wind speed. Greater mitigation can be expected from larger, well established trees.
- Pergola Structures: Pergolas provide similar mitigation to planting and porous screening combining their effects. Pergolas can disrupt and slow airflow providing shelter.

9.99 Wind tunnel testing would be secured by means of an appropriately worded planning condition and undertaken at the detailed design stage to refine and demonstrate the effectiveness of these measures. The results of this assessment would be used to inform the design of the public realm to ensure that proposed uses achieve the required wind conditions.

9.100 Based on professional judgement and experience, the above listed measures could successfully mitigate the significant adverse and unsafe effects identified within this assessment.

Enhancement Measures

9.101 No enhancement measures are applicable for this assessment.

Demolition and Construction Residual Effects

9.102 The residual effects would remain temporary **Negligible**.

Completed Development Residual Effects

9.103 The results presented here are based upon a worst-case combination of annual wind conditions. The intention is to inform mitigation and detailed design decisions. It is reasonable to expect that spaces subject to seasonal use, such as outdoor seating areas, may see improvements (one category) when solely assessed against summer conditions. Such seasonal effects will be further assessed at the detailed design stage following wind tunnel testing.

9.104 The mitigation measures identified above would be developed at the detailed design stage by means of wind tunnel testing to be secured by means of an appropriately worded planning condition. However, at this outline stage, the effects remain as follows:

- Existing off-site thoroughfares: Negligible – Minor Adverse
- Proposed development thoroughfares: Negligible – Moderate Adverse
- Pedestrian crossings: Negligible – Minor Beneficial
- Existing off-site entrances: Moderate Beneficial – Minor Adverse
- Proposed development entrances: Negligible – Major Adverse
- Off-site bus stop: Minor Adverse
- Off-site amenity area: Minor – Moderate Adverse
- Proposed development ground floor amenity: Minor Beneficial – Major Adverse
- Proposed development roof top amenity: Minor Beneficial – Major Adverse

9.105 Any adverse effect would be material to the planning decision process because it implies that a location, or area, has a wind microclimate that is unsuitable for the desired use of that area. Accordingly, minor to major adverse effects would be considered to be significant. As such, all receptor locations above would experience significant adverse effects.

Summary of Residual Effects

Table 9.10: Summary of Residual Wind Effects

Receptor	Residual Effect	Additional Mitigation	Nature of Residual Effect*					
			Scale of Effect **	+ -	D I	P T	R IR	St Mt Lt
Demolition and Construction								
Pedestrians on-site and on off-site thoroughfares	Wind conditions suitable for strolling and walking	None	Negligible	N/A	D	T	R	St
Completed Development								
Pedestrians on Vastern Road	Wind conditions suitable for strolling and walking	Mitigation would be required and would be explored at the detailed design stage. This would include: articulation of the building form,	Negligible to Minor Adverse	N/A -	D	P	R	LT
Pedestrians on Caversham Road	Wind Conditions suitable for strolling and walking		Negligible to Minor	N/A -	D	P	R	LT
Pedestrians on Trooper Ports Way	Wind Conditions suitable for strolling and walking		Negligible to Minor	N/A -	D	P	R	LT

Table 9.10: Summary of Residual Wind Effects

Receptor	Residual Effect	Additional Mitigation	Nature of Residual Effect*					
			Scale of Effect **	+ -	D I	P T	R IR	St Mt Lt
Pedestrians to Binghams Mead	Wind conditions suitable for walking	scale and massing; screening; landscaping; and planting.	Minor	-	D	P	R	LT
Pedestrians to De Montford Road	Wind conditions suitable for walking		Minor	-	D	P	R	LT
Pedestrians to Lynmouth Road	Wind conditions suitable for walking		Minor	-	D	P	R	LT
Pedestrians on-site Thoroughfares 1 to 4	Wind Conditions suitable for strolling to Uncomfortable		Minor to Moderate	+ -	D	P	R	LT
Pedestrians using crossings	Wind Conditions range from suitable for sitting to strolling		Minor Negligible	+ N/A	D	P	R	LT
Pedestrians and building occupants using off-site building entrances	Wind Conditions range from suitable for outdoor dining to strolling		Moderate to Minor	+ -	D	P	R	LT
Pedestrians and building occupants using on-site building entrances	Wind Conditions suitable for standing to uncomfortable		Negligible to Major	N/A -	D	P	R	LT
Pedestrians using bus stop	Wind Conditions suitable for walking		Minor	-	D	P	R	LT
Pedestrians using station entrance	Wind Conditions suitable for walking		Minor to Moderate	-	D	P	R	LT
Users of on-site ground floor proposed development amenity areas	Wind Conditions range from suitable for outdoor dining to uncomfortable		Minor to Major	+ -	D	P	R	LT
Users of on-site roof level proposed development amenity areas	Wind Conditions range from suitable for outdoor dining to uncomfortable		Minor to Major	+ -	D	P	R	LT

Notes:

* - = Adverse/ + = Beneficial/ +/- Neutral; D = Direct/ I = Indirect; P = Permanent/ T = Temporary; R=Reversible/ IR= Irreversible; St- Short term/ Mt –Medium term/ Lt –Long term.

**Negligible/Minor/Moderate/Major

9.106 Where the pedestrian comfort assessment identified minor to major adverse effects, these are considered to be significant.

9.107 All instances of strong winds exceeding the 15m/s threshold are considered to be major adverse and significant.

Cumulative Effects

9.108 The following cumulative schemes are within close proximity to the application site and have the potential to lead to inter-project cumulative effects:

- Former BMW Site – Thames Quarter;
- Station Hill;
- 29 Station Road Reading;
- Network Rail Thames Valley Area site office/ Former Royal Mail site; and
- Former Scottish and Southern Energy site.

Demolition and Construction

9.109 The cumulative scheme sites are currently occupied by low-rise buildings ranging from 1 to 5 storeys in height.

9.110 Based upon professional judgement, the demolition of the existing low-rise structures of the application site together with construction works at cumulative schemes in close proximity to the application site are not anticipated to give rise to any significant change to the existing (relatively calm) wind microclimate both on and off-site. The likely effect is therefore judged to be **Negligible** and wind conditions both on and off-site would remain acceptable for their intended pedestrian uses.

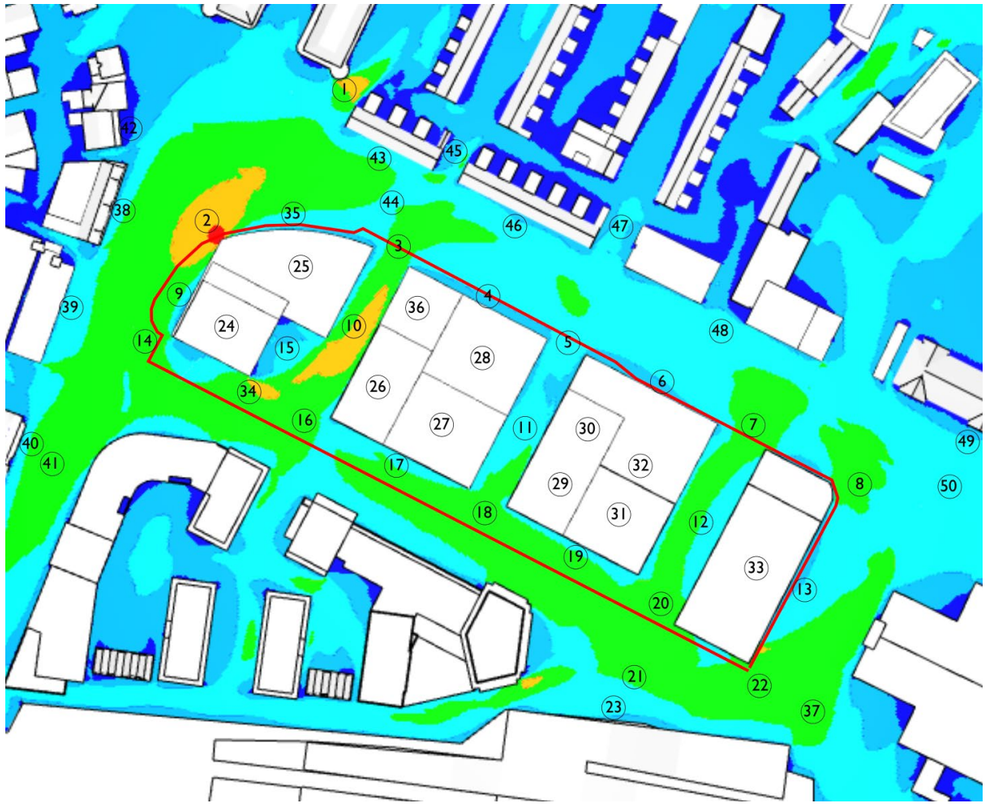
9.111 As construction of the proposed development and the above mentioned cumulative schemes proceed, the wind conditions of the application site and its surrounds would gradually adjust to those described below for the completed development.

Completed Development

Configuration 3: Existing Baseline + Proposed Development + Cumulative Schemes

Pedestrian Comfort

9.112 The combined pedestrian comfort effects resulting from the cumulative development of neighbouring sites are considered in this section. The Lawson Comfort Criteria plots for the proposed development + cumulative schemes is shown in Figure 9.10 for ground level.



	A	2 m/s	< 5%	Outdoor Dining
	B	4 m/s	< 5%	Pedestrian Sitting
	C	6 m/s	< 5%	Pedestrian Standing
	D	8 m/s	< 5%	Strolling
	E	10 m/s	< 5%	Walking
	U	10 m/s	> 5%	Uncomfortable

Figure 9.10: Configuration 3 - Ground Level (Pedestrian Comfort)

Existing Off-Site Thoroughfares

9.113 Following the introduction of the cumulative schemes, all off-site thoroughfare locations with the exception of measurement location 2, would achieve the target conditions or calmer and therefore the effects would be **Negligible**. Measurement location 2 would experience uncomfortable conditions, which is two to three categories windier than the target conditions and therefore the effect would range from **Moderate to Major Adverse**.

Proposed Development Thoroughfares

9.114 Following the introduction of the cumulative schemes, thoroughfares two, three and four within the application site would achieve the target conditions or calmer and therefore the effects would be **Minor Beneficial** to **Negligible.** Thoroughfare one would continue to experience wind conditions suitable for walking use and therefore the effect would remain **Minor Adverse**.

Pedestrian Crossings

Following introduction of the cumulative schemes, the wind conditions and effects on the pedestrian crossings woudl achieve the target conditions or calmer and therefore the effects are **Moderate** to **Minor Beneficial**.

Existing Off-Site Entrances

9.115 All off-site entrances would achieve the required conditions or calmer. Accordingly, the effects are **Moderate Beneficial** to **Negligible**.

Proposed Development Entrances

9.116 Entrances locations for the proposed development have not yet been defined. Measurement locations 4, 6, 9 and 15 would remain the most suitable points for entrances with either sitting or standing wind conditions which are suitable for this use**.** The cumulative effects here would be **Negligible to Minor Beneficial**.

9.117 Wind conditions at measurement locations 9 and 19 change from standing use to suitable for strolling use, a **Minor Adverse** effect when compared to target conditions.

9.118 Around measurement location 11, conditions improve from walking use to standing use, a **Negligible** effect when compared to target conditions making this location suitable for an entrance.

Off-site Bus Stops

9.119 The bus stop at measurement location 37 at the railway station would improve from walking use to strolling use, a **Minor Adverse** effect when compared to target conditions.

Off-Site Amenity Areas

9.120 The wind conditions at the sitting and pick-up area outside the railway station at measurement location 21 would remain suitable for walking use representing a **Moderate Adverse** effect when compared to target conditions.

Proposed Development Ground Floor Amenity

9.121 The wind conditions around development Buildings A to B would remain varied with areas suitable for outdoor dining to uncomfortable. The cumulative effects when compared to target conditions therefore range from **Minor Beneficial** to **Major Adverse.**

Proposed Development Roof tops

9.122 Wind conditions at the roof top level would range from being suitable for outdoor dining to being uncomfortable. When compared against the assumed target condition range of sitting to standing, the cumulative effect would range from **Minor Beneficial** to **Major Adverse**.

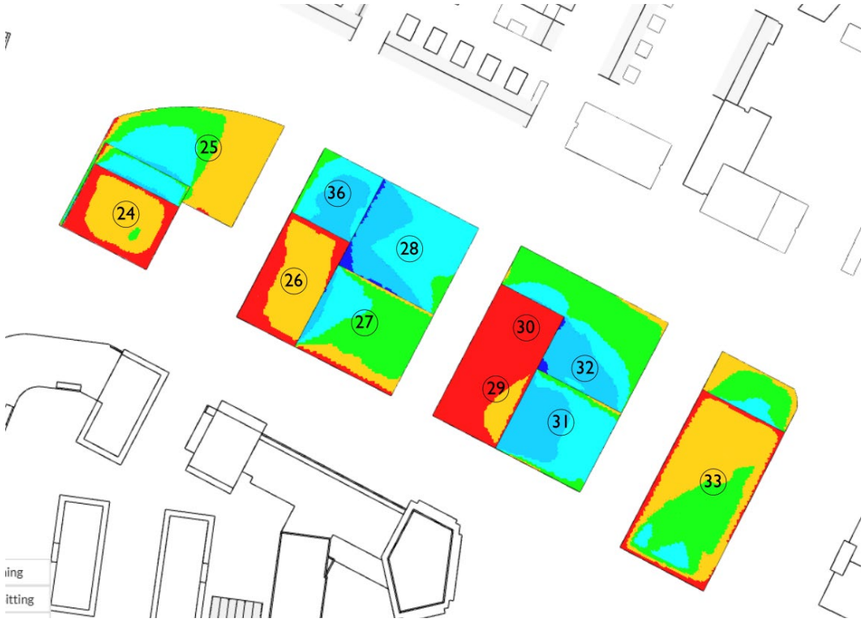


Figure 9.11: Configuration 3 - Roof Level (Pedestrian Comfort)

Strong Winds

The Lawson Safety criteria plots for strong wind for the development + cumulative schemes is shown in Figure 9.12 for ground level, and Figure 9.13 for roof top level.



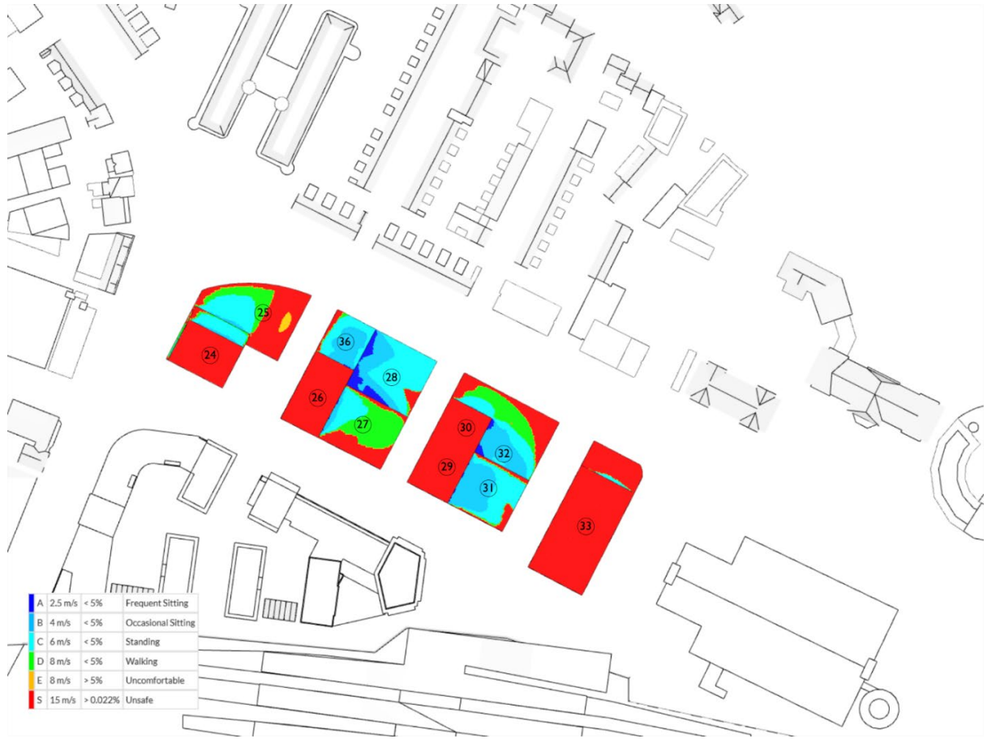
	A	2.5 m/s	< 5%	Frequent Sitting
	B	4.0 m/s	< 5%	Occasional Sitting
	C	6.0 m/s	< 5%	Standing
	D	8.0 m/s	< 5%	Walking
	E	8.0 m/s	> 5%	Uncomfortable
	S	15.0 m/s	> 0.022%	Unsafe

Figure 9.12: Configuration 3 - Ground Level (Strong Winds)

9.123 The impact of strong winds would be reduced by the cumulative schemes, although several large areas of unsafe wind conditions would remain unchanged around measurement locations 2, 10, 12, 22, 34.

9.124 Measurement locations 3, 7, 16, 18, 20, 21, and 37, improve from being unsafe to walking safety.

9.125 Measurement locations 5, and 11 reduce from being unsafe to standing safety levels.
The unsafe wind conditions on the roof tops remain similar to the configuration 2 conditions.



	A	2.5 m/s	< 5%	Frequent Sitting
	B	4.0 m/s	< 5%	Occasional Sitting
	C	6.0 m/s	< 5%	Standing
	D	8.0 m/s	< 5%	Walking
	E	8.0 m/s	> 5%	Uncomfortable
	S	15.0 m/s	> 0.022%	Unsafe

Figure 9.13: Configuration 3 - Roof Level (Strong Winds)

10 DAYLIGHT, SUNLIGHT, OVERSHADOWING AND SOLAR GLARE

Introduction

11.1 This chapter of the ES assesses the potential impacts and likely effects of the proposed development with respect to daylight, sunlight, overshadowing and solar glare during the demolition and construction works and once the proposed development is complete and operational.

11.2 This chapter describes the methodology used to assess the potential impacts and likely effects; the baseline conditions currently existing at the application site and surrounding study area; where necessary the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been adopted.

11.3 This chapter is supported by the following appendices in ES Volume 3:

- Technical Appendix 10.1 – Drawings of the Baseline, the Proposed Development and the Cumulative Scenario;
- Technical Appendix 10.2 – Daylight and Sunlight Results for Neighbouring Properties for both the Proposed Development and the Cumulative Scenario;
- Technical Appendix 10.3 – Overshadowing Assessment; and
- Technical Appendix 10.4 – Solar Glare Assessment.

Methodology

11.4 The assessment has been undertaken in accordance with the Building Research Establishment publication 'Site Layout Planning for Daylight and Sunlight. A Guide to Good Practice.' (2011), commonly referred to as the 'BRE guidelines' [1].

11.5 The assessment scope and methodology have been informed by the following relevant national, regional and local legislation and policy:

- NPPF[2];
- PPG;
- Reading Borough Local Plan 2019[3];
- Reading Central Area Action Plan 2009[4];
- Reading Station Area Framework (RSAF)[5];
- British Standard 8206 Part 2: Code of Practice for Daylighting, 2008[6];
- Commission Internationale de L'Eclairage (CIE) 146:2002 and 147:2002 Collection on Glare, 2002[7];
- CIBSE Lighting Guide LG10 - Daylighting - A Guide for Designers, 2014[8]; and
- Information paper IP 3/87 Solar dazzle reflected from sloping glazed facades, 1987[9].

Consultation

11.6 No consultations have been undertaken in addition to the formal EIA scoping process. At the time of undertaking this assessment, the EIA Scoping Opinion remains outstanding.

Assessment Scope

11.7 The assessment has been based on a series of development parameters, assumptions and commitments as described in Chapter 2: EIA Process and Methodology; Chapter 4: Proposed Development Description; and Chapter 5: Demolition and Construction Environmental Management. Due to the flexibility being sought in respect of land use classes and associated development scenarios, the daylight, sunlight, overshadowing and solar glare assessments have been undertaken of the worst-case massing proposals represented by the maximum height residential scheme as shown on Parameter Plan PP-104, due to its height. The solar glare assessment has assumed a worst-case uniform reflective façade treatment for the proposed development.

Technical Scope

11.8 The assessment has considered the following:

- The effect of the proposed development on daylight and sunlight availability at adjacent existing receptors;
- The effect of the proposed development on levels of sunlight at adjacent existing receptors; and
- The effect of the proposed development on existing receptors in respect of potential solar glare.

Spatial Scope

11.9 In respect of daylight and sunlight, the study area comprises sensitive residential receptors within the immediate surroundings of the application site that may be affected by the newly introduced massing of the proposed development.

11.10 In respect of the overshadowing, professional judgement and experience were used to determine the open space and private amenity receptors considered to be in close enough proximity to be affected by shadow cast from the proposed development.

11.11 For the solar glare assessment, professional judgement and experience were used to identify the transport receptors considered to be in close enough proximity to be affected by glare arising from the façade of the proposed development.

[1] Littlefair, P.J, 2011. Building Research Establishment – Site Layout Planning for Daylight and Sunlight. A Guide to Good Practice. Building Research Establishment..BREPress.
[2] Secretary of State for Ministry of Housing, Communities and Local Government, 2019. National Planning Policy Framework.
[3] Reading Borough Council, 2019. Reading Borough Local Plan. RBC.
[4] Reading Borough Council, 2009. Reading Central Area Action Plan.
[5] Reading Borough Council, 2010. Reading Station Area Framework.
[6] British Standards Institution, 2008. British Standard 8206 Part 2: Code of Practice for Daylighting. BSI. London.
[7] Commission Internationale de L'Eclairage, 2002. CIE Collection on Glare 146:2002. Austria. CIE
[8] Chartered Institution of Building Services Engineers, 2014. Lighting for the Built Environment LG10: Daylighting - A Guide for Designers. London. The Society of Light and Lighting.
[9] Littlefair, P.J, 1987. Information paper IP 3/87 Solar dazzle reflected from sloping glazed facades. BRE. BREPress.

Temporal Scope

11.12 The assessment considers the potential impacts and likely effects of the proposed development during the demolition and construction stage and the completed development stage.

11.13 For the completed development stage, the following scenarios have been assessed and are reported within this chapter:

- Existing baseline;
- Existing baseline + proposed development;
- Existing baseline + proposed development + cumulative schemes; and
- Existing baseline + Reading Station Area Framework.

11.14 The assessment of the Reading Station Area Framework (RSAF) has been included in order to provide a comparison against the results for the proposed development. The RSAF is considered a material consideration and represents the massing and density envisaged by the RBC for the application site and the wider Reading Railway Station regeneration area.

Baseline Characterisation Method

Desk Study

11.15 A desk top review of the site location was undertaken to identify the potential neighbouring sensitive receptors. Information on residential properties was obtained from public records on RBC's website and online property sources (i.e. Rightmove). Online research endeavoured to establish the internal configuration of residential properties and assisted with the site visit.

Field Study

11.16 A site visit was undertaken in May 2018 and October 2019. This was carried out in order to confirm the existing application site and study area conditions. Photographs were taken during the visit in order to inform the computer modelling and observations made with regard to the potential internal configuration of the sensitive receptors. During the site visit, the location for the assessment of the potential for solar glare was considered.

Modelling

11.17 In respect of daylight and sunlight, the baseline conditions were determined by producing a 3D computer model of the neighbouring properties and the existing structures on the application site. The 3D computer modelling was undertaken by means of a 3D context massing model, site survey, site photographs and online research in relation to the neighbouring residential receptors and orientated with reference to Ordnance Survey information. Information on the dimensions of only 19 % of the rooms within the neighbouring properties were obtained, with the remainder being based on assumptions. The analysis was carried out using MBS Software.

11.18 No baseline modelling was undertaken in respect of overshadowing and solar glare.

Assessment Method

Methodology

11.19 A technical analysis was undertaken to establish the potential impacts of the proposed development with regard to daylight, sunlight and overshadowing enjoyed by the sensitive receptors. The analysis was based on a 3D computer model, created in AutoCAD, of the existing situation on the application site, the neighbouring properties and use of the following information:

- Photographs taken during the site visit;
- Full measured survey;
- Information obtained from public records on RBC's website;
- Information obtained from online property sources (i.e. Rightmove); and
- Drawings produced by the Applicant's appointed Architects which form part of the EIA.

11.20 A specialist computer programme (MBS) was used to undertake the required technical analysis of Vertical Sky Component (VSC), No Sky Line (NSL), Annual Probable Sunlight Hours (APSH), permanent shadow and solar glare in accordance with the BRE guidelines. This process used Waldram diagrams to quantify the levels of daylight and sunlight in both the baseline condition and with the completed proposed development.

11.21 The assessments comprised the following:

- Identify the neighbouring receptors that are likely to be impacted by the proposed development;
- Through detailed modelling, determine the effects that the proposed development would have on the daylight and sunlight compared with the existing situation and consider the results against numerical targets; and
- Assess the cumulative effect of the proposed development and approved developments on existing receptors.

Daylight and Sunlight

11.22 The BRE guidelines suggests that residential properties have the greatest need for good daylight and sunlight and that key habitable rooms should be considered. The BRE guidelines states "*the guidelines are intended for use for rooms in adjoining dwellings where light is required, including living rooms, kitchens and bedrooms*". Bedrooms are considered less important as they are mainly occupied at night-time. The guidelines also highlight other property types which may be considered as 'sensitive receptors' such as schools, hospitals, hotels and hostels, small workshops and some offices, if they have a reasonable expectation for daylight.

11.23 Within the guidelines there are several methods for calculating daylight; however, there are two methods that are predominantly used; these being the measurement of the Vertical Sky Component (VSC) and Daylight Distribution (DD) with regard to neighbouring sensitive receptors.

11.24 The BRE guidelines advise that in urban areas, particularly in areas of regeneration, the VSC and DD test may not be the most appropriate assessment due to the relationship between buildings and the fact that VSC and DD is based on the existing and proposed condition. Therefore, where there is a clear sky or there are particularly low-rise buildings existing on the application site, as in the case here, results are distorted. Where the VSC and DD values fall considerably short of the numerical values in the BRE guidelines, analysis results have been considered against alternative targets consistent with the application site's urban location, considering, e.g. massing and obstruction angles in the existing situation or existing buildings that are particularly close to an application site's boundary. In this situation, the BRE guidelines describe an appropriate methodology to assess cases where an existing building has windows unusually close to the application site boundary and taking more than their fair share of light.

11.25 With regard to sunlight, the Annual Probable Sunlight Hours (APSH) are calculated, as well as consideration of the levels during the winter months, for all windows facing within 90° of due south to the neighbouring residential properties, in both the baseline condition and with the proposed development implemented.

11.26 As with daylight, where appropriate, alternative targets which are consistent with sites located in dense urban locations have been adopted to assess sunlight access to the neighbouring buildings.

11.27 Daylight and sunlight assessments of the neighbouring residential properties have been undertaken using the VSC, NSL and APSH calculations. All properties that may possibly be affected have been included in the assessment.

11.28 To establish whether a neighbouring residential property is required to be considered, it is calculated whether the proposed development will bisect a 25° line drawn from the centre of the window to the lowest window within the neighbouring property, serving a habitable room, as indicated on Figure 10.1. Where this plane is bisected, a more detailed daylight and sunlight assessment is required.

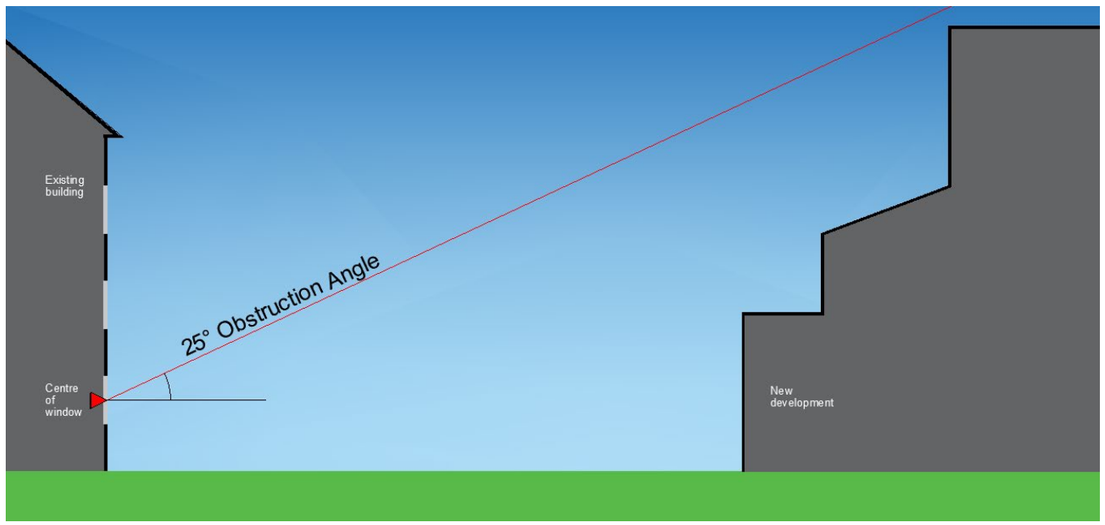


Figure 10.1: Initial 25° Daylight and Sunlight Analysis

Vertical Sky Component

11.29 The VSC analysis establishes the amount of available daylight received directly from the sky for each individual window. The reference point for the analysis is the centre of the window, on the plane of the outer window wall.

11.30 This is the ratio of the direct sky illuminance falling on the vertical wall at a reference point, to the simultaneous horizontal illuminance under an unobstructed sky. The VSC does not include reflected light.

11.31 To maintain good levels of daylight, the BRE guidelines recommend a VSC of 27 % or greater. However, within an urban environment, the guidelines recognise that a lower VSC is acceptable. Given the application site context and based on similar sites, professional judgement has been used to establish that a VSC of 15 % could be considered acceptable for such an urban context. However, on balance, it is considered that a VSC of 20 % is a more appropriate alternative target.

11.32 Where windows are affected by the proposed development, or cumulative effects of the proposed developments and a VSC of less than 20 % is calculated, a comparison of existing and proposed levels of VSC should be made. Where possible, the proposed development VSC should not be less than 80 % of the pre-development VSC.

Daylight Distribution

11.33 As well as calculating the VSC, the assessment for surrounding receptors has also considered the distribution of the daylight within the neighbouring residential properties by plotting the No Sky Line (NSL). This is the point within the room that at desk top level can see no sky and the BRE guidelines recommend that a significant portion of the room (80 %) or at least 0.8 times the existing area is in front of this line. For such an urban context, 50 % is considered to be an appropriate alternative target.

11.34 Concerning the neighbouring residential properties, no access has been obtained to measure the internal arrangements and, therefore, where possible, plans obtained from online planning records have been used.

Annual Probable Sunlight Hours

11.35 The BRE has produced sunlight templates for London, Manchester and Edinburgh which indicate the APSH for these regions. For this study, the London template has been used.

11.36 A sunlight analysis is undertaken using a similar method for calculating the VSC. Within residential accommodation, the BRE guidelines under paragraph 3.2.3 state that the criteria for a sunlight analysis is that the main windows that are *"within 90^0 of due south"* should be assessed by measuring the APSH. Windows more than 90^0 from due south do not therefore need to be analysed. Within residential accommodation, sunlight is mainly required for living rooms and is regarded as less important in bedrooms and kitchens, although the guidelines advise that care should be taken not to block out too much sun.

11.37 The APSH is defined as the total number of hours in the year that sun is expected to shine on unobstructed ground.

11.38 The BRE guidelines suggest that a window enjoys adequate sunlight if it receives at least 25 % APSH throughout the year, with at least 5 % during the winter months; 21st September to 21st March. Where this is not achieved, if the difference between the baseline and the proposed assessment is more than 4 % or less or provided the total APSH including the winter months is within 0.8 times the existing, the window will not be adversely affected.

Overshadowing

11.39 Part 3.3 of the BRE guidelines provides guidance and methodology for assessing the implications a proposal will have on the overshadowing of gardens and amenity areas and sets out recommendations for the minimum area that should achieve at least two hours of sunlight on 21st March.

11.40 The open spaces that it states would normally be considered are:

- Gardens, usually the main back gardens of a house;
- Parks and playing fields;
- Children's playgrounds;
- Outdoor swimming pools and paddling pools;
- Sitting out areas such as those between non-domestic buildings and in public spaces; and
- Focal points for views such as a group of monuments or fountains.

11.41 The guidelines go on to state under paragraph 3.3.17:

"*It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of new development an existing garden or amenity area does not meet the above, and the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable. If a detailed calculation cannot be carried out, it is recommended that the centre of the area should receive at least two hours of sunlight on 21 March*."

11.42 The overshadowing assessment has been undertaken in relation to all relevant existing public amenity space currently within the vicinity of the application site that may be affected by the proposed development.

11.43 The assessment has also considered the potential public and communal amenity space within the proposed development, with reference to the development parameters as described in Chapter 4: Proposed Development Description, and the access to direct sunlight this would enjoy.

Solar Glare

11.44 Where solar glare occurs, it can cause a temporary impairment to drivers' sight. As a result, the effect of reflective elements of the façade treatment are considered.

11.45 With reference to solar glare, the BRE guidelines make the following statement under Clause 5.8.1:

"Glare or dazzle can occur when sunlight is reflected from a glazed façade or area of metal cladding. This can affect road users outside and the occupants of adjoining buildings. The problem can occur either when there are large areas of reflective glass or cladding on the façade, or when there are areas of glass or cladding which slope back so that high altitude sunlight can be reflected along the ground. Thus, solar dazzle is only a long-term problem for some heavily glazed (or mirror clad) buildings…"

11.46 The assessment has considered potentially sensitive Test Points (TP) surrounding the application site.

11.47 It considers the potential for solar glare or dazzle from the glazing or reflective facades of the proposed development in relation to each of the specific points. The key factor being the contrast between the brightness of the façade compared with the background ambient luminance.

11.48 Building Research Establishment Information Paper referenced IP8/87 states:

"Glare or dazzle can occur when sunlight is reflected from a glazed façade. For vertical facades this problem usually occurs only when the sun is low in the sky; but some types of modern design incorporate sloping facades which can, under certain circumstances, reflect unwanted high altitude sunlight in-to the eyes of motorists, pedestrians and people in nearby buildings. Addressed to architects, consulting engineers, planning consultants and planners, this paper presents a new method which can be used at the design stage to calculate whether such solar dazzle will be reflected from a proposed building façade."

11.49 Guidance on determination of significance is contained in Appendix I of the BRE guidelines, which states: "The assessment of impact will depend on a combination of factors and there is no simple rule of thumb that can be applied."

11.50 The assessment for each sensitive receptor has been carried out at drivers' eye height, considered to be 1.5m for cars and at the appropriate distance from the junction, taking into account direction of travel and the relevant traffic element.

11.51 The Field of Vision is the extent of the observable world that is seen at any given moment.

"*The normal human visual field extends to approximately 60 degrees nasally (towards the nose or inward) in each eye, to 100 degrees temporally (away from the nose or outward) and approximately 60 degrees above and 75 degrees below the horizontal meridian. In the United Kingdom, the minimum field requirement for driving is 60 degrees either side of the vertical meridian and 20 degrees above and below horizontal. The macula corresponds to the central 13 degrees of the visual field, the fovea to the central 3 degrees, they are most sensitive to solar glare.*"

11.52 Occurrences of solar glare at angles beyond 30^0 would be of little significance. When driving in a typical car, the windscreen would normally obstruct the driver's view beyond angles of 30^0 from the line of sight.

11.53 The assessment is undertaken using a specialist computer programme (MBS). It considers the path of the sun for the entire year assuming a perfectly clear sky and then uses the data from weather information for the closest location, to calculate the potential for glare to occur, which factors in whether at each time of day throughout the year sunlight is likely to occur, this factor being between 0 % and 50 % with reference to the BRE's information paper IP 3/87 'Solar dazzle reflected from sloping glazed facades'.

Assessment Criteria

11.54 The criteria set out in the BRE guidelines has been used to assess if the likely effects from the proposed development on the neighbouring receptors is significant or not. This is determined by considering the sensitivity of the receptor, magnitude of impact, and scale of effect (including the duration of the effect and the geographical extent of the effect) and the application of professional judgement.

11.55 The assessment has considered the effects on the neighbouring residential receptors, with reference to the levels set out in the BRE guidelines: these being negligible, minor, moderate or major. The assessment has considered the VSC achieved by each window serving a habitable room and the DD to each habitable room with reference to the numerical values set out in the BRE guidelines. The assessment has also considered the sunlight enjoyed by windows facing within 90° due south with reference to the APSH enjoyed during the summer months, as well as during winter months.

11.56 As clearly stated in the BRE guidelines, they need to be applied flexibly.

11.57 In relation to the proposed amenity space within the proposed development, the publicly open space between and surrounding the building plots within the application site boundary were assessed to identify those areas that would enjoy at least 2hrs of direct sunlight on 21 March, in accordance with the BRE guidelines.

11.58 The solar glare analysis has considered the potential for glare to occur from the façade of the proposed development based on a uniform reflectivity and the appropriate climate data, to establish the potential for and duration of solar glare in relation to the line of sight.

11.59 To consider the significance of likely effects, the results of the analysis have been compared against the recommendations set out in the BRE guidelines, as summarised in Table 10.1.

Table 10.1: Summary of Assessment Criteria

Issue		**BRE Criteria**
Daylight	VSC	A window may be adversely affected if its VSC measured at the centre of the window is less than 27 % and less than 0.8 times its former value, although for such a location a VSC of 20% is considered appropriate
	NSL	A room may be adversely affected if less than 0.8 times its existing area lies infront of the NSL, although for such a location, 50 % of the room in front of the NSL is considered appropriate.
Sunlight	APSH	A window may be adversely affected if a point at the centre of the window receives in the year less than 25 % of the annual probable sunlight hours including at least 5 % of the winter probable sunlight hours. (APSH) during the winter months (21st September to 21st March) and less than 0.8 times its former sunlight hours during either period.
Overshadowing		The BRE recommend that for gardens and open spaces to appear adequately sunlight throughout the year, at least half of the area (50 %) should receive at least two hours of sunlight on 21st March.
Solar Glare		Motorists may experience glare from the potential for solar dazzle for long periods within 30^0 of the line of sight.

11.60 However, in some instances, a further daylight assessment has been undertaken against alternative targets, as described in the assessment method section, namely a VSC of 20 % and at least 50 % of a rooms area able to see skylight, as the BRE guidelines are based on a low density urban location. This is considered to be suitably justifiable given the urban nature of the application site and by virtue of the results of the assessment against the RSAF massing, which confirmed the appropriateness of the alternative targets.

Receptor Sensitivity Criteria

11.61 The sensitivity of receptors has been classified as low, medium or high, in line with the criteria set out in Table 10.2.

Table 10.2: Receptor Sensitivity Criteria

Sensitivity	**Criteria**

Table 10.2: Receptor Sensitivity Criteria	
Low	Small number or low sensitivity of viewers assumed. Viewers with a passing interest in their surroundings and momentary viewing periods. Infrequent users of open spaces around the proposed development.
Medium	Viewers with everyday access to this environment but perhaps with less expectations as they are spending shorter periods of time in the space or are within an office environment. They may have previously used the space and therefore will be aware of the change, but it would affect them less. Areas of residential properties that are not main living rooms and therefore less time is spent in these spaces.
High	Viewers likely to feel the immediate impact to their surroundings and notice a significant reduction in the amount of natural light to their environment. Such receptors would include areas where viewers spend a large amount of time and expect access to high levels of daylight, such as living areas or residential properties.

Impact Magnitude Criteria

11.62 The magnitude of impact has been classified as very small, small, medium, high and is based on professional judgement with reference to the criteria set out in Table 10.3.

Table 10.3: Impact Magnitude Criteria	
Magnitude of Impact	**Criteria**
High	Daylight and Sunlight numerical values less than BRE guidance targets by more than 50 %.
Medium	Daylight and Sunlight numerical values less than BRE guidance targets by no more than 50 %.
Small	Daylight and Sunlight numerical values less than BRE guidance targets by no more than 20 %.
Very Small	BRE guidance numerical targets for Daylight and Sunlight met.

Significance Criteria

11.63 The BRE guidelines have been used to produce significance criteria to assess the likely effects of the proposed development. Within Appendix I of the guidelines it states:

"*Adverse impacts occur when there is a significant decrease in the amount of skylight and sunlight reaching an existing building where it is required, or in the amount of sunlight reaching an open space. The assessment of impact will depend on a combination of factors, and there is no simple rule of thumb that can be applied.*"

"*Where the loss of skylight or sunlight fully meets the guidelines in this book, the impact is assessed as negligible or minor adverse. Where the loss of light is well within the guidelines, or only a small number of windows or limited area of open space lose light (within the guidelines), a classification of negligible impact is more appropriate. Where the loss of light is only just within the guidelines, and a larger number of windows or open space area are affected, a minor adverse impact would be more appropriate, especially if there is a particularly strong requirement for daylight and sunlight in the affected building or open space.*"

"*Where the loss of skylight or sunlight does not meet the guidelines in this book, the impact is assessed as minor, moderate or major adverse. Factors tending towards a minor adverse impact include:*

- *only a small number of windows or limited area of open space are affected;*
- *the loss of light is only marginally outside the guidelines;*
- *an affected room has other sources of skylight or sunlight;*
- *the affected building or open space only has a low-level requirement for skylight or sunlight; and*
- *there are particular reasons why an alternative, less stringent, guideline should be applied*"

"*Factors tending towards a major adverse impact include*:

- *a large number of windows or large area of open space are affected;*
- *the loss of light is substantially outside the guidelines;*
- *all the windows in a particular property are affected; and*
- *the affected indoor or outdoor spaces have a particularly strong requirement for skylight or sunlight, e.g. a living room in a dwelling or a children's playground*"

"*Beneficial impacts occur when there is a significant increase in the amount of skylight and sunlight reaching an existing building where it is required, or in the amount of sunlight reaching an open space. Beneficial impacts should be worked out using the same principles as adverse impacts. Thus, a tiny increase in light would be classified as a negligible impact, not a minor beneficial impact.*"

11.64 With reference to the BRE guidelines, the Tables 10.4 – 10.8 provide numerical values to assist in the assessment of the significance of the effect, although it should be noted that in each instance, professional judgement has been applied taking into account particular factors/considerations, as stated in paragraph 1.6 of the BRE guidelines.

Table 10.4: Vertical Sky Component Criteria	
Window Reduction	**Scale of Effect**
Less than 20% reduction or >27% VSC	Negligible
Between 20 % and 29.9 % reduction	Minor
Between 30 % and 39.9 % reduction	Moderate
Greater than 40 % reduction	Major

Table 10.5: Daylight Distribution Criteria	
Window Reduction	**Scale of Effect**
Proposed area is >0.8 times former value	Negligible
Proposed area is between 0.6 and 0.79 times former value	Minor
Proposed area is between 0.4 and 0.59 times former value	Moderate
Proposed area is <0.4 times former value	Major

Table 10.6: Annual Probable Sunlight Hours Criteria	
Window Reduction	**Scale of Effect**
Less than 20% reduction or >25% APSH	Negligible
Between 20% and 29.9% reduction	Minor
Between 30% and 39.9% reduction	Moderate
Greater than 40% reduction	Major

Table 10.7: Annual Probable Sunlight Hours Winter Test Criteria	
Window Reduction	**Scale of Effect**
Proposed APSH in winter >5%	Negligible
Proposed APSH in winter <5% between 0.6 and 0.79 times former value	Minor
Proposed APSH in winter <5% between 0.4 and 0.59 times former value	Moderate
Less than 0.4 times former value	Major

Table 10.8: Overshadowing Criteria	
Percentage of Amenity Area that receives 2 hours Sunlight on 21 March	**Scale of Effect**
>50% or >0.8 times existing	Negligible
>40% or >0.6 times existing	Minor
>25% or >0.4 times existing	Moderate
>25% or >0.4 times existing	Major

11.65 In respect of solar glare, there are no numerical values available to identify the effect on sensitive receptors. In relation to each sensitive receptor location, professional judgement has been used to determine the scale of effect and associated significance. Complete avoidance of glare is not possible; however, its duration and frequency will determine its effect. The criteria in Table 10.9 informed the assessment.

Table 10.9: Solar glare Criteria	
Scale of Effect	**Description of Solar Glare Effect**
Negligible	No solar dazzle visible or if visible, all occurs outside the driver's typical field of view.
Minor	Solar dazzle visible within the driver's typical field of view for short periods of time, e.g over one or two months of the year
Moderate	Solar dazzle visible within the driver's typical field of view for long periods of time, e.g over the majority of the year
Major	Solar dazzle visible within 3^0 of the driver's line of sight.

11.66 The nature of the effects may be either adverse (negative), beneficial (positive) or neutral.

11.67 Where the numerical criteria of the BRE guidelines is achieved, a Negligible effect has been reported.

11.68 As a general rule, the following criteria has been applied:

- 'Moderate' or 'major' effects are deemed to be 'significant';
- 'Minor' effects are considered to be 'not significant', although they may be a matter of local concern; and
- 'Negligible' effects are considered to be 'not significant' and not a matter of local or wider concern.

11.69 Where an effect is given as a range such as minor to moderate, professional judgement has been used to determine the significance with reference to the greater of the two effects.

Assumptions and Limitations

11.70 When considering the neighbouring sensitive receptors for the assessment, research was undertaken using online resources. This provided information on the internal configuration of 19 % of these. Based on this information, reasonable assumptions were made on the internal layout of the remaining, in conjunction with on-site observations.

11.71 The assumptions made for the Vastern Road properties are: -

- 17 to 29 Vastern Road:
  - Single aspect ground floor reception room 4.4 m x 3.4 m
  - First floor single aspect bedroom 3.6 m x 4.6 m
  - Second floor bedroom 4.5 m x 4.3 m
  - Note, 29 Vastern Road only has windows at ground and first floor.
- 31-33 Vastern Road
  - Single aspect ground floor reception room 4.2 m x 3.5 m
  - First floor single aspect bedroom 4.4 m x 3.5 m
  - Second floor bedroom 3.5 m x 1.6 m
- 35-49 Vastern Road
  - Single aspect ground floor reception room 4.2 m x 3.3 m
  - First floor single aspect bedroom 4.4 m x 3.3 m
  - Second floor bedroom 5.8 m x 4.5 m
- With regard to 87-89, 91 and 93-99 Caversham Road, floor plans were obtained for 87-89 and 93-99 from RBC's website and in relation to 91 Caversham Road, the following assumptions have been made:
  - First floor rooms 3.55 m x 4.65 m
  - Second floor bedroom 3.55 m x 4.65 m

11.72 There are no neighbouring non-domestic buildings that have a reasonable expectation of daylight identified.

11.73 No existing amenity space were identified in the vicinity of the application site that required an overshadowing analysis. In relation to the proposed development, 10 % of the site area is to be delivered as open space, which includes the thoroughfares between each of the plots (A-D). Therefore, an overshadowing assessment has been undertaken of this area.

11.74 In relation to the solar glare analysis, this does not quantify the intensity but just whether there is a potential for it to occur.

11.75 Whilst care has been taken to identify all sensitive receptors, there may be other sensitive receptors where solar dazzle could occur. However, the assessor considers the assessment presented in this chapter to be robust and representative.

11.76 The assessment has only considered the potential for solar glare from the proposed development in the local vicinity, and it has been assumed that the facades of the proposed development would be finished with a material with reflection properties equivalent to glass.

Baseline Conditions

Existing Baseline

11.77 The application site is occupied by four low-rise pavilion style commercial units and one building extending to approximately 2-3 storeys in height. The wider context of the application site is characterised by low rise urban development with a mixture of commercial, industrial and residential uses.

11.78 The application site is considered to be underdeveloped for such an urban location and therefore the neighbouring properties currently enjoy a very high level of daylight and sunlight.

11.79 Overshadowing and solar glare are not comparative assessments and therefore no baseline conditions have been recorded.

Sensitive Receptors

Daylight and Sunlight

11.80 The BRE guidelines state that habitable rooms within surrounding residential properties that can expect to receive a reasonable amount of daylight should be assessed. In the first instance, a 25º line analysis was undertaken to establish which of the neighbouring properties subtend this angle and therefore receive a good level of daylight.

11.81 The properties that do not subtend 25º therefore need to be assessed. The receptors identified as sensitive to the proposed development and which have been scoped into the assessment are set out in Table 10.10.

Table 10.10: Summary of Sensitive Receptors

Receptor	Sensitivity
17-49 Vastern Road	High
87-89 Caversham Road	High
91 Caversham Road	High
93-99 Caversham Road	High

11.82 The location of these properties is illustrated in Figure 10.2.



Figure 10.2: Existing Residential Receptors

11.83 Within each receptor, only the windows that face the proposed development have been analysed. The location of neighbouring non-domestic buildings where a reasonable expectation of daylight is required, identified of the windows analysed are indicated on drawing numbers 2271-102 in Appendix 10.1.

Overshadowing

11.84 Based on on-site observations, there are no neighbouring amenity areas that would be affected by the proposed development and therefore assessment of surrounding amenity areas has not been considered further. Instead the assessment has focussed on the amenity space to be provided on-site as part of the proposed development, based on the interpretation of the development parameters set out in Chapter 4: Proposed Development Description.

Solar Glare

11.85 Based on on-site observations, the key locations that have been considered are traffic junctions adjacent to the application site, sections of road where it is considered that drivers of vehicles are likely to be affected having regard to the direction of traffic flow. The eight locations considered in the assessment are:

- Test Point 1 – Caversham Road southbound to round-a-bout with Vastern Road
- Test Point 2 – Vastern Road westbound to De Montford Road Junction
- Test Point 3 – De Montford Road Junction with Vastern Road
- Test Point 4 – Vastern Road westbound to Lynmouth Road Junction
- Test Point 5 – Lynmouth Road Junction with Vastern Road
- Test Point 6 – Vastern Road eastbound
- Test Point 7 – Vastern Road eastbound to Lynmouth Road Junction
- Test Point 8 – Caversham Road northbound to Northfield Road Junction

11.86 The location of these test points is illustrated in Figure 10.3



Figure10.3: Solar Glare Test Point Scenarios

Baseline Daylight and Sunlight

11.87 The daylight analysis of the residential receptors has considered the VSC enjoyed by 75 windows and the DD within 62 rooms these serve.

11.88 The APSH has considered 61 rooms that face within 90° of due south.

11.89 The results of the baseline daylight assessment demonstrate that all 75 windows achieve a VSC of at least 27 % with all except 15 second floor bedrooms of the 62 rooms these serve, having a significant portion of their area seeing skylight and therefore achieving the recommended DD.

11.90 With regard to the sunlight baseline assessment, all 61 rooms achieve an APSH of at least 25 % with at least 5 % during the winter months.

11.91 Within the baseline condition, not all rooms achieve the recommended DD set out in the BRE guidelines as the rooms are served by small windows which restrict the access to daylight.

11.92 Table 10.11 summarises the baseline results for daylight and sunlight to the neighbouring residential properties.

Table 10.11: Baseline Daylight Results

Receptor	Number of Windows		
	Assessed	Achieve BRE Guidelines	%
17-49 Vastern Road	57	57	100
87-89 Caversham Road	6	6	100
91 Caversham Road	3	3	100
93-99 Caversham Road	9	9	100
Total	75	75	100

11.93 Table 10.12 summarises the baseline DD results.

Table 10.12: Baseline Daylight Distribution Results

Receptor	Number of Rooms		
	Assessed	Achieve BRE Guidelines	%
17-49 Vastern Road	50	36	72
87-89 Caversham Road	4	4	100
91 Caversham Road	2	2	100
93-99 Caversham Road	6	6	100
Total	62	47	77

11.94 Table 10.13 summarises the baseline sunlight results.

Table 10.13: Baseline Sunlight Results

Receptor	Number of Rooms		
	Assessed	Achieve BRE Guidelines	%
17-49 Vastern Road	50	50	100
87-89 Caversham Road	4	4	100
91 Caversham Road	2	2	100
93-99 Caversham Road	5	5	100
Total	61	61	100

Assessment of Effects

Demolition and Construction Effects

11.95 During the demolition and construction stage, there are likely to be negligible, short-term improvements to daylight and sunlight enjoyed by the surrounding sensitive receptors, owing to the low scale of the existing structures on the application site. In respect of solar glare, there would be no effect or potentially a short-term improvement with the buildings removed, although due to their low scale and form of construction, this is considered Negligible.

11.96 Throughout the construction of the proposed development, the magnitude of impact and the resultant effect on daylight, sunlight, overshadowing and solar glare would gradually increase as the massing increases. No technical analysis has been undertaken of the potential effect as the situation would be constantly changing. The effects would almost certainly be less than that of the completed proposed development and therefore the effect during this period would be temporary and range from **Negligible Beneficial** to **Moderate Adverse**, but due to the temporary nature, would not be significant.

Completed Development Effects

11.97 The proposed development is expected to generate potential direct daylight, sunlight and solar glare impacts.

11.98 The detailed results of the analysis are set out in Appendix 10.2 and are summarised for each receptor below. The receptors have been assessed based on the numerical values set out in the BRE guidelines. In the case of daylight to 17-49 Vastern Road, an assessment against the alternative targets as set out in the Assessment Methodology section has also been undertaken.

11.99 Professional judgement has been used when considering the significance of the effect taking into account the urban context of the application site.

Daylight to Surrounding Sensitive Receptors

17-49 Vastern Road

11.100 These 17 properties are located to the north of the application site on the opposite side of Vastern Road. They are within two blocks of terraced houses providing residential accommodation over two or three storeys.

11.101 The daylight analysis has considered 57 windows serving these properties, with the results set out on Table 10.14.

Table 10.14: 17-49 Vastern Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible <20 % existing or >27 % VSC	Minor 20 – 29 % reduction	Moderate 30 – 39 % reduction	Major >40 %
57	0	0	0	39	18

11.102 Of the 17 properties analysed, information relating to the internal configuration has been obtained on 19 % of these. This information has been used to form the basis of the assumptions made in relation to

the remaining properties. Due to the underdeveloped nature of the application site, they currently enjoy exceptional levels of daylight for such an urban location.

11.103 The results of the analysis against the BRE criteria (27%) show that the majority (39) experience a reduction of between 30-40 %. A further 18 would experience a reduction of just over 40 %. No windows would experience a reduction over 50 %. The effect would therefore appear to be **Moderate** to **Major Adverse**.

11.104 This however does not reflect the true situation, as the resulting VSC is being expressed as a percentage of the baseline assessment where these properties are experiencing an exceptionally high VSC considering the urban location.

11.105 In respect of the actual level of daylight that these windows would continue to enjoy, Appendix 10.2 demonstrate that all 57 windows would achieve a VSC of at least 20 %, which is considered an appropriate alternative numerical target for an urban area. Based on professional judgment, it is considered that the proposals would have a **Minor to Moderate** Adverse effect on the VSC enjoyed by these properties.

11.106 The results of the DD analysis, based on the assumptions made, are summarised in Table 10.15.

Table 10.15: 17-49 Vastern Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible >0.8 existing	Minor 0.6 – 0.79 %	Moderate 0.4 – 0.59 %	Major <0.4 %
50	14	14	25	7	4

11.107 Of the 50 rooms considered, 33 of these are bedrooms which the BRE guidelines state are considered less important.

11.108 In relation to the 17 living rooms, considered against the BRE criteria (>80% or 0.8 times the existing area in front of the NSL) 15 of these would achieve the BRE guideline targets or experience a Minor effect. Concerning the remaining two living rooms, these would experience a Moderate effect.

11.109 With regard to the 33 bedrooms analysed, which the BRE guidelines state are less important, 27 % of these would achieve the BRE guidelines numerical values and the effect would be negligible. 45 % of the bedrooms would experience a Moderate effect, with 15 % experiencing a Moderate or Major effect. All the bedrooms that experience a Moderate or Major effect are the large second floor bedrooms that are served by small windows and in the baseline condition do not achieve the numerical values within the BRE guidelines despite the under developed nature of the application site. Accordingly, the effect on DD would be **Minor to Major Adverse** and significant.

11.110 Taking into account the underdeveloped nature of the site for such a location, all except one living room and all except the second-floor bedrooms, would achieve the alternative target, having more than 50 % of their area in front of the NSL.

11.111 Based on the BRE criteria it is considered that the effect on daylight enjoyed by these receptors would be **Moderate Adverse**, which would be considered significant.

11.112 However, taking into account the underdeveloped nature of the application site for such an urban location and the exceptionally high levels of daylight enjoyed in the baseline scenario, it is more appropriate to consider the actual levels of retained daylight that would be achieved in the proposed scenario, rather than considering these as a percentage reduction of the baseline.

11.113 Accordingly, when assessed against the alternative targets, the effect on these receptors would be **Minor to Moderate Adverse**, with only a number of isolated locations experiencing **Moderate Adverse** effects, which, on balance, would not be considered significant.

87-89 Caversham Road

11.114 This property is located to the west of the application site on the opposite side of Caversham. Commercial accommodation is provided at ground floor level with residential accommodation on the two upper floors. The magnitude impact on these properties would be Very Small with an isolated location where it would be Small**.**

11.115 The results of the VSC analysis are summarised in Table 10.16.

Table 10.16: 87-89 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible <20 % existing or >27 % VSC	Minor 20 – 29 % reduction	Moderate 30 – 39 % reduction	Major >40 %
6	3	3	2	1	0

11.116 The results of the analysis demonstrate that three of the windows assessed would not achieve the BRE guidelines numerical values. However, all would achieve a VSC of at least 26.6 % as set out in Appendix 10.2 and therefore the effect is considered to be **Negligible**.

11.117 The results of the DD analysis, based on the assumptions made, are summarised in Table 10.17.

Table 10.17: 87-89 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for VSC	Negligible >0.8 existing	Minor 0.6 – 0.79	Moderate 0.4 – 0.59	Major <0.4 existing
4	4	4	0	0	0

11.118 The results demonstrate that despite the urban location of these properties, all rooms would achieve the BRE guidelines numerical values for DD and the effect would therefore be **Negligible**.

11.119 As a result, the effect on the daylight enjoyed by these properties would be **Negligible Adverse**.

91 Caversham Road

11.120 This property is located to the west of the application site on the opposite side of Caversham Road. Based on the site visit undertaken, the property provides commercial accommodation at ground floor level with residential accommodation on the two upper floors. The magnitude of impact on this property would be Very Small.

11.121 The results of the VSC analysis are summarised in Table 10.18.

Table 10.18: 91 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible <20 % existing or >27 % VSC	Minor 20 – 29 % reduction	Moderate 30 – 39 % reduction	Major >40 %
3	3	3	0	0	0

11.122 The results of the analysis demonstrate that all windows would achieve the BRE guidelines numerical values. The effect would therefore be Negligible.

11.123 The results of the DD analysis, based on the assumptions made, are summarised in Table 10.19.

Table 10.19: 91 Caversham Road – Summary of DD Results					
No. of rooms analysed	**No of rooms achieving BRE Guidelines for DD**	**Negligible >0.8 existing**	**Minor 0.6 – 0.79**	**Moderate 0.5 – 0.59**	**Major <0.4 existing**
2	2	2	0	0	0

11.124 The results of the DD analysis demonstrate that despite the urban location of this property, the BRE guidelines numerical values would be achieved and therefore the effect on this property would be Negligible.

11.125 The effect on the daylight enjoyed by this property would therefore be **Negligible Adverse**.

93-97 Caversham Road

11.126 This property is located to the west of the application site on the opposite side of Caversham Road. Based on the site visit undertaken, the property appears to provide commercial accommodation at ground floor with the two upper floors providing residential accommodation. The magnitude of impact on this property would be Very Small.

11.127 The results of the VSC analysis are summarised in Table 10.20.

Table 10.20: 93-97 Caversham Road – Summary of VSC Results					
No. of windows analysed	**No of windows achieving BRE Guidelines for VSC**	**Negligible <20 % existing or >27 % existing**	**Minor 20 – 29 % reduction**	**Moderate 30 – 39 % reduction**	**Major >40 %**
9	9	9	0	0	0

11.128 As the summary table shows, all windows analysed would achieve the BRE guideline numerical values. It is therefore considered that the effect on this property would be Negligible.

11.129 The results of the DD analysis, based on the assumptions made, are summarised in Table 10.21.

Table 10.21: 93-97 Caversham Road – Summary of DD Results					
No. of rooms analysed	**No of rooms achieving guidelines for DD**	**Negligible >0.8 existing**	**Minor 0.6 – 0.79**	**Moderate 0.4 – 0.59**	**Major <0.4 existing**
6	6	6	0	0	0

11.130 The results of the analysis demonstrate that the BRE guideline numerical values for DD would be achieved, despite the urban location of these properties. The effect on this property would therefore be **Negligible**.

11.131 The effect on the daylight enjoyed by this property would therefore be **Negligible Adverse**.

Sunlight

11.132 A sunlight assessment has been undertaken for each of the neighbouring residential receptors based on the criteria contained within the BRE guidelines. The BRE guidelines state that a window may be adversely affected if it receives less than 25 % of the APSH, including at least 5 % during the winter months (21 September to 21 March) and less than 0.8 times the existing value.

11.133 The results of the analysis are set out in Appendix 10.2 and are summarised for each of the neighbouring residential receptors below.

17-49 Vastern Road

11.134 Table 10.22 presents the summary results of the APSH analysis and Table 10.23 presents the summary results for the APSH analysis during the winter months. These demonstrate that the magnitude of impact would be Very Small.

Table 10.22: 17-49 Vastern Road – Sunlight (APSH) Results					
No. of rooms analysed	**No. of rooms achieving BRE Guidelines for APSH**	**Negligible >25 % or reduction <20 %**	**Minor Reduction between 20 – 29 %**	**Moderate Reduction between 30 – 39 %**	**Major Reduction >40 %**
50	50	50	0	0	0

Table 10.23: 17-49 Vastern Road – Sunlight (APSH during winter months) Results					
No. of rooms analysed	**No. of rooms achieving BRE Guidelines for APSH winter**	**Negligible >5 % or 0.8 existing**	**Minor Between 0.6 – 0.79 existing**	**Moderate Between 0.4 – 0.59 existing**	**Major <0.4 existing**
50	50	50	0	0	0

11.135 The results of the analysis indicate that the BRE guidelines numerical values would be achieved and therefore the effect of the proposed development would be **Negligible Adverse**.

87-89 Caversham Road

11.136 Table 10.24 presents the summary results of the APSH analysis and Table 10.25 presents the summary results for the APSH analysis during the winter months. These demonstrate that the magnitude of impact would be Very Small.

Table 10.24: 87-89 Caversham Road – Sunlight (APSH) Results					
No. of rooms analysed	**No. of rooms achieving BRE Guidelines for APSH**	**Negligible >25 % or reduction <20 %**	**Minor Reduction between 20 – 29 %**	**Moderate Reduction between 30 – 39 %**	**Major Reduction >40 %**
4	4	4	0	0	0

Table 10.25: 87-89 Caversham Road – Sunlight (APSH during winter months) Results					
No. of rooms analysed	**No. of rooms achieving BRE Guidelines for APSH winter**	**Negligible >5 % or 0.8 existing**	**Minor Between 0.6 – 0.79 existing**	**Moderate Between 0.4 – 0.59 existing**	**Major <0.4 existing**
4	4	4	0	0	0

11.137 The results of the analysis indicate that for both APSH and APSH during the winter months, the BRE guidelines numerical values would be achieved and therefore the effect of the proposed development would be **Negligible Adverse**.

91 Caversham Road

11.138 Table 10.26 summarises the results of the APSH analysis, whereas Table 10.27 sets out the results of the APSH analysis during the winter months. These demonstrate that the magnitude of impact would be Very Small.

Table 10.26: 91 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible >25 % or reduction <20 %	Minor Reduction between 20 – 29 %	Moderate Reduction between 30 – 39 %	Major Reduction >40 %
2	2	2	0	0	0

Table 10.27: 91 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible >5 % or 0.8 existing	Minor Between 0.6 – 0.79 existing	Moderate Between 0.4 – 0.59 existing	Major <0.4 existing
2	2	2	0	0	0

11.139 The results of the analysis demonstrate that for both APSH and APSH during the winter months, the numerical values within the BRE guidelines are achieved and therefore the proposed development would have a **Negligible Adverse** effect.

93-97 Caversham Road

11.140 Table 10.28 summarises the results of the APSH analysis and Table 10.29 sets out the APSH achieved during the winter months. These demonstrate that the magnitude of impact would be Very Small.

Table 10.28: 93-97 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible >25 % or reduction <20 %	Minor Reduction between 20 – 29 %	Moderate Reduction between 30 – 39 %	Major Reduction >40 %
6	6	6	0	0	0

Table 10.29: 93-97 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible >5 % or 0.8 existing	Minor Between 0.6 – 0.79 existing	Moderate Between 0.4 – 0.59 existing	Major <0.4 existing
6	6	6	0	0	0

11.141 The results of the analysis demonstrate that for both APSH and APSH during the winter months, the numerical values within the BRE guidelines are achieved and therefore the proposed development would have a **Negligible Adverse** effect.

Overshadowing

11.142 This analysis has considered only the access to direct sunlight for amenity space introduced by the proposed development, as there is no amenity space to the north of the application site.

11.143 The results of this assessment are presented in drawing number 2271-111 in Appendix 10.3 and demonstrate that the numerical values set out in the BRE guidelines are achieved and therefore the proposed development would provide amenity space with good access to sunlight, with more than 50 % enjoying at least two hours or direct sunlight on 21 March. Accordingly, the effect would be **Negligible**.

Solar Glare

11.144 The BRE guidelines state that key locations around an application site should be considered to establish whether there is potential for solar glare or dazzle to be caused. The main factor to be considered is the contrast between the brightness of the façade compared with the background ambient luminance.

11.145 The assessment has considered the potential reflection of the sun on what has been assumed as a fully glazed façade for the proposed massing.

11.146 The detailed results of the assessment are presented in Appendix 10.4 and a summary provided in the following paragraphs.

Test Point 1 – Caversham Road southbound to Vastern Road Roundabout

11.147 The tinted zones on drawing number 2271-112 attached at Appendix 10.4 show the results of the solar glare at this point.

11.148 The analysis indicates that the reflected solar dazzle could occur intermittently throughout the year; approximately 1,072 hours per year. The sunlight availability protractor, as set out in the BRE's information paper "*Solar dazzle reflected from sloping glazed facades*", indicates that sunlight is obtained between 0 % and 50 % of the time.

11.149 Therefore, using the appropriate climate data, solar dazzle could occur at this point for approximately 266 hours per year. This is considered to be a **Moderate Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 2 - Vastern Road westbound to De Montford Road Junction

11.150 The tinted zones on drawing number 2271-113 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.151 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 1,294 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper "*Solar dazzle reflected from sloping glazed facades.*" indicates that sunlight is obtained between 0 % and 50 % of the time.

11.152 Therefore, using the appropriate climate data, solar dazzle could occur at this point for approximately 326 hours per year. This is considered to be a **Moderate Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included and mitigated by the driver using the sun visor as a large area of the façade is above the line of this.

Test Point 3 - De Montford Road Junction with Vastern Road

11.153 The tinted zones on drawing number 2271-114 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.154 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 1,114 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper "*Solar dazzle reflected from sloping glazed facades.*", indicates that sunlight is obtained between 0 % and 50 % of the time.

11.155 Therefore, solar dazzle could occur at this point for approximately 298 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 4 - Vastern Road westbound to Lynmouth Road Junction

11.156 The tinted zones on drawing number 2271-117 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.157 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 884 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper *"Solar dazzle reflected from sloping glazed facades."* indicates that sunlight is obtained between 0 % and 50 % of the time.

11.158 Therefore, solar dazzle could occur at this point for approximately 174 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 5 - Lynmouth Road Junction with Vastern Road

11.159 The tinted zones on drawing number 2271-115 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.160 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 1,034 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper *"Solar dazzle reflected from sloping glazed facades."* indicates that sunlight is obtained between 0 % and 50 % of the time.

11.161 Therefore, solar dazzle could occur at this point for approximately 282 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 6 - Vastern Road eastbound

11.162 The tinted zones on drawing number 2271-118 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.163 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year, but primarily between 16 January and 25 November; approximately 776 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper *"Solar dazzle reflected from sloping glazed facades."* indicates that sunlight is obtained between 0 % and 50 % of the time.

11.164 Therefore, solar dazzle could occur at this point for approximately 186 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 7 - Vastern Road eastbound to Lynmouth Road Junction

11.165 The tinted zones on drawing number 2271-116 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.166 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 1,192 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper *"Solar dazzle reflected from sloping glazed facades."* indicates that sunlight is obtained between 0 % and 50 % of the time.

11.167 Therefore, solar dazzle could occur at this point for approximately 306 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Test Point 8 - Caversham Road northbound Northfield Road Junction

11.168 The tinted zones on drawing number 2271-119 attached at Appendix 10.4 shows the results of the solar glare for this point.

11.169 The analysis indicates that reflected solar dazzle could occur intermittently throughout the year; approximately 424 hours per year. The sunlight availability protractor, as set out in the BRE's Information Paper *"Solar dazzle reflected from sloping glazed facades."* indicates that sunlight is obtained between 0 % and 50 % of the time.

11.170 Therefore, solar dazzle could occur at this point for approximately 122 hours per year. This is considered to be a **Minor Adverse** effect, localised and temporary periodic effect and would be reduced further once the detailed faced treatment is included.

Assessment of Residual Effects

Additional Mitigation

11.171 The assessment of daylight, sunlight and overshadowing has been undertaken of the worst-case height and massing proposals. It is expected that during the detailed design, the building envelope would be reduced and refined by means of setbacks and articulation. However, no account can be taken of this at the outline planning stage.

11.172 The solar glare assessment has been based upon the indicative façade materials submitted with the Application and a worst case fully reflective facade. As the façade details progress during the detailed design the façade materiality and design would be refined further, and any solar glare effects would be reduced to the greatest extent feasible.

11.173 Effective mitigation could comprise the selection of non-reflective materials, fins or louvres which would act to reduce or obscure the solar rays and prevent instances of solar reflection from glazing elements and consequently reduce solar glare effects.

Enhancement Measures

11.174 No enhancement measures are proposed in respect of daylight, sunlight, overshadowing or solar glare.

Demolition and Construction Residual Effects

11.175 During the demolition and construction of the proposed development, no mitigation would be required in relation to daylight, sunlight, overshadowing and solar glare. Accordingly, the likely effects presented in the previous section remain unchanged for the residual effects, namely temporary **Negligible Beneficial to Moderate Adverse** for daylight, sunlight and solar glare.

Completed Development Residual Effects

11.176 Whilst additional mitigation measures would be explored during the detailed design to reduce effects on identified receptors, these cannot be assessed at the outline stage of planning.

11.177 Accordingly, the likely daylight effects reported in the previous section remain unchanged for the residual effects, namely:

- 17-49 Vastern Road: **Moderate Adverse** and significant when assessed against the BRE Criteria, but Minor to Moderate and not significant when assessed against the alternative targets;
- 87-89 Caversham Road: **Negligible**;
- 91 Caversham Road: **Negligible**; and
- 93-97 Caversham Road: **Negligible.**

11.178 Accordingly, the likely sunlight effects reported in the previous section remain unchanged for the residual effects, namely:

- 17-49 Vastern Road: **Negligible;**
- 87-89 Caversham Road: **Negligible**;
- 91 Caversham Road: N**egligible**; and
- 93-97 Caversham Road: **Negligible**.

11.179 In respect of overshadowing the effect on the proposed on-site amenity space would be **Negligible**.

11.180 In respect of solar glare, the residual effect would be **Minor Adverse** for all of the eight sensitive receptors.

Summary of Residual Effects

11.181 A summary of the results of residual effects are presented below in Table 10.30. Those effects reported in blue text are the residual effects assessed against the alternative targets.

Table 10.30: Summary of Residual Daylight, Sunlight, Overshadowing and Solar Glare Effects

Receptor	Residual Effect	Additional Mitigation	Scale of Effect **	Nature of Residual Effect*				
				+ -	D I	P T	R IR	St Mt Lt
Demolition and Construction								
17-49 Vastern Road	Temporary change in daylight and sunlight levels at surrounding residential receptors	N/A	Negligible to Moderate	+ -	D	T	R	St
87-89 Caversham Road								
91 Caversham Road								
93-97 Caversham Road								
11 Road Testing Points	Change in solar glare levels	N/A	Negligible to Moderate	+ -	D	T	R	St
Completed Development								
17-49 Vastern Road	Reduction in access to daylight and sunlight	N/A	Moderate Minor to Moderate	- - -	D	P	IR	Lt
87-89 Caversham Road	Reduction in access to daylight and sunlight	N/A	Negligible	-	D	P	IR	Lt
91 Caversham Road	Reduction in access to daylight and sunlight	N/A	Negligible	-	D	P	IR	Lt
93-97 Caversham Road	Reduction in access to daylight and sunlight	N/A	Negligible	-	D	P	IR	Lt
On-site Amenity Space	Sunlight availability within amenity space	N/A	Negligible	N/A	N/A	N/A	N/A	N/A
8 Road Receptor Points	Creation of solar glare	N/A	Minor	-	D	P	IR	Lt

Notes:

* - = Adverse/ + = Beneficial/ +/- Neutral; D = Direct/ I = Indirect; P = Permanent/ T = Temporary; R=Reversible/ IR= Irreversible; St- Short term/ Mt –Medium term/ Lt –Long term.
**Negligible/Minor/Moderate/Major

11.182 The effects of the proposed development on daylight to 17-49 Vastern Road would be significant when assessed against the BRE targets. When assessed against the alternative targets, the effects are not considered to be significant.

11.183 All other residual daylight, sunlight, overshadowing and solar glare effects would not be significant.

Cumulative Effects

11.184 There are a number of schemes that are within close proximity to the application site, as set out in Chapter 2: EIA Process and Methodology. Of these only the following two have been included within the cumulative scenario as these are located in close proximity to the application site:

- Former Royal Mail site; and
- Former Scottish and Southern Energy site.

11.185 The location of these and the massing that has been considered is indicated on drawing numbers 2271-106 and 107 in Appendix 10.1.

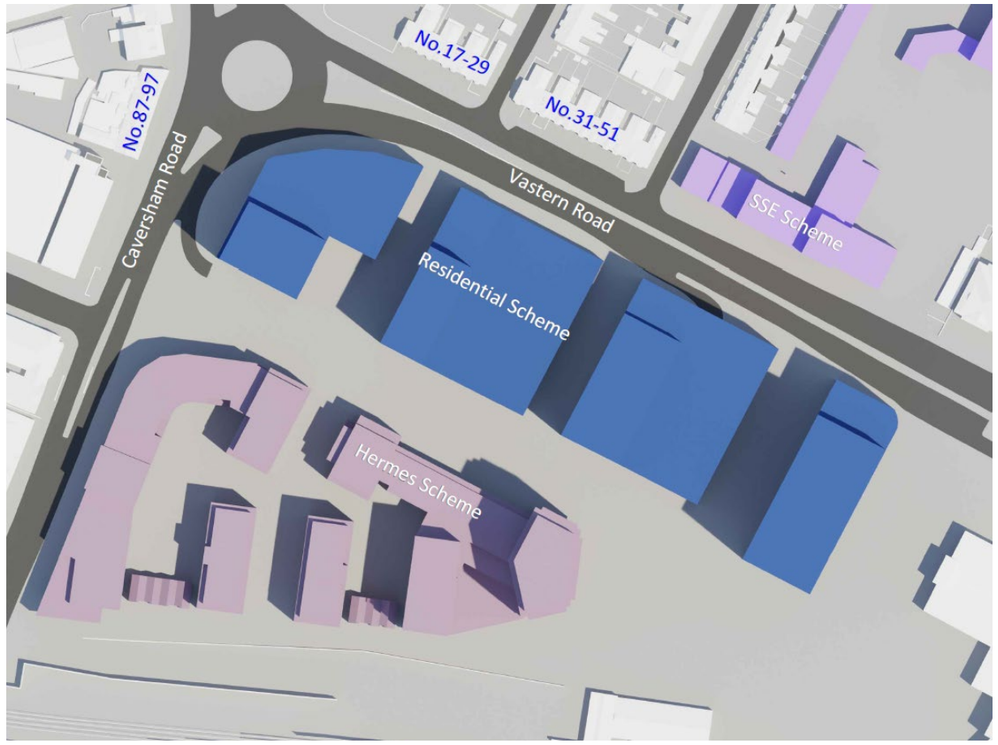


Figure 10.4: Cumulative Schemes Location Plan

Demolition and Construction Cumulative Effects

11.186 During the demolition stage, there may be a negligible short-term improvement to daylight and sunlight enjoyed by the surrounding sensitive receptors, owing to the low scale of the existing structures or their relationship to the receptors.

11.187 Throughout the construction works, the effects on the surrounding sensitive receptors is not possible to determine as the potential effects on daylight and sunlight would slowly increase as the massing progressed to its final extent. The use of scaffolding, hoarding etc. may also have a temporary effect, increasing the obstruction. Based on professional judgement, the cumulative daylight, sunlight and solar glare effect would remain temporary **Negligible Beneficial** to **Moderate Adverse** and not significant.

Completed Development Cumulative Effects

11.188 The results of the cumulative assessment on the neighbouring residential receptors are set out in the tables attached at Appendix 10.2 and summarised in Tables 10.31 to 10.46 below.

17-49 Vastern Road

11.189 The cumulative assessment of 17-49 Vastern Road is summarised in Tables 10.31 and 10.32. These demonstrate that the overall cumulative magnitude of impact on these receptors would remain Medium to High and the effect on these receptors would remain **Moderate Adverse and** significant when considered against the BRE criteria, but **Minor to Moderate** and not significant when considered against the alternative targets.

Table 10.31: 17-49 Vastern Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
57	0	0	0	37	20

Table 10.32: 17-49 Vastern Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
50	14	14	25	7	4

11.190 In relation to the cumulative sunlight assessment, Tables 10.33 and 10.34 demonstrate that the magnitude of impact would be Very Small, and the effect would remain **Negligible Adverse.**

Table 10.33: 17-49 Vastern Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
57	57	57	0	0	0

11.191

Table 10.34: 17-49 Vastern Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
57	57	57	0	0	0

87-89 Caversham Road

11.192 Concerning 87-89 Caversham Road, the analysis demonstrates that whilst there would be a reduction in VSC, all windows would achieve a VSC of greater than 24 %, above the 20 % considered appropriate for such an urban location. All rooms would achieve the recommended DD. The magnitude of impact would be Small and the effect **Moderate Adverse** and not significant.

Table 10.35: 87-89 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
6	0	0	6	6	0

Table 10.36: 87-89 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
4	4	4	0	0	0

11.193 The magnitude of impact on sunlight would remain Very Small and the effect would remain **Negligible Adverse**.

Table 10.37: 87-89 Caversham Road – Sunlight (APSH) Results					
No. of rooms analysed	**No. of rooms achieving BRE Guidelines for APSH**	**Negligible**	**Minor**	**Moderate**	**Major**
4	4	4	0	0	0

Table 10.38: 87-89 Caversham Road – Sunlight (APSH during winter months) Results					
No. of rooms analysed	**No. of rooms achieving BRE Guidelines for APSH winter**	**Negligible**	**Minor**	**Moderate**	**Major**
4	4	4	0	0	0

91 Caversham Road

11.194 Of the three windows serving 91 Caversham Road, two would experience a **Moderate Adverse** effect based on the VSC assessment, but all rooms would achieve the recommended DD. It is therefore considered that the magnitude of impact would be Small and the effect would be **Negligible Adverse**.

Table 10.39: 91 Caversham Road – Summary of VSC Results					
No. of windows analysed	**No of windows achieving BRE Guidelines for VSC**	**Negligible**	**Minor**	**Moderate**	**Major**
3	1	1	2	0	0

Table 10.40: 91 Caversham Road – Summary of DD Results					
No. of rooms analysed	**No of rooms achieving BRE Guidelines for DD**	**Negligible**	**Minor**	**Moderate**	**Major**
2	2	2	0	0	0

11.195 The magnitude of impact on sunlight would be Very Small and the effect on sunlight would be **Negligible Adverse**.

Table 10.41: 91 Caversham Road – Sunlight (APSH) Results					
No. of rooms analysed	**No. of rooms achieving BRE Guidelines for APSH**	**Negligible**	**Minor**	**Moderate**	**Major**
2	2	2	0	0	0

Table 10.42: 91 Caversham Road – Sunlight (APSH during winter months) Results					
No. of rooms analysed	**No. of rooms achieving BRE Guidelines for APSH winter**	**Negligible**	**Minor**	**Moderate**	**Major**
2	2	0	0	0	0

93-97 Caversham Road

11.196 For 93-97 Caversham Road, of the eight windows analysed, seven would experience a **Negligible Adverse** effect, with the other experiencing a VSC only just below 27 %. With all rooms achieving the recommended DD, the magnitude of impact would be Small and the effect **Negligible Adverse**.

Table 10.43: 93-97 Caversham Road – Summary of VSC Results					
No. of windows analysed	**No of windows achieving BRE Guidelines for VSC**	**Negligible**	**Minor**	**Moderate**	**Major**
9	8	8	1	0	0

Table 10.44: 93-97 Caversham Road – Summary of DD Results					
No. of rooms analysed	**No of rooms achieving BRE Guidelines for DD**	**Negligible**	**Minor**	**Moderate**	**Major**
6	6	6	0	0	0

11.197 The magnitude of impact on sunlight would be Very Small and the effects **Negligible Adverse**.

Table 10.45: 93-97 Caversham Road – Sunlight (APSH) Results					
No. of rooms analysed	**No. of rooms achieving BRE Guidelines for APSH**	**Negligible**	**Minor**	**Moderate**	**Major**
6	6	6	0	0	0

Table 10.46: 93-97 Caversham Road – Sunlight (APSH during winter months) Results					
No. of rooms analysed	**No. of rooms achieving BRE Guidelines for APSH winter**	**Negligible**	**Minor**	**Moderate**	**Major**
6	6	6	0	0	0

Comparison against Reading Station Area Framework

11.198 The RSAF recognised the need for a comprehensive approach to the area's future redevelopment and following a series of height, massing and sectional studies, provides guidance on the scale mass and density of new developments. This massing is indicated on drawing number 2271-104 and 105 attached in Appendix 10.2.

11.199 This assessment considers the effects that the massing set out in the RSAF would have on the surrounding residential receptors and demonstrates what numerical values for such an urban location are considered appropriate, applying the BRE guidelines flexibly.

11.200 The results demonstrate that the RSAF envisaged by the RBC, whilst resulting in less windows and rooms not achieving the numerical values in the BRE guidelines compared with the results for the proposed

development, would result in a similar scale of effects as experienced with the proposed development. As this RSAF has been adopted by the RBC, it is considered to be a material consideration which sets a precedent for the levels of daylight and sunlight which could be considered reasonable and acceptable in planning terms and therefore justifies the use of alternative targets.

17-49 Vastern Road

11.201 The summary of the results for 17-49 Vastern Road demonstrate that the RSAF massing would have a magnitude of impact of Medium to High and **Minor** to **Moderate Adverse** effects on the VSC and DD enjoyed by these properties.

Table 10.47: 17-49 Vastern Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
57	40	35	4	13	0

Table 10.48: 17-49 Vastern Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
50	25	25	13	7	5

11.202 The RSAF massing would have a Very Small impact and a **Negligible Adverse** effect on the sunlight enjoyed by 17-29 Vastern Road.

Table 10.49: 17-49 Vastern Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
50	50	50	0	0	0

Table 10.50: 17-49 Vastern Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
50	50	50	0	0	

87-89 Caversham Road

11.203 The assessment of the effect the RSAF massing on 87-89 Caversham Road demonstrates that in relation to both VSC and DD, the magnitude of impact would be Very Small with a **Negligible Adverse** effect.

Table 10.51: 87-89 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
6	6	6	0	0	0

Table 10.52: 87-89 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
4	4	4	0	0	0

11.204 The impact on sunlight would be Very Small with a **Negligible Adverse** effect.

Table 10.53: 87-89 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
4	4	4	0	0	0

Table 10.54: 87-89 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
4	4	4	0	0	0

91 Caversham Road

11.205 The assessment of the effect the RSAF massing on 91 Caversham Road demonstrates that in relation to both VSC and DD, the impact would be Very Small with a **Negligible Adverse** effect.

Table 10.55: 91 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE Guidelines for VSC	Negligible	Minor	Moderate	Major
3	**3**	**3**	**0**	**0**	**0**

Table 10.56: 91 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE Guidelines for DD	Negligible	Minor	Moderate	Major
2	2	2	0	0	0

11.206 The impact on sunlight will be **Very Small** with a **Negligible** effect.

Table 10.57: 91 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
2	2	2	0	0	0

Table 10.58: 91 Caversham Road – Sunlight (APSH during winter months) Results

No. of windows analysed	No. of windows achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
2	2	0	0	0	0

93-97 Caversham Road

11.207 The assessment of the effect the RSAF massing on 93-97 Caversham Road demonstrates that in relation to both VSC and DD, the impact would be Very Small with a **Negligible Adverse** effect.

Table 10.59: 93-97 Caversham Road – Summary of VSC Results

No. of windows analysed	No of windows achieving BRE guidelines for VSC	Negligible	Minor	Moderate	Major
9	9	9	0	0	0

Table 10.60: 93-97 Caversham Road – Summary of DD Results

No. of rooms analysed	No of rooms achieving BRE guidelines for DD	Negligible	Minor	Moderate	Major
6	6	6	0	0	0

11.208 The impact on sunlight would be Very Small with a **Negligible Adverse** effect.

Table 10.61: 93-97 Caversham Road – Sunlight (APSH) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH	Negligible	Minor	Moderate	Major
6	6	6	0	0	0

Table 10.62: 93-97 Caversham Road – Sunlight (APSH during winter months) Results

No. of rooms analysed	No. of rooms achieving BRE Guidelines for APSH winter	Negligible	Minor	Moderate	Major
6	6	6	0	0	0

11 CUMULATIVE EFFECTS

Introduction

11.1 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017[1] (hereafter referred to as 'the EIA Regulations') require that the likely significant environmental effects of a development are taken into account, including cumulative effects.

11.2 There is no prescriptive guidance on the methodology for the assessment of cumulative effects; however, The Planning Inspectorate (PINS) document 'Using the 'Rochdale Envelope' (July 2018)[2] which was drafted in relation to infrastructure projects, states the following:

"The potential cumulative impacts with other developments will also need to be carefully identified such that the likely significant effects can be shown to have been identified and assessed against the baseline position (which would include built and operational development). In assessing cumulative impacts, other development should be identified through consultation with the local planning authorities and other relevant authorities."

11.3 PINS have also published an Advice Note[3] on the approach to cumulative effects assessment relevant to nationally significant infrastructure projects, which provides more useful context.

11.4 The Institute of Environmental Management and Assessment (IEMA) Guidance[4] identifies two types of cumulative effects:

- Inter-project effects – incremental changes caused by other development schemes occurring together with the proposed development and the cumulative effects combining to worsen the effect of a particular impact; and
- Intra-project effects – those effects that occur as a result of impact interaction between different environmental topics within the same project. For example, a project might affect bird species as a result of direct loss of habitat and by noise and light disturbance. Each of these when considered in isolation may have a limited effect but taken together the sum is greater than the parts.

Inter-Project Cumulative Effects

11.5 A list of cumulative schemes for consideration in the inter-project cumulative effect assessment of the proposed development was presented to RBC as part of the EIA Scoping Opinion Request Report (ES Volume 3: Technical Appendix 2.1). Details of the full list of cumulative schemes are presented in Chapter 2: EIA Process and Methodology of this ES Volume.

11.6 Inter-project effects have been addressed in each technical chapter of the ES (Chapters 6-10 of ES Volume 1 and Chapters 1 and 2 of ES Volume 2), as appropriate. To avoid significant repetition, information on the potential combined effects of the proposed development together with cumulative schemes is not presented within this chapter of the ES.

Intra-Project Cumulative Effects

11.7 The potential for intra-project cumulative effects is considered within this Chapter.

Intra-Project Cumulative Effects

Assessment Approach

11.8 As mentioned earlier, there is no established EIA methodology for assessing and quantifying the combined effects of individual effects on sensitive receptors. Accordingly, Ramboll has developed an approach which uses the defined residual effects of the proposed development to determine the potential for interactions between effects and consequently the potential for significant intra-project cumulative effects to arise.

11.9 The approach comprised the following steps:

1. a review of the likely residual effects (and in particular the likely significant environmental effects) presented within the ES was undertaken;
2. the likely receptors or receptor groups were identified;
3. the individual effects which may affect a singular receptor or receptor group were listed in a tabular/matrix format;
4. the potential for individual effects to interact were identified; and
5. the scale of the combined intra-project cumulative effects was assessed.

11.10 To ensure a proportionate approach, negligible and neutral effects have been disregarded.

11.11 It is noted that intra-project cumulative effects are more likely to arise when the receptor or receptor group is more sensitive to change, such as human receptors.

11.12 Where there is more than one effect likely to arise on a particular receptor or receptor group, the potential for effect interactions and the scale of the combined effect have been determined. The results of the assessment are presented within a tabular/matrix format within the following section of this chapter.

11.13 The assessment has been based on professional judgement and experience.

Assessment Results

11.14 Based on the methodology detailed above, Table 11.1 and Table 11.2 present the review of the potential for interactions of individual effects during the demolition and construction works and once the proposed development is complete and operational, respectively.

[1] Secretary of State, 2017. Town and Country Planning (Environmental Impact Assessment) Regulations 2017, London, HMSO.
[2] The Planning Inspectorate. July 2018. Using the 'Rochdale Envelope'.
[3] The Planning Inspectorate, December 2015. Cumulative Effects Assessment.
[4] Institute of Environmental Management and Assessment. The State of Environmental Impact Assessment Practice in the UK. 2011.

Likely Residual Effects		Relevant Receptor Groups													
		Existing commercial uses	Existing off-site residential occupants	Future on-site commercial occupants	Future on-site residential occupants	Existing working age residents	Existing and future pedestrians	Existing social infrastructure	Users of exisiting off-site amenity space	Users of future on-site amenity space	Existing surrounding townscape character and views	Existing transport infrastructure	Off-site Bus Stop users	Local Economy	Listed Building
Socio-Economics	Generation of construction employment														
	Local expenditure														
Air Quality	Dust Soiling and PM10 due to demolition and construction works														
	NO2 and PM10 due to vehicle emissions														
Noise and Vibration	Demolition and Construction Noise														
	Demolition and Construction Traffic														
	Demolition and Construction Vibration														
Wind Microclimate	Wind conditions suitable for strolling														
Daylight, Sunlight and Overshadowing	Temporary change in daylight and sunlight levels														
	Change in solar glare levels														
Townscape and Visual	Detraction from the character of a Conservation Area														
	Alter setting of a Conservation Area														
	Effect on visual amenity experience														
Built Heritage	Visual and aural disruption to the setting of the listed building and the appreciation of its heritage significance caused by demolition and construction activity														
Potential for Effect Interaction and so Combined Cumulative Effect?		**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**

Major Beneficial
Moderate Beneficial
Minor Beneficial
Minor Adverse
Moderate Adverse
Major Adverse

Table 11.1: Demolition and Construction Intra-Project Cumulative Effects

Demolition and Construction

11.15 As shown in Table 11.1, the proposed development would not result in intra-project cumulative effect interactions during the demolition and construction stage.

Likely Residual Effects		Relevant Receptor Groups														
		Existing commercial uses	Future on-site commercial occupants	Existing off-site residential occupants	Future on-site residential occupants	Existing off-site human health	Existing and future pedestrians	Existing social infrastructure	Users of exisiting off-site amenity space	Users of future on-site amenity space	Users of roof top amenity	Existing surrounding townscape character and views	Existing transport infrastructure	Off-site Bus Stop users	Local Economy	Listed Building
Socio-Economics	Provision of new housing															
	Increased spending from new employees	Major Beneficial													Major Beneficial	
	Net loss of employment on-site	Moderate Adverse														
	Additional spending by employees and residents	Major Beneficial													Major Beneficial	
	Increased demand for GP provision															
	Increased demand for dentist provision							Minor Adverse								
	Increased demand on early years school places															
	Increased demand on primary school places															
	Increased demand on secondary school places															
	Provision of open space															
	Impact on levels of deprivation															
	Impact on crime levels															
Air Quality	NO2, PM10 and PM2.5 effects due to vehicle emissions															
	NO2, PM10 and PM2.5 effects due to local air quality					Minor Adverse										
Noise and Vibration	Changes in traffic noise															
	Noise from fixed plant installations															
	Noise from servicing vehicle movements															
	Noise from servicing vehicle idling															
Wind Microclimate	Unsuitable wind conditions		Minor Adverse / Major Adverse		Minor Adverse / Major Adverse		Minor Adverse / Moderate Adverse			Minor Adverse / Major Adverse	Major Adverse			Minor Adverse		
	Suitable wind conditions		Minor Beneficial		Minor Beneficial		Minor Beneficial			Minor Beneficial	Minor Beneficial					
Daylight, Sunlight and Overshadowing	Reduction in access to daylight and sunlight			Minor Adverse / Moderate Adverse												
	Sunlight availability within amenity space															
	Creation of solar glare			Minor Adverse / Moderate Adverse									Minor Adverse / Moderate Adverse			
Townscape and Visual	Direct and indirect changes to Conservation Area											Minor Beneficial / Moderate Beneficial				
	Effect on visual amenity experience															
Built Heritage	Alteration in the setting of the locally listed building															Minor Adverse
	Alteration in the setting of the listed building															Minor Adverse / Moderate Adverse
Potential for Effect Interaction and so Combined Cumulative Effect?		**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**	**None**

Major Beneficial
Moderate Beneficial
Minor Beneficial
Minor Adverse
Moderate Adverse
Major Adverse

Table 11.2: Completed Development Intra-Project Cumulative Effects

Completed Development

11.16 As shown in Table 11.2, the proposed development would not result in intra-project cumulative effect interactions during the completed development stage.

Conclusions

11.17 Based on the assessments presented in Table 11.1 and Table 11.2, the proposed development would not have the potential to create to intra-project cumulative effect interaction during either the demolition and construction stage, or the completed development stage.

12 RESIDUAL EFFECTS AND MITIGATION

Introduction

12.1 This chapter summarises the additional mitigation and enhancement measures identified in the technical assessments of ES Volume 1 Chapters 6-10 and ES Volume 2 Chapter 1 and 2 and provides a summary of the residual effects and the likely significant environmental effects attributed to the proposed development.

Additional Mitigation and Enhancement

12.2 As set out in Chapter 2: EIA Process and Methodology, the aim of an EIA is to develop measures to prevent, reduce and mitigate the significant adverse environmental effects of a project and to enhance any beneficial effects.

12.3 Within each of the technical assessments, the need for additional mitigation measures has been considered to prevent, reduce or mitigate likely significant adverse effects as far as reasonably possible. In addition, opportunities for environmental enhancement have been explored where practicable. The proposed additional mitigation and enhancement measures are in addition to the embedded design and operational mitigation measures (as described in ES Chapter 4: Proposed Development Description), and standard construction mitigation measures (as described in ES Chapter 5: Demolition and Construction Environmental Management), which have been considered within the technical assessments.

12.4 Table 12.1 presents a summary of the additional mitigation and enhancement measures categorised under the following stages:

- Demolition and Construction; and
- Completed Development.

12.5 Reference should be made to individual technical chapters for more detail.

Table 12.1: Summary of Proposed Additional Mitigation and Enhancement Measures

Topic	Proposed Additional Mitigation and Enhancement Measures
Demolition and Construction	
Socio-Economics	None
Air Quality	None
Noise and Vibration	None
Wind	None
Daylight, Sunlight, Overshadowing and Solar Glare	None
Townscape and Visual	None
Built Heritage	None
Completed Development	
Socio-Economics	CIL payment to be used towards the extension of an existing, or provision of a new school(s) in the local area to be advised by Reading Local Education Authority (LEA)
Air Quality	None
Noise and Vibration	• Commitment to undertake further detailed design to avoid potential for noise effects from plant and entertainment uses. • Implementation of signage to minimise the idling of delivery vehicles close to surrounding residential receptors
Wind	Mitigation would be explored at the detailed design stage. This would include: • articulation of the building scale, footprint and mass of the proposed development; • elevational treatments including fins, canopies, balustrades, arcades and screens to slow and redirect wind flow; • recessed building entrances to provide an area of shelter; • screening in the form of sculptures and porous screens to reduce the energy the wind contains; and • landscaping and planting to provide shelter and reduce exposure and break up air flow.
Daylight, Sunlight and Overshadowing and Solar Glare	Non-reflective materials to reduce impacts of solar glare
Townscape and Visual	Adherence to commitments in the Design Code in regards to high-quality design and the delivery of a landmark development
Built Heritage	None

Residual Effects

12.6 Reference should be made to ES Volume 1 Chapters 6-10 and ES Volume 2 Chapter 1 and 2 for a detailed description of residual and likely significant environmental effects.

Demolition and Construction Residual Effects

12.7 Table 12.2 summarises the likely residual effects which have been identified by the individual technical assessments as a result of the construction of the proposed development. Significant effects are shown in **bold**.

Table 12.2: Residual Effects during Proposed Development Demolition and Construction Stage

Topic Area	Description of Residual Effect	Scale of Effect	Adverse/ Beneficial	Duration of Effect
Socio-economics	Generation of construction employment	**Major**	**Beneficial**	Short Term
	Local expenditure	**Major**	**Beneficial**	Short Term
Air Quality	Dust Soiling and PM_{10} due to demolition and construction works	Negligible	Neutral	Medium Term
	NO_2, PM_{10} and $PM_{2.5}$ due to vehicle	Negligible	Neutral	Medium Term

Table 12.2: Residual Effects during Proposed Development Demolition and Construction Stage

Topic Area	Description of Residual Effect		Scale of Effect	Adverse/ Beneficial	Duration of Effect
	emissions				
Noise and Vibration	Demolition and Construction noise	Receptor 9 (31-51 Vastern Road)	**Moderate**	**Adverse**	**Medium Term**
		Receptor 10 (SSE)	Minor	Adverse	Medium Term
		All other receptors	Negligible	Adverse	Medium Term
	Demolition and Construction Traffic Noise at all receptors		Negligible	Adverse	Medium Term
	Demolition and Construction Vibration at all receptors		Negligible	Adverse	Medium Term
Wind	Wind conditions suitable for strolling and walking		Negligible	N/A	Short Term
Daylight, Sunlight, Overshadowing and Solar Glare	Temporary change in daylight and sunlight levels at surrounding residential receptors		Negligible – Moderate	Neutral	Short Term
	Change in solar glare levels		Negligible - Moderate	Neutral	Short Term
Townscape and Visual	*Townscape Receptors*				
	Detraction from the application site character		**Moderate**	**Adverse**	**Short Term**
	Detracting from the character of the Conservation Area - CA 22: Vastern Road		**Moderate**	**Adverse**	**Short Term**
	Slight deterioration in the setting of the Conservation Area	CA 12: Caversham Road, CA 23: King's Meadow	Minor	Adverse	Short Term
		CA 11: Napier Road	Negligible	Adverse	Short Term
	No alteration to any of the key characteristics of the CA 1: Station Hill		Minor	Adverse	Short Term
	Views and Visual Receptors				
	Limited deterioration to the existing view: Site Context Photograph 01		**Moderate**	**Adverse**	**Short Term**
	Limited deterioration to the existing view: Site Context Photograph 02		**Minor - Moderate**	**Adverse**	**Short Term**
	Occupation of a greater area of the skyline in views: Site Context Photograph 03		**Moderate**	**Adverse**	**Short Term**
	Interruption of views of recognisable townscape elements: Site Context Photograph 04		**Moderate**	**Adverse**	**Short Term**
	Detraction from the visual amenity: Site Context Photograph 05		**Moderate**	**Adverse**	**Short Term**
	Introduction of additional element of clutter into views: Site Context Photograph 25		Minor	Adverse	Short Term
Built Heritage	Visual and aural disruption to the setting of the locally listed building and the appreciation of its heritage significance caused by demolition and construction activity		Negligible	Adverse	Short Term
	Visual and aural disruption to the setting of the listed building and the appreciation of its heritage significance caused by demolition and construction activity – All Receptors		Negligible	Adverse	Short Term

12.8 During the demolition and construction stage, significant beneficial effects would be likely in respect of generation of construction employment and local expenditure.

12.9 During the demolition and construction stage, significant adverse effects would be likely in respect of the following:

- **Noise and Vibration** - Demolition and construction noise on receptor 9 (31-51 Vastern Road – residential); and
- **Townscape and Visual** - Change to the character of the application site, the conservation area (CA 22: Vastern Road), and change to views (Site Context Photographs 1-5 and 25).

Completed Development Residual Effects

12.10 Table 12.3 summarises the likely residual effects which have been identified by the individual technical assessments as a result of the operation of the proposed development. Significant effects are shown in bold.

Table 12.3: Residual Effects of the Completed Proposed Development

Topic Area	Residual Effect	Scale of Effect	Adverse/ Beneficial	Duration of Effect
Socio-economics	No residential dwellings delivered	Negligible	Beneficial	Long Term
	Local expenditure	**Major**	**Beneficial**	**Long Term**
	Net loss of employment on-site	Minor	Adverse	Long Term
	Economic output	**Moderate**	**Beneficial**	**Long Term**
	Demand for GP provision	Negligible (following mitigation in form of CIL payment)	Adverse	Long Term
	Demand for dentist provision	Minor	Adverse	Long Term
	Demand on early years school places	Negligible	Beneficial	Long Term
	Demand on primary school places	Negligible	Beneficial	Long Term
	Demand on secondary school places	Negligible	Beneficial	Long Term
	Demand for open space	Negligible	Beneficial	Long Term

Table 12.3: Residual Effects of the Completed Proposed Development

Topic Area	Residual Effect		Scale of Effect	Adverse/ Beneficial	Duration of Effect
	Impact on levels of deprivation		Negligible	Beneficial	Long Term
	Impact on crime		Negligible	Beneficial	Long Term
Air Quality	NO_2, PM_{10} and $PM_{2.5}$ effects due to vehicle emissions		Slight	Adverse	Long Term
	NO_2, PM_{10} and $PM_{2.5}$ effects due to local air quality		Negligible	Neutral	Long Term
Noise and Vibration	Changes in traffic noise		None	N/A	Long Term
	Noise from fixed plant installations		Negligible	Adverse	Long Term
	Noise from servicing vehicle movements		Negligible	Adverse	Long Term
	Noise from servicing vehicle idling		Negligible	Adverse	Long Term
Wind	Off-Site Thoroughfares (target conditions suitable for walking/strolling).	Vastern Road	**Negligible to Minor**	**Adverse**	**Long Term**
		Caversham Road	**Negligible to Minor**	**Adverse**	**Long Term**
		Troopers Port Way	**Negligible to Minor**	**Adverse**	**Long Term**
		Brighams Mead	**Minor**	**Adverse**	**Long Term**
	Proposed Development Thoroughfares (target conditions suitable for walking/strolling)	Thoroughfare 1, 2 and 3	**Negligible to Moderate**	**Adverse**	**Long Term**
		Thoroughfare 4	**Minor**	**Beneficial/ Adverse**	**Long Term**
	Pedestrian Crossings		**Negligible to Minor**	**N/A Beneficial**	**Long Term**
	Proposed Development on-site building entrances		**Negligible to Major**	**N/A Major**	**Long Term**
	Off-Site Entrances (target conditions suitable for standing)	Entrance to a neighbouring property measurement location 38 (across Caversham Road)	**Minor**	**Adverse**	**Long Term**
		Entrance to the railway station	Negligible	Adverse	Long Term
		Entrance to a neighbouring property measurement location 45 (across Vastern Road)	**Minor to Moderate**	**Beneficial**	**Long Term**
		Off-site Bus Stops (target conditions suitable for standing)	**Minor**	**Adverse**	**Long Term**
		Off-Site Amenity Area (target conditions suitable for sitting to standing)	**Minor to Moderate**	**Adverse**	**Long Term**
		Proposed Development Amenity (target condition range of sitting to standing) – Ground Floor	**Minor to Major**	**Beneficial / Adverse**	**Long Term**
		Proposed Development Amenity (target condition range of sitting to standing) – Roof top	**Minor to Major**	**Beneficial / Adverse**	**Long Term**
		Strong winds at ground level and roof level	**Major**	**Adverse**	**Long term**
Daylight, Sunlight, Overshadowing and Solar Glare		Reduction in access to daylight and sunlight - 17-49 Vastern Road (when assessed based on BRE criteria)	**Moderate**	**Adverse**	**Long Term**
		Reduction in access to daylight and sunlight - 17-49 Vastern Road (when assessed based on alternative targets)	Minor-Moderate	Adverse	Long Term
		Reduction in access to daylight and sunlight - 87-89 Caversham Road, 91 Caversham Road and 93-97 Caversham Road	Negligible	Adverse	Long Term
		Sunlight availability within amenity space	Negligible	N/A	N/A
		Creation of Solar Glare	Minor	Adverse	Long Term
Townscape and Visual		**Townscape Receptors**			
		Detraction of the application site character	**Moderate**	**Beneficial**	**Permanent**
		Change to CA 22: Vastern Road	**Moderate**	**Beneficial**	**Permanent**
		Change to CA 12: Caversham Road	Negligible	Beneficial	Permanent
		Change to the setting of the Conservation Area – CA 23: King's Meadow, CA 1: Station Hill	Minor	Beneficial	Permanent
		Change to the setting of the Conservation Area – CA 11: Napier Road	Negligible	Beneficial	Permanent
		Views and Visual Receptors			

Table 12.3: Residual Effects of the Completed Proposed Development					
Topic Area	**Residual Effect**		**Scale of Effect**	**Adverse/ Beneficial**	**Duration of Effect**
	Change to view	Site Context Photograph 01 - 05: View south from Vastern Road/Lynmouth Road, Site Context Photograph 02	Negligible	Beneficial	Permanent
		Site Context Photograph 25: View North from Station Square	Minor	Adverse	Permanent
Built Heritage	Alteration in the setting of no 55 Vastern Road (locally listed building)		Minor	Adverse	Permanent
	Alteration in the setting of the listed building – Great Western House		Minor	Adverse	Permanent
	Alteration in the setting of the listed building – Main building of Reading General Station		**Moderate**	**Adverse**	**Permanent**
	Alteration in the setting of the listed building – Remaining Receptors		Negligible	Adverse	Permanent

12.11 The completed development would give rise to significant beneficial effects in respect of economic output and local expenditure. The completed development would also give rise to moderate beneficial effects in respect of the application site character and change to Consercation Area 22.

12.12 The completed development would give rise to the following significant adverse effects:

- **Wind Microclimate -** Where the pedestrian comfort assessment identified minor to major adverse effects, these are considered to be significant. In addition, all instances of strong winds exceeding the 15m/s threshold are considered to be major adverse and significant.
- **Daylight, Sunlight, Overshadowing and Solar Glare -** The effects of the proposed development on daylight to 17-49 Vastern Road would be significant when assessed against the BRE Targets. When assessed against the alternative targets, the effects are not considered to be significant.
- **Built Heritage –** The effects on the alteration of the setting of the listed building – Great Western House are considered to be moderate adverse and permanent.

GLOSSARY OF TERMS

Accurate Visual Representations	A static or moving image which shows the location of a proposed development as accurately as possible; it may also illustrate the degree to which the development will be visible, its detailed form or the proposed use of materials. AVRs are produced by accurately combining images of the proposed building with a representation of its context.
Amenity	A pleasant or advantageous aspect of the environment.
Annual Probable Sunlight Hours	A measure of sunlight that a given window may expect over a year period.
Aquifer	A below ground, water-bearing layer of soil or rock.
Alluvium	Sediment laid down by a river. Can range from sands and gravels deposited by fast flowing water and clays that settle out of suspension during overbank flooding. Other deposits found on a valley floor are usually included in the term alluvium (e.g. peat).
Arisings	Material (often spoil) derived from the ground through excavation
Baseline Studies	Studies of existing environmental conditions which are designed to establish the baseline conditions against which any future changes can be measured or predicted.
Biodiversity	The diversity, or variety of plants and animals and other living things in a particular area of region. It encompasses landscape diversity, ecosystem diversity, species diversity and genetic diversity.
Borehole	A deep hole bored into the ground as part of intrusive geological investigations.
Carbon Dioxide (CO_2)	Carbon dioxide is a naturally occurring gas comprising 0.04% of the atmosphere. The burning of fossil fuels releases carbon dioxide fixed by plants many millions of years ago, and this has increased its concentration in the atmosphere by some 12% over the past century. It contributes about 60 per cent of the potential global warming effect of manmade emissions of greenhouse gases.
Combined Heat and Power	A low carbon technology which generates electricity whilst also capturing usable heat that is produced in the process.
Completed Development	A development scheme which has been build out.
Conservation Area	An area designated by the Local Authority as being of special architectural or historic interest under the provisions of the Planning (Listed Buildings and Conservation Areas 1990) Act, the character or appearance of which it is desirable to preserve or enhance.
Construction Environmental Management Plan	A documented management system with environmental procedures to monitor residual impacts of the construction phase of a development.
Construction Method Statement	A document which addresses the health and safety risks to workers and other personnel on-site during the construction phase of the development.
Cumulative Developments	Developments that have received planning permission and have a signed legal agreement in place. They are assumed to be in place by the time the Development being assessed is completed.
Cumulative Effects	Effects that result from incremental changes caused by other past, present or reasonably foreseeable actions.
Desk-top Study	A non-intrusive study and review of all available information pertaining to a site, including historical records, collated and monitored data, and consultation with relevant stakeholders.
Directive	European Union (EU) Directives impose legal obligations on European Member States. They are binding as to the results to be achieved, but allow individual states the right to decide the form and methods used to achieve the results. An example of this is the EU Air Quality Framework Directive (1996) that is brought into legal effect in the UK by the Air Quality (England) Regulations (2000).
Early Medieval (Saxon)	Historic time period from AD 410-AD 1066.
EIA Scoping	An initial stage in determining the nature and potential scale of the environmental impacts arising from a proposed development, and assessing what further studies are required to establish their significance.
EIA Scoping Opinion	A written statement of the opinion of the relevant planning authority as to the information to be provided in the Environmental Statement.
EIA Screening	An initial stage in which the need for EIA is considered in respect of a development. Some developments are automatically subject to EIA by means of their inevitable size, nature and effects (Schedule 1 developments). Other projects are made subject to EIA because it is anticipated that they are likely to have significant environmental effects (Schedule 2 developments).
Embodied Energy	Energy used in the sourcing, manufacture, transportation and assembly of goods and materials.
Emission	A material that is expelled or released to the environment. Usually applied to gaseous or odorous discharges to the atmosphere.
Environmental Impact Assessment	A process by which information about the environmental effects of a development is collected and taken into account by the relevant decision-making body before a decision is given on whether the development should go ahead.
Environmental Statement	A statement that includes such information that is reasonably required to assess the environmental effects of a development.
Evaluation (archaeological)	A field evaluation is 'a limited programme of non–intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area'.
Façade	The front or face of a building.
Finished Floor Levels	The final level or position of the finished floor, including any tiles, as opposed to the level of the concrete or wood subfloor surface or floor joist
Fit-out	Installation of all non-substructure and non-superstructure items such as electrical water services, as well as final internal finishings.
Geotechnical	Ground investigation, typically in the form of boreholes and/or trial/test pits, carried out for engineering purposes to determine the nature of the subsurface deposits.

Glare	The uncomfortable brightness of a light source or illuminated area when viewed against a dark background.
Grade I Listed Building	A listed building that is of exceptional interest.
Grade II Listed Building	A listed building that is of special interest.
Grade II* Listed Building	A listed building that is of particular importance and of more than special interest.
Gross External Area	A measure of floor space calculated in accordance with the Royal Institution of Chartered Surveyors (RICS) Code of Measuring Practice.
Gross Internal Area	A measure of the area of a building measured to the internal face of the perimeter walls at each floor level.
Groundwater Source Protection Zone	An area in which groundwater is abstracted for public water supply.
Heritage Asset	A building, area or scene which makes a positive contribution of special architectural, historic or environmental interest.
Hoarding	A temporary board fence set up on the perimeter of a building site.
In-situ	In the natural, original or appropriate position.
Intrusive Investigation	An in-depth investigation involving further sampling and analysis, such as the gathering of samples from the ground, walls, ceilings for the detection of contamination, asbestos and or archaeological remains.
Lawson Comfort Criteria	The so called 'Lawson' criteria which define whether a space is comfortable for business walking, strolling or sitting by a threshold wind speed i.e. the hourly mean wind speed exceeded 5% of the time.
Listed Building	A building or structure of special architectural or historic interest which is included in a list made by the Secretary of State.
Made Ground	Soils or other material which has been deposited by man rather than natural processes, for example to make up ground levels.
Mechanical Ventilation Heat Recovery	An energy recovery ventilation system using equipment known as a heat recovery ventilator, heat exchanger, air exchanger, or air-to-air heat exchanger which employs a cross flow or counter-flow heat exchanger (countercurrent heat exchange) between the inbound and outbound air flow. The system provides fresh air and improved climate control, while also saving energy by reducing heating (and cooling) requirements.
Mitigation	Any process, activity of thing designed to avoid, reduce or remedy adverse environmental impacts likely to be caused by a development project.
Mitigation Measure	Measure aiming at reducing an adverse environmental effect.
National Planning Policy Framework	It sets out the Government's economic, environmental and social planning policies for England and summarises, in a single document, all previous national planning policy advice (Planning Policy Statements and Planning Policy Guidance notes).
Non-Technical Summary	A summary of the Environmental Statement in 'non-technical language'.
No-sky Line	A measure of the distribution of diffuse daylight within a room.
Open Space	Includes all open spaces, plus other spaces that provide a break from the densely built-up urban form, such as pedestrianised areas and station concourses; hard-landscaped areas with private access; pedestrian/cycle and wildlife routes; and all the green infrastructure that links open spaces together, including green corridors, private residential gardens, trees, green roofs, and green landscaped areas.
Ordnance Datum	Land levels are measured relative to the average sea level at Newlyn, Cornwall. This average level is referred to as 'Ordnance Datum'.
Overshadowing	Overshadowing occurs when a structure blocks out sunlight from neighbouring properties on the northern side of that structure. It can affect the amount of daylight let into neighbouring properties when the shadow cast falls across windows or glazed doors.
Palaeoenvironmental	An environment at a period in the geological past.
Permeability	The extent to which an environment allows people a variety of access routes through it. A permeable environment is one where there is ease of movement and where people have a choice of the routes they may use.
Photomontage	The use of photographs of a site from a certain viewpoint to show both the current base state of the site and the anticipated view of the site once development is complete.
Pile	A timber, steel or concrete post which is driven, jacked or cast (bored) into the ground to carry vertical or horizontal loads.
Plant	A building's generator, heating, ventilation, and/or electricity-production system.
Planning Practice Guidance	A web-based resource that came into force in 2014. It seeks to consolidate existing technical guidance into a consolidated online format and provides further detail on the policies contained within the NPPF.
Post-Medieval	Historic time period from AD 1485-present
Prehistoric	Historic time period from 7500,000-AD AD43
Preservation by Record	Archaeological mitigation strategy where archaeological remains are fully excavated and recorded archaeologically and the results published. For remains of lesser significance, preservation by record might comprise an archaeological watching brief or evaluation.
Preservation *in situ*	Archaeological mitigation strategy where nationally important (whether Scheduled or not) archaeological remains are preserved in situ for future generations, typically through modifications to design proposals to avoid damage or destruction of such remains.
Public Realm	The space between and within buildings that are publicly accessible, including streets, squares, forecourts, parks and open spaces.
Receptor (Sensitive)	A component of the natural, created, or built environment such as human being, water, air, a building, or a plant that is affected by an impact.
Residual Effects	Those effects of a development that cannot be mitigated following implementation of mitigation proposals.

Risk Assessment	An assessment of the likelihood and severity of an occurrence.
Roman	Historic time period from AD 43-AD 410.
Scheduled Monument	Site of archaeological or historic interest included in the Schedule of Monuments compiled by the Secretary of State under the Ancient Monuments and Archaeological Areas Act 1979.
Setting	The context in which a building or area can be appreciated.
Sites and Monuments Record	A computerised record of information for all statutorily listed buildings, known archaeological sites and stray finds, parks and gardens of special interest in England
Statutory Consultees	Groups or bodies that, by law, must be consulted as part of the planning application process for EIA development.
Strata	Layer of rock or soil.
Substructure	Elements of a development below ground level, typically basements and foundations.
Superstructure	Elements of a development above ground principally the mega frame, supporting northern core and outer shell cladding.
Supplementary Planning Document	Documents which seek to give guidance and support on the Council's planning processes and are one of the material considerations in determining planning applications.
Sustainable Development	Development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.
The Applicant	The person or entity making the planning application.
The application site	The extent of the development site, as defined by the red-line boundary plan.
Topography	The natural and man-made features of an area collectively.
Travel Plan	A document which puts measures in place that will encourage sustainable travel and reduce reliance on single occupancy cars.
Truncate	Partially or wholly remove. In archaeological terms remains may have been truncated by previous construction activity.
Vertical Sky Component	A 'spot' measure of the skylight reaching the mid-point of a window from an overcast sky. It represents the amount of visible sky that can be seen from that reference point, from over and around an obstruction in front of the window.
Vibration	The periodic movements of structures transferred by ground and parts of the building, due to events such as train pass-by, piling, blasting or use of heavy machinery.
Watching Brief (archaeological)	An archaeological watching brief is 'a formal programme of observation and investigation conducted during any operation carried out for non–archaeological reasons.'
Wind Safety Criteria	Criteria for the safety of an individual in relation to the wind environment. There are two categories: S1: unsafe for typical use (threshold speed 20m/s) and S2: unsafe for sensitive use (threshold speed 15m/s).

ABBREVIATIONS

ADF	Average Daylight Factor
AOD	Above Ordnance Datum
APA	Archaeological Priority Area
AQMA	Air Quality Management Area
ASHP	Air Source Heat Pump
AVRs	Accurate Visual Representations
bgl	Below Ground Level
BGS	British Geological Survey
BTVA	Built Heritage, Townscape, and Visual Assessment (BTVA)
BRE	Building Research Establishment
BREEAM	British Research Establishment Environmental Assessment Method
CA	Conservation Area
CABE	Commission Activity for the Architecture and the Built Environment
CDM	Construction Design and Management
CFA	Continuous Flight Auger
CHP	Combined Heating and Power
CIBSE	Chartered Institute of Building Services Engineers
CIE	Commission on Illumination
CIFA	Chartered Institute of Archaeologists
CLC	City of Lincoln Council
CMP	Construction Management Plan
CO_2	Carbon dioxide
DCLG	Department for Communities and Local Government
DEFRA	Department of Environment, Food and Rural Affairs
DHW	Domestic Hot Water
EA	Environment Agency
EC	European Commission
EH	English Heritage
EIA	Environmental Impact Assessment
EPI	Environmental Performance Indicators
ES	Environmental Statement
FRA	Flood Risk Assessment
FTTP	Fibre to the Premises
FWEP	Flood Warning and Evacuation Plan
GEA	Gross External Area
GIA	Gross Internal Area
GIS	Geographic Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
Ha	Hectare
HE	Historic England
HEA	Historic Environment Assessment
HER	Historic Environment Record
HGV	Heavy Goods Vehicle
HIA	Health Impact Assessment
hr	Hour
HSE	Health and Safety Executive
HTVIA	Heritage, Townscape, Visual Impact Assessment
IAQ	Indoor Air Quality
IEMA	Institute of Environmental Management and Assessment
IPC	Infrastructure Planning Commission
KPI	Key Performance Indicators
l	litres
l/s	Litres per second
LCC	Lawson Comfort Criteria
LLB	Locally Listed Building
LLFA	Lead Local Floor Authority
LPA	Local Planning Authority
LZC	Low or Zero Carbon
m	Metre
m^2	Square metre
m^3	Cubic metre
mAOD	Metres Above Ordnance Datum
MEP	Mechanical, Electrical and Plumbing
MMC	Modern Methods of Construction
MOLA	Museum of London Archaeology
MVHR	Mechanical Ventilation and Heat Recovery
NHL	National Heritage List for England
NMR	National Monuments Record
No_x	Nitrogen Oxides
NO_2	Nitrogen Dioxide

NRHE	National Record for the Historic Environment
NSC	No Sky-Line Contour
NSL	No-Sky Line
NSR	Noise Sensitive Receptor
NTS	Non-Technical Summary
NPPF	National Planning Policy Framework
OD	Ordnance Datum
OS	Ordnance Survey
OSNGR	Ordnance Survey National Grid Reference
PEA	Preliminary Ecological Assessment
PEM	Project Environmental Manager
PI	Performance Indicators
PINS	The Planning Inspectorate
PPG	Planning Practice Guidance
PRA	Preliminary Risk Assessment
RBC	Reading Borough Council
RCHME	Royal Commission on the Historical Monuments of England
SFP	Specific Fan Powers
SFRA	Strategic Flood Risk Assessment
SI	Site Investigation
SLB	Statutory Listed Buildings
SMR	Sites and Monuments Record
SoP	Standard of Protection
SPG	Supplementary Planning Guidance
Sq. Ft.	Square Feet
Sqm	Square Metres
Sq. Mts	Square Metres
SuDS	Sustainable Drainage Systems
SWMP	Site Waste Management Plan
TPO	Tree Preservation Order
TRY	Test Reference Year
UK	United Kingdom
VSC	Vertical Sky Component
VOC	Volatile Organic Compounds
WSI	Written Scheme of Investigation