

East Reading Mass Rapid Transit Scheme

Environmental Statement

Volume 1 Main Report

Reading Borough Council Highways and Transport Department



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1 Introduction

1.1 Background

- 1.1.1 This Environmental Statement (ES) has been prepared in respect of a planning application for a new mass rapid transit (MRT) scheme to the east of Reading, Berkshire (referred to as the 'proposed development'). The application is being promoted by Reading Borough Council (RBC) Highways and Transport Department as the local highways authority. The purpose of the East MRT scheme is to provide a high speed public transport, cycle and pedestrian route into the town centre.
- 1.1.2 This ES documents the Environmental Impact Assessment (EIA) of the East MRT scheme, in combination with the already permitted Thames Valley Park (TVP) Park & Ride Site, (referred to as 'TVP P&R'). TVP P&R lies within Wokingham Borough Council's (WBC) administrative boundary and will provide 277 car parking spaces to the west of TVP Drive.
- 1.1.3 A site location plan for the proposed development is included in [Appendix 1](#). The proposed development straddles the two Local Planning Authority areas of RBC and WBC. The planning application will therefore be submitted to both RBC and WBC for determination.
- 1.1.4 The proposed development comprises the construction of a segregated fast-track public transport route, pedestrian and cycle bridge over the River Kennet, with associated Public Right of Way (PRoW) links, junction improvements and landscaping. The purpose of the East MRT Scheme is to improve the attractiveness of travelling more sustainably, therefore reducing private car trips, easing forecast congestion and air quality along the existing highway network, particularly on the A4 corridor.
- 1.1.5 The project is being promoted by RBC, working with WBC, and Thames Valley Berkshire Local Enterprise Partnership (TVB LEP). The public-sector led project has been allocated funding by TVB LEP from the Local Growth Fund.

1.2 Terms and Definitions

- 1.2.1 The following terms and definitions have been used within this ES:
- The application site: the area within the planning application boundary East Reading Mass Rapid Transit scheme (See [Appendix 1](#))
 - the proposed development – the development for which full planning permission is sought;
 - East Reading Mass Rapid Transit scheme (abbrev. East MRT scheme) – the name of the development;
 - TVP P&R– the boundary of the Thames Valley Park and Ride Site (See [Appendix 1](#);
 - Combined site - refers to the collective area of both the application site and the TVP P&R.

1.3 The Environmental Statement

- 1.3.1 The ES comprises the following volumes:

- Volume 1: Main Report
- Volume 2: Appendices
- Non-Technical Summary.

1.3.2 The main report (Volume 1) is presented in chapters shown in **Table 1-1**. The appendices (Volume 2) relate to the same topics sequentially.

Table 1-1: Contents of the Environmental Statement

Chapter Nos.	Title of ES Chapter
1	Introduction
2	Site and Surrounding Area
3	Proposed Development
4	Construction and Site Management
5	Assessment Method
6	Planning Policy Context
7	Socio-Economics
8	Transport and Access
9	Air Quality
10	Hydrology and the Water Environment
11	Ground Conditions
12	Landscape and Visual including Lighting
13	Ecology
14	Archaeology and Heritage
15	Impact Interactions and Summary
16	Glossary of Terms

1.4 Project Team

1.4.1 The Planning and ES work has been undertaken by the professional teams provided in **Table 1-3**.

Table 1-3: Environmental Impact Assessment Team

Consultant	Technical Discipline
Peter Brett Associates LLP	Town and Country Planning
	EIA Co-ordination
	Socio-Economics
	Transport & Access
	Air Quality
	Hydrology and the Water Environment
	Noise and Vibration
	Landscape and Visual

Consultant	Technical Discipline
	Lighting
	Ecology
Orion Heritage	Archaeology and Heritage

2 Site and Surrounding Area

2.1 Application Site

- 2.1.1 The proposed route is located between Thames Valley Park and Napier Road, Reading, alongside the Great Western Main Line Railway and the River Thames which flows west to east. A site location plan is provided at **Appendix 1** and is located between the approximate Ordnance Survey (OS) National Grid References (NGR) of 472553(E) 173856(N) to the west and 473579(E) 173891(N) to the east. The approximate size of the application site is 3.2 ha.
- 2.1.2 The western area of the application site (within Reading Borough) where the proposed development would connect with Napier Road is characterised by a retail superstore with associated fuel filling station and parking. Further west is residential tower blocks at Luscinia View.
- 2.1.3 The central area of the application site where the proposed development crosses the River Kennet is characterised by the confluence of the River Thames and the River Kennet. There is an existing listed railway bridge over the River Kennet and an attached listed footbridge allowing access over the River Kennet for the Thames Path National Trail.
- 2.1.4 The eastern area of the application site (within Wokingham Borough) is undeveloped flood plain adjacent to the River Thames. The Thames Valley Park Rowing Club and Wokingham Waterside Canoe and Kayak Centre are in close proximity to the north-east. There are also temporary moorings along the southern bank of the River Thames. The Thames and Kennet Marina and Redgrave and Pinsent Rowing Lake are located approximately 100 m to the north on the opposite side of the River Thames. The Suttons Business Park is located beyond the Great Western main line railway to the south.
- 2.1.5 The application site is partially within safeguarded land for a 'cross town route' (in accordance with Wokingham Borough Council (2014) Development Plan – Adopted Managing Development Delivery Local Plan Policy CC08) and therefore for much of its length the application site is undeveloped and consists of grassland, scrub and trees. This safeguarding is consistent with the infrastructure corridor nature of the site, including the railway, footpath and overhead electricity lines.
- 2.1.6 The application site is constrained by the River Thames to the north and the Great Western main line to the South, a Network Rail maintenance delivery unit to the west and Thames Valley Park to the east.

2.2 Environmental Setting

- 2.2.1 The proposed route is located alongside the River Thames. The proposed route also passes over the River Kennet at its confluence with the River Thames at Kennet mouth.
- 2.2.2 The Environment Agency (EA) 'Flood Map for Planning' shows that the western part of the proposed route lies within Flood Zone 2 'Medium Probability' (between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding). The eastern part of the proposed route lies within Flood Zone 3 'High Probability' (greater than 1 in 100 (1%) annual probability river flooding).
- 2.2.3 The land to the west of the River Kennet is situated on a historical landfill that was also used in the past for railway sidings. The land to the east of the River Kennet comprises undeveloped land. The land directly to the east of the River Kennet is combined amenity grassland and scrub with scattered trees, then continuing eastwards towards Thames Valley Park vegetation advances into denser woodland.
- 2.2.4 The closest designated heritage asset to the application site is the Grade II Listed Railway Bridge and attached Accommodation Bridge over the River Kennet. This lies immediately to

the south of the application site. These were built as part of the Isambard Kingdom Brunel industrial engineering era for The Great Western Railway in the mid-19th century.

- 2.2.5 The River Terrace Deposits and the White Chalk Subgroup geology at the application site are classified as Principal Aquifers. The Alluvium is classified as Secondary A Aquifer.
- 2.2.6 RBC has declared an Air Quality Management Area (AQMA) due to exceedances of the annual mean nitrogen dioxide objective. The AQMA comprises Reading town centre and extends out along the major arterial roads and part of the application site is located within the AQMA. However, the exceedance in this area is primarily as a result of the railway line emissions. Electrification of the line is underway that should result in an improvement to local air quality.
- 2.2.7 The Thames Path National Trail and National Cycle Route 4 / Route 5 – Thames Valley pass through the application site alongside the River Thames.
- 2.2.8 Part of the Coal, Kennet mouth and Kings Meadow East Local Wildlife Site (LWS) is located within the application site. The LWS is classed as ‘open mosaic habitat on previously developed land’.

2.3 TVP P&R

- 2.3.1 The TVP P&R is located between the approximate OS NGR of 473339 (E), 173844 (N) in the west and 473574 (E), 173928 (N) in the east. It is located to the south of the River Thames and to the west of Thames Valley Business Park, adjacent to the north and east of the proposed East MRT scheme at its junction with the TVP roundabout. The site comprises a triangular plot of land of approximately 1.35 ha, also known as Broken Bow. The existing status of the site is undeveloped land, characterised by dense woodland and scrubland.
- 2.3.2 The TVP P&R development, at the P&R, was granted full planning permission (application ref: 161596) by WBC on 10/11/2016 for:

“Development of a Park & Ride facility providing approximately 277 vehicular spaces, motorcycle parking and associated vehicular access and landscaping.”

- 2.3.3 The approved site layout for the development is provided in **Appendix 2**, which incorporates the following:
- Vegetation and arboriculture clearance;
 - Provision of 277 car parking spaces, to include 6 disabled spaces;
 - A bus stop;
 - Provision for motorcycle, and cycle parking;
 - A bus shelter;
 - Access onto the roundabout that connects the A329(M), and Thames Valley Park Drive;
 - 2m wide maintenance strip along the site boundary.
- 2.3.4 The TVP P&R development is proposed to be accessed via a new access road running west off the existing TVP roundabout junction, adjacent to the south of the P&R parking area. The route of the East MRT scheme is proposed to connect with the permitted P&R access road, running up to the TVP roundabout junction.
- 2.3.5 It is understood that detailed design work is currently being undertaken for the TVP P&R development, following the grant of full planning permission, and it is currently scheduled to commence construction in 2019.

- 2.3.6 The TVP P&R development and the East MRT development are being progressed separately and have been designed to be capable of operating independently. However, it is anticipated that the proposed East MRT scheme and TVP P&R uses would complement each other once both developments become operational.

3 The Proposed Development

3.1 Introduction

- 3.1.1 The purpose of the scheme is to improve access to and from Reading for buses, pedestrians and cyclists. This will help relieve the forecast increase in travel demand along the heavily congested A4 corridor, which provides access to existing residential, employment and educational areas, as well as Reading town centre, Reading railway station and substantial planned development in Wokingham Borough and Reading town centre.
- 3.1.2 The scheme will seek to achieve the following key aims:
- Provide a sustainable alternative solution to accommodate future travel demand on the London Road corridor;
 - Increase capacity for movement of people thereby reducing journey times and forecast congestion, as well as improving reliability of journeys along the corridor;
 - Support economic development in Reading Town Centre, east Reading, Wokingham and within the Thames Valley;
 - Develop a high quality, sustainable system which provides a sustainable alternative to the private car;
 - Facilitate a future MRT network for Reading and the Thames Valley;
 - Allow access for mobility impaired and pushchairs.

3.2 Development Description

- 3.2.1 The development comprises the following:
- “Construction of a segregated fast-track public transport, pedestrian and cycle bridge, comprising concrete bridge structure with a river span of 59.5m and a land span of 316m, supported by concrete columns and reinforced soil embankment, with associated footpath links, junction improvements and landscaping.”*
- 3.2.2 Plans illustrating the proposed development and to be read with the following description are provided in **Appendix 3-1**.
- 3.2.3 The new route is approximately 0.9 km in length, running from the Tesco Superstore/ Napier Road junction in the west to the Thames Valley Park Drive roundabout in the east. A new priority junction will be created at the existing Tesco Superstore/ Napier Road junction, as well as an additional link to the existing 2 arm roundabout at the Thames Valley Park Drive / A3290 junction.
- 3.2.4 The development comprises a dedicated bus lane and separate segregated footway and cycleway for pedestrians and cyclists, including a new bridge across the River Kennet.
- 3.2.5 The segregated footway and cycleway will each run along the entirety of the route, with the footway being 2m wide and the cycleway being 3m wide. The East MRT bus lane will be 6.5m wide at the western section of the route, allowing for a two-way bus only corridor. As the route approaches the bridge over the River Kennet, the bus route narrows to a 3.5m wide one-way

road which is signal controlled at both sides of the bridge. To the east of the River Kennet bridge the bus route widens again to a two-way 6.5m wide carriageway up to the roundabout.

Operation

- 3.2.6 The operation of the route will link the A3290 at Thames Valley Park, adjacent to a proposed new Park & Ride facility, to Napier Road, Reading town centre and the railway station. Once the proposed TVP P&R becomes operational, the East MRT route will also facilitate travel directly to and from the TVP P&R facility itself.
- 3.2.7 It is proposed that buses will use the East MRT route running at regular intervals throughout the day, with more frequent bus services running during the peak AM and peak PM periods. It is proposed that the existing fleet of buses, currently travelling to and from TVP via the A4, will instead use the East MRT route.
- 3.2.8 The East MRT scheme also provides the opportunity for the TVP P&R to operate at weekends and for extended hours during the week due to additional bus services serving the TVP P&R.
- 3.2.9 Cyclists and pedestrians will be able to use the route at all times via the segregated cycleway and footway. The route will not be open to any other forms of traffic including taxis and motorcycles.

Bridge Design

- 3.2.10 The proposed bridge form comprises a single span of 59.5m along a gentle camber across the mouth of the River Kennet. The bridge will be aligned parallel to the adjacent listed bridge, at a slight angle across the mouth of the river.
- 3.2.11 The bridge comprises an in-situ concrete bridge deck with galvanised steel parapet, and supported by weathering steel bridge girders. The eastern bridge abutments comprise a row of columns, with the western abutments comprising a retaining concrete wall, supported by a soil embankment slope.
- 3.2.12 The maximum height of the bridge will be 6.77m, matching that of the adjacent rail bridge, so as to minimise impacts on views and the setting of the listed bridge and support navigation.
- 3.2.13 A 204m viaduct is proposed on the eastern side of the route in order to accommodate flood flows beneath the structure and minimise flood impacts to the structure itself. The viaduct is raised up on concrete columns and rises gently at a steady 1:43 gradient from ground level in the east, adjacent to the proposed TVP P&R, to the new bridge across the Kennet in the west at a maximum height of 6.77m.
- 3.2.14 The viaduct, comprising an in-site concrete deck and crossbeams, stretches across 8 equal spans of 25.5m supported by concrete columns.

Lighting

- 3.2.15 The design of the proposed development is supported by a lighting strategy to facilitate the safe and secure functioning of the scheme. The lighting strategy is based on secured by design principles focusing on crime reduction and promoting people's safety, and minimising the impact on the surrounding natural and built environment.
- 3.2.16 Lighting is proposed along the length of the route to support operational requirements, with different types proposed dependant on the requirements of that area and the location of sensitive receptors.

- 3.2.17 Along the route, predominantly 6m columns are proposed along the footway and cycleway, oriented towards the road junction to avoid light spillage. No lighting is proposed on the bus carriageway itself to minimise impacts on the surrounding area.

Landscape

- 3.2.18 A landscape strategy for the application site has been developed in parallel with the design of the East MRT itself. Key features of the landscape strategy include:
- Retention of existing trees and vegetation where practicable, with additional planting of new native trees and shrubs to complement the retained trees;
 - Selective management and re-planting of the woodland within the LWS to replace trees which require removal, increase diversity to the woodland, and provide additional screening of the East MRT embankment and route from locations within the LWS woodland and on the tow-path adjacent to the LWS. This will include selective removal of existing shrubs and groundcover, e.g. removal of non-native species such as Buddleia and the invasive Virginia Creeper, to increase light levels and promote the growth of a more diverse ground flora;
 - Retain and enhance / extend the existing area of Acid Grassland at the western end of the East MRT route, to provide biodiversity enhancement with scattered new tree planting to create a glade with dappled shade;
 - Enhancements to the riparian corridor, for example removal of Himalayan Balsam, retention of Lodden Lily and the installation of riparian habitat rafts alongside selected areas of engineered banks (east of the River Kennet mouth);
 - Creation of tussocky grassland between the River Thames and the East MRT, and wildflower hydro-seeded grassland on the East MRT embankment;
 - Provision of 'green panels' (for example, living willow panels or CorTen steel panels with climbers), set at an angle to the direction of the tow-path / PRoW / Thames Path to filter people's views of the East MRT and provide additional 'greening' of the space; and
 - Creation of reclaimed boat planters, providing raised beds for urban community food growing;

Surface Water Drainage

Eastern side (River Kennet Bridge and Viaduct)

- 3.2.19 Due to the need to keep the viaduct as slender as possible, a combined kerb drainage system is proposed. This will collect the surface water runoff to the low point (adjacent to the TVP P&R). This will then be picked up by a carrier drain, into an oil interceptor and then into a cellular storage attenuation system prior to discharging into the River Thames at the greenfield runoff rate of 5 litres per second (l/s). At times the outfall will be submerged so a non-return flap valve will be installed on the outfall. The attenuation will be sized such that it can continue to operate in times of flood.

Western side (adjacent to Tesco)

- 3.2.20 A channel system (Althon or similar) is proposed which will run both sides of the cambered carriageway as these systems incorporate attenuation. The surface water will then be picked up by a carrier drain to a point approximately adjacent to the realigned towpath, into an oil interceptor and then, due to level constraints, a pumping station will need to be installed which

will pump the water to an outfall into the Thames, again at a controlled greenfield rate of 5l/s and with a non-return flap valve on the outfall.

- 3.2.21 Within the site there are both overhead and underground electricity cables and underground high pressure and medium pressure gas mains. These will require localised diversions to accommodate the proposed development. Further information is provided within the Utilities Statement submitted with the planning application.

Floodplain Capacity

- 3.2.22 In order to demonstrate no detrimental impact to fluvial (river) floodplain capacity it is proposed to incorporate a number of areas of localised ground lowering to 'compensate' for any losses in floodplain storage, up to the reference 1 in 100 annual probability plus allowance for climate change flood level, in accordance with local and national planning policy. These areas consist of:

- lowering of an earth embankment to the immediate north-east of the Tesco store;
- a cutting into the embankment at the eastern end of the East MRT (where the land rises out of the floodplain near the new P&R site); and
- a shallow scrape of and (<250mm) immediately east of Kennetmouth.

- 3.2.23 These works support an overall improvement in floodplain storage capacity up to the reference flood level as a result.

3.3 Incorporated Mitigation

- 3.3.1 The EIA has been carried out concurrently with an iterative design process. This has sought to identify that the parameters and detail of the application incorporate the necessary mitigation to reduce the likelihood of significant effects arising from the proposed development. Environmental mitigation has been embedded into the proposed development including:

- Implementation of a Construction Environmental Management Plan (CEMP). The CEMP will outline the arrangements and management practices to adopt in order to minimise the environmental effects of construction.
- Ecological management and mitigation strategy to created alongside the CEMP, and avoiding the most ecologically sensitive areas of the Coal, Kennetmouth and Kings Meadow East LWS, whilst enhancing habitats specifically within the on and off site portions of this LWS.
- Incorporation of a number of sustainable drainage measures to minimise the risk of fluvial flooding, such as flood compensation measures, and flood storage areas in the form of an embankment of the west side of the River Kennet.
- A selection of landscape enhancements on the site to maintain/ improve the landscape including re-planting of woodland and tree plantings, creation of new grasslands, and the integration of a riparian habitat adjacent to the River Thames.
- A sensitive lighting strategy to minimise night-time effects on the surrounding area including directional lighting columns to face away from the more sensitive ecological areas, and exclusion of lighting on the East MRT bus route aspect of the development.
- Bridge design and height to coincide with the existing listed bridge adjacent to the site, to not disrupt the heritage and character of this local asset, and result in no additional mitigation.

3.4 Consideration of Alternatives

- 3.4.1 The EIA Regulations require an ES to include an outline of the main alternatives considered by the applicant, indicating the main reasons for the choice made, taking into account the environmental effects.
- 3.4.2 This legal requirement is expressed in very general and high-level terms, requiring only the inclusion of an "outline" of "main" alternatives and an "indication" of "main" reasons. Although a full description of alternatives and a full assessment of their likely environmental effects are not required, sufficient detail should be provided to allow for a meaningful comparison between the alternatives and the proposed development.
- 3.4.3 It is a matter for the applicant to decide which alternatives it intends to consider. The EIA Regulations do not expressly require that an applicant considers alternatives, although it is widely encouraged at the policy level, both European and domestic, and is a feature of EIA best practice.
- 3.4.4 The consideration of alternatives in this ES complies with that requirement and has regard to the guidance in the PPG on Environmental Impact Assessment. The PPG states "Where alternative approaches to development have been considered, the Environmental Statement should include an outline of the main alternatives studied and the main reasons for the choice made, taking into account the environmental effects."
- 3.4.5 Whilst environmental effects are relevant when choosing between alternatives, other factors are also relevant. The main selection criteria which the applicant has used when choosing between the alternatives which it has considered include: planning policy, viability, design quality, site constraints and opportunities and environmental effects.
- 3.4.6 A two stage options appraisal was used to deliver the scheme objectives. The development options were compared with a 'do nothing' option where the following outcomes were identified:
- Ever increasing congestion and worsening transport conditions will act as an inhibitor to growth with private sector investment attracted to other areas with better accessibility;
 - Air Quality issues will be exacerbated without the mitigation afforded by intervention; and
 - The resident population will be disadvantaged by restricted accessibility to jobs services.
- 3.4.7 The options considered and the options assessment process are documented in **Appendix 3-2**.

4 Construction and Site Management

4.1 Introduction

4.1.1 The construction stage of the development will be carefully managed to limit the impact on the local area.

4.1.2 The key activities associated with the construction of the development are:

- Removal or diversion of utilities;
- Removal of vegetation on site where applicable;
- Erection of site compounds (assumed to be on each side of the River Kennet), including temporary buildings;
- Commencing road construction;
- Installation of bridge beams;
- Construction of full height embankment;
- Completion of bridge and viaduct structures;
- Landscaping and drainage works; and
- Highway works to connect the East MRT route into the wider network.
- To accommodate the proposed 7m bridge height the East MRT will be raised on either side of the bridge. A retaining wall will be used to the west of Tesco Car Park while imported fill material will be used to the east of the River Kennet.

4.2 Construction Works & Programme

4.2.1 It is anticipated that construction of East MRT will commence in July 2019 (although seasonal site clearance may need to be done earlier in 2019) with completion expected in Spring 2022. Given the length of the East MRT the development is likely to be implemented in phases and therefore construction is unlikely to be undertaken at any one location through the construction period.

4.3 Construction Management

4.3.1 A CEMP will be prepared for the site, and should be secured through a suitably worded planning conditions to manage the impacts of construction. The CEMP will identify a range of measures, in relation to aspects such as dust and air pollution, ground conditions, ecology, water resources, which will be utilised during the construction of the proposed development.

4.3.2 The format of the CEMP will need to be reviewed once the construction techniques and methodologies to be employed are confirmed. The CEMP will identify the responsibilities of all parties involved in the design, management and construction of the development. It is anticipated that matters to be addressed in a CEMP would include aspects set out in below, as well as the construction mitigation and enhancement measures identified in each of the topic chapters of this ES. Measures include:

- **Health and Safety:** contractor's competence, risk method statements, contractor communication, welfare facilities, accident reporting, standards on personal protective equipment, display of safety notices etc.;
- **Contaminated land:** compliance with method statements for storage;

- **Noise and vibration:** selection of appropriate plant, site operation hours, monitoring, complaints procedure;
- **Dust and air:** prevention and mitigation measures, complaints procedure, wheel washing (if required);
- **Waste minimisation and management:** reduction, re-use, recovery, disposal (including Duty of Care), should include details of waste management and procurement policy;
- **Ecology:** timing of site clearance, tree protection (as necessary), new planting;
- **Water resources:** storage of materials, protocol for spillages and managing site drainage during construction, including from soil and silt run-off into nearby water courses;
- **Emergency planning & incident control:** incident recognition training, emergency planning, incident reporting and control;
- **Site logistics & operations:** safety and security; working hours; maintaining access, general site layout including compound location, construction traffic, access routes; and
- **Community liaison:** meetings and community contact, telephone helpline, designated point of contact.

5 Assessment Method

5.1 Introduction

- 5.1.1 This chapter describes the process by which the EIA has been carried out. It includes a discussion of the relevant Regulations, the EIA process, consultations, and the over-arching assessment methods applied. Details of the technical method followed for each topic are presented in each of the chapters (7-14.) as appropriate.

5.2 EIA Regulations

- 5.2.1 The process of EIA for this development is governed by the Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (as amended 2015) (the EIA Regulations). The EIA Regulations implement EC Directive 85/337/EEC, as amended, into domestic legislation. The initial Directive and its three amendments have been codified by Directive 2011/92/EU.
- 5.2.2 This Directive has also been amended in 2014; however, the implications were only enacted in the UK in May 2017 and the transitional arrangements set out in the Regulations means that the proposed development falls under the 2011 Regulations.
- 5.2.3 The EIA Regulations set out the requirements for undertaking an EIA and Schedule 4 details the required information for inclusion in an Environmental Statement (ES).

5.3 The EIA Process

- 5.3.1 In general terms, the main stages in the EIA are as follows:
- Screening – determining the need for EIA;
 - Scoping – identifying significant issues, determining the scope for EIA;
 - Data review – draw together and review available data;
 - Baseline surveys – undertake baseline surveys and monitoring;
 - Assessment and iteration – assess likely significant effects of development, evaluate alternatives, provide feedback, to design team on potential adverse impacts, modify development, incorporating mitigation (including potential monitoring any long-term management), assess effects of mitigated development; and
 - Preparation of ES

5.4 Screening & Scoping

- 5.4.1 The proposed development is considered to constitute Schedule 2 development under the EIA Regulations as an Infrastructure Project (Section 10) for which the area of development exceeds 1 ha (for Part (f) 'Construction of roads') and which could result in significant environmental effects. The application site is smaller than the 'indicative criteria and threshold' in the Planning Practice Guidance (PPG) to be used when considering if there are likely to be significant environmental effects, however, the sensitivity of the receiving environment and river crossing means that there remains the potential for likely significant effects. RBC has therefore voluntarily prepared this ES to be submitted with the planning application.
- 5.4.2 A scoping request letter was submitted to both RBC and WBC on 11th August 2016, addressing the intention to undertake an EIA to be documented in an ES. The scoping letter was supported by a scoping report, which has set out information on the application site and the proposed development, the topics to be assessed as part of the EIA, the methodology for

assessment and the rationale for those topics to be scoped out of the EIA. A copy of the EIA Scoping Report is provided in **Appendix 5-1**.

5.4.3 RBC provided its EIA Scoping Opinion on 25th November 2016, a copy of which is provided in **Appendix 5-2**. Following adoption of the Scoping Opinion there was further discussion with RBC to agree the approach to cumulative assessment with the TVP P&R and to agree the other committed developments to be considered in relation cumulative effects,

5.4.4 This ES has been prepared to fulfil the requirements of the EIA Scoping Opinion and subsequent discussion.

5.5 Consultation

5.5.1 A comprehensive programme of consultations has been undertaken with statutory and non-statutory organisations, as well as a public exhibition in July 2016 at the Waterside Centre. Such consultations have been undertaken to inform the emerging design and the EIA.

5.5.2 As part of the EIA process, the following consultees have been consulted to agree the scope of the assessment, to provide information, to discuss assessment methods and findings, and agree mitigation measures and design responses:

- RBC;
- WBC;
- Environment Agency;
- Design South East Panel;
- Berks, Bucks and Oxon Wildlife Trust; and
- Natural England

5.5.3 The EIA has been undertaken to fulfil the requirements of the consultees and the assistance of these consultees is gratefully acknowledged.

5.5.4 Consultation specific to each of the environmental topics covered in this ES is set out in the relevant ES environmental topic chapters and the technical appendices are presented in **Volume 2** of the ES. A full overview of pre-application consultation undertaken is provided within the Consultation Report, which is also submitted as part of the planning application.

5.6 Committed Developments

5.6.1 The EIA Regulations require the assessment to consider the likely significant effects of the proposed development in the context of other local developments likely to come forward, as well as cumulative effects that may result from the proposed development and these other developments.

5.6.2 Common EIA practice is that committed developments are considered to be planning permissions that are partially built out and extant planning permissions. Planning applications that have been submitted but not yet determined are also frequently considered. Generally, allocations or potential future planning applications are not considered as such allocations are covered by Strategic Environmental Assessment/ Sustainability Appraisal and/or as a result of insufficient information being available on potential development to gain meaningful assessment.

5.6.3 As noted in Chapter 2, the TVP P&R was granted full planning permission in October 2016. In response to the EIA Scoping Opinion the EIA has considered the likely significant cumulative

effects of the East MRT with the TVP P&R development. This is provided within a discreet section within each of the topic chapters.

- 5.6.4 In addition, a review has been undertaken of major extant or submitted planning applications in the vicinity of the application site. The full details of committed developments within 1km of the application site and their most recent decision status (as of end of May 2017) are included as **Appendix 5-3**, along with a plan identifying their location. It is worth noting that the search performed included a 1km radius from the edge of any part of the site, as to capture all major developments in close proximity to the application site.
- 5.6.5 Each of the topic chapters has then reviewed this schedule of developments and has undertaken a further cumulative assessment of the likely significant effects of the combined development with these other major local developments. The level of detail for these cumulative assessments is tailored to the topic and effects under consideration.

5.7 Assessment Assumptions

- 5.7.1 The following assumptions have been used to make sure that the EIA has undertaken an assessment of the reasonable worst case effects (unless otherwise specified in each of the technical chapters):
- Baseline conditions have been identified on the basis of current conditions at the site, with assumptions made as to the potential for changes in the future to enable an assessment of the effects of the development against a 'no development' baseline scenario;
 - The TVP P&R will be built as permitted;
 - The assessment of likely significant cumulative effects has assumed that the committed developments identified in **Section 5.6** will be built out as set out in the documents supporting these applications;
 - The East MRT will be constructed in accordance with the programme outlined in Chapter 4 and the construction works will be undertaken in accordance with a CEMP secured by way of a suitably worded planning condition;
- 5.7.2 Any limitations in preparing this ES are noted in each of the environmental topic chapters, as appropriate.

5.8 Assessing Effects

Establishing Baseline Conditions

- 5.8.1 Baseline conditions have been established based on technical surveys and assessments, the reporting of which is sometimes too detailed and lengthy for incorporation into chapters of this ES. In such instances, the technical survey and stand-alone assessment reports are provided in full as an appendix to the ES (Volume 2), with a relevant summary and cross-reference provided in the appropriate chapter in Volume 1. The geographical scope of these surveys and assessments has been based on the likelihood for significant effects.
- 5.8.2 To provide a basis for decision making, effects of the development are compared against the current baseline. However, where there are potentially significant changes anticipated (e.g. in traffic levels), future conditions have been used to describe the baseline, as explained in the relevant topic chapter. This also includes consideration as appropriate of the committed developments identified in **Section 5.6**.

Assessing Construction Effects

- 5.8.3 A principal contractor has not yet been appointed. It is not possible to be definitive about the construction works and therefore the assessment of likely significant environmental effects during the construction phase has been based on available information and reasoned judgements based on professional experience to enable the likely significant environmental effects to be identified.
- 5.8.4 Construction effects will be temporary and intermittent, i.e. they will not occur at one place throughout the duration of the construction works. The potential duration and intermittency of effects is identified as appropriate in ES Chapters 7-15.

Assessing Operational Effects

East MRT

- 5.8.5 To provide a robust assessment and one that is generally consistent between ES environmental topic chapters, the EIA has focussed on assessing the likely significant environmental effects of the completed development. This approach allows for the full environmental effects of the development have been considered.
- 5.8.6 The level of detail within each of the assessment has been tailored to the likelihood of significant environmental effects. Where detailed information is not yet available on the proposed development, reasoned professional judgement has been used to enable a robust assessment of the likely significant effects of the proposed development.

Combined Development

- 5.8.7 In accordance with the EIA Scoping Opinion, the EIA has assessed the likely significant effects of East MRT and the TVP P&R. This has been undertaken on the basis of the assessment of the likely significant effects of the East MRT in isolation and the reports submitted with the TVP P&R application.
- 5.8.8 The EIA has then undertaken a detailed assessment of the likely significant effects of the combined development. Typically, this has been to the same level of detail as to the assessment of the East MRT in isolation, with any adaption of this approach tailored to the likelihood of significant effects.

5.9 Uncertainty

- 5.9.1 The prediction of future effects inevitably involves a degree of uncertainty. Where necessary, the ES has described the principal factors giving rise to uncertainty in the prediction of environmental effects and the degree of the uncertainty.
- 5.9.2 Confidence in predictions will be engendered by employing accepted assessment methodologies, e.g. Guidance for Ecological Impact Assessment by the Institute of Ecology and Environmental Management. Uncertainty inherent within the prediction will be described. As a general principle the ES will describe credible, reasonable worst case foreseeable events and their effects.
- 5.9.3 Uncertainty also applies to the success or otherwise of measures to mitigate negative environmental effects. Where the success of a mitigation measure is uncertain, the extent of the uncertainty has been identified in the ES.
- 5.9.4 The ES has identified, in accordance with Schedule 4 of the EIA Regulations, any difficulties that have been encountered in undertaking the assessment. This may include the collection of baseline data, the prediction of future conditions, data not being available, etc. It remains the

intention of the project team however to make sure that the ES provides a robust assessment of the likely significant environmental effects of the proposed development and that sufficient information is provided to inform decision makers of the likely significant environmental effects and the requirements for mitigation.

5.10 Mitigation

- 5.10.1 One of the most important functions of the EIA process is to identify ways to mitigate adverse environmental effects and identify opportunities that the proposed development may have for environmental improvements. The EIA Regulations require an ES to contain: *“A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment”*.
- 5.10.2 A hierarchy of methods for mitigating significant adverse effects has been followed; these are, in order of preference:
- Enhancement - opportunities that the proposed development may provide to enhance the local and wider environment (e.g. enhanced walking and cycling/ leisure opportunities);
 - Avoidance – designing a proposed development in such a way that avoids effects on the environment (e.g. designing to minimise the impact on the nearby sensitive ecological areas and river systems);
 - Reduction – design the development or employ construction methodologies such that significant effects identified are reduced (e.g. employment of sustainable drainage to mitigate effects of development in flood prone areas); and
 - Compensation – providing off-site enhancement in order to compensate for where onsite mitigation may not be possible (e.g. landscaping mitigation measures such as the introduction of a riparian habitat on the River Thames).
- 5.10.3 Environmental effects remaining after mitigation measures have been incorporated are termed residual effects and have been fully described in the ES.
- 5.10.4 Where necessary, the ES describes measures that will be taken to monitor the effectiveness of controls, compensation, mitigation, enhancement and remediation. Monitoring will enable any shortfall in expectations directly attributable to the development to be addressed.

Embedded Mitigation

- 5.10.5 There is a distinction between mitigation that is incorporated or ‘embedded’ into the design of the development (embedded mitigation) and mitigation that is subsequently identified in order to prevent, reduce or offset any remaining significant adverse effects. Embedded mitigation may include, for example, reducing the maximum height of infrastructure to mitigate visual effects, or retaining existing hedgerows to mitigate ecological effects.
- 5.10.6 Embedded mitigation evolves through the iterative design process and early consideration of the likely significant impacts is essential to incorporating suitable embedded mitigation measures. Design principles of the development have been established and the ES will

document the embedded mitigation measures that have been employed within the design in response to the identification of potentially significant effects, as well as subsequent mitigation.

5.11 Residual Effects

- 5.11.1 The incorporation of mitigation measures, primarily as part of the scheme design and construction phase, has been reported where appropriate and likely significant residual effects that remain will be described and assessed according to the significance criteria set out below.

5.12 Significance Criteria

- 5.12.1 As noted above, the EIA Regulations require that the ES describes likely significant effects of the proposed development. However, there is no applicable definition of significance and interpretations differ. In accordance with the European Commission's Guidance on Scoping, the EIA will study those effects that will influence decision-making or those where there is uncertainty about their magnitude. This approach is consistent with best practice for EIA in the UK.
- 5.12.2 The significance of an effect is typically the product of two factors, the value of the environmental resource affected and the magnitude of the impact, while consideration may also need to be given to the likelihood of an effect occurring. A significant effect may arise as a result of a slight impact on a resource of national value or a severe impact on a resource of local value. In addition, the accumulation of many non-significant effects on similar local resources geographically spread throughout the scheme may give rise to an overall significant effect. An example of this might be the loss of ecological habitat of low value at many locations.
- 5.12.3 This approach to assessing and assigning significance to an environmental effect has relied upon such factors as legislative requirements, guidelines, standards and codes of practice, consideration of the EIA Regulations, the advice and views of statutory consultees and other interested parties and expert judgement. The following questions are relevant in evaluating the significance of likely environmental effects:
- Which risk groups are affected and in what way?
 - Is the effect reversible or irreversible?
 - Does the effect occur over the short, medium or long term?
 - Is the effect permanent or temporary? Does the effect increase or decrease with time?
 - Is the effect of local, regional, national or international importance?
 - Is it a positive, neutral or adverse effect?
 - Are health standards or environmental objectives threatened?
- 5.12.4 Specific significance criteria will be prepared for each specialist topic, based on the above and the generic criteria set out in **Table 5-1**.

Table 5-1: Generic Significance Criteria

Significance level	Criteria
Severe	Only adverse effects are assigned this level of significance as they represent key factors in the decision-making process. These effects are generally, but not exclusively associated with sites and features of international, national or regional importance. A change at a regional or district scale site or feature may also enter this category.
Major	These effects are likely to be important considerations at a local or district scale but, if adverse, are potential concerns to the project and may become key factors in the decision-making process.
Moderate	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.
Minor	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process. Nevertheless, they are of relevance in enhancing the subsequent design of the project and consideration of mitigation or compensation measures.
Negligible	No effect or effect which is beneath the level of perception, within normal bounds of variation or within the margin of forecasting error.

- 5.12.5 Effects that are described as ‘severe’, ‘major’ or ‘moderate’ are determined to be *significant*; and effects that are described as ‘minor’ or ‘negligible’ are determined to be *not significant* in the context of the EIA Regulations.

5.13 Cumulative Effects and Impact Interactions

- 5.13.1 As set out in section 5.6, the ES has assessed the likely significant cumulative effects of the combined development and the combined development with other local major developments within each of the topic chapters of the ES.
- 5.13.2 Likely significant impact interactions have assessed within a separate chapter of the ES (Chapter 15) in order to identify the overall effect of the proposed development on environmental receptors, as it draws together the outcomes of individual discipline assessments.

6 Planning Policy Context

6.1 Introduction

- 6.1.1 This chapter sets out the national and local planning policy which is relevant to the proposed development.

6.2 National Policy

- 6.2.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and outlines how these are expected to be applied to both plan-making and decision-making.
- 6.2.2 Paragraph 17 of the NPPF sets out 12 core planning principles which should underpin both plan-making and decision-taking. Most notably and of relevance to the current proposals, planning should:
- “proactively drive and support sustainable economic development to deliver the homes, business and industrial units, infrastructure and thriving local places that the country needs;”
 - “promote mixed use developments, and encourage multiple benefits from the use of land in urban and rural areas, recognising that some open land can perform many functions (such as for wildlife, recreation, flood risk mitigation, carbon storage, or food production);” and
 - “actively manage patterns of growth to make the fullest possible use of public transport, walking and cycling, and focus significant development in locations which are or can be made sustainable”
- 6.2.3 Of further relevance, Paragraph 29 of the NPPF states that the transport system should be balanced in favour of sustainable transport modes, in order to give people a choice about how they travel. Paragraph 30 provides additional encouragement for solutions which support reductions in greenhouse gas emissions and reduce congestion.

National Planning Practice Guidance

- 6.2.4 On 6 March 2014, the Department for Communities and Local Government (DCLG) launched the national planning practice guidance (NPPG) web-based resource. This resource replaced a number of previous planning practice guidance documents and now provides practical planning advice to support the overarching principles set out in the NPPF and to inform development proposals. The current development proposals are being progressed in the context of relevant guidance set out in the NPPG.

6.3 Local Planning Policy

- 6.3.1 In accordance with Section 38 (6) of the Planning and Compulsory Purchase Act 2004, development control decisions must be made in accordance with the development plan, unless material considerations indicate otherwise. As the extent of the proposed development

straddles both the boroughs of Reading and Wokingham, the development plan for each local authority area is applicable.

Development Plan

- 6.3.2 The application site is predominantly located within the jurisdiction of Reading Borough Council where the adopted development plan comprises:
- Core Strategy (adopted January 2008, altered January 2015);
 - Proposals Map (adopted October 2012);
 - Reading Central Area Action Plan (adopted January 2009); and
 - Sites and Detailed Policies Document (adopted October 2012, altered January 2015).
- 6.3.3 The Council is currently working on a new Local Plan, which when adopted will replace the current adopted Core Strategy and guide how Reading will develop up to 2036. The Council undertook consultation on Issues and Options between January and March 2016, and a subsequent draft Local Plan consultation between May and June 2017. Adoption is anticipated in 2019.
- 6.3.4 The application site is also partially located within Wokingham Borough Council where the adopted development plan comprises:
- Core Strategy (adopted January 2010); and
 - Managing Development Delivery (MDD) Local Plan (adopted February 2014).
- 6.3.5 WBC is also currently preparing a new Local Plan which will guide development in the borough for the next 20 years. WBC undertook Issues and Options consultation in August 2016 and anticipate adoption of the updated Local Plan in 2019.

Supplementary Planning Guidance

- 6.3.6 Reading Borough Council has adopted a number of additional supplementary planning documents to provide additional specific guidance to supplement the provisions of the adopted development plan. Additional planning guidance adopted by RBC and of relevance to the current development proposals is contained within the Infrastructure Delivery Plan (adopted July 2011) and the Local Transport Plan 3: Strategy 2011-2026 (adopted April 2011).
- 6.3.7 Wokingham Borough Council has also adopted a number of additional supplementary planning documents to support the provisions of the development plan. Additional planning guidance adopted by WBC and of relevance to the current development proposals is contained within the Infrastructure Delivery Plan (June 2012, supporting the MDD Local Plan), Borough Design Guide SPD (adopted May 2012), Sustainable Design and Construction SPD (adopted May 2010), and Local Transport Plan 3: Strategy 2011-2026 (adopted 2011).

Key Planning Policies

Reading Borough Council

- 6.3.8 The principle of the proposed development within the jurisdiction of RBC has been established within adopted local planning policy. Policy CS20 of the Core Strategy requires development proposals to contribute appropriately to the provision of a balanced transport network as outlined in the Local Transport Plan, including the implementation of core transport infrastructure projects. The East MRT Scheme is identified as a priority transport project in Core Strategy Policy CS21 and the Local Transport Plan, where implementation will be prioritised. Policy CS21, together with Policies RC1 and RC3 of the Reading Central Area

Action Plan and accompanying Figure 6.2, add that land needed for implementation of the East MRT Scheme (identified as running east from Napier Road) will be safeguarded from other forms of development.

- 6.3.9 The Proposals Map identifies a number of designations for land in or adjacent to the Site, where local planning policy provides relevant detailed guidance. The development proposals and environmental assessment work will be undertaken having regard to the specific requirements of relevant planning policies outlined below.
- 6.3.10 Land between Napier Road and the River Kennet, including the application site (in part), is designated as an 'Area safeguarded for Crossrail extension'. Paragraph 15.3.6 of the Sites and Detailed Policies Document notes that the Council will consult with Crossrail Limited on planning applications within this designated land. Land between Napier Road and the River Kennet includes a designated Green Link, where Policy DM17 of the Sites and Detailed Policies Document requires development to maximise enhancement opportunities and incorporate landscaping features.
- 6.3.11 Land between the River Thames/Kennet and Tesco, within (in part) and to the north of the Site, is identified as a Major Landscape Feature and an area of public open space, where Policies CS37 of the Core Strategy, SA17 of the Sites and Detailed Policies Document and RC14d of the Reading Central Area Action Plan are relevant. Policies CS37 and SA14 seek to preserve the character and appearance of the Major Landscape Feature, whilst Policy RC14 requires development to protect and make a positive contribution towards the quality of areas of public open space. This area of land also includes a designated Cycle Route, where Policy SA14 of the Sites and Detailed Policies Document seeks to ensure that development does not detrimentally affect the identified route but provides improvements where possible.
- 6.3.12 Land adjacent to the railway line, within (in part) and to the south of the Site, is identified as an Area of Archaeological Potential. Core Strategy Policy CS33 states that areas of historic importance will be protected and where appropriate enhanced.
- 6.3.13 A number of additional planning policies contained within the development plan provide further detailed guidance which will be taken into account in the preparation of the current development proposals. In particular, the development proposals will seek to adhere to the provisions of: Core Strategy Policies CS1 (Sustainable Construction and Design), CS3 (Social Inclusion and Diversity), CS7 (Design and the Public Realm), CS8 (Waterspaces), CS28 (Loss of Open Space), CS34 (Pollution and Water Resources), CS35 (Flooding), CS36 (Biodiversity and Geology); and Sites and Detailed Policies Document Policies SA16 (Public And Strategic Open Space), DM1 (Adaptation To Climate Change), DM4 (Safeguarding Amenity), DM12 (Access, Traffic And Highway-Related Matters), DM16 (Provision Of Open Space), and DM19 (Air Quality).

Wokingham Planning Policy

- 6.3.14 The principle of the proposed development within the jurisdiction of WBC is addressed within local planning policy and supporting documentation. Policy CP6 of the Core Strategy supports schemes that provide for sustainable forms of transport, and Policy CP10 of the Core Strategy, together with Policy CC08 and Appendix 3 of the MDD Local Plan, safeguard areas identified for improvements to the strategic transport network including mass rapid transit along the A4/A329 corridors, improvements to public transport services and improvements to footpath and cycle networks.
- 6.3.15 Appendix 3 of the MDD Local Plan refers to strategic transport projects indicated on Figure 24 of the Local Transport Plan, which includes a proposed highway scheme connecting west into Reading Borough from Thames Valley Park and the proposed Park & Ride facility. Supporting text to Policy SAL09 of the MDD Local Plan (Paragraphs 4.68-4.69) requires development

proposals to have regard to the 'Cross Town Link' proposals from Thames Valley Park being pursued by RBC.

- 6.3.16 The Proposals Map identifies a number of designations for land in or adjacent to the Site, where local planning policy provides relevant detailed guidance. The development proposals and environmental assessment work will be undertaken having regard to the specific requirements of relevant planning policies outlined below.
- 6.3.17 Land adjacent to the west of the roundabout at Thames Valley Park, including the application site (in part), is located within a 'Major Development Location', where development proposals are acceptable in principle in accordance with Core Strategy Policy CP9. Core Strategy Policy CP09 requires that proposals outside of defined Development Limits (including part of the Site) contribute to enterprise and promote recreation, whilst not leading to excessive encroachment.
- 6.3.18 Land adjacent to the west of the roundabout at Thames Valley Park is also allocated for development under Policies SAL07 and SAL09 of the MDD Local Plan for either 2,700sqm commercial floorspace or a Park & Ride facility and associated development. A planning application has been submitted for a Park & Ride facility in this location.
- 6.3.19 Thames Valley Park and Sutton's Industrial Estate, located to the east and south of the Site, are identified as Core Employment Areas within the Borough, where development for business, industry or warehousing is acceptable in accordance with Policy CP15 of the Core Strategy.
- 6.3.20 A number of additional planning policies contained within the development plan provide further detailed guidance which will be considered in the current development proposals. In particular, the development proposals will seek to adhere to the provisions of: Core Strategy Policies CP3 (General Principles for Development), CP7 (Biodiversity), and MDD Local Plan Policies CC03 (Green Infrastructure, Trees and Landscaping), CC04 (Sustainable Design and Construction), CC06 (Noise), CC09 (Development and Flood Risk), CC10 (Sustainable Drainage), TB21 (Landscape Character) and TB23 (Biodiversity and Development).

7 Socio-Economics

7.1 Introduction

7.1.1 This chapter, prepared by Peter Brett Associates LLP (PBA) on behalf of Reading Borough Council (RBC) Highways and Transport Department, assesses the socio-economic impact of the East MRT and the East MRT combined with the Thames Valley Park & Ride (TVP P&R). It provides:

- A review of relevant socio-economic policy and strategy documents;
- The socio-economic baseline context;
- An assessment of gross employment generated in construction and operational phases;
- An assessment of net employment and Gross Value Added (GVA)¹ impacts once operational; and
- The cumulative impacts when considered alongside committed development.

7.2 Policy Context

7.2.1 Relevant planning policies are summarised in the Planning Statement.

7.2.2 Planning, housing and economic development policies relating specifically to socio-economics are provided in **Appendix 7A: Policy**.

7.2.3 A review of policy and strategy documents identifies an emphasis on sustainable travel policies and objectives set out in national policy. The NPPF advocates managing patterns of growth and making the fullest use of public transport, walking and cycling, and focusing on major developments which are or can be the most sustainable. Paragraph 35 notes that plans should protect and exploit opportunities to accommodate the efficient delivery of goods and people. It promotes a balance of land uses to minimise journey times for employment, shopping, leisure education and other activities.

7.2.4 The sub-region's growth strategy is premised on connectivity, given the area's links to London and polycentric economic geography. Key priority areas within the Strategic Economic Plan (TVB Strategic Enterprise Partnership, 2015) are identified as the delivery of housing, enhanced urban connectivity, and improving the STEM skills base and targeting business support. It recognises the importance of the area's international connectivity (particularly given the areas proximity to London) and commits to continuous investment particularly through Local Growth Funding and implementation of the SEP. In particular, the plan aims to address constraints on strategic growth including near capacity on road and rail networks.

7.2.5 More generally, the TVB Growth Deal (2014) aims to enhance urban connectivity to address strategic infrastructure priorities. This is crucial to achieving new housing delivery (particularly in Wokingham) and improving journey times across the LEP area.

7.2.6 Reading's Core Strategy (amended 2015) and Reading's Central Area Action Plan (2009) supports economic development as complementary to existing public transport services. Policy CS10 notes the importance of supporting major office developments along key transport corridors. Policy CS 13 similarly notes that employment development should provide mitigation measures in line with impacts on housing, labour, skills and the transport network,

¹ Gross Value Added (GVA) is a measure of the value of goods and services produced in an area

recognising potential pressures on a 'tight' labour market. Development control policies CS25-CS27 advocate the development of centres.

- 7.2.7 Wokingham's Core Strategy sets out key policies with respect to sustainable development. Among environmental improvements, this includes demonstrating a support for reducing travel need, and providing functional, attractive, accessible, safe and accessible schemes. Development control policies (CP9) notes that the scale and location of development proposals need to reflect existing levels of facilities and services at a location, in addition to accessibility. CP10 sets out improvements to the Strategic Transport Network, which similarly identifies the need for improved accessibility in public transport through the East MRT projects. Reading's draft Local Plan (2017) identifies the East MRT as necessary infrastructure to provide alternative's to car use, encourage sustainable transport, reduce congestion and improve accessibility and air quality. The East MRT and other accessibility improvements are consistent with town centre improvement.

7.3 Consultation

- 7.3.1 No consultations have been carried out to prepare this socio-economic assessment.

7.4 Methodology

Study Area

- 7.4.1 The study areas adopted for the socio-economic assessment reflects the geography of anticipated impacts. The economic impacts are measured on a 60-minute drive time catchment reflecting typical travel to work patterns. The 60-minute drive time study area is shown in the map provided in **Appendix 7B: Study Area**. The baseline also provides information on Reading Borough Council and Wokingham Borough Council labour market areas.

Assessment

- 7.4.2 The main stages of the approach are as follows:

- **Review Available Data/Information:** Data and information from national and local databases has been reviewed. Key data sources include: Experian 2017 (based on Census 2011 data); Office of National Statistics data; East Reading Mass Rapid Transit Business Case (2016) and PBA Demand Model Outputs 2021 and 2031 (2017).
- **Baseline Conditions:** The study area's current socio-economic position has been described using standard indicators:
 - o Economic: the area has been described using a combination of publically available National Statistics and indicators including Experian 2017, Census 2011 and NOMIS 2017;
 - o Social: the area's demographic structure has been examined within the 60-minute study area; and
 - o Policy Context: planning, economic development and other relevant policy have been reviewed to identify related economic, social and regeneration objectives that the proposed development may affect (whether contributing to their realisation or otherwise).

- **Assessment of Effects:** A detailed assessment of likely significant effects on the local and national economy during construction and operation has been undertaken, covering:
 - Direct economic impacts: jobs and GVA² that are wholly or largely related to the proposed development;
 - Indirect economic impacts (beneficial and negative): jobs and GVA generated in the study area in the chain of suppliers of goods and services to the direct activities;
 - Induced economic impacts: jobs and GVA created by direct and indirect employees' spending in the study area or in the wider economy; and
 - Wider economic and social effects (beneficial and negative): employment and income generated in the economy.

7.4.3 As noted above, best practice principles³ have been applied to assess the employment impact of the proposed development. An economic impact model, consistent with appraisal guidance, has been used to measure net additional employment and GVA.⁴ Appropriate economic appraisal guidance⁵ and professional judgment based on economic impact assessment elsewhere has been used to estimate values for:

- **Deadweight** - what would happen in the absence of the proposed development;
- **Leakage** - the proportion of employment opportunities accessed by people living outside the study area;
- **Displacement** – the proportion of proposed development benefit accounted for by a reduction in benefit elsewhere;
- **Substitution** - when a firm substitutes one activity for another to take advantage of public sector assistances; and
- **Multipliers** – to estimate further economic activity associated with additional income and supplier purchases.

Mitigation and Enhancement Measures

7.4.4 Mitigation and enhancement measures have been identified where appropriate to address potentially significant effects and enhance potential beneficial effects.

Residual Effects

7.4.5 Likely significant residual effects (i.e. effects following any proposed mitigation) on the local and wider socio-economic context have been identified.

Significance of Effects

7.4.6 The significance of residual effects have been determined using professional judgement and the Significance Criteria Table 5-1.

² GVA is a measure in economics of the value of goods and services produced in an area

³https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf

⁴ The economic impact model allows the guidance to be applied to the quantitative elements of the employment impact assessment

⁵ HM Treasury Green Book Economic Appraisal Guidance (see Reference section).

Cumulative Effects

- 7.4.7 An assessment of likely cumulative effects is provided. This takes into account the major local committed developments identified in Chapter 5. Cumulative impacts have been calculated for the East MRT and the East MRT combined with the TVP P&R.

7.5 Baseline Conditions

- 7.5.1 **Appendix 7C: Baseline** provides a description of the socio-economic conditions within the local area (Reading and Wokingham Borough Council local authority areas) and the socio-economic study area (60-minute drive time from the centre of the proposed development).
- 7.5.2 The aspects considered include: population and demographic change; travel to work patterns; unemployment rates, education and skills; projected employment change to 2025 and 2035 and Gross Value Added (GVA) by industry.

7.6 Socio-economic Summary

- 7.6.1 Reading, Wokingham and the 60-minute drive time study area are characterised by higher than average population growth projections. Each area has a rapidly increasing working age population which is contrary to the national trend.
- 7.6.2 Economic activity is high in the 60-minute drive time area and within Reading and Wokingham. The population is highly qualified, with about half of the population employed in highly skilled jobs. The areas share of professional, scientific and technical activities is particularly high compared to wider region and national averages. Across the council areas, greatest growth to 2035 is expected in finance and insurance, professional services, utilities, accommodation and food services and recreation.
- 7.6.3 Reading, Wokingham and the study area⁶ is defined by a mobile but relatively contained workforce. A significant number of people that work in Reading or Wokingham travel east-west to places of work. Travel patterns are similar around the application site, with the majority of local employees travelling from within Reading and from Wokingham. Detailed in Table 7C8, it is clear that a significant proportion of the workforce in Reading travel from Wokingham and vice versa to a more limited extent.

7.7 East MRT Site

- 7.7.1 The East MRT Full Business Case (2016) states “*the eastern corridor has reached capacity, therefore no further growth can be accommodated including planned growth for the local and wider area.*”⁷
- 7.7.2 The scale of impact that can be directly linked to the project has been calculated using the future growth set out in the Full Business Case and the increase in new East MRT users which is used as a proxy for realised capacity. **Table 7-1** shows 15,000 jobs and 6,000 homes are planned in the area. This scale of development is threatened by the lack of road network capacity.

Future Growth – Planned Projects

⁶ 60 minute drive time

⁷ MRT East Full Business Case (2016), Page 6

Table 7-1: Planned Projects

Jobs/ Home	Location
15,000 jobs	Thames Valley Park and IQ Winnersh
2,000 homes	Kenavon Drive, Station Hill, Chatham Place and Royal Mail sites
4,000 homes	Wokingham

Source: East MRT Full Business Case (Page 6)

Uplift in patronage as a result of the East MRT

- 7.7.3 A Demand Model prepared by PBA as part of Demand Modelling supporting the Business Case for East MRT provides an indication of the level of capacity that will be released by the East MRT. Table 7-2 shows 404 additional new users will use the East MRT, 249 (62%) of which are directly related to the bus service and 155 (38%) are related to the Thames Valley Park Park & Ride (TVP P&R) as part of the Business Case.

Table 7-2: Uplift in patronage as a result of the East MRT

Demand Model Outputs	2021	2031
Bus	249	334
TVP P&R	155	240
Combined	404	574

Source: PBA Demand Model Outputs; PBA Transport Team

Capacity Released

- 7.7.4 The information above relating the capacity constraints, planned developments and capacity released by the East MRT has been used to estimate the number of jobs and homes that can be considered to be enabled by the additional network capacity. The East MRT will provide enough network capacity to accommodate a further 2.7%-3.8% new jobs and between 3.4%-4.8% new homes identified in the East MRT Full Business Case.⁸

Table 7-3: Capacity Released by East MRT

Demand Model Outputs	Jobs (15,000)		Homes (6,000)	
	2021	2031	2021	2031
Bus	1.7%	2.2%	2.1%	2.8%
TVP P&R	1.0%	1.6%	1.3%	2.0%
Combined	2.7%	3.8%	3.4%	4.8%

Source: PBA

- 7.7.5 As at May 2017 there is no planning conditions attached to planning permissions linked to future road projects. However, planning permissions are now being linked to the South MRT.

⁸ 15,000 jobs and 6,000 homes (Table 7.1)

Given the capacity restrictions it is possible future permissions will be linked to planned projects that release network capacity (such as the East MRT).

- 7.7.6 East MRT also potentially opens up substantially more capacity than tested in the Demand Model for the Business Case. In the future East MRT could be connected to further P&Rs in the area. Crossrail is also likely to result in additional journeys to Reading railway station. East MRT can therefore be viewed as the first step in delivering greater urban connectivity and accessibility.
- 7.7.7 The information in Table 7-3 is therefore a conservative estimate based on available information. This data has been used in the economic impact model to show the net additional impact that can be directly linked to the East MRT and the East MRT and the TVP P&R (please see **Appendix 7D: Additionality Data & Assumption**).

7.8 East MRT Site

Potential Effects

- 7.8.1 The section estimates the potential economic, social and housing related impacts that could result from the East MRT 's construction and operational phases.

Construction: Employment & GVA

Gross Impact

- 7.8.2 Construction impacts have been estimated for the construction of the East MRT and the net additional impact on housing through released capacity.
- 7.8.3 A standard method has been used to estimate the number of direct construction jobs supported by the construction phase. Estimated construction costs are £16.0 million for the East MRT and £862million for the 6,000 new homes.
- 7.8.4 According to the Office of National Statistics construction expenditure of £104,380⁹ supports one construction worker for a one-year period (i.e. the output per head in the construction sector). On this basis, East MRT construction phase would create 153 person years of construction employment while the new homes would create 8,259 person years of construction employment.¹⁰

Net Additional Impact ¹¹

- 7.8.5 **Only a proportion of this impact and associated benefit is directly attributable to the East MRT and not all of it will occur in the study area.**¹² A bespoke Economic Impact Model consistent with best practice guidance has been built to measure the net additional impact in the study area (i.e. factoring in deadweight, leakage, displacement and multipliers).
- 7.8.6 The Economic Impact Model applies the Additionality Data and Assumptions in Appendix Table7D1 to the scale of planned development. Table 7-4 below shows the gross and net additional impacts of the East MRT.

⁹ ONS Construction Statistics Annual (rebased to 2016 prices)

¹⁰ £16m/ 104,380 = 153

¹¹ i.e. factoring in deadweight, leakage, displacement and multiplier effects

¹² This is because workers may live and spend wages outside the area. Activity at the proposed development may also reduce activity elsewhere in the economy

Table 7-4: Gross Impact of Planned Projects and Net Additional Impact of East MRT

Demand Model Outputs	Estimated Construction Cost (£m)	Gross		Net Additional Impact in 60-minute study area	
		Person years	GVA (£m)	Person years	GVA (£m)
East MRT	£16.0	153	£12.8	56	£4.7
Housing	£862.0	8,259	£687.5	135	£11.2
Total				191	£15.9

Source: PBA

7.8.7 The East MRT is likely to support an estimated:

- **56 net additional temporary construction local jobs in the study area during the construction of the East MRT; and**
- **135 net additional temporary construction local jobs in the study area from the scale of planned housing that can be directly linked to the capacity released through road network improvements.**

7.8.8 Gross Value Added (GVA) is a measure of the value of goods and services produced in an area. GVA per head in the construction industry in South East England is £83,247 compared to £70,618 nationally.¹³ It is estimated the proposed development will therefore have the following net additional GVA impact:

- **£4.7 million net additional GVA** relating to the East MRT; and
- **£11.2 million net additional GVA** related to the housing element.

7.8.9 Construction impacts are considered to be of local level scale which classified as **minor beneficial effects** according to the Significance Criteria in Table 5-1.

Operation: Employment & GVA Impacts

7.8.10 Some 15,000 jobs are planned in the East of Reading c.15 years. The PBA Demand Model Assessment shows the East MRT will provide between 1.7% - 2.2% capacity (Table 7.3). This information has been used to inform the Operational Additionality assumptions in Appendix 7D2. General non-sector specific employment multipliers and average GVA per head values have been used.

7.8.11 The East MRT will support an estimated:

- **221 net additional operational local jobs in the study area that can be directly linked to the capacity released through road network improvement;**
- **£17.1 million net additional GVA** impact on the local economy;¹⁴ and
- **7 training and apprenticeship places.¹⁵**

¹³ PBA working using Experian 2017 GVA per sector and number of FTEs

¹⁴ 165 x £77,031 (Average GVA per worker in Study Area)

¹⁵ Apprenticeship Statistics: <http://dera.ioe.ac.uk/22847/1/SN06113.pdf>

- 7.8.12 Construction impacts are considered to be of local level scale which classified as **minor beneficial effects** according to the Significance Criteria in Table 5-1.

7.9 Mitigation and Enhancement

Mitigation

- 7.9.1 The construction and operational impacts are considered to be beneficial and do not require specific mitigation measures.

Enhancement

- 7.9.2 The scale of beneficial construction effects that could be secured locally could be enhanced by maximising the value of supply chain contracts that could be delivered locally. This could be achieved through meet the contractor days or business engagement with Thames Valley Berkshire Local Enterprise Partnership, the Reading and Wokingham Chamber of Commerce or other relevant organisations.
- 7.9.3 The construction programme also offers employment opportunities for participants of construction related apprenticeship programmes such as the Thames Valley Construction Training Association.
- 7.9.4 The local impact could be maximised through liaison with local career, employability and recruitment services to help maximise the number of jobs that are taken up by local residents. This would help lower the area's unemployment rate and improve productivity and competitiveness.

7.10 Combined Site (East MRT and Thames Valley Park Park & Ride (TVP P&R))

Potential Effects

- 7.10.1 Potential employment and GVA effects have been calculated for the combined project using the same methodology for the East MRT. The differentiating factors are the consideration of the extra capacity released from the combined project and the higher construction costs.
- 7.10.2 **Table 7-5** shows the East MRT and TVP P&R scheme are estimated to cost a combined £19.6million.¹⁶ This scale of construction activity will provide **69 net additional temporary construction jobs** and provide **£5.7million net additional GVA**.
- 7.10.3 Combined the East MRT and the TVP P&R will release enough network capacity to accommodate housing growth that will directly provide **231 net additional temporary construction jobs** and **£19.3million net additional GVA**. This is 72% higher than the East MRT without the TVP P&R.

¹⁶ £16.0million + £3.6million = £19.6million

Table 7-5: Gross Impact of Planned Projects and Net Additional Impact of East MRT and Thames Valley Park & Ride

Demand Model Outputs	Estimated Construction Cost (£m)	Gross		Net Additional Impact in 60-minute study area	
		Person years	GVA (£m)	Person years	GVA (£m)
East MRT and TVP P&R	£19.6	188	£15.6	69	£5.7
Housing	£862.0	8,259	£687.5	231	£19.3
Total				300	£25.0

Source: PBA

Operation: Employment & GVA Impacts

7.10.4 The East MRT and TVP P&R will support an estimated:

- **380 net additional** operational local jobs in the study area that can be directly linked to the capacity released through road network improvement;
- **£29.3 million net additional GVA** impact on the local economy;¹⁷ and
- **11** training and apprenticeship places.¹⁸

7.10.5 Construction impacts are considered to be of local level scale which are classified as **minor beneficial effects** according to the Significance Criteria in Table 5.1. The employment effects are 72% higher than the East MRT in isolation.

Mitigation and Enhancement

Mitigation

7.10.6 The construction and operational impacts are considered to be beneficial and do not require specific mitigation measures.

Enhancement

7.10.7 Enhancement effects are comparable to those described for the East MRT (please see paragraph 7.12.14).

Sensitivity Analysis

7.10.8 The results above are based on the East MRT and TVP P&R directly releasing capacity that can support a small number of jobs and homes. Based on the findings of the Full Business Case the project will have a much greater effect on employment and housing development (please see 7.8.1). Appendix E provides the results of a sensitivity analysis that assesses greater levels of impact that can be directly related to the East MRT.

7.11 Residual Effects

7.11.1 The residual effects have been estimated based on the information provided in the Baseline Conditions section and the assessment of Potential Effects section. The assessment relies on

¹⁷ 380 x £77,031 (Average GVA per worker in Study Area)

¹⁸ Apprenticeship Statistics: <http://dera.ioe.ac.uk/22847/1/SN06113.pdf>

professional judgement based on the Significance Criteria outlined in Table 5.1 along with consideration of the study area's labour market and scale of effect.

7.11.2 The construction phase will provide minor beneficial employment effects for the East MRT and the combined scheme. Beneficial training effects are considered to be negligible. The operational phase will also provide minor beneficial employment effects.

7.11.3 Table 7-6 provides a summary of residual effects along with explanatory comments.

Table 7-6 Summary of Residual Effects (East MRT and East MRT and TVP P&R)

	Quantum of Impact	Description of Impact	Residual Significance Level	Comments
Construction Phase				
Construction Jobs	Creation of jobs during construction phase: East MRT: 191 net additional temporary construction jobs East MRT and TVP P&R 300 net additional temporary construction jobs.	The South East of England has construction workforce containment level of around 55%. It is likely the majority of construction jobs will be taken up by residents with a 60-minute drive time and that most of the positive economic benefit will be secured within this area.	Minor beneficial effect. Minor beneficial effect	Beneficial effects could be maximised through enhanced engagement with local construction firms and other supply chain companies.
Training and apprenticeships	The development will support approximately: Between 7-11 construction related apprenticeship placements.	Potential for onsite training in construction Potential development of local skills which in turn will benefit the local economy.	Negligible beneficial effect	Apprentices in South of England remain below their 2011/12 level
Operational Phase				
Operational jobs	Creation of jobs during operational phase: East MRT 221 net additional local jobs. East MRT and TVP P&R	The new jobs will be created in a targeted growth sector. The Project's development would present an opportunity for local residents with appropriate skills and experience that currently work outwith the local area. The new jobs would provide employment opportunities for graduates	Minor beneficial effect	Beneficial effects could be maximised through local career, employability and recruitment services.

	Quantum of Impact	Description of Impact	Residual Significance Level	Comments
	380 net additional local jobs	related training courses and would be suitable for reskilling some of the areas currently available workforce.	Minor beneficial effect	

7.12 Green Infrastructure

- 7.12.1 Chapter 12: Landscape and Visual provides a qualitative assessment of effects on trees, vegetation watercourses, open space and footpaths/cycleways. This has been prepared in accordance with the significance criteria in Table 5.1 and includes an assessment of residual effects 15 years after completion once planting is expected to have matured.

7.13 Cumulative Effects

- 7.13.1 **Appendix 7F: Cumulative Assessment** provides a schedule of projects that have been considered for the cumulative assessment. Tables 7F1 to Table 7F5 in Appendix 7 provides analysis that demonstrates there is sufficient construction labour in the study area to build the East MRT along with the cumulative projects along with the East MRT and TVP P&R without creating any minor labour market distortions (i.e. the total requirement does not exceed 15% of the workforce for any category).
- 7.13.2 Table 7-7 below provides the headline findings that summarise the cumulative assessment. A total of 1,074 temporary construction jobs would be required to build nearby projects, or 1,300 including the East MRT and the TVP P&R. This accounts for less than 1% of the available construction workforce. The cumulative projects could therefore be built using labour from the study area without creating any minor labour market distortions.

Table 7-7 Required Employment and Absorption Capacity within Labour Market Area.

Employment & Absorption	Value (£ or %)
Total Annual Investment (excluding. East MRT, TVP P&R)	£112.1m
Construction Requirement: Cumulative Projects only	
Total annual employment	1,074
% of construction workforce (in study area)	0.5%
Construction Requirement: Cumulative Projects & East MRT	
Total required workforce including East MRT	1,266
% of construction workforce (in study area)	0.5%
Construction Requirement: Cumulative Projects & East MRT & TVP P&R	
Total required workforce including East MRT, TVP P&R	1,300
% of construction workforce (in study area)	0.6%
Notes:	

Employment & Absorption	Value (£ or %)
- Person years of construction labour prepared using a consistent method as the main assessment - Construction costs estimates have been prepared using Building Cost Information Service data (April 2017)	

- 7.13.3 The Absorption Capacity analysis assumes a worst case scenario (i.e. all cumulative projects will be constructed at the same time.) In practice this is unlikely to occur for a number of reasons, as discussed in Appendix 7F.
- 7.13.4 Based on this assessment, there will be no adverse cumulative impact on the wider labour market area, as the total projects are anticipated to constituted below 15% of total construction labour in the study area. Combined, the cumulative projects will provide a beneficial stimulus to the study area economy through the provision of construction related training and employment opportunities and supply chain linkages.

7.14 Summary

- 7.14.1 The East MRT and the TVP P&R is consistent with local and sub regional strategy, policy and economic objectives. It will enable high value employment opportunities and new housing that is required for a study area characterised by above average population growth and high levels of economic activity, skills and qualifications.
- 7.14.2 This chapter has examined the socio-economic conditions of the area, which suggests a relatively highly skilled and qualified working populations. Reading's Core Strategy describes as a 'tight' labour market, with high levels of travel between the adjacent councils of Reading and Wokingham.
- 7.14.3 The assessment incorporates the findings of the East MRT Full Business case which states the eastern corridor has reached capacity, therefore no further growth can be accommodated. The assessment also includes the results of the Demand Modelling supporting the Business Case to provide an indication of the scale of network capacity that could be released.
- 7.14.4 The economic impact assessment is consistent with best practice guidance.¹⁹ The East MRT in isolation and when combined with the TVP P&R will deliver minor beneficial employment effects over the construction and operational phases.
- 7.14.5 The cumulative effects of the scheme have also been considered. The analysis demonstrates sufficient construction labour in the study area to build the East MRT and TVP P&R along with the cumulative projects without creating any minor labour market distortions.
- 7.14.6 The cumulative impact assessment shows the East MRT and TVP P&R when combined with nearby construction projects would not account for more than 1% of the study areas construction workforce. This requirement is well below the level that could create minor labour market distortions.

¹⁹ HM Treasury Green Book Guidance – Appraisal and Evaluation in Central Government

7.15 References

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Data

- Experian Drive Time Labour Market Data, 2017
- NOMIS Labour Market Data 2017

8 Transport and Access

8.1 Introduction

- 8.1.1 This chapter has been prepared by Peter Brett Associates LLP (PBA) to document the likely significant effects of the proposed East MRT Scheme in terms of traffic and transport.
- 8.1.2 A Transport Statement (TS) has been prepared supporting the planning application for the proposed East MRT Scheme, and is included in **Appendix 8-1**. The TS informed the preparation of this chapter. The reader is referred to the TS where further information is required.
- 8.1.3 This chapter includes a review of the current transport conditions within the study area. It outlines the mitigation measures that have already been incorporated into the proposals, or will be implemented in the future, and then the significance of the residual effects of the East MRT Scheme have been assessed.

8.2 Policy Context

National Planning Policy Framework

- 8.2.1 The National Planning Policy Framework (NPPF, Department for Communities and Local Government, 2012) sets out the Government's economic, environmental and social planning policies for England. These policies articulate the Government's vision of sustainable development, which should be interpreted and applied to meet local aspirations.
- 8.2.2 The NPPF recognises the importance transport policies have in facilitating development, but also in contributing to wider sustainability and health objectives. The Framework identifies at paragraph 32, that all developments that generate significant amounts of movement should be supported by a Transport Statement or Transport Assessment. Plans and decisions should take account of whether:
- “The opportunities for sustainable transport modes have been taken up depending on the nature and location of the site, to reduce the need for major transport infrastructure;
 - Safe and suitable access to the site can be achieved for all people; and
 - Improvements can be undertaken within the transport network that (cost) effectively limit the significant impacts of the development. Development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe”.
- 8.2.3 NPPF paragraphs 34 to 36, identifies that Local Authority plans and decisions should ensure developments that generate significant movements are located where the need to travel will be minimised and the use of sustainable transport modes can be maximised. Plans should protect and exploit opportunities for the use of sustainable transport modes for the movement of goods and people. Therefore, developments should be located and designed where practical to:
- Accommodate the efficient delivery of goods and supplies;
 - Give priority to pedestrian and cycle movements, and have access to high quality public transport facilities;
 - Create safe and secure layouts which minimise the conflicts between traffic and cyclists or pedestrians, avoiding street clutter and where appropriate establishing home zones;

- Incorporate facilities for charging plug-in and other ultra-low emission vehicles; and
 - Consider the needs of people with disabilities by all modes of transport.
- 8.2.4 NPPF recognises that a key tool to facilitate this will be a Travel Plan such that all developments which generate significant amounts of movement should be required to provide a Travel Plan.
- 8.2.5 The provision of a mixture of land uses within larger scale residential developments to provide opportunities to undertake day-to-day activities including work is encouraged by NPPF specifically stating at paragraph 38 that “where practical, particularly within large scale developments, key facilities such as primary schools and local shops should be located within walking distance of most properties.”
- 8.2.6 In respect of setting local parking standards for development, NPPF (at paragraph 39) encourages local planning authorities to take the following into account:
- “The accessibility of the development;
 - The type, mix and use of development;
 - The availability of and opportunities for public transport;
 - Local car ownership levels; and
 - An overall need to reduce the use of high-emission vehicles.”
 - Department for Transport Circular 02/2013: The Strategic Road Network and the Delivery of Sustainable Development
- 8.2.7 In September 2013, The Strategic Road Network and the Delivery of Sustainable Development was published as DfT circular (02/2013). The document sets out Highways England’s (HE) plans to engage with communities and the development industry in order to promote sustainable development and growth whilst requiring the safeguarding of the strategic road network.
- 8.2.8 Travel plans are promoted as an effective way of encouraging sustainable travel. Paragraph 28 states that “the preparation and implementation of a robust travel plan that promotes use of sustainable transport modes such as walking, cycling and public transport is an effective means of managing the impact of development on the road network, and reducing the need for major transport infrastructure”.
- 8.2.9 A Framework Travel Plan (FTP) has been submitted in support of the planning application, in order to provide guidance for new residents and for future occupiers for producing tenant-specific travel plans.

Thames Valley Berkshire LEP Strategic Priorities

- 8.2.10 The LEP seek to “*ensure we have transport infrastructure for the 21st century*”
- 8.2.11 One of LEP’s objectives is “*to secure investment for Thames Valley Berkshire Strategic infrastructure from public or private sources that will cause barriers to growth in the four areas*”:
- Housing and Regeneration
 - Transport
 - Telecommunications

- Utilities

Reading Borough Council Core Strategy

8.2.12 Policy CS21 'Major Transport Projects' states:

"As a regional transport hub, priority will be given to the implementation of the priority transport projects identified in the Local Transport Plan, particularly the upgrading of Reading Station Interchange, Park and Ride Sites, Mass Rapid Transit, road improvements, Quality Bus Routes and associated transport improvements. Land needed for the implementation of priority transport projects will be safeguarded from development, to enable their future provision."

Reading Borough Council Local Transport Plan

8.2.13 Reading Borough Council's Local Transport Plan (2011 – 2026) provides the following detail with regards to their Transport Vision for Connecting Reading:

"Transport in Reading will better connect people to the places that they want to go: easily, swiftly, safely, sustainably and in comfort. We will meet the challenges of a dynamic, low-carbon future to promote prosperity for Reading. Whichever way you choose to travel, by foot or bicycle, motorcycle, bus, rail, car or boat whether to work or education, to leisure or the services you need, our transport system will help you get there."

8.2.14 The LTP provides a number of Area Action Plans (AAP's) for the different areas across the borough, with each of these supporting the implementation of East MRT through 'Opportunities for Addressing Challenges'.

Eastern AAP includes:

- *"To continue to work with Wokingham Borough Council, South Oxfordshire District Council, Oxfordshire County Council and Bracknell Forest District Council to find cross-boundary solutions to transport challenges."*
- *To work with Wokingham Borough Council to progress the implementation of a long term Park and Ride strategy, considering alternative sites to Loddon Bridge, including the possible use of Broken Brow at the northern end of the A3290."*
- *To carry out targeted neighbourhood or area studies, working with Wokingham Borough Council to build on previous work to deliver multi-targeted benefits, including the improvement of public transport journey times and reliability and the management of development pressures. One focus would be on strategic radial routes into Reading and the potential provision of a mass rapid transit supporting a park and ride strategy."*
- *To work with the private sector and Wokingham Borough Council to innovate and secure delivery of integrated transport choices associated with new development proposed within Wokingham Borough."*
- *To work with Wokingham Borough Council to deliver an East Reading Transport Link and associated Park & Ride facilities"*

8.2.15 The LTP notes that: "An MRT system must be designed to meet a set of standards above and beyond a quality local bus. The long-term vision incorporates a network that expands the public transport offer rather than replacing existing networks, and it will be branded as such. The East MRT network extends beyond Reading to offer public transport and interchange options to the wider travel to work area. The Park and Ride objectives and policies support the East MRT and interchange options, aiming to reduce private transport mileage and improve journey times and air quality on some of Reading's busiest roads."

Wokingham Borough Core Strategy

- 8.2.16 High Quality express bus services or mass rapid transit along the A4 and A329 corridors are identified as an integral part of Wokingham Borough Council's Core Strategy. Policy CP10 of the Core Strategy, together with Policy CC08 and Appendix 3 of the MDD Local Plan, safeguard areas identified for improvements to the strategic transport network including mass rapid transit along the A4/A329 corridors, improvements to public transport services and improvements to footpath and cycle networks.
- 8.2.17 The East MRT Scheme will help assist the planning obligations related to South Wokingham (2500 homes) and North Wokingham (1500 homes):
- *"Improvements to the quality and frequency of public transport services along any part of the network" ...*
 - *"High quality express bus services or mass rapid transit along A329 corridor"*

Wokingham Local Transport Plan

- 8.2.18 Policy PT8 Park & Ride: *"The council will promote the use of Park & Ride services and will support the future introduction of new sites in the borough where feasible.*

Over the life of this plan and the development of the adopted core strategy we will work with Reading Borough council and Bracknell Forest Councils to deliver and retain Park & Ride at the following locations:

- *Near to Coppid Beach roundabout on the A329 in Wokingham*
 - *Park and Ride in the vicinity of the M4 junction 11 (MereOak)*
 - *Relocation or retention of the Park & Ride at Winnersh*
 - *Park & Ride located in Thames Valley Park to complement the high quality express bus services or mass rapid transit along the A4 or A329 corridors into central Reading."*
- 8.2.19 This confirms their aspirations to connect to a mass rapid transit system along the A4 or A329.
- 8.2.20 Policy SP1: Support for Major Infrastructure sets out that *"the Council will actively support development of suitable major transport projects that are necessary to support the future growth and success of the Borough. Major Strategic Public Transport, Walking and Cycling Infrastructure includes:*
- *"High quality express bus services or mass rapid transit along the A4 and A329 corridors*
 - *High quality express bus services or mass rapid transit between Reading and Woodley town centres*
 - *High quality express bus services between Green Park and Twyford stations via the Park & Rides in the vicinity of M4, J11 and Loddon Bridge and Winnersh Triangle Railway Station*
 - *Measures to improve accessibility by non-car transport modes along routes to the stations at Green Park and Winnersh Triangle"*

Wokingham Borough Managing Development Delivery (MDD) Local Plan (adopted February 2014).

- 8.2.21 Appendix 3 of the MDD Local Plan refers to strategic transport projects indicated on Figure 24 of the Local Transport Plan, which includes a proposed highway scheme connecting west into

Reading Borough from Thames Valley Park and the proposed TVP P&R facility. Supporting text to Policy SAL09 of the MDD Local Plan (Paragraphs 4.68-4.69) requires development proposals to have regard to the 'Cross Town Link' proposals from Thames Valley Park being pursued by RBC.

8.3 Methodology

Study Area

- 8.3.1 The assessment area includes transport links on the approaches to the proposed East MRT Scheme and alternative routes between the A3290 and Inner Distributor Road at Napier Road/Kings Meadow Road.
- 8.3.2 The assessment area comprises the links listed in **Table 8-1**, and is shown in **Figure 8.1**.

Table 8-1: Assessment Area Links and Junctions

Link	Link Name
L1	Site Access
L2	Thames Valley Park Drive
L3	A3290 between Site Access and A4
L4	A4 London Road South of Shepherds Hill
L5	A4 London Road east of Cemetery Junction
L6	A4 London Road west of Cemetery Junction
L7	Pitts Lane
L8	Church Road
L9	Woodlands Avenue
L10	Whitegates Lane
L11	Palmer Park Avenue
L12	Wokingham Road adjacent to Palmer Park
L13	Crescent Road
L14	Erleigh Road
L15	A329 Kings Road adjacent to Reading College
L16	A329 Queens Road
L17	A329 Kings Road adjacent to Gas Works Road
L18	A329 Forbury Road between Kings Road and Kenavon Drive
L19	A329 Forbury Road between Kenavon Drive and Vastern Road
L20	Vastern Road Rail Bridge
L21	Vastern Road
L22	Napier Road
L23	New East MRT Scheme Route

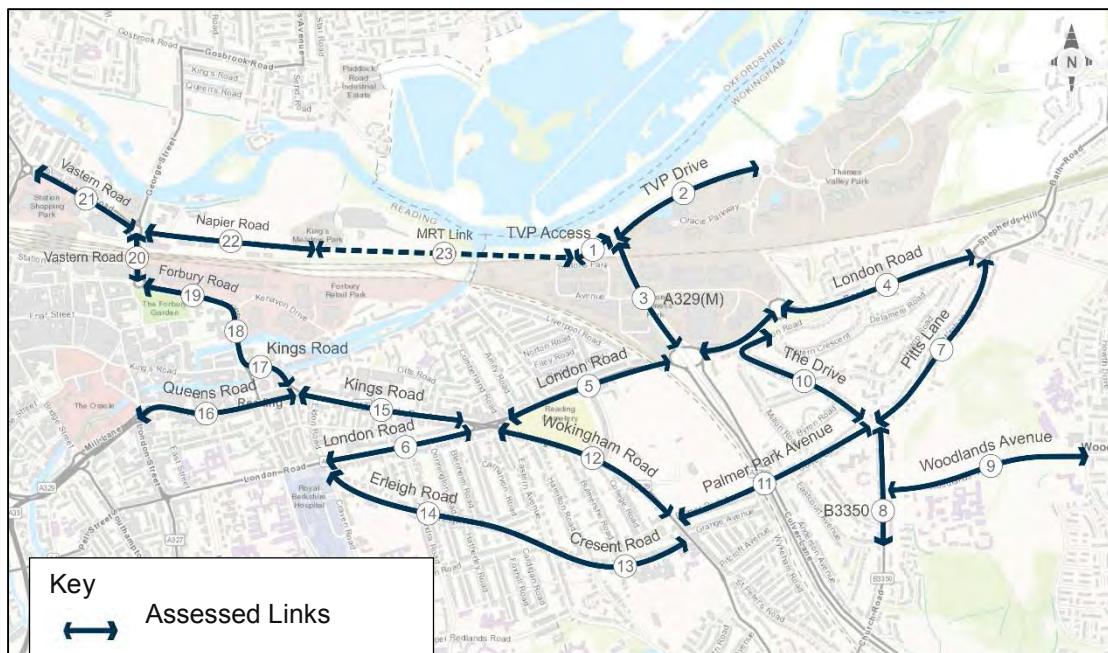


Figure 8.1: Assessment Area

Consultation

- 8.3.3 PBA has consulted with Reading Borough Council and Wokingham Borough Council in their capacity as the local highway authorities.
- 8.3.4 An EIA Scoping Report has also been prepared and informed the preparation of the EIA Scoping Opinion. This chapter has been prepared in accordance with the Scoping Report and Opinion (see **Chapter 5** for more details).
- 8.3.5 A public exhibition was held in July 2016 to present the draft proposals and invite feedback. The comments received during public exhibition were reviewed and considered within the East MRT Scheme proposals.

Baseline Data Collection

Reading Borough Council Traffic Data

- 8.3.6 Automatic Traffic Count (ATC) data is available online which is provided at a number of sites across Reading by RBC. Data is available from 2014 up to present day and includes

information on the quantity, the classes and the speed of vehicles. The data was used from 3 ATC's on London Road east of Cemetery Junction, Kings Road and Wokingham Road.

Thames Valley Park and Ride (TVP P&R) Transport Assessment

- 8.3.7 The TVP P&R has a separate Transport Assessment which provides information on traffic flows. The data relating to the traffic flows at the junction between the A3290 and London Road was taken from the Transport Assessment.

SATURN Model

- 8.3.8 The SATURN model uses data from the Reading road network model to model the effect of a number of schemes. The SATURN Model is based on the 2021 future baseline with allowances for the committed developments, which are expected to be complete by 2021.
- 8.3.9 With the 2021 future baseline the SATURN Model simulates the effect of the East MRT Scheme, the TVP P&R, and both the TVP P&R and East MRT Scheme in the network.

Assessment

Scenarios

- 8.3.10 It is expected that the committed TVP P&R will be delivered in advance of the East MRT Scheme, but there is the potential that these are not delivered in this sequence therefore this Environmental Statement assesses the effect of the East MRT Scheme with and without the TVP P&R and in combination will the TVP P&R.
- 8.3.11 **Table 8-2** shows the schemes compared for each scenario in the Baseline and Proposed Scheme situation.

Table 8-2: The Baseline and Proposed Scheme for each scenario

Reference	Baseline	Proposed Scheme
Scenario 1	2021 Future Baseline (No TVP P&R but with committed development)	2021 Future Baseline with East MRT (No TVP P&R)
Scenario 2	2021 Future Baseline (No TVP P&R but with committed development)	2021 Future Baseline with East MRT and TVP P&R
Scenario 3	2021 Future Baseline (With TVP P&R and with committed development)	2021 Future Baseline with East MRT and TVP P&R

Approach

- 8.3.12 The effects of the TVP P&R have been abstracted from the Transport Assessment prepared to support the planning permission for the scheme. The effects of the East MRT Scheme and

any combined effects have been informed by the SATURN modelling explained in the Transport Statement supporting this planning application.

- 8.3.13 In order to convert the peak hour flows, an automatic traffic counter profile for that link or similar link has been applied based on the location and size of road as well as the direction of the traffic.
- 8.3.14 Links which experienced an increase or reduction in vehicle flow of greater than 10% are investigated in further detail in the assessment.
- 8.3.15 Across all links the AM and PM peak hours flow have been calculated in addition to the AAWT (Annual Average Weekday Travel) for further analysis.

Assessment Criteria

- 8.3.16 The potential effects of the East MRT Scheme which are assessed in this chapter are set out in The Guidelines for the Environmental Assessment of Road Traffic published by The Institute of Environmental Assessment in 1993 (now the Institute of Environmental Management and Assessment –the IEMA Guidelines). Definitions of each of the potential effects identified are set out below along with explanatory text relating to assessment criteria. It is on this basis that the assessment in this chapter has been undertaken.

- **Driver Delay** - delay to drivers generally occurs at junctions where opposing vehicle manoeuvres are undertaken with vehicles having to give or receive priority depending upon the type of junction arrangement. The IEA guidance states that computer modelling programmes can be used to assess the changes in driver delay on the network as a result of the Proposed Development. The guidelines do not state specific thresholds to calculate the magnitude of the effect, however, it does advise that delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system.

Table 8-3 below shows the magnitude-scale applied to the category 'driver delay' for the purpose of this assessment.

Table 8-3: Driver Delay - Scale of Magnitude

Magnitude	Description
Large	Average vehicle delay changes of more than 1 minute as a result of the proposed development during the peak hour periods
Medium	Average vehicle delay changes are between 30 and 60 seconds as a result of the proposed development during the peak hour periods
Small	Average vehicle delay changes are between 20 and 30 seconds as a result of the proposed development during the peak hour periods
Negligible	Average vehicle delay changes are less than 20 seconds as a result of the proposed development during the peak hour periods

- **Public Transport Delay** – this is the delay caused to busses and public transport vehicles as a result of the proposed development. This is different to driver delay as public transport operate along designated routes, such as MRT routes, separate to general vehicles. Additionally, public transport vehicles often have a defined route which cannot be altered to avoid heavy traffic.

- **Severance** - is the perceived division that can occur within a community when it becomes severed by a major traffic artery. This may result from the difficulty in crossing of a heavily trafficked road or a physical barrier. Severance is difficult to measure and by its subjective nature is likely to vary between different groups within a single community. In addition to the volume, composition and speed of traffic, severance is also likely to be influenced by the geometric characteristics of a road, the demand for movement across a road and the variety of land uses and extent of community located on either side of a road. All these factors are considered when determining the likely severance effect.

The main indicators for the assessment of separation have been formulated from studies of changes in traffic flow on observed links and are discussed in the 'Guidelines for the Environmental Assessment of Road Traffic'. It must be recognised that these are guidelines only, and are highly dependent on existing ambient traffic levels. They are in no way definitive measures of separation. Indicators for this assessment are presented in **Table 8-4** below.

Table 8-4: Severance - Scale of Magnitude

Magnitude	Description
Large	Links subject to a 60+% traffic flow increase per day
Medium	Links subject to a 40% - 60% traffic flow increase per day
Small	Links subject to a 30% - 40% traffic flow increase per day
Negligible	Links with daily traffic flow increases below 30%

- **Pedestrian Delay and Amenity** - pedestrian delay and amenity for a particular walking journey are related to traffic flows through the impact of changes in vehicular demand on the ability of pedestrians to cross individual routes. This will therefore affect an individual's desire to make a particular walking journey. Changes in the volume, speed or composition of traffic are most likely to affect pedestrian delay, with the level of severity dependent on the general level of pedestrian activity and the physical condition of crossing points.

The determination of what constitutes a material impact on pedestrian delay and amenity is generally left to the judgement of the assessor and knowledge of local factors and conditions. However, the 'Guidelines for the Environmental Assessment of Road Traffic' suggest that pedestrian delay, the time a pedestrian has to wait before crossing a road, at an individual link should not exceed 40 seconds where no crossing facilities are available. It further advises that the lower threshold equates to a two-way flow of approximately 1,400 vehicles per hour.

Pedestrian amenity can be materially affected where traffic flow is halved or doubled. It can also be improved by the provision of new dedicated facilities or segregated routes.

Table 8-5 shows the magnitude-scale applied to the category 'pedestrian delay and pedestrian amenity' for the purpose of this assessment.

Table 8-5: Pedestrian Delay - Scale of Magnitude

Magnitude	Description
Large	Change in traffic flow of >50%
Medium	Change in traffic flow of 40%-50%
Small	Change in traffic flow of 30%-40%
Negligible	Change in traffic flow of <30% or Traffic flow less than 800 vehicles per hour*

*Note: This threshold is based upon the Manual for Streets (2007) threshold of 10,000 vehicles per day for traffic flow and road safety for streets with direct frontage access. Peak hour flow is estimated at approximately 8.5% of daily flow (850 vehicles), although this has been reduced to 8% (800 vehicles) in order to provide a robust assessment threshold.

- **Fear and Intimidation** - is broadly defined as the relative pleasantness of a journey, it is affected by traffic flow, traffic composition and pavement width / separation from traffic. It encompasses the overall relationship between pedestrians and traffic, including fear and intimidation which is the most emotive and difficult effect to quantify and assess. There are no commonly agreed thresholds for quantifying the significance of changes in pedestrian amenity, although the IEA guidelines suggest a useful study which could be referenced when considering any effect. These thresholds are replicated in **Table 8-6**.

Table 8-6: Fear and Intimidation – Threshold Guidelines

Degree of Hazard	Average traffic flows over 18hr day (vehicles/hour)	Total 18hr HGV flow	Average vehicle speed over 18hr day (mph)
Extreme	1,800	>3,000	>20
Moderate	1,200-1,800	2,000 – 3,000	15 – 20
Slight	600 – 1,200	1,200 – 2,000	10-15

Notwithstanding the thresholds set out above, the guidance suggests that they should be approached with a certain level of caution as the individual factors could be weighted by local circumstances to decide on the overall value of intimidation. For example, a road may show higher speeds but lower flows making crossing easier or high flows but congested and constant traffic, therefore reducing total fear of passing vehicles but increasing crossing difficulties.

Table 8-7 shows the magnitude-scale applied to the category ‘fear and intimidation’ for the purpose of this assessment.

Table 8-7: Fear and Intimidation – Scale of Magnitude

Magnitude	Description
Large	Change in average traffic flow over 18 hours of >1500 vehicles/hr; An average 18 hour HGV flow of >2500; or

Magnitude	Description
	Change in average speed over 18 hours of >17 mph
Medium	Change in average traffic flow over 18 hours of 1200-1500 vehicles/hr; An average 18 hour HGV flow of 2000-2500; or Change in average speed over 18 hours of 15-17 mph
Small	Change in average traffic flow over 18 hours of 600-1200 vehicles/hr; An average 18 hour HGV flow of 1000-2000; or Change in average speed over 18 hours of 10-15 mph
Negligible	Change in average traffic flow over 18 hours of <600 vehicles/hr; An average 18 hour HGV flow of <1000; Change in average speed over 18 hours of <10 mph

- **Accidents and Safety** - the guidance states that overall changes in vehicle kilometres on account of the proposed development may be used to assess the magnitude of impact on accidents and safety. However, the guidance does not prescribe specific criteria, which can be applied to the changes in vehicle kilometres to identify impact magnitude dependent on local circumstances such as traffic speed, flow and composition as well as vehicle conflict and pedestrian activity. The guidelines state that it is this combination that enables a professional judgement to be made regarding the significance of the effect.
- **Dust and Dirt** - the impact of dust and dirt on the highway has been assessed in relation to the nature of development and in particular during the construction stage. This has been considered in **Chapter 10** (Air Quality).
- **Hazardous Loads** - the impact of hazardous loads on the highway has not been assessed, as the development is not expected to generate any hazardous loads in either the construction or operational stage.

8.3.17 The significance of the effect on these topics has been determined on the magnitude of the effect, the sensitivity of the receptor and whether the impact is temporary or permanent.

8.3.18 Further to the level of significance, environmental effects will also be determined by whether effects are temporary or permanent, and whether they are beneficial or adverse.

Significance Criteria

8.3.19 The two principal criteria for determine the significance of an environmental effect are the sensitivity of the receptor (see **Table 8-10**) and magnitude of effect (see **Table 8-3** to **Table 8-5**, as well as **Table 8-7**).

8.3.20 **Table 8-8** shows the significance matrix used to determine the significance of environmental transport effects.

Table 8-8: Transport and Access – Significance Criteria

	Sensitivity of Receptor			
Magnitude of Effect	High	Medium	Low	Negligible

	Sensitivity of Receptor			
Large	Severe	Major	Moderate	Minor / Not significant*
Medium	Major	Moderate	Minor	Not Significant
Small	Moderate	Minor	Not Significant	Not Significant
Negligible	Minor / Not Significant*	Not Significant	Not Significant	Not Significant

*Note: The choice between 'Minor' and 'Not significant' will depend on the specifics of the impact and will be down to professional judgement and reasoning.

- 8.3.21 Further to the level of significance, environmental effects will also be determined by whether effects are temporary or permanent, and whether they are beneficial or adverse.
- 8.3.22 A description of criteria for each level of significance (severe, major, moderate, minor and not significant) can be found in **Table 8-9**.

Table 8-9: Significance Criteria

Significance Level	Criteria
Severe	Only adverse effects are assigned this level of importance as they represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites and features of international, national or regional importance. A change at a regional or borough scale site or feature may also enter this category.
Major	These effects are likely to be important considerations at a local or borough scale but, if adverse, are potential concerns to the project and may become key factors in the decision-making process.
Moderate	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.
Minor	These effects may be raised as local issues but are unlikely to be of importance in the decision-making process.
Not Significant	No effect or effect which is beneath the level of perception, within normal bounds of variation or within the margin of forecasting error.

- 8.3.23 The Guidelines for the Environmental Assessment of Road Traffic provides a general rule that can be used to be used as a screening process to establish the extent of the assessment. The rules are as follows:
- 'Rule 1 - Include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%); and
 - Rule 2 - Include any other specifically sensitive areas where traffic flows have increased by 10% or more'.
- 8.3.24 Categories of receptor sensitivity have been defined based on the principles set out in the Guidelines for the Environmental Assessment of Road Traffic, although in detail, each

receptor assessed will have a different sensitivity to each specific impact. **Table 8-10** sets out how the sensitivity or value of each receptor has been determined.

Table 8-10: Sensitivity / Value of Receptors

Sensitivity / value of a receptor	Examples
High	Schools, colleges and other educational institutions; retirement/care homes for the elderly or infirm; roads used by pedestrians with no footways; high pedestrian activity; accident black spots.
Medium	Hospitals, surgeries and clinics; parks and recreation areas; shopping areas; roads used by pedestrians with narrow footways.
Low	Open space; tourist/visitor attractions; historical buildings; churches

8.4 Baseline Conditions

Walking

8.4.1 There are currently three main pedestrian route (PR) options for pedestrians travelling from the A4 London Road east of the A3290 roundabout to Reading town centre and station, these are:

- PR1) Via London Road and Kings Road,
- PR2) Via the River Kennet towpath,
- PR3) Via the River Thames and Napier Road towpaths,

8.4.2 The routes are illustrated in **Figure 8.2, 8.3** and **8.4**.



Figure 8.2: Pedestrian Route 1 – Via London Road and Kings Road

Pedestrian Route 1 (PR1)

- 8.4.3 PR1 is approximately 1.75 miles in length and the whole route is lit and along footways or through pedestrianised zones. The first section of Route 1 is along the A4 London Road and Kings Road, which are both heavily trafficked main roads with footways and signalised crossings. The Kings Road crosses the Reading Inner Distribution Road (IDR) at a signalised junction with pedestrian crossing facilities. Kings Road then alters in character from a busy main road to a much lower trafficked town centre route. Kings Road then continues along Broad Street and Queen Victoria Street, both of which are pedestrianised, and onto Station Road, a low trafficked street that is primarily a bus route with wide footways either side, to Reading Station.

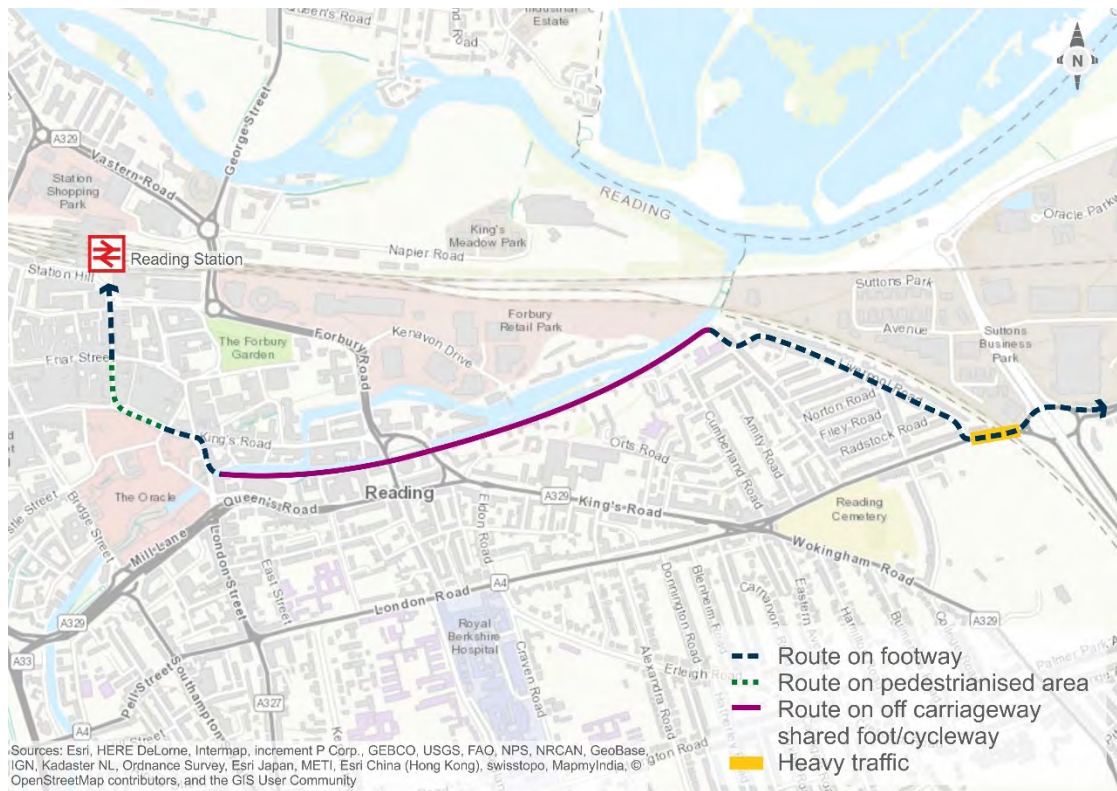


Figure 8.3: Pedestrian Route 2 – Via the River Kennet

Pedestrian Route 2 (PR2)

8.4.4 PR2 is approximately 1.85 miles in length and the whole route is lit and along footways or through pedestrian zones. The first section of the route is along the A4 London Road for approximately 150m, the route then continues along Liverpool Road before reaching the River Kennet towpath. Liverpool Road is a quiet, traffic calmed residential street in a 20mph speed limit zone and the River Kennet towpath is a shared foot/cycle way. The route reaches the town centre at Duke Street, a low trafficked street that is primarily a bus route, which leads to the pedestrianised area of Broad Street. The route then continues along PR1 to Reading Station.

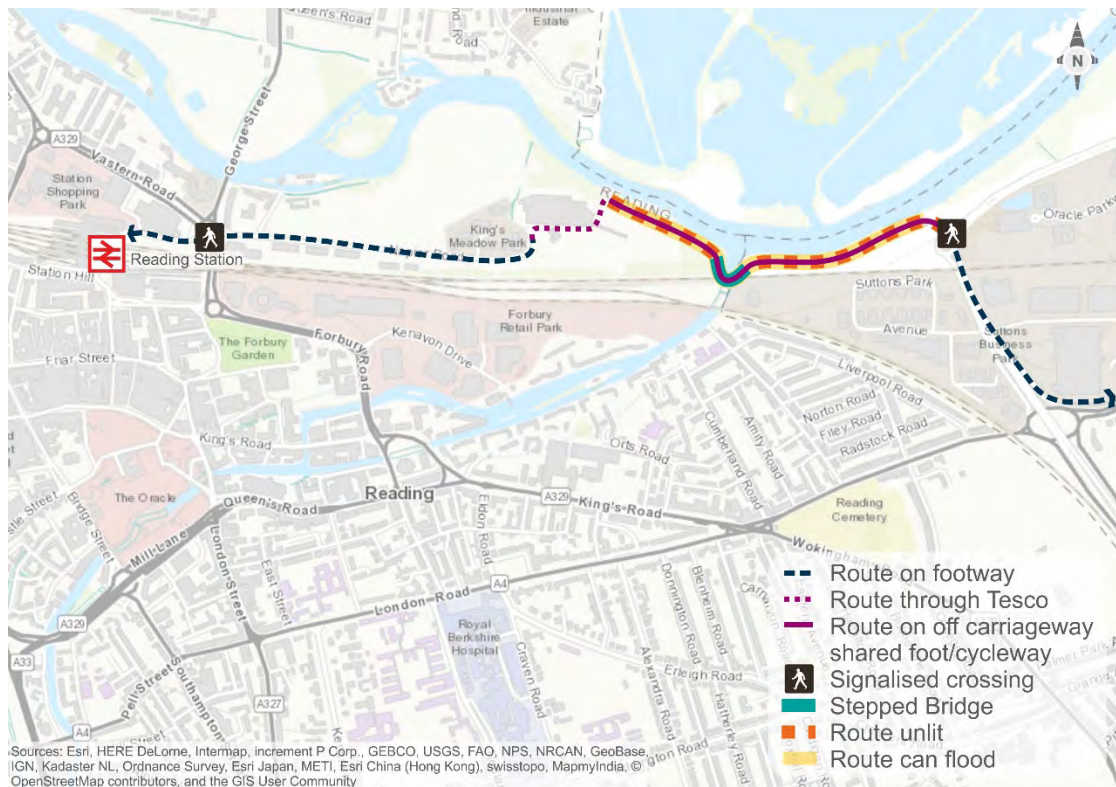


Figure 8.4: Pedestrian Route 3 – Via the River Thames

Pedestrian Route 3 (PR3)

8.4.5 PR3 is approximately 1.85 miles in length, the whole route is along footways but part of the route, along the Thames towpath, is unlit and at risk of flooding. The first section of the route is along a shared foot/cycleway alongside the A3290 for approximately 500m. This section of the A3290 provides access to the Waterside Centre and TVP and accommodates relatively high peak hour traffic flows due to people arriving and leaving the business park. The route then crosses the road via a signalised pedestrian crossing and onto the River Thames towpath. The Thames towpath is a shared foot/cycleway; however, it is unlit and narrow in places with the width ranging between approximately 1.5 to 3.0m. The route crosses the River Kennet at its confluence with the River Thames via a stepped (with small cycle ramp alongside) pedestrian footbridge known as the Horseshoe Bridge, see **Figure 8-5**. The route continues along the towpath up to a Tesco Superstore. Here the route travels around the superstore and onto Napier Road. Napier Road is a 30mph, relatively low trafficked route with a footway. Napier Road meets the IDR at Reading Bridge Roundabout; a signalised pedestrian crossing facility is available which crosses the IDR to the Reading Station car park and through to the northern station entrance.



Figure 8.5: Stepped Horseshoe Bridge

Pedestrian Survey on Thames Towpath

- 8.4.6 A pedestrian survey has been undertaken along the Thames Towpath between the Waterside Centre and the Horseshoe Bridge. The purpose of this survey was to understand the number of pedestrian movement within the area, and to understand the use of the space.
- 8.4.7 **Figure 8.6** shows the results of the 24hr pedestrian count survey was undertaken on a Wednesday and a Saturday in the summer period of August and during a typical week in September.

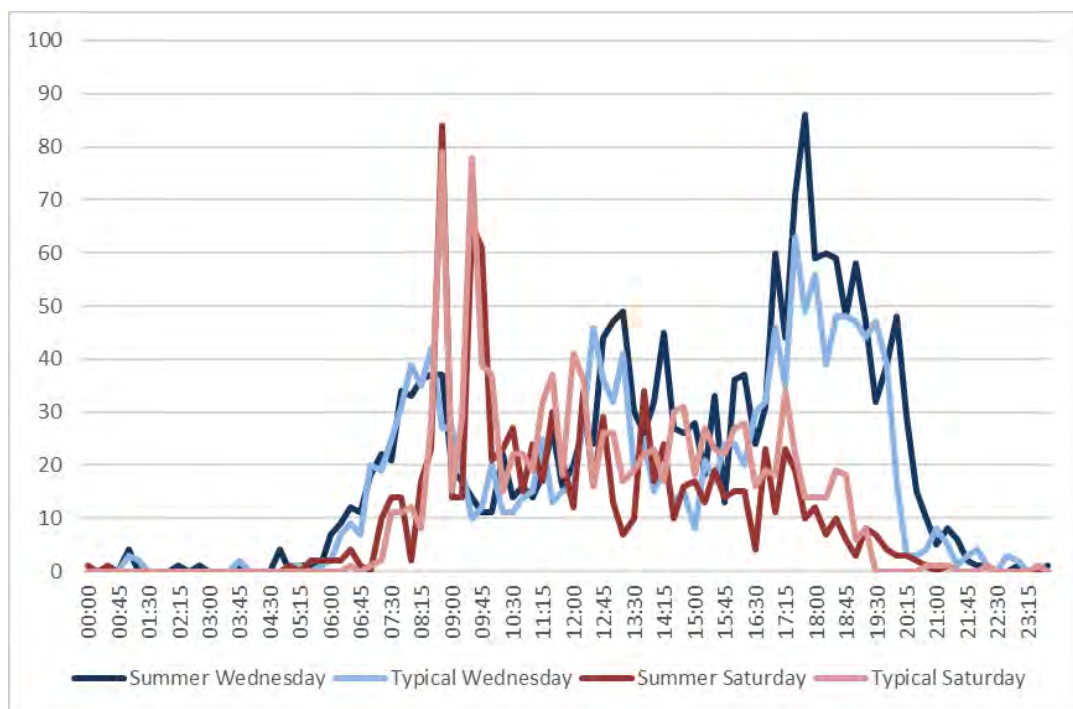


Figure 8.6: Pedestrian Survey on Thames Towpath

- 8.4.8 **Figure 8.6** shows that on the surveyed weekday the peak number of movements were during the evening hours of 17:30 until 19:30, whereas on a Saturday the peak number of movements during the morning hours of 08:00 until 10:00. A copy of the pedestrian movement survey is included as part of the Transport Statement within **Appendix 8.1**.

Open Space Video Observation Survey

- 8.4.9 An hourly video observation beat survey was carried out covering the area of open space between the Horseshoe Bridge and Dreadnought building, see **Figure 8.7**. The survey was undertaken between 09:00 and 18:00 on Thursday 1st June 2017, a sunny half term holiday week.
- 8.4.10 The results of the survey showed no use of the space with people only using the tow path. Two people were observed sitting on the edge of the towpath using their mobile phones which indicates a potential need for benches. The only activity seen in the open space was a tent laid out which appeared to belong to a narrow boat owner and a couple of erected tents. See screenshots in **Figures 8.8**.
- 8.4.11 It should be noted that the meadows further west and east opposite Tesco and Thames Valley Park Drive respectively were well used during the surveys periods.

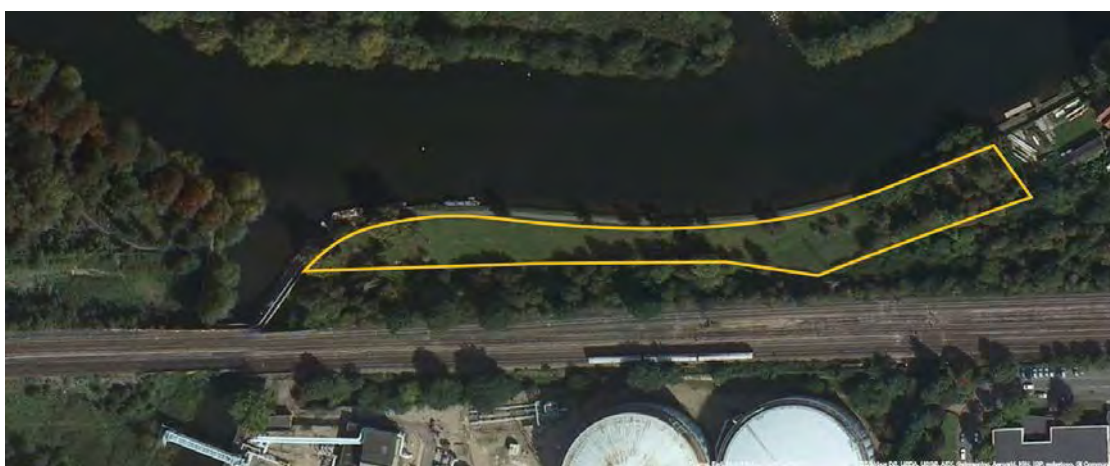


Figure 8.7: Open Space Survey Area

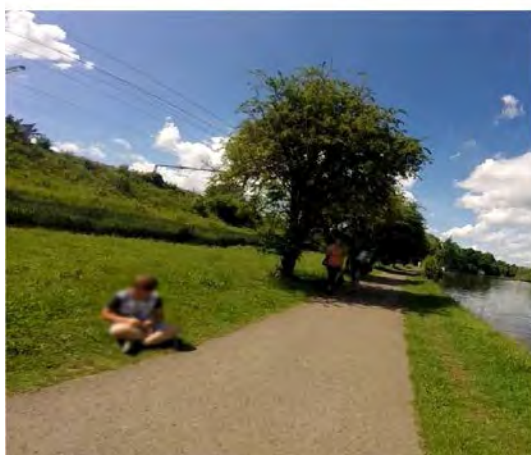


Figure 8.8: Survey Result Screenshots

Cycling

8.4.12 There are currently three signed route options for cyclists travelling from the A4 London Road / A3290 roundabout to Reading town centre and station, these are:

- CR1) Via the River Thames towpath,
- CR2) Via the River Thames and Kennet towpaths,
- CR3) Via the River Kennet towpath

8.4.13 The routes are illustrated in **Figure 8.9, 8.10, 8.11** and **8.12**.

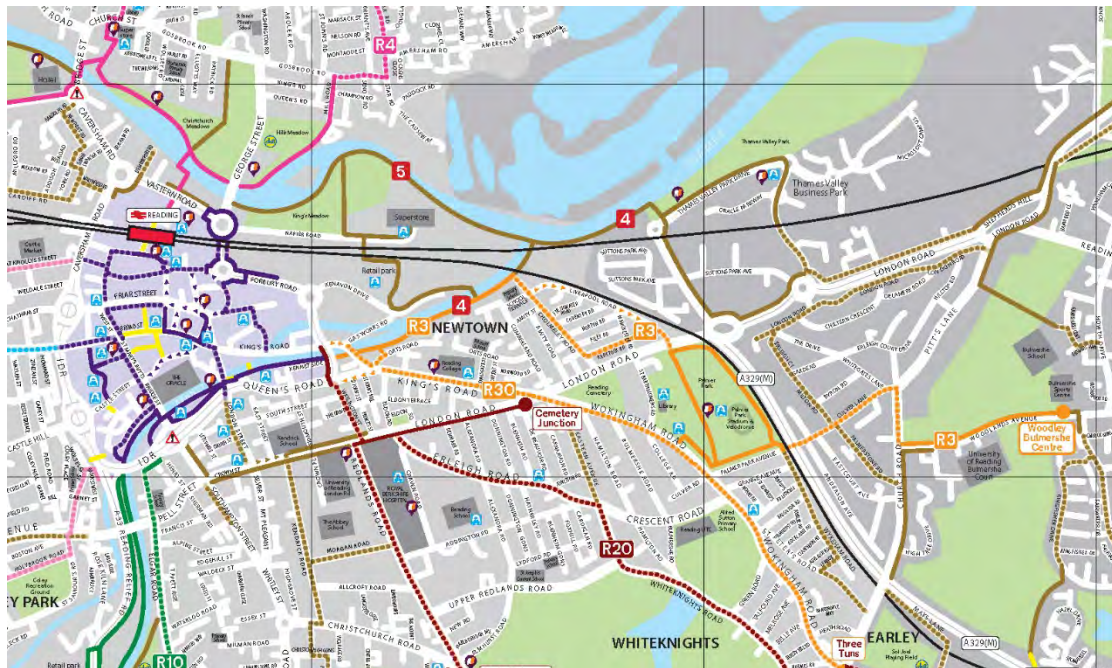


Figure 8.9: Extract from Reading Borough Cycle Map

8.4.14 The only available continuous cycle route from the A4 east of the A3290 roundabout to Reading town centre and station is along the River Thames, as shown in **Figure 3.8**. The section on the A4 London Road between the A3290 junction and Kings Road is a heavily trafficked route with narrow traffic lanes therefore an undesirable route for cyclists. Cycling along this route, on carriageway, would be potentially dangerous with a high risk of collisions between vehicles and cyclists.



Figure 8.10: Cycle Route 1 – Via the River Thames

Cycle Route 1 (CR1)

8.4.15 CR1 is approximately 1.9 miles in length, the whole route is along shared foot/cycleways but the majority of the route, along the Thames towpath, is at risk of flooding, unlit and narrow in places. The Thames Path is not a legal cycle path; however, it is part of the National Cycle Network. Pedestrians also use the shared foot/cycleways therefore speed is limited for cyclists as they have to navigate slower pedestrians. The Horseshoe Bridge is a stepped (small cycle ramp alongside the steps) pedestrian bridge where cyclists must dismount, see **Figure 3.4**. The route follows PR3 up to Tesco superstore and then continues along the towpath to Reading Bridge. At Reading Bridge, the route travels through a private car park and onto the IDR, Vastern Road. Vastern Road has shared foot/cycleways on both sides of the carriageway. The route crosses the IDR via a signalised crossing and continues to Trooper Potts Way, the northern entrance to Reading Station.

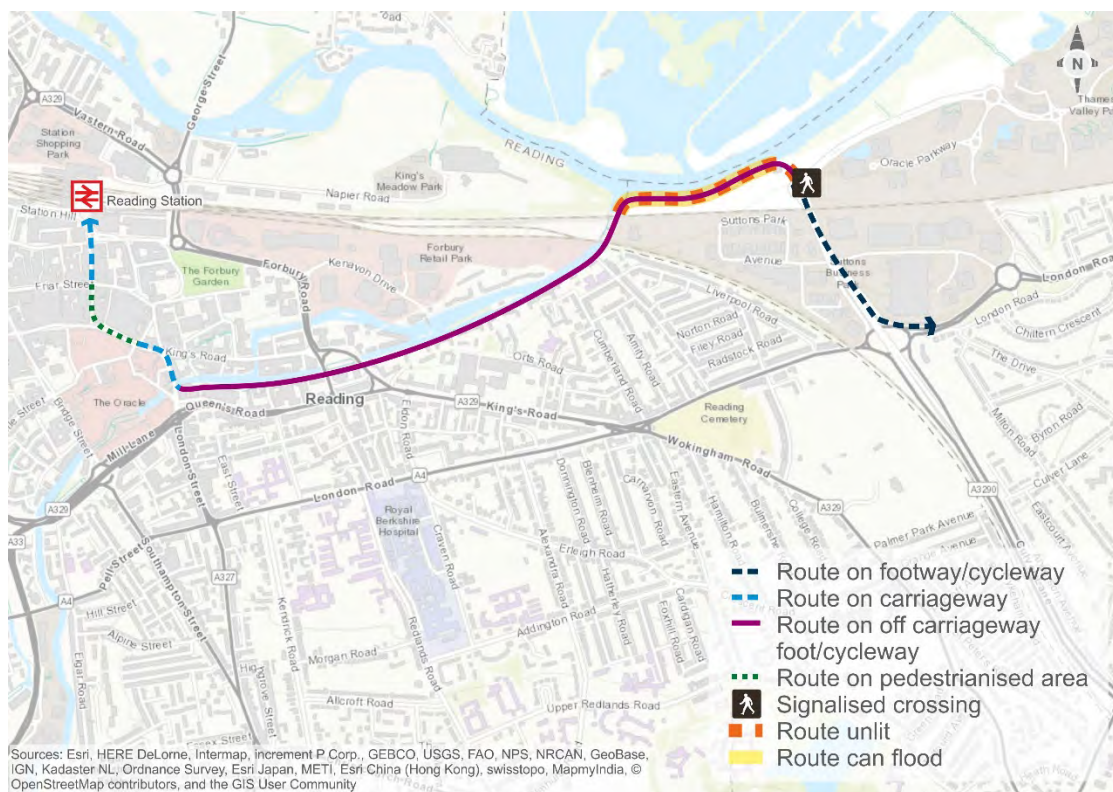


Figure 8.11: Cycle Route 2 – Via the River Thames and River Kennet

Cycle Route 2 (CR2)

- 8.4.16 C2 is approximately 2.1 miles in length, the route is along shared foot/cycleways and town centre streets, part of the route along the Thames towpath is unlit and at risk of flooding. Pedestrians also use the shared foot/cycleways therefore speed is limited for cyclists as they have to navigate slower pedestrians. The route follows CR1 up to the confluence of River Thames and Kennet. The route then follows PR2 along the River Kennet and through Reading town centre.

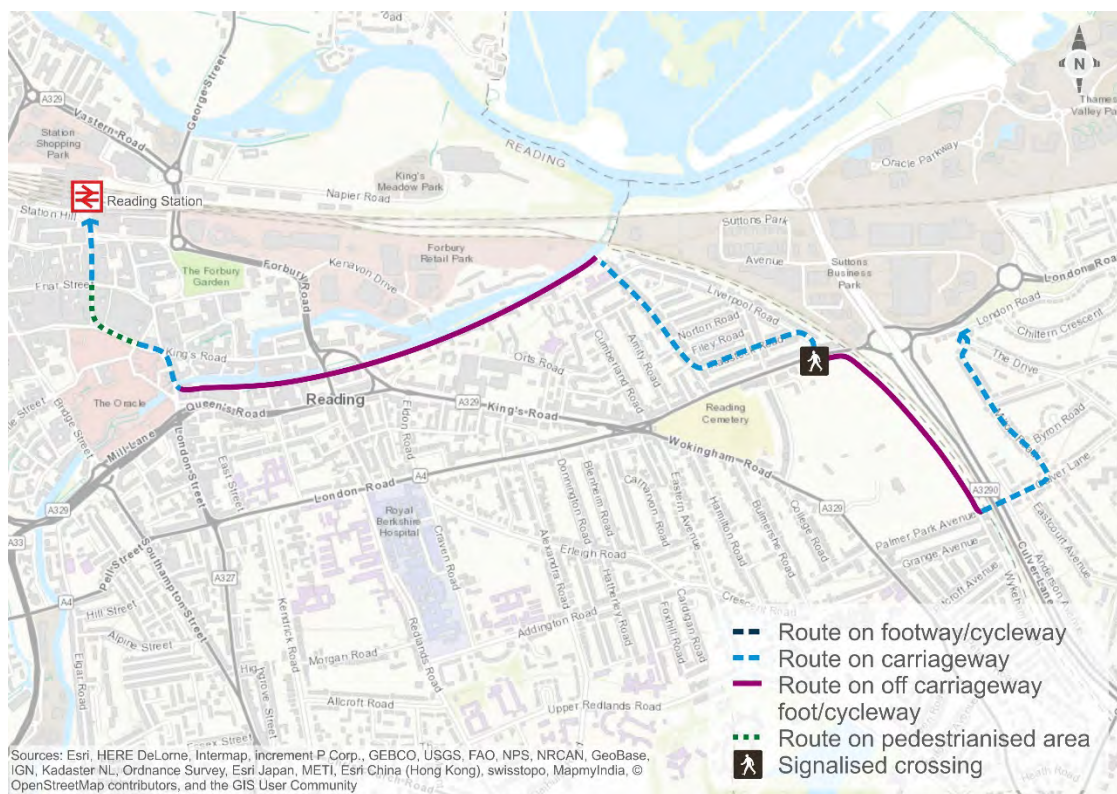


Figure 8.12: Cycle Route 3 – Via the River Kennet

Cycle Route 3 (CR3)

8.4.17 CR3 is approximately 2.7 miles in length, the route is along shared foot/cycleways, quiet streets and town centre streets. Pedestrians also use the shared foot/cycleways therefore speed is limited for cyclists as they have to navigate slower pedestrians. The route follows Milton Road, a quiet residential street up to Palmer Park Avenue which is also a residential street but with higher traffic flows than Milton Road. The route then continues through Palmer Park via a shared foot/cycleway up to the A4 London Road. Cyclists can cross London Road via a signalised crossing and onto Liverpool Road. The route then continues along Radstock Road and Cholmley Road, both 20mph quiet residential streets. The route then follows CR2 along the River Kennet and through Reading town centre.

Cycle Hire

8.4.18 Ready Bike Cycle Hire bicycles are available for use at TVP. People travelling between TVP and Reading station and town centre can currently use hire bicycles on routes CR1 and CR2.

Public Transport

8.4.19 Public transport services on the A4 London Road between Reading and the A4 east of the A3290 roundabout, comprise of five different key bus services;

- TVP P&R from Winnersh Triangle
- Thames Valley Park (TVP) Commuter bus
- Heathrow Rail Air coach services
- Service 13 and 14, between Woodley and Reading town centre; and

- Reading – Twyford – Henley – High Wycombe (850)
- Reading – Twyford – Wokingham (Nos. 127/128/129)
- Service 28/28a, provides a shuttle bus service between Reading Town Centre and Tesco's.

8.4.20 The frequency of these services shown in **Table 8-11**.

Table 8-11: Existing Public Transport Services Travelling Along A4 London Road

Bus Route and Service	Operator	Hours of Operation*			Two Way Number of Buses by Time Period Weekday		
		Weekday	Saturday	Sunday	AM Peak (07:00-10:00)	Inter Peak (10:00-16:00)	PM Peak (16:00-19:00)
Winnersh Park and Ride – Central Reading	Reading Buses	06:45 to 19:12	08:02 to 18:50	-	12	24	12
Reading Station - Thames Valley Park (TVP)	Stewarts	06:45 to 19:22	-	-	26	22	24
Reading Station - Heathrow Airport (RailAir)	First	04:00 to 23:00	04:00 to 23:00	04:00 to 23:00	9	18	8
Reading - Woodley (12, 13 & 14)	Reading Buses	05:00 to 00:19	05:00 to 03:19	07:30 to 23:19	15	28	15
Reading – Twyford – Henley – High Wycombe (850)	Arriva	05:25 to 23:43	06:40 to 23:43	07:45 to 21:47	5	7	4
Reading – Twyford – Wokingham (127/128/129)	Courtney Buses	06:07 to 19:27	07:38 to 18:23	-	4	6	4
Tesco – Reading - Kentwood Hill (28/28a)	Reading Buses	07:01 to 16.20	-	-	4	8	2

*Taken from timetables May 2017

- 8.4.21 Commuter shuttle buses operate from Reading town centre and railway station to Thames Valley Park between 06:45 and 19:30. These bus services are primarily used towards TVP in the AM peak period and towards Reading Station in the PM peak period. Commuter shuttle buses also run between Thames Valley Park and Winnersh Triangle during peak periods only.
- 8.4.22 Inbound buses use the A4 London Road as far as Cemetery Junction, where there is a contra-flow bus lane on the A329 Kings Road to the town centre. Outbound buses use Kings Road, where there is a bus lane to A4 London Road. There is limited scope to provide further bus priority on the section of A4 London Road between Cemetery Junction and the A3290 junction due to lack of available space.

- 8.4.23 The London Road suffers from peak period traffic congestion which leads to unreliable public transport journey times. Journey times have been analysed using available on-line data sources. This shows that travelling between the A3290 / A4 roundabout and Reading Station can take between 12 and 24 minutes during peak traffic periods.

Highway

- 8.4.24 The A4 London Road is the main strategic route for vehicles travelling to and from Reading town centre to the east and provides a link to the M4 junction 10. It is heavily constrained comprising two narrow lanes for traffic travelling towards central Reading and a single narrow lane exiting towards the A3290. The A4/A329 Cemetery Junction is a pinch point along the route. The existing highway network is shown in **Figure 8.13**.

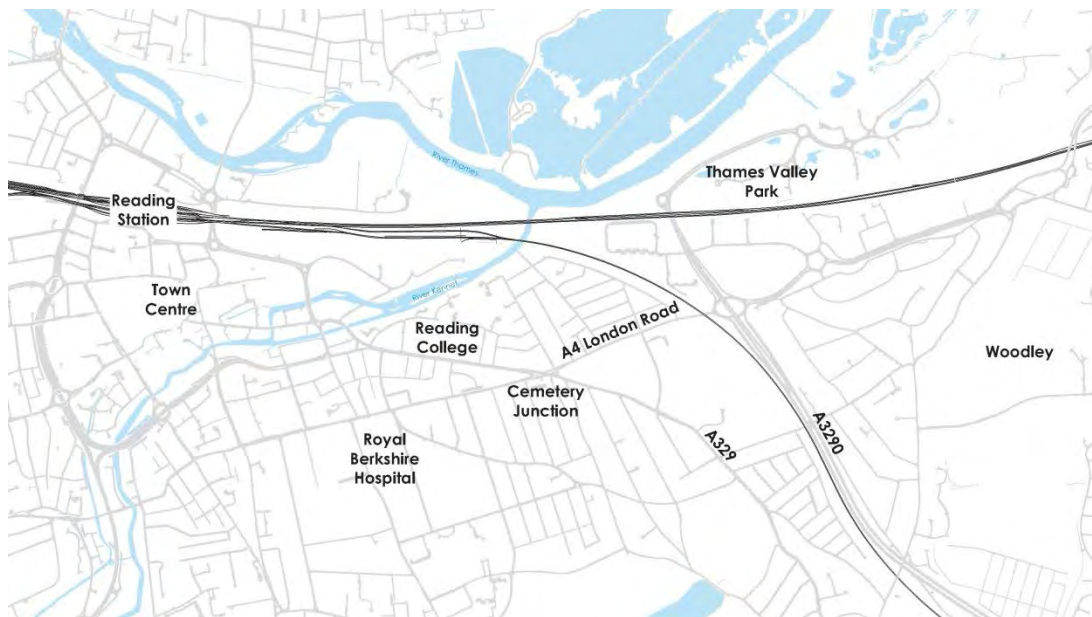


Figure 8.13: Existing Highway Network

- 8.4.25 RBC has installed a permanent automatic traffic counter on London Road to the west of the A4/A3290 junction. This shows that two-way daily traffic flows on the A4 London Road are in the region of 35,000 vehicles. **Figure 8.14** shows the average daily flow over the last eight years. The daily traffic flows show that traffic flows at this site appear to have fallen over the period, but stabilised between 2014 and 2015. This may be due to either inaccuracies of the automatic counter with the heavy congestion, or as a result of increasing traffic conflicts causing a reduction in capacity, rather than demand reducing.

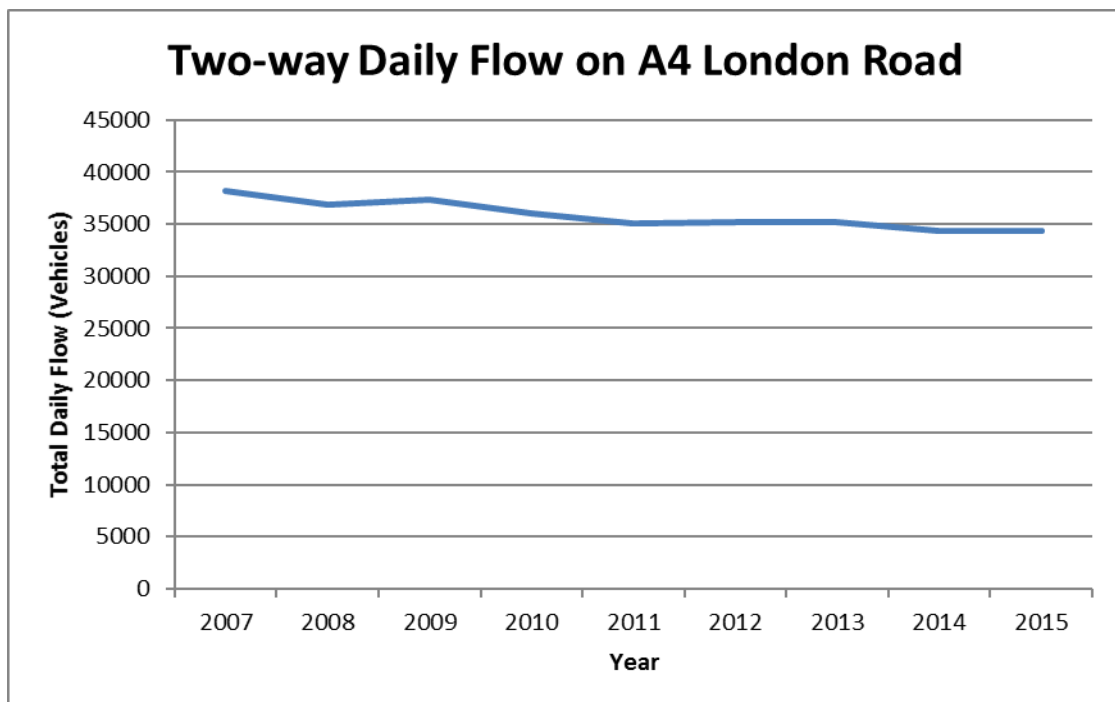


Figure 8.14: Two Way Flow on A4 London Road between Cemetery Junction and the A3290

(NB: No data available for 2013 – 2012 data used)

- 8.4.26 **Figure 8.15** shows the profile of the daily traffic flow in 2015. This shows that peak spreading has occurred with traffic only reducing between 10:00–12:00, and only in the outbound direction, then gradually increasing towards an extended evening peak period.

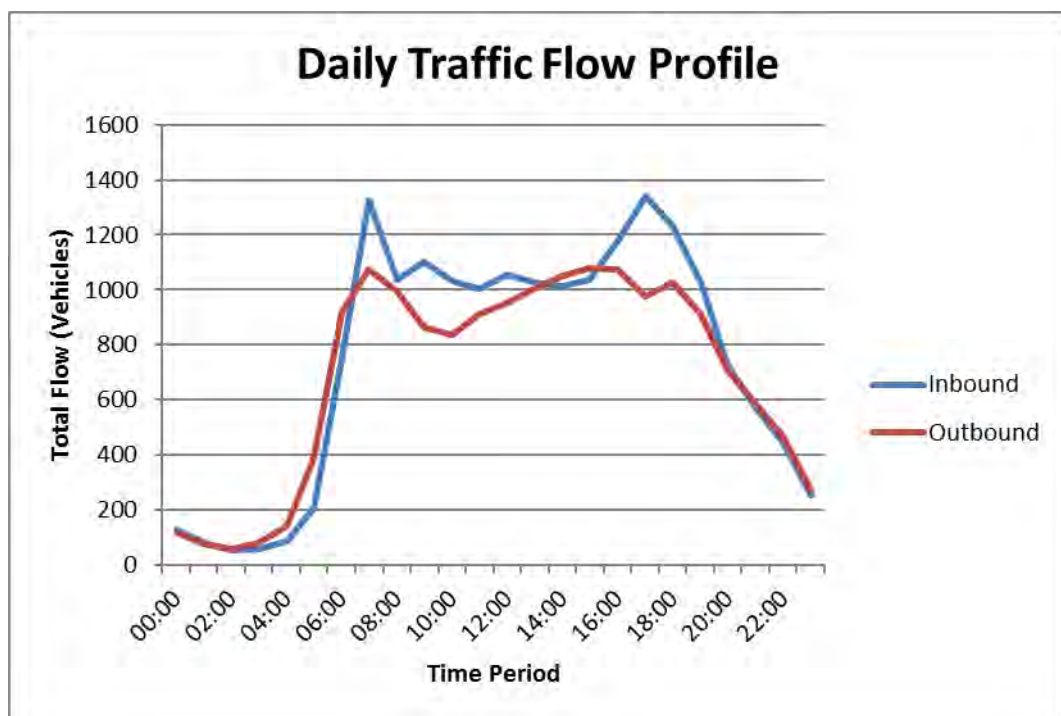


Figure 8.15: Daily Traffic Profile on A4 London Road

- 8.4.27 These daily profiles, alongside known congestion and observed queues, indicate that the corridor is operating at, or over capacity during the majority of the day. Traffic queues can reach 300–550 vehicles exiting Reading in the peak periods and between 60–200 vehicles entering Reading in the peak periods.
- 8.4.28 Journey times range from 7 to 24 minutes east bound, depending upon the time of day and westbound the journey times range from 10 to 24 minutes. This shows there is currently significant variations in journey time due to congestion, which will severely limit the potential for future growth on the corridor.

Personal Injury Collisions

Classification

- 8.4.29 The collisions are classed into three categories, definitions of which are provided below:
- Slight injury: An injury of a minor character such as a sprain (including neck whiplash injury), bruise or cut which are not judged to be severe, or slight shock requiring roadside attention. This definition includes injuries not requiring medical treatment.
 - Serious injury: An injury for which a person is detained in hospital as an “in-patient”, or any of the following injuries whether or not they are detained in hospital: fractures, concussion, internal injuries, crushings, burns (excluding friction burns), severe cuts, severe general shock requiring medical treatment and injuries causing death 30 or more days after the accident.
 - Fatal injury: An injury which causes death either immediately or any time up to 30 days after the accident.

Reading Borough – Collision Data

- 8.4.30 A summary of the annual rolling collision data (March to February) is provided below in **Table 8-12**. The PIC data covers the study areas on London Road east of Cemetery Junction, Kings Road adjacent to Reading College and Napier Road.

Table 8-12: Summary of Collision Data within Reading Borough Council.

Casualty	Severity of Casualty	Year Beginning					
		2012	2013	2014	2015	2016	Total
Total	Fatal	0	0	0	0	0	0
	Serious	1	6	2	2	3	13
	Slight	13	24	19	14	14	84
	Total	14	30	21	16	17	97
Pedestrian	Fatal	0	0	0	0	0	0
	Serious	1	4	1	1	0	7
	Slight	2	4	8	4	3	21
	Total	3	8	9	5	3	28
Cyclist	Fatal	0	0	0	0	0	0
	Serious	0	0	0	0	2	2
	Slight	4	3	4	3	3	17

Casualty	Severity of Casualty	Year Beginning					
		2012	2013	2014	2015	2016	Total
	Total	4	3	4	3	5	19

8.4.31 **Table 8-16** shows that during the 60 month period between 01/02/2010 and 31/01/2015 there were 97 collisions resulting in 13 (13%) serious injury and 84 (87%) slight injuries. There were no fatal collisions.

8.4.32 Over the entire five-year period, 48% (47) of collisions involved a pedestrian or a cyclist, resulting in 9 serious injuries, 38 slight injuries and no fatal collisions.

8.4.33 In some locations, a high number of accidents occur in a small area. Further analysis of these accident clusters is carried out to determine if there is a common cause and to identify if highway layout is a cause. The accident cluster analysis is provided in **Appendix 8.2**.

Wokingham – Collision Data

8.4.34 A summary of the annual rolling collision data (March to February) is provided below in **Table 8-17**. The PIC data covers the study area on the A3290 between the site access and the junction between the A3290 and London Road.

Table 8-13: Summary of Collision Data within Reading Borough Council.

Casualty	Severity of Casualty	Year Beginning					
		2012	2013	2014	2015	2016	Total
Total	Fatal	0	0	0	0	0	0
	Serious	1	0	1	0	0	2
	Slight	4	3	2	1	0	10
	Total	5	3	3	1	0	12
Pedestrian	Fatal	0	0	0	0	0	0
	Serious	0	0	0	0	0	0
	Slight	0	0	0	0	0	0
	Total	0	0	0	0	0	0
Cyclist	Fatal	0	0	0	0	0	0
	Serious	1	0	1	0	0	2
	Slight	0	0	0	0	0	0
	Total	1	0	1	0	0	2

8.4.35 **Table 8-13** shows that during the 60 month period between 01/02/2010 and 31/01/2015 there were 12 collisions resulting in two (17%) serious injury and ten (83%) slight injuries. There were no fatal collisions.

8.4.36 Over the entire five-year period, 17% (two) of collisions involved a pedestrian or a cyclist, resulting in two serious injuries and no slight injuries or fatal collisions.

8.4.37 In some locations, a high number of accidents occur in a small area. Further analysis of these accident clusters is carried out to determine if there is a common cause and to identify if highway layout is a cause. The accident cluster analysis is provided in **Appendix 8-2**.

8.5 Construction Works Assumptions

Assessment of Construction Effects

8.5.1 At this stage, it should be recognised that there is limited information available on the proposed construction works as there are a number of details that are yet to be finalised. The transport and access effects of the construction of the proposed development will be dependent on various factors including: the final programme and phasing of construction works, import/export/re-use of materials and construction processes adopted.

8.5.2 Consequently, a qualitative assessment has been made of the likely significant transport and access effects of the proposed construction works. This has been based on an estimation of reasonable worst-case conditions and has sought to consider those aspects of the construction works that could lead to significant effects. The assessment has drawn upon PBA's experience of assessing the environmental effects of similar developments.

- 8.5.3 Suitable management and control measures have been identified, which it is proposed should be incorporated into a Construction Environmental Management Plan (CEMP) to manage the construction works.

Construction Vehicle Movements

- 8.5.4 It is anticipated that construction of East Reading Mass Rapid Transit will commence in July 2019 (although site seasonal site clearance may need to be done earlier in 2019) with completion expected in Spring 2022.
- 8.5.5 The peak construction traffic environmental impact is expected as a result of the following activities, with potentially several activities being undertaken over the same time period (it should be noted that this is a worst case, as works are intended to be phased where possible):
- Full height embankment construction
 - Assembling main bridge beams involving 250t+ installation crane
 - Deck pouring
 - Road surfacing
- 8.5.6 The embankment being constructed to full height is expected to have the most significant impact on the transport networks. This is due to the volumes of fill material being imported on site. It is estimated that a delivery rate of 15 to 20 tonnes per hour are required to meet the programme. The Bridge deck construction is not expected to progress until the embankment construction has been completed, because of the volume of vehicle movements.
- 8.5.7 Several operations may occur in parallel. The Bridge deck construction will commence in parallel with carriageway drainage, formation and subsequent road construction operations, which requires additional operatives to be on site for these specialist activities, together with an increase in the number of HGV movements to deliver the necessary quantities of materials.
- 8.5.8 The construction traffic generation has been determined on the basis of the number of operatives and management staff required on the site and the quantities of materials to be imported through the duration of the works. A number of assumptions have been made:
- 8-wheel haulage lorries, with 20 tonne capacity, it will be used for transporting bulk earthwork materials to and from the site;
 - Other deliveries will be made using different sized vehicles, including articulated HGVs for larger and bulk items;
 - Deliveries will be limited to off-peak periods to avoid disruption in peak periods, 09:30 – 16:30;
 - Space will be provided within the site to accommodate delivery vehicles so that they are not waiting on the public highway;
 - There will be various points for unloading and storing materials on the site;
 - Vehicle turnaround to be deemed as 15 minutes, i.e. 4 loads per hour at two points = 8 two-way trips per hour;
 - Adequate on-site parking will be provided for all operatives and staff; and
 - Vehicle sharing and use of public transport amongst operatives and site management is anticipated and will be encouraged

- 8.5.9 This will result in a maximum of 60 two-way HGV movements per day or 8 HGV trips per hour during the construction period. This is peak traffic movements rather than a typical level of traffic, particularly regarding deliveries.

Construction Worker Vehicle Movements

- 8.5.10 The construction process is expected to require work being undertaken in several different areas at the same time, utilising a range of skills from general labourers and skilled operatives through to professionals and managers. It is envisaged that workers will originate from a variety of areas and that some will travel together to and from the site.
- 8.5.11 It is estimated that the peak construction period would require up to 50 operatives and management staff on the site. Based on PBA's experience of similar developments, a number of these trips will be shared because of the distances travelled by operatives and the fact that they often travel together from their depots rather than from home. On this basis, we have estimated that a workforce of 50 would equate to 38 vehicle trips arriving before 08:00 and leaving after 18:00. These times will vary however, because of the reduced hours of daylight in the winter.
- 8.5.12 In summary, as a worst-case assessment, the total construction traffic generated will be:
- 38 vehicle trips of the employees, before and after peak hours (before 08:00 and after 18:00 subject to the time of year); and
 - 60 two-way HGV movements per day (8 two-way HGV movements per hour)
- 8.5.13 On a typical day, the total construction traffic generated will be:
- 20-25 vehicle trips of the employees, before and after peak hours (before 08:00 and after 18:00 subject to the time of year); and
 - 5-10 two-way HGV movements per day

Construction Vehicle Routes

- 8.5.14 The construction vehicles accessing the eastern section of the site will be routed from the M4 in the south of Reading via the A3290 (m) which the site is located adjacent too. Vehicles accessing the western section of the site will be routed from the M4 via the A33 and Vastern Road to Napier Road which the site is located adjacent to.

8.6 Potential Effects, Mitigation and Residual Effects

Sensitive Receptors

- 8.6.1 Likely sensitive receptors located within the study area have been identified and are shown, together with their sensitivity rating, in **Table 8-14**.

Table 8-14: Sensitivity Receptors

Sensitivity Rating	Link	Receptor	Description
Low	L1	Site Access	Open Space
	L2	Thames Valley Park Drive	No building frontage, large footpath
	L3	A3290 between Site Access and A4	No building frontage, large footpath

	L4	A4 London Road South of Shepards Hill	Residential roads run parallel to the main road on either side
	L9	Woodlands Avenue	No building frontage, large footpath
	L18	A329 Forbury Road between Kings Road and Kenavon Drive	No building frontage
	L20	Vastern Road Rail Bridge	No building frontage, separated footway
	L23	New East MRT Scheme Route	Open Space
Medium	L5	A4 London Road east of Cemetery Junction	Residential frontage with wide pavements
	L6	A4 London Road west of Cemetery Junction	Busy Road with residential frontage
	L7	Pitts Lane	Residential frontage with wide pavements and verges
	L8	Church Road	Residential frontage with wide pavements and verges
	L10	Whitegates Lane	Residential frontage with wide pavements and verges
	L11	Palmer Park Avenue	Adjacent to Palmer Park
	L12	Wokingham Road adjacent to Palmer Park	Adjacent to Palmer Park
	L16	A329 Queens Road	Commercial and residential frontage, wide footpath
	L17	A329 Kings Road adjacent to Gas Works Road	Commercial frontage, busy road
	L19	A329 Forbury Road between Kenavon Drive and Vastern Road	No building frontage, adjacent to Forbury Gardens
	L21	Vastern Road	Residential frontage with wide pavements
	L22	Napier Road	Commercial frontage, adjacent to Kings Meadow
High	L13	Crescent Road	Adjacent to UTC Reading
	L14	Erleigh Road	Adjacent to Royal Berkshire Hospital and Retirement Homes
	L15	A329 Kings Road adjacent to Reading College	Busy road, adjacent to Reading College

Construction Effects

- 8.6.2 The construction of the proposed development will result in approximately 8 two-way HGV trips per hour to and from the site if the identified combination of construction activities were to

- occur in parallel, i.e. worst case. Through a construction management plan, HGV movements will be restricted to take place between 09:30 and 16:30, outside the peak hours.
- 8.6.3 For the majority of the year, 38 construction worker trips are expected to arrive at the site before the AM peak hour (by 08:00), and to leave the site after the PM peak hour (after 18:00). Therefore, there are expected to be no/minimal vehicle trips to or from the site in the peak hours.
- 8.6.4 Due to reduced daylight hours in the winter, construction worker trips may vary. At worst case the construction workers would arrive during the AM peak flow and leave at PM peak flow. The baseline two traffic flow on the A3290 is 1721 in the AM and 924 in the PM (as shown in **Table 8-19**). An additional 38 vehicles would result in an increase in traffic flow of 2% in the AM and 4% in the PM, which is less than 10% and therefore not significant.
- 8.6.5 The low volume of construction trips will not result in any significant effects on severance, driver delay, pedestrian delay and amenity, or accidents and road safety.
- 8.6.6 The suggested threshold guidance for pedestrian fear and intimidation, as shown in **Table 8-6**, proposes a slight adverse effect on fear and intimidation, if average 18-hour HGV flows are in the region of 1,200 to 2,000.
- 8.6.7 The construction of the proposed development will generate approximately 60 two-way HGV trips per day, which falls well below the suggested threshold shown in **Table 8-6**. As a result, it is expected that the construction vehicle movements of the proposed development will have an insignificant effect on pedestrian fear and intimidation.

Operational Potential Effects – Scenario 1

Scenario 1 – Effect of East MRT Scheme

- 8.6.8 Scenario 1 assesses the effect of the East MRT Scheme if the TVP P&R is not delivered. The changes in traffic flows are included in **Table 8-15** and **Table 8-16**.
- 8.6.9 It is assumed that at peak flow times, which are between 6:00 to 9:00 in the morning and 15:00 to 18:00 in the afternoon, there will be 17 buses per hour in each direction on the East MRT Scheme Route, and between 9:00 and 15:00 there will be 10 buses per hour in each direction.

Table 8-15: Scenario 1 AM and PM Peak Flows

Link	Link Name	2021 AM Peak Flow			2021 PM Peak Flow		
		Baseline	Proposed Scheme	% Change	Baseline	Proposed Scheme	% Change
1	Site Access	0	34	N/A	0	34	N/A
2	Thames Valley Park Drive	1721	1756	2%	914	924	1%
3	A3290 between Site Access and A4	1721	1744	1%	914	912	0%
4	A4 London Road South of Shepards Hill	1508	1516	1%	1592	1593	0%
5	A4 London Road east of Cemetery Junction	2298	2315	1%	1700	1676	-1%
6	A4 London Road west of Cemetery Junction	1754	1757	0%	2225	2218	0%
7	Pitts Lane	1193	1181	-1%	1162	1193	3%
8	Church Road	1103	1111	1%	1156	1174	2%
9	Woodlands Avenue	841	841	0%	1138	1148	1%
10	Whitegates Lane	328	333	2%	304	316	4%
11	Palmer Park Avenue	618	607	-2%	527	528	0%
12	Wokingham Road adjacent to Palmer Park	1178	1189	1%	1470	1474	0%
13	Crescent Road	1110	1087	-2%	820	811	-1%
14	Erleigh Road	673	643	-4%	922	880	-5%
15	A329 Kings Road adjacent to Reading College	1627	1618	-1%	1599	1582	-1%
16	A329 Queens Road	2578	2573	0%	2777	2793	1%
17	A329 Kings Road adjacent to Gas Works Road	2412	2414	0%	2394	2421	1%
18	A329 Forbury Road between Kings Road and Kenavon Drive	2450	2432	-1%	2408	2379	-1%
19	A329 Forbury Road between Kenavon Drive and Vastern Road	2328	2310	-1%	2425	2397	-1%
20	Vastern Road Rail Bridge	2288	2283	0%	2429	2427	0%
21	Vastern Road	2076	2075	0%	2131	2126	0%
22	Napier Road	235	268	14%	153	186	22%
23	New East MRT Scheme Route	0	34	N/A	0	34	N/A

Table 8-16: Scenario 1 Total 24 Hour Flows

Link	Link Name	Total 24 Hour Flow		
		Baseline	Proposed Scheme	% Change
1	Site Access	0	324	N/A
2	Thames Valley Park Drive	9802	9992	2%
3	A3290 between Site Access and A4	9802	9872	1%
4	A4 London Road South of Shepards Hill	24428	24489	0%
5	A4 London Road east of Cemetery Junction	30353	30246	0%
6	A4 London Road west of Cemetery Junction	32988	32940	0%
7	Pitts Lane	19042	19306	1%
8	Church Road	18559	18794	1%
9	Woodlands Avenue	16623	16729	1%
10	Whitegates Lane	5110	5263	3%
11	Palmer Park Avenue	6696	6670	0%
12	Wokingham Road adjacent to Palmer Park	22125	22235	0%
13	Crescent Road	11102	10946	-1%
14	Erleigh Road	9785	9356	-4%
15	A329 Kings Road adjacent to Reading College	30090	29855	-1%
16	A329 Queens Road	49876	50008	0%
17	A329 Kings Road adjacent to Gas Works Road	45027	45330	1%
18	A329 Forbury Road between Kings Road and Kenavon Drive	43778	43341	-1%
19	A329 Forbury Road between Kenavon Drive and Vastern Road	43048	42620	-1%
20	Vastern Road Rail Bridge	43245	43174	0%
21	Vastern Road	38755	38693	0%
22	Napier Road	2990	3308	11%
23	New East MRT Scheme Route	0	324	N/A

- 8.6.10 As shown in **Table 8-15** and **Table 8-16** no links experience a change in flow rate of greater than 30% as a result of Scenario 1. The maximum change in flow in link 22 is 22% during the PM peak. The change in flow in all remaining links is below 10% for this scenario.
- 8.6.11 Links 1 and 23 will be built as part of the proposed scheme and therefore have no flow during the Baseline situation.

Assessment of Operational Effects – Scenario 1

- 8.6.12 This section presents the assessment of the operational effects for a typical weekday in the year of 2021 for Scenario 1.

Driver Delay

- 8.6.13 The SATURN model of the area surrounding the site has been used to assess the likely impact of the proposed East MRT Scheme on the surrounding links.
- 8.6.14 The links that experience a change in flow of greater than 30% are assessed in addition to high sensitivity links that experience a flow of more than 10%.
- 8.6.15 The access (L1) and the New East MRT Scheme (L23) each experience a change in flow of greater than 30% as they currently do not have any flow. No high sensitivity links are identified with a greater than 10% change in flow.

L1: Access

- 8.6.16 The East MRT Scheme has been assessed from the existing roundabout on the A3290. **Table 8-17** shows the modelled impacts of driver delay at the access.

Table 8-17: Scenario 1 –Driver Delay at the Access

Peak Hour	Baseline Delay (Seconds)	Proposed Scheme Delay (Seconds)	Difference (Seconds)	Magnitude of Impact
08:00-09:00	N/A	20	N/A	N/A
17:00-18:00	N/A	15	N/A	N/A

- 8.6.17 As the access does not currently exist, there is no flow in the Baseline situation. There is therefore no impact on driver delay compared to the Baseline situation.

L23: New East MRT Scheme

- 8.6.18 As there is currently no junction at the location where the proposed East MRT Scheme joins Napier Road and no flow on the New East MRT Scheme, there is no impact driver delay on the link.

Overall

- 8.6.19 The impact on driver delay on the proposed links is considered to be negligible on all links with a change in flow of less than 30% and less than 10% on high sensitivity links. The driver delay

on the access and new East MRT Scheme Route are minimal. It is therefore considered that overall the development will have a **negligible** effect on driver delay.

Public Transport Delay

- 8.6.20 The Reading Transport SATURN Model (RTM) has been used to understand any potential journey time savings the East MRT scheme would deliver. The public transport delay is assessed from the A3290 London Road Roundabout to Reading Railway Station. The existing route for public transport is via London Road, Kings Road, Forbury Road, South East Station Interchange. The new proposed route for public transport is via A3290, East MRT Scheme, Napier Road, Northern Station Interchange.

L23: New East MRT Scheme

- 8.6.21 The new East MRT Scheme provides a journey saving time of between 4 minutes and 7 minutes at AM and PM peak flow in comparison to the existing route. This is a significant journey time saving and is considered **major beneficial**.

Overall

- 8.6.22 The East MRT Scheme provides a significant reduction in public transport journey time between the A3290 London Road Roundabout and Reading Town Centre and Railway Station. Therefore, the overall effect of the development on Public Transport Delay is considered to be **major beneficial**.

Severance

- 8.6.23 The assessment of severance has identified that, with two exceptions (L1 –Access and L23 – New East MRT Scheme Route), the change in flow on links is below 30%. Such changes in flow are **not significant** with respect to severance.
- 8.6.24 The assessment has not identified any high sensitivity links with a change in flow rate of greater than 10% as a result of the scenario.

L1: Access

- 8.6.25 L1 is part of the new MRT route and therefore does not have a vehicle flow in the Baseline situation. L1 will be subject to a two-way flow of 34 vehicles in the AM and PM peak hours. Buses using this route are rerouted from Kings Road and London Road. On this basis, it is considered appropriate to judge the effect of the traffic on this link in comparison to the traffic utilising L5 and L15 (London Road east of Cemetery Junction and Kings Road adjacent to Reading College). The Proposed Scheme situation causes a reduction in the number of vehicles on L5 and L15. The demand for crossing is also expected to be limited in this location as the MRT route is between a railway line and the River Thames. Therefore, the effect in terms of severance is considered to be **minor beneficial**.

L23: New East MRT Scheme Route

- 8.6.26 L23 is part of the new MRT route and therefore does not have a vehicle flow in the Baseline situation. L23 will be subject to a two-way flow of 34 vehicles in the AM and PM peak hours. Buses using this route are rerouted from Kings Road and London Road. On this basis, it is considered appropriate to judge the effect of the traffic on this link in comparison to the traffic utilising L5 and L15 (London Road east of Cemetery Junction and Kings Road adjacent to Reading College). The Proposed Scheme situation causes a reduction in the number of vehicles on L5 and L15. The demand for crossing is also expected to be limited in this location as the route is at high level along most of its length. Pedestrians and cyclists will not need to cross the route when on the riverside footpath, and will be able to walk/cycle under the route at riverside level. The route does not therefore cause any significant severance, but provides a

new pedestrian route and cycle route into the town centre. The route is a short direct well lit, in comparison to the existing alternatives. Therefore, the effect in terms of severance is considered to be **major beneficial**.

Overall

- 8.6.27 The links for which severance is not negligible are the new links to be constructed as part of the scheme. The proposed East MRT Scheme is located at high level between the River Thames and a rail line and is a mainly undeveloped area and as a result the severance at this location is negligible. Severance is reduced on the L5 and L15 links as a result of the Proposed Scheme situation. In addition, the scheme includes walking and cycling routes alongside the proposed East MRT Scheme, reducing severance between the east of Reading the Town Centre, where the existing routes are narrow, stepped, shared, adjacent to busy traffic and/or unlit. Therefore, the overall effect of the development on severance is considered to be **major beneficial**.

Pedestrian and Cyclist Delay and Amenity

- 8.6.28 The assessment of pedestrian and cyclist delay and amenity has identified that, with two exceptions (L1 and L23), the change in flow on links is below 30%. Such changes in flow give rise to not significant effect with respect to Pedestrian and Cyclist Delay and Amenity.
- 8.6.29 The assessment has not identified any high sensitivity links with a change in flow rate of greater than 10% as a result of the scenario.

L1: Access

- 8.6.30 L1 has been assessed as this will be a new link. L1 will be subject to a two-way flow of 34 vehicles in the AM and PM peak hours. This is significantly less than 800 vehicles per hour. In addition, the East MRT Scheme includes designated pedestrian and cycle routes separate from vehicle traffic. As a consequence, the effect in terms of pedestrian and cyclist delay and amenity is considered to be **minor beneficial**.

L23: New East MRT Scheme

- 8.6.31 L23 has been assessed as this will be a new link. L23 will be subject to a two-way flow of 34 vehicles in the AM and PM peak hours. This is significantly less than 800 vehicles per hour. In addition, the East MRT Scheme includes designated pedestrian and cycle routes separate from vehicle traffic which provides a segregated, wide, lit relatively flat, direct route into Reading town centre from the east. As a consequence, the effect in terms of pedestrian and cyclist delay and amenity is considered to be **major beneficial**.

Overview

- 8.6.32 The effect of the development on Pedestrian and Cyclist Delay and Amenity has been shown to be an improvement for all of the assessed links. This is either due to a small change in the number of vehicles using the links or the total hourly flow of vehicles being less than the

threshold of 800 per hour. Additionally, the East MRT Scheme includes new pedestrian and cycle which will reduce cyclist and pedestrian delay.

- 8.6.33 Overall therefore, the effect of the development on pedestrian delay and amenity is considered to be **major beneficial**.

Fear and Intimidation

- 8.6.34 A number of factors are considered in determining changes in the level of fear and intimidation experienced by pedestrians and cyclists, including changes in traffic volumes, its HGV proportion, its speed and its proximity to people.
- 8.6.35 The assessment has not identified any high sensitivity links with a change in flow rate of greater than 10% as a result of the scenario. The total number of HGVs on MRT route per 24 hour period is 324 which is significantly less than the threshold of 1,000 per 18 hour period.
- 8.6.36 The proposed East MRT Scheme reduces the number of buses on Kings Road and London Road which are roads with a high number of pedestrians. Buses are instead rerouted along the East MRT Scheme via lower sensitivity roads.
- 8.6.37 The East MRT Scheme includes designated pedestrian and cycle routes separate from vehicle traffic. The pedestrian and cycle route is alongside the East MRT Scheme which has significantly fewer vehicles and HGVs in comparison to the alternative London Road Kings Road route.
- 8.6.38 The effect on pedestrian fear and intimidation is **major beneficial**.

Accidents and Road Safety

- 8.6.39 The accident data is analysed in all links where there is a 10% or more change in traffic flow at AM or PM peak flow or in average flow over 24 hours. For this scenario, Napier Road (L22) is the only analysed link which shows a change in vehicle flow rate of greater than 10%. Full details of the collision data analysis is provided in **Section 8.5**.
- 8.6.40 Prediction of the effects of the proposed development on accidents and road safety is generally considered by identifying any changes where greater or less conflict might occur. Changes in traffic volumes and vehicle speeds have an effect on accidents and road safety.
- 8.6.41 Although Napier Road will experience an increase traffic flow, this could lead to slower vehicle speeds, which may reduce the number and/or severity of accidents.
- 8.6.42 It is considered that the change in vehicle flow due to the proposed scheme could potentially increase the risk of accidents. This increase is likely to be small, as the increases in traffic flows are low in comparison to baseline traffic flows. Over the last 60 months on Napier Road only two collisions have been recorded in the Personal Injury Collision data, which is low in comparison to all of the other roads which were assessed.
- 8.6.43 When considering the overall scheme, the development will deliver walking and cycling improvements, bus service improvements, and new junctions designed to meet highway standards, which could lead to road safety improvements, particularly in terms of vulnerable road users. The new segregated wide lit foot/cycleway will provide a safe route for these users.

- 8.6.44 Therefore, in terms of accidents and road safety, the overall effect of the proposed development is to be **minor beneficial**.

Operational Potential Effects – Scenario 2

- 8.6.45 Scenario 2 assesses the effect of the East MRT Scheme and TVP P&R combined. The changes in traffic flows are presented in **Tables 8-18** and **8-19**.
- 8.6.46 It is assumed that at peak flow times, which are between 6:00 to 9:00 in the morning and 15:00 to 18:00 in the afternoon, there will be 17 buses per hour in each direction on the East MRT Scheme. Between 9:00 and 15:00 there will be 10 buses per hour in each direction.
- 8.6.47 It is assumed that all 277 the spaces in the TVP P&R are in use. Vehicles are assumed to enter the TVP P&R in the morning between 7:00 and 10:00 with a peak flow of 151 vehicles between 8:00 and 9:00. Vehicles are assumed to leave the TVP P&R in the afternoon between 16:00 and 19:00 with a peak flow of 151 vehicles between 17:00 and 18:00.

Table 8-18: Scenario 2 AM and PM Peak Flows

Link	Link Name	2021 AM Peak Flow			2021 PM Peak Flow		
		Baseline	Proposed Scheme	% Change	Baseline	Proposed Scheme	% Change
1	Site Access	0	185	N/A	0	185	N/A
2	Thames Valley Park Drive	1721	1763	2%	914	925	1%
3	A3290 between Site Access and A4	1721	1902	11%	914	1061	16%
4	A4 London Road South of Shepards Hill	1508	1525	1%	1592	1596	0%
5	A4 London Road east of Cemetery Junction	2298	2144	-7%	1700	1521	-11%
6	A4 London Road west of Cemetery Junction	1754	1637	-7%	2225	2230	0%
7	Pitts Lane	1193	1180	-1%	1162	1170	1%
8	Church Road	1103	1109	1%	1156	1172	1%
9	Woodlands Avenue	841	850	1%	1138	1141	0%
10	Whitegates Lane	328	333	2%	304	313	3%
11	Palmer Park Avenue	618	608	-2%	527	527	0%
12	Wokingham Road adjacent to Palmer Park	1178	1193	1%	1470	1471	0%
13	Crescent Road	1110	1090	-2%	820	813	-1%
14	Erleigh Road	673	657	-2%	922	892	-3%
15	A329 Kings Road adjacent to Reading College	1627	1618	-1%	1599	1443	-10%
16	A329 Queens Road	2578	2565	-1%	2777	2833	2%
17	A329 Kings Road adjacent to Gas Works Road	2412	2408	0%	2394	2317	-3%
18	A329 Forbury Road between Kings Road and Kenavon Drive	2450	2434	-1%	2408	2410	0%
19	A329 Forbury Road between Kenavon Drive and Vastern Road	2328	2313	-1%	2425	2426	0%
20	Vastern Road Rail Bridge	2288	2284	0%	2429	2454	1%
21	Vastern Road	2076	2068	0%	2131	2165	2%
22	Napier Road	235	268	14%	153	186	22%
23	New East MRT Scheme Route	0	34	N/A	0	34	N/A

Table 8-19: Scenario 2 Total 24 hour flows

Link	Link Name	Total 24 Hour Flow		
		Baseline	Proposed Scheme	% Change
1	Site Access	0	878	N/A
2	Thames Valley Park Drive	9802	10025	2%
3	A3290 between Site Access and A4	9802	10437	6%
4	A4 London Road South of Shepards Hill	24428	24579	1%
5	A4 London Road east of Cemetery Junction	30353	29530	-3%
6	A4 London Road west of Cemetery Junction	32988	32987	0%
7	Pitts Lane	19042	19040	0%
8	Church Road	18559	18762	1%
9	Woodlands Avenue	16623	16710	1%
10	Whitegates Lane	5110	5230	2%
11	Palmer Park Avenue	6696	6662	-1%
12	Wokingham Road adjacent to Palmer Park	22125	22230	0%
13	Crescent Road	11102	10980	-1%
14	Erleigh Road	9785	9519	-3%
15	A329 Kings Road adjacent to Reading College	30090	29706	-1%
16	A329 Queens Road	49876	50377	1%
17	A329 Kings Road adjacent to Gas Works Road	45027	45503	1%
18	A329 Forbury Road between Kings Road and Kenavon Drive	43778	43689	0%
19	A329 Forbury Road between Kenavon Drive and Vastern Road	43048	42951	0%
20	Vastern Road Rail Bridge	43245	43468	1%
21	Vastern Road	38755	39053	1%
22	Napier Road	2990	3308	11%
23	New East MRT Scheme Route	0	324	N/A

- 8.6.48 As shown in **Table 8-22** and **Table 8-23** no links experience a change in flow rate of greater than 30% as a result of Scenario 2. Links 3 and 22 experience an increase in flow rate of between 10% and 30%. Links 5 and 15 experience a reduction in flow rate of between 10% and 30%. The change in flow in all remaining links is below 10% for this scenario.
- 8.6.49 Links 1 and 23 will be built as part of the proposed scheme and therefore do not currently exist and have no flow during the Baseline situation.

Assessment of Operational Effects – Scenario 2

- 8.6.50 This section presents the assessment of the operational effects for a typical weekday in the year of 2021 for scenario 2.

Driver Delay

- 8.6.51 The SATURN model of the area surrounding the site and the data from the TVP P&R Transport Assessment have been used to assess the likely impact of the proposed East MRT Scheme and TVP P&R on the surrounding links.
- 8.6.52 The links that experience a change in flow of greater than 30% are assessed in addition to high sensitivity links that experience a flow of more than 10%.
- 8.6.53 The access (L1) and the New East MRT Scheme (L23) each experience a change in flow of greater than 30% as they currently do not have any flow. Kings Road adjacent to Reading College is a high sensitivity link are identified with a greater than 10% change in flow.

L1: Access

- 8.6.54 The East MRT Scheme has been assessed from the existing roundabout on the A3290. **Table 8-20** shows the modelled impacts of driver delay at the access.

Table 8-20: Scenario 1 – Driver Delay at the Access

Peak Hour	Baseline Delay (Seconds)	Proposed Scheme Delay (Seconds)	Difference (Seconds)	Magnitude of Impact
08:00-09:00	N/A	20	N/A	N/A
17:00-18:00	N/A	18	N/A	N/A

- 8.6.55 As the access does not currently exist there is no flow in the Baseline situation. There is therefore no impact on driver delay compared to the Baseline situation.

L15: Kings Road

- 8.6.56 Kings Road experiences a reduction in vehicle flow as a result of the Proposed Scheme situation. There is therefore a reduction in traffic flow and driver delay as a result of the Proposed Scheme situation.

L23: New East MRT Scheme Route

- 8.6.57 As there is currently no junction at the location where the proposed East MRT Scheme Route joins Napier Road and no flow on the New East MRT Scheme Route, there is no impact driver delay on the link.

Overall

- 8.6.58 The impact on driver delay on the proposed links is considered to be negligible on all links with a change in flow of less than 30% and less than 10% high sensitivity links with a change in flow of less than 10%. The driver delay on the access and new East MRT Scheme Route are both minimal. There is a reduction in driver delay on Kings Road as a result of the development. It is therefore considered that overall the effect of the development will **not significant**.

Public Transport Delay

- 8.6.59 The Reading Transport SATURN Model (RTM) has been used to understand any potential journey time savings the East MRT Scheme would deliver. The public transport delay is assessed from the A3290 London Road Roundabout to Reading Railway Station. The existing route for public transport is via London Road, Kings Road, Forbury Road, South East Station Interchange. The new proposed route for public transport is via A3290, East MRT Scheme Route, Napier Road, Northern Station Interchange.

L23: New East MRT Scheme Route

- 8.6.60 The new East MRT Scheme Route provides a journey saving time of between 4 minutes and 7 minutes at AM and PM peak flow in comparison to the existing route. This is a significant journey time saving and is considered **major beneficial**.

Overall

- 8.6.61 The East MRT Scheme provides a significant reduction in public transport journey time between the A3290 London Road Roundabout and Reading Town Centre and Railway Station. Therefore, the overall effect of the development on Public Transport Delay is considered to be **major beneficial**.

Severance

- 8.6.62 As outlined within the methodology section of this chapter, severance is defined as the perceived division of a community that may arise when a road traffic link runs through an existing settlement. This can occur when a road becomes too heavily trafficked, making crossing the road difficult for pedestrians or cyclists.

- 8.6.63 The assessment of severance has identified that, with two exceptions (L1 – Access and L23 – New East MRT Scheme), the change in flow on links is below 30%. Such changes in flow are **not significant** with respect to severance.
- 8.6.64 The vehicle flow rate along Kings Road reduces by 10% as a result of the scenario. As Kings Road is a high sensitivity link the effect of the scenario on this link has been assessed in accordance with Rule 2.

L1: Access

- 8.6.65 L1 is part of the new MRT route and therefore does not have a vehicle flow in the Baseline situation. L1 will be subject to a two-way flow of 185 vehicles in the AM and PM peak hours. Buses using this route are rerouted from Kings Road and London Road. On this basis, it is considered appropriate to judge the effect of the traffic on this link in comparison to the traffic utilising L5 and L15 (London Road east of Cemetery Junction and Kings Road adjacent to Reading College). The Proposed Scheme situation causes a reduction in the number of vehicles on L5 and L15. The demand for crossing is also expected to be limited in this location as the MRT route is between a railway line and the River Thames. Therefore, the effect in terms of severance is considered to be **minor beneficial**.

L15: Kings Road

- 8.6.66 As a result of the scenario the traffic flow along Kings Road is reduced during the peak AM, PM and total flow over 24 hours. A reduction in flow within Kings Road is an improvement to the current situation in terms of severance.

L23: New Easy MRT Scheme

- 8.6.67 L23 is part of the new MRT route and therefore does not have a vehicle flow in the Baseline situation. L23 will be subject to a two-way flow of 34 vehicles in the AM and PM peak hours. Buses using this route are rerouted from Kings Road and London Road. On this basis, it is considered appropriate to judge the effect of the traffic on this link in comparison to the traffic utilising L5 and L15 (London Road east of Cemetery Junction and Kings Road adjacent to Reading College). The Proposed Scheme situation causes a reduction in the number of vehicles on L5 and L15. The demand for crossing is also expected to be limited in this location as the route is at high level along most of its length. Pedestrians and cyclists will not need to cross the route when on the riverside footpath, and will be able to walk/cycle under the route at riverside level. The route does not therefore cause any significant severance, but provides a new pedestrian route and cycle route into the town centre. The route is a short direct well lit, in comparison to the existing alternatives. Therefore, the effect in terms of severance is considered to be **major beneficial**.

Overall

- 8.6.68 The links for which severance is not negligible are the new links to be constructed as part of the scheme. The proposed East MRT Scheme is located at high level between the River Thames as a result the severance at this location is negligible. Severance is reduced on the L5 and L15 links as a result of the Proposed Scheme situation. In addition, the scheme includes walking and cycling routes alongside the proposed East MRT Scheme, reducing severance between the east of Reading and the Town Centre where the existing routes are narrow, shared, stepped, adjacent to busy traffic and/or unlit. Therefore, the overall effect of the development on severance is considered to be **major beneficial**.

Pedestrian and Cyclist Delay and Amenity

- 8.6.69 The assessment of pedestrian and cyclist delay and amenity has identified that, with two exceptions (L1 and L23), the change in flow on links is below 30%. Such changes in flow give rise to not significant effect with respect to Pedestrian and Cyclist Delay and Amenity.
- 8.6.70 The vehicle flow rate along Kings Road reduces by 10% as a result of the scenario. As Kings Road is a high sensitivity link the effect of the scenario on this link will be assessed in accordance with Rule 2.

L1: Access

- 8.6.71 L1 has been assessed as this will be a new link. L1 will be subject to a two-way flow of 185 vehicles in the AM and PM peak hours. This is significantly less than 800 vehicles per hour. In addition, the East MRT Scheme includes designated pedestrian and cycle routes separate from vehicle traffic. As a consequence, the effect in terms of pedestrian and cyclist delay and amenity is considered to be **minor beneficial**.

L15: Kings Road

- 8.6.72 Kings Road experiences a 10% reduction in traffic flow during this scenario. This will reduce the pedestrian and cyclist delay and amenity which is an improvement compared to the existing situation.

L23: New East MRT Scheme

- 8.6.73 L23 has been assessed as this will be a new link. L23 will be subject to a two-way flow of 34 vehicles in the AM and PM peak hours. This is significantly less than 800 vehicles per hour. In addition, the East MRT Scheme includes designated pedestrian and cycle routes separate from vehicle traffic which provides a segregated, wide, lit relatively flat, direct route into Reading town centre from the east. As a consequence, the effect in terms of pedestrian and cyclist delay and amenity is considered to be **major beneficial**.

Overview

- 8.6.74 The effect of the development on Pedestrian and Cyclist Delay and Amenity has been shown to be an improvement for all of the assessed links. This is either due to a small change in the number of vehicles using the links or the total hourly flow of vehicles being less than the threshold of 800 per hour. Additionally, the East MRT Scheme includes new pedestrian and cycle routes which will reduce cyclist and pedestrian delay.
- 8.6.75 Overall therefore, the effect of the development on pedestrian delay and amenity is considered to be **major beneficial**.

Fear and Intimidation

- 8.6.76 A number of factors are considered in determining changes in the level of fear and intimidation experienced by pedestrians and cyclists, including changes in traffic volumes, its HGV proportion, its speed and its proximity to people.
- 8.6.77 The assessment has not identified any high sensitivity links with a change in flow rate of greater than 10% as a result of the scenario. The total number of HGVs on new proposed

MRT route per 24 hour period is 324 which is significantly less than the threshold of 1000 per 18 hour period.

8.6.78 The proposed East MRT Scheme reduces the number of buses on Kings Road and London Road which are roads with a high number of pedestrians. Buses are instead rerouted along the East MRT Scheme via lower sensitivity roads.

8.6.79 The East MRT Scheme includes designated pedestrian and cycle routes separate from vehicle traffic. The pedestrian and cycle route is alongside the East MRT Scheme which has significantly fewer vehicles and HGVs in comparison to the alternative London Road Kings Road route.

8.6.80 The effect on pedestrian fear and intimidation is **major beneficial**.

Accidents and Road Safety

8.6.81 The accident data is analysed in all links where there is a 10% or more change in traffic flow at AM or PM peak flow or in average flow over 24 hours. For this scenario, A3290 between Site Access and A4 (L3), A4 London Road east of Cemetery Junction (L5), A329 Kings Road adjacent to Reading College (L15) and Napier Road (L22) are the only analysed links which shows a change in vehicle flow rate of greater than 10%. Full details of the collision data analysis are provided in **Section 8.5**.

8.6.82 Prediction of the effects of the proposed scheme on accidents and road safety is generally considered by identifying any changes where greater or less conflict might occur. Changes in traffic volumes and vehicle speeds have an effect on accidents and road safety.

8.6.83 The **A3290 between Site Access and A4** will experience an increase in traffic flow as a result of the East MRT Scheme and TVP P&R. It is considered that the change in vehicle flow due to the proposed development could potentially increase the risk of accidents on the A3290. This increase is likely to be small, as the increases in traffic flows are low in comparison to baseline traffic flows. The Personal Injury Collision data did not include records of any collisions over the last 60 months either on assessed section of the A3290 or on the roundabout which the proposed access site will be accessed from.

8.6.84 **London Road** east of Cemetery Junction experiences a reduction in traffic flows as a result of the proposed East MRT Scheme and TVP P&R. This section of London Road is currently very busy, especially at peak times. It is considered that the reduction in vehicle flow will reduce the risk accidents on the road.

8.6.85 **Kings Road** adjacent to Reading College experiences a reduction in traffic flows as a result of the proposed East MRT Scheme and TVP P&R. This section of Kings Road is currently very busy, especially at peak times. The number of vehicles travelling west along the bus lane of Kings Road is significantly reduced by the development. Vehicles travelling along this section of road were in particular involved in collisions at the junction between Kings Road and London Road. It is considered that the reduction in vehicle flow will reduce the risk accidents on the road.

8.6.86 Although **Napier Road** will experience an increase traffic flow, this could lead to slower vehicle speeds, which may reduce the number and/or severity of accidents. It is considered that the change in vehicle flow due to the proposed development could potentially increase the risk of accidents on Napier Road. This increase is likely to be small, as the increases in traffic flows are low in comparison to baseline traffic flows. Over the last 60 months on Napier Road only 2 collisions have been recorded in the Personal Injury Collision data which is low in comparison to all of the other roads which were assessed.

8.6.87 When considering the overall scheme, the development will deliver walking and cycling improvements, bus service improvements, and new junctions designed to meet highway

standards, which could lead to road safety improvements, particularly in terms of vulnerable road users. The new segregated wide lit foot/cycleway will provide a safe route for these users.

- 8.6.88 Therefore, in terms of accidents and road safety, the overall effect of the proposed development is to be **minor beneficial**.

Operational Potential Effects – Scenario 3

- 8.6.89 Scenario 3 assesses the effect of including the East MRT Scheme with the committed TVP P&R in place in **Tables 8-21** and **8-22**.
- 8.6.90 It is assumed that at peak flow times, which are between 6:00 to 9:00 in the morning and 15:00 to 18:00 in the afternoon, there will be 17 buses per hour in each direction on the East MRT Scheme and between 9:00 and 15:00 there will be 10 buses per hour in each direction.
- 8.6.91 It is assumed that all 277 the spaces in the TVP P&R are in use. Vehicles are assumed to enter the TVP P&R in the morning between 7:00 and 10:00 with a peak flow of 151 vehicles between 8:00 and 9:00. Vehicles are assumed to leave the TVP P&R in the afternoon between 16:00 and 19:00 with a peak flow of 151 vehicles between 17:00 and 18:00.

Table 8-21: Scenario 3 AM and PM peak flows

Link	Link Name	2021 AM Peak Flow			2021 PM Peak Flow		
		Baseline	Proposed Scheme	% Change	Baseline	Proposed Scheme	% Change
1	Site Access	151	185	23%	151	185	23%
2	Thames Valley Park Drive	1721	1763	2%	914	925	1%
3	A3290 between Site Access and A4	1872	1902	2%	1065	1061	0%
4	A4 London Road South of Shepards Hill	1508	1525	1%	1592	1596	0%
5	A4 London Road east of Cemetery Junction	2147	2144	0%	1549	1521	-2%
6	A4 London Road west of Cemetery Junction	1603	1637	2%	2225	2230	0%
7	Pitts Lane	1193	1180	-1%	1162	1170	1%
8	Church Road	1103	1109	1%	1156	1172	1%
9	Woodlands Avenue	841	850	1%	1138	1141	0%
10	Whitegates Lane	328	333	2%	304	313	3%
11	Palmer Park Avenue	618	608	-2%	527	527	0%
12	Wokingham Road adjacent to Palmer Park	1178	1193	1%	1470	1471	0%
13	Crescent Road	1110	1090	-2%	820	813	-1%
14	Erleigh Road	673	657	-2%	922	892	-3%
15	A329 Kings Road adjacent to Reading College	1627	1618	-1%	1448	1443	0%
16	A329 Queens Road	2578	2565	-1%	2777	2833	2%
17	A329 Kings Road adjacent to Gas Works Road	2412	2408	0%	2243	2317	3%
18	A329 Forbury Road between Kings Road and Kenavon Drive	2450	2434	-1%	2408	2410	0%
19	A329 Forbury Road between Kenavon Drive and Vastern Road	2328	2313	-1%	2425	2426	0%
20	Vastern Road Rail Bridge	2288	2284	0%	2429	2454	1%
21	Vastern Road	2076	2068	0%	2131	2165	2%
22	Napier Road	235	268	14%	153	186	22%
23	New East MRT Scheme Route	0	34	N/A	0	34	N/A

Table 8-22: Scenario 3 Total 24 hour flow

Link	Link Name	Total 24 Hour Flow		
		Baseline	Proposed Scheme	% Change
1	Site Access	554	878	58%
2	Thames Valley Park Drive	9802	10025	2%
3	A3290 between Site Access and A4	10356	10437	1%
4	A4 London Road South of Shepards Hill	24428	24579	1%
5	A4 London Road east of Cemetery Junction	29799	29530	-1%
6	A4 London Road west of Cemetery Junction	32711	32987	1%
7	Pitts Lane	19042	19040	0%
8	Church Road	18559	18762	1%
9	Woodlands Avenue	16623	16710	1%
10	Whitegates Lane	5110	5230	2%
11	Palmer Park Avenue	6696	6662	-1%
12	Wokingham Road adjacent to Palmer Park	22125	22230	0%
13	Crescent Road	11102	10980	-1%
14	Erleigh Road	9785	9519	-3%
15	A329 Kings Road adjacent to Reading College	29813	29706	0%
16	A329 Queens Road	49876	50377	1%
17	A329 Kings Road adjacent to Gas Works Road	44750	45503	2%
18	A329 Forbury Road between Kings Road and Kenavon Drive	43778	43689	0%
19	A329 Forbury Road between Kenavon Drive and Vastern Road	43048	42951	0%
20	Vastern Road Rail Bridge	43245	43468	1%
21	Vastern Road	38755	39053	1%
22	Napier Road	2990	3308	11%
23	New East MRT Scheme Route	0	324	N/A

8.6.92 As shown in **Table 8-21** and **Table 8-24** link 1 experiences an increase in flow rate of greater than 30% as a result of Scenario 3. Link 22 experiences an increase in flow rate of up to 22%

during the PM peak flow. The change in flow in all remaining links is below 10% for this scenario.

- 8.6.93 Link 23 will be built as part of the East MRT Scheme and therefore is not build as part of the TVP P&R and has no flow during the Baseline situation.

Assessment of Operational Effects – Scenario 3

- 8.6.94 This section presents the assessment of the operational effects for a typical weekday in the year of 2021 for scenario 3.

Driver Delay

- 8.6.95 The SATURN model of the area surrounding the site has been used to assess the likely impact of the proposed East MRT Scheme on the surrounding links.
- 8.6.96 The links that experience a change in flow of greater than 30% are assessed in addition to high sensitivity links that experience a flow of more than 10%.
- 8.6.97 The site access (L1) and the New East MRT Scheme (L23) each experience a change in flow of greater than 30%. No high sensitivity links are identified with a greater than 10% change in flow.

L1: Access

- 8.6.98 The East MRT Scheme will be accessed from the existing roundabout on the A3290. **Table 8-23** shows the modelled impacts of driver delay at the access.

Table 8-23: Scenario 1 – Driver Delay at the Access

Peak Hour	Baseline Delay (Seconds)	Proposed Scheme Delay (Seconds)	Difference (Seconds)	Magnitude of Impact
08:00-09:00	0	20	+20	Small
17:00-18:00	3	15	+12	Negligible

- 8.6.99 With the TVP P&R included in the Baseline situation the East MRT Scheme causes a small magnitude impact during the AM peak flow and a negligible impact during the PM peak flow.

L23: New East MRT Scheme Route

- 8.6.100 As there is currently no junction at the location where the proposed East MRT Scheme joins Napier Road and no flow on the New East MRT Scheme, there is no impact driver delay on the link.

Overall

- 8.6.101 The impact of driver delay on the proposed links is considered to be negligible on all links with a change in flow of less than 30% and less than 10% on high sensitivity links. The driver delay on the new East MRT Scheme are minimal. The East MRT Scheme has a small effect on the

driver delay on site access. It is therefore considered that overall the development will have a **negligible** effect on driver delay.

Public Transport Delay

8.6.102 The Reading Transport SATURN Model (RTM) has been used to understand any potential journey time savings the East MRT Scheme would deliver. The public transport delay is assessed from the A3290 London Road Roundabout to Reading Railway Station. The existing route for public transport is via London Road, Kings Road, Forbury Road, South East Station Interchange. The new proposed route for public transport is via A3290, East MRT Scheme Route, Napier Road, Northern Station Interchange.

L23: New East MRT Scheme

8.6.103 The new East MRT Scheme provides a journey saving time of between 4 minutes and 7 minutes at AM and PM peak flow in comparison to the existing route.

8.6.104 The public transport journey time saving is reduced further between the TVP P&R and Reading Railway Station as a result of the East MRT Scheme. This is because the TVP P&R is located along the route of the A3290 London Road Roundabout and Reading Railway Station. This is a significant journey time saving and is considered **major beneficial**.

Overall

8.6.105 The East MRT Scheme provides a significant reduction in public transport journey time between the A3290 London Road Roundabout and Reading Town Centre and Railway Station. Therefore, the overall effect of the development on Public Transport Delay is considered to be **major beneficial**.

Severance

8.6.106 As outlined within the methodology section of this chapter, severance is defined as the perceived division of a community that may arise when a road traffic link runs through an existing settlement. This can occur when a road becomes too heavily trafficked, making crossing the road difficult for pedestrians or cyclists.

8.6.107 The assessment of severance has identified that, with two exceptions (L1 – Access and L23 – New East MRT Scheme Route), the change in flow on links is below 30%. Such changes in flow are **not significant** with respect to severance.

8.6.108 The assessment has not identified any high sensitivity links with a change in flow rate of greater than 10% as a result of the scenario.

L1: Access

8.6.109 L1 is part of the new MRT route which will provide access to both the TVP P&R and the East MRT Scheme during the Proposed Scheme situation and provide access to the TVP P&R during the Baseline situation. During the Baseline situation the MRT route will be subject to a two-way peak flow of 151 vehicles in the AM and PM peak hours. During the Proposed Scheme situation, the MRT route will be subject to a two-way peak flow of 185 vehicles in the AM and PM peak hours. This results in a 23% increase in flow from the Proposed Scheme situation.

8.6.110 Buses using this route are rerouted from Kings Road and London Road. On this basis, it is considered appropriate to judge the effect of the traffic on this link in comparison to the traffic utilising L5 and L15 (London Road east of Cemetery Junction and Kings Road adjacent to Reading College). The Proposed Scheme situation causes a reduction in the number of vehicles on L5 and L15. The demand for crossing is also expected to be limited in this location

as the MRT route is between a railway line and the River Thames. Therefore, the effect in terms of severance is considered to be **minor beneficial**.

L23: New East MRT Scheme

8.6.111 L23 is part of the new MRT route and therefore does not have a vehicle flow in the Baseline situation. L23 will be subject to a two-way flow of 34 vehicles in the AM and PM peak hours. Buses using this route are rerouted from Kings Road and London Road. On this basis, it is considered appropriate to judge the effect of the traffic on this link in comparison to the traffic utilising L5 and L15 (London Road east of Cemetery Junction and Kings Road adjacent to Reading College). The Proposed Scheme situation causes a reduction in the number of vehicles on L5 and L15. The demand for crossing is also expected to be limited in this location as the route is at high level along most of its length. Pedestrians and cyclists will not need to cross the route when on the riverside footpath, and will be able to walk/cycle under the route at riverside level. The route does not therefore cause any significant severance, but provides a new pedestrian route and cycle route into the town centre. The route is a short direct well lit, in comparison to the existing alternatives. Therefore, the effect in terms of severance is considered to be **major beneficial**.

Overall

8.6.112 The links for which severance is not negligible are the new links to be constructed as part of the scheme. The proposed East MRT Scheme is located at high level between the River Thames and a rail line and is a mainly undeveloped area and as a result the severance at this location is negligible. Severance is reduced on the L5 and L15 links as a result of the Proposed Scheme situation. In addition, the scheme includes walking and cycling routes alongside the proposed East MRT Scheme, reducing severance between the east of Reading the Town Centre, where the existing routes are narrow, stepped, shared, adjacent to busy traffic and/or unlit. Therefore, the overall effect of the development on severance is considered to be **major beneficial**.

Pedestrian and Cyclist Delay and Amenity

8.6.113 The assessment of pedestrian and cyclist delay and amenity has identified that, with two exceptions (L1 and L23), the change in flow on links is below 30%. Such changes in flow give rise to not significant effect with respect to Pedestrian and Cyclist Delay and Amenity.

8.6.114 The assessment has not identified any high sensitivity links with a change in flow rate of greater than 10% as a result of the scenario.

L1: Access

8.6.115 L1 has been assessed as this will be a new link. L1 will be subject to a two-way flow of 34 vehicles in the AM and PM peak hours. This is significantly less than 800 vehicles per hour. In addition, the East MRT Scheme includes designated pedestrian and cycle routes separate from vehicle traffic. As a consequence, the effect in terms of pedestrian and cyclist delay and amenity is considered to be **minor beneficial**.

L23: New East MRT Scheme

8.6.116 L23 has been assessed as this will be a new link. L23 will be subject to a two-way flow of 34 vehicles in the AM and PM peak hours. This is significantly less than 800 vehicles per hour. In addition, the East MRT Scheme includes designated pedestrian and cycle routes separate from vehicle traffic which provides a segregated, wide, lit relatively flat, direct route into

Reading town centre from the east. As a consequence, the effect in terms of pedestrian and cyclist delay and amenity is considered to be **minor beneficial**.

Overview

8.6.117 The effect of the development on Pedestrian and Cyclist Delay and Amenity has been shown to be an improvement for all of the assessed links. This is either due to a small change in the number of vehicles using the links or the total hourly flow of vehicles being less than the threshold of 800 per hour. Additionally, the East MRT Scheme Route includes new pedestrian and cycle which will reduce cyclist and pedestrian delay.

8.6.118 Overall therefore, the effect of the development on pedestrian delay and amenity is considered to be **major beneficial**.

Fear and Intimidation

8.6.119 A number of factors are considered in determining changes in the level of fear and intimidation experienced by pedestrians and cyclists, including changes in traffic volumes, its HGV proportion, its speed and its proximity to people.

8.6.120 The assessment has not identified any high sensitivity links with a change in flow rate of greater than 10% as a result of the scenario. The total number of HGVs on new proposed MRT route per 24 hour period is 324 which is significantly less than the threshold of 1000 per 18 hour period.

8.6.121 The proposed East MRT Scheme reduces the number of buses on Kings Road and London Road which are roads with a high number of pedestrians. Buses are instead rerouted along the East MRT Scheme via lower sensitivity roads.

8.6.122 The East MRT Scheme includes designated pedestrian and cycle routes separate from vehicle traffic. The pedestrian and cycle route is alongside the East MRT Scheme which has significantly fewer vehicles and HGVs in comparison to the alternative London Road Kings Road route.

8.6.123 The effect on pedestrian fear and intimidation is **major beneficial**.

Accidents and Road Safety

8.6.124 The accident data is analysed in all links where there is a 10% or more change in traffic flow at AM or PM peak flow or in average flow over 24 hours. For this scenario, Napier Road (L22) is the only analysed link which shows a change in vehicle flow rate of greater than 10%. Full details of the collision data analysis is provided in **Section 8.5**.

8.6.125 Prediction of the effects of the proposed development on accidents and road safety is generally considered by identifying any changes where greater or less conflict might occur. Changes in traffic volumes and vehicle speeds have an effect on accidents and road safety.

8.6.126 Although Napier Road will experience an increase traffic flow, this could lead to slower vehicle speeds, which may reduce the number and/or severity of accidents.

8.6.127 It is considered that the change in vehicle flow due to the proposed scheme could potentially increase the risk of accidents. This increase is likely to be small, as the increases in traffic flows are low in comparison to baseline traffic flows. Over the last 60 months on Napier Road only two collisions have been recorded in the Personal Injury Collision data, which is low in comparison to all of the other roads which were assessed.

8.6.128 When considering the overall scheme, the development will deliver walking and cycling improvements, bus service improvements, and new junctions designed to meet highway

standards, which could lead to road safety improvements, particularly in terms of vulnerable road users. The new segregated wide lit foot/cycleway will provide a safe route for these users.

8.6.129 Therefore, in terms of accidents and road safety, the overall effect of the proposed development is to be **minor beneficial**.

8.7 Mitigation & Enhancement

8.7.1 This section describes the measures that will be implemented to mitigate adverse environmental effects identified for the construction as well as operational phase of the proposed development.

8.7.2 No mitigation has been identified as being required during the operation of the proposed East MRT Scheme.

Construction Environmental Management Plan

8.7.3 One important element to control any adverse environmental effects arising during the construction phase of the proposed development will be the implementation of a Construction Environmental Management Plan (CEMP), which will be agreed with WC and RBC prior to commencement of construction. The CEMP will outline the arrangements and management practices to adopt in order to minimise the environmental effects of construction.

8.7.4 As no contractor has been appointed yet, the CEMP will need to be reviewed once the construction methodologies and techniques to be employed are confirmed. The CEMP will outline the following transport-specific details:

- Site Logistics;
- Working Hours;
- Maintaining Access;
- General Site layout, including accesses and routes;
- Construction traffic; and
- Designated access routes.

8.7.5 Further details regarding the CEMP can be found in Chapter 5.

8.8 Residual Effects

- 8.8.1 This section summarises any residual environmental effects of the construction and operational phase of the proposed development following the implementation of mitigation measures, as outlined in **Section 8.7** above.

Construction

- 8.8.2 No significant adverse effects resulting from the construction of the proposed development have been identified.

Operation

- 8.8.3 No significant adverse effects arising from the development have been identified.
- 8.8.4 **Table 8-24** shows the residual effects.

Table 8-24: Summary of Residual Effects

Sensitivity Rating	Duration (Temporary/Permanent)	Significance
Construction		
Severance	Temporary	Not Significant
Pedestrian and cyclist delay and amenity	Temporary	Not Significant
Fear and Intimidation	Temporary	Not Significant
Accidents and Road Safety	Temporary	Not Significant
Operation – Scenario 1		
Driver Delay	Permanent	Not Significant
Public Transport Delay	Permanent	Major Beneficial
Severance	Permanent	Major Beneficial
Pedestrian and cyclist delay and amenity	Permanent	Major Beneficial
Fear and Intimidation	Permanent	Major Beneficial
Accidents and Road Safety	Permanent	Minor Beneficial
Operation – Scenario 2		
Driver Delay	Permanent	Not Significant
Public Transport Delay	Permanent	Major Beneficial
Severance	Permanent	Major Beneficial
Pedestrian and cyclist delay and amenity	Permanent	Major Beneficial
Fear and Intimidation	Permanent	Major Beneficial
Accidents and Road Safety	Permanent	Minor Beneficial
Operation – Scenario 3		
Driver Delay	Permanent	Not Significant
Public Transport Delay	Permanent	Major Beneficial
Severance	Permanent	Major Beneficial
Pedestrian and cyclist delay and amenity	Permanent	Major Beneficial
Fear and Intimidation	Permanent	Major Beneficial
Accidents and Road Safety	Permanent	Minor Beneficial

8.9 Conclusion

- 8.9.1 The effect of the East MRT Scheme has been assessed within three scenarios. The East MRT Scheme provides benefits across many of the assessment criteria and no significant effect on the remaining assessment criteria.
- 8.9.2 It has been identified that during the construction phase the East MRT Scheme has no significant impact on severance, pedestrian and cyclist delay and amenity, fear and intimidation and accidents and road safety.
- 8.9.3 The East MRT Scheme has a major beneficial effect on public transport delay, as it provides significant journey time savings. The East MRT Scheme provides an alternative route from the A3290 London Road Roundabout to the Reading Railway Station.
- 8.9.4 It has been demonstrated that the East MRT Scheme will have a major beneficial on severance, as a result of reducing traffic flows on London Road and Kings Road which have residential and commercial frontage. The buses are routed via the East MRT Scheme Route which is located at high level between the River Thames and a railway line, which is a mainly undeveloped area, therefore resulting in a negligible effect on severance in this location.
- 8.9.5 The effect of the East MRT Scheme on pedestrian and cyclist delay and amenity has been shown to have a major benefit for all of the assessed scenarios. There is either a minimal change in vehicle flow rate or a total of less than 800 vehicles using each of the links within the study area as a result of the East MRT Scheme. Additionally, the East MRT Scheme includes new pedestrian and cycle routes which will reduce cyclist and pedestrian delay.
- 8.9.6 The East MRT Scheme provides a major benefit to fear and intimidation, as buses using London Road and Kings Road are rerouted along the East MRT Scheme. The East MRT Scheme includes cycle and pedestrian routes, therefore offers a route which is separate to traffic.

9 Air Quality

9.1 Introduction

- 9.1.1 This chapter documents the assessment of the likely significant effects of the proposed development with respect to air quality and has been prepared by Peter Brett Associates LLP (PBA).
- 9.1.2 The proposed development has the potential to adversely affect air quality during both the construction phase and operational phase. The main air pollutants of concern related to construction are dust and fine particulate matter (PM₁₀), and for road traffic they are nitrogen dioxide (NO₂) and fine particulate matter (PM₁₀ and PM_{2.5}).
- 9.1.3 For the construction phase assessment, the study area is defined as up to 350 m from the application site boundary in accordance with the Institute of Air Quality Management (IAQM) guidance on the assessment of construction dust effects (Ref 9.1).
- 9.1.4 During the construction period, the increase in heavy duty vehicles (HDVs) movements on the road network will be below the threshold of 25 movements per day on an Air Quality Management Area (AQMA) for an assessment to be necessary according to Environmental Protection UK (EPUK) and IAQM guidance. The expected increase in HDV movements on Napier Road, is approximately 5 to 10 HDV movements per day. The construction traffic impacts on human health receptors in the area are considered to be insignificant, and have therefore been scoped out of this assessment.
- 9.1.5 For ecological receptors, the criteria for an assessment to be undertaken is a change in traffic of more than 1,000 vehicles per day or 250 HDVs on a road within 200 m of a habitat, in accordance with Highways England Design Manual for Roads and Bridges (DMRB) HA207/07 guidance (Ref 9-2).
- 9.1.6 Highwood Local Nature Reserve (LNR) is located within 200 m northeast of A3290 and Church Road (**Appendix 9-4 Figure 9.2**). Given the distance between the Local Nature Reserve and the Application Site, construction phase effects are very unlikely to be significant. The increase in traffic flow brought about by the development on A3290 and Church Road are below threshold for an assessment to be necessary and, therefore, the impacts on Highwood LNR have been scoped out of this assessment.
- 9.1.7 The assessment has been prepared taking into account relevant local and national guidance and regulations.

9.2 Policy Context

The Air Quality Strategy

- 9.2.1 The Air Quality Strategy (2007) establishes the policy framework for ambient air quality management and assessment in the UK (Ref 9-3). The primary objective is to ensure that everyone can enjoy a level of ambient air quality which poses no significant risk to health or quality of life. The Strategy sets out the National Air Quality Objectives (NAQOs) and Government policy on achieving these objectives.
- 9.2.2 Part IV of the Environment Act 1995 introduced a system of Local Air Quality Management (LAQM) (Ref 9-4). This requires local authorities to regularly and systematically review and assess air quality within their boundary, and appraise development and transport plans against these assessments. The relevant NAQOs for LAQM are prescribed in the Air Quality (England) Regulations 2000 (Ref 9-5) and the Air Quality (Amendment) (England) Regulations 2002 (Ref 9-6).

- 9.2.3 Where an objective is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the objectives within its AQMA.
- 9.2.4 The Local Air Quality Management Technical Guidance 2016, issued by the Department for Environment, Food and Rural Affairs (Defra) for Local Authorities provides advice as to where the NAQOs apply (Ref 9-7). These include outdoor locations where members of the public are likely to be regularly present for the averaging period of the objective (which vary from 15 minutes to a year). Thus, for example, annual mean objectives apply at the façades of residential properties, whilst the 24-hour objective (for PM₁₀) would also apply within the garden. They do not apply to occupational, indoor or in-vehicle exposure.

EU Limit Values

- 9.2.5 The Air Quality Standards Regulations 2010 implements the European Union's Directive on ambient air quality and cleaner air for Europe (2008/50/EC), and includes limit values for NO₂ (Ref 9-8). These limit values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and the legal responsibility for ensuring that they are complied with. The compliance date for the NO₂ EU Limit Value was 1 January 2010, five years later than the date for the NAQO.
- 9.2.6 Directive 2008/50/EC consolidated the previous framework directive on ambient air quality assessment and management and its first three daughter directives. The limit values remained unchanged, but it now allows Member States a time extension for compliance, subject to European Commission (EC) approval.
- 9.2.7 The Directive limit values are applicable at 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 to which all relevant provisions concerning health and safety at work apply; and
 - On the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access.

Air Quality Objectives

Human Health

- 9.2.8 The NAQOs for NO₂ and PM₁₀ set out in the Air Quality Regulations (England) 2000 and the Air Quality (England) (Amendment) Regulations 2002, are shown in **Table 9-1**.
- 9.2.9 The objectives for NO₂ and PM₁₀ were to have been achieved by 2005 and 2004, respectively, but also continue to apply in all future years thereafter. Analysis of long-term monitoring data suggests that if the annual mean NO₂ concentration is less than 60 µg/m³ then the one-hour mean NO₂ 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 (**Ref 9-7**).

Table 9-1: NO₂ and PM₁₀ Objectives

Pollutant	Time Period	Objective
Nitrogen Dioxide (NO ₂)	1-hour mean	200µg/m ³ not to be exceeded more than 18 times a year
	Annual mean	40µg/m ³
Particulate Matter (PM ₁₀)	24-hour mean	50µg/m ³ not to be exceeded more than 35 times a year
	Annual mean	40µg/m ³

- 9.2.10 The Air Quality Strategy 2007 (Ref 9-3) includes an exposure reduction target for smaller particles known as PM_{2.5}. These are an annual mean target of 25 µg/m³ by 2020 and an average urban background exposure reduction target of 15% between 2010 and 2020.
- 9.2.11 The Ambient Air Quality and Cleaner Air for Europe directive (2008/50/EC) was adopted in May 2008, and includes a national exposure reduction target, a target value and a limit value for PM_{2.5}, shown in **Table 9-2**. The UK Government transposed this new directive into national legislation in June 2010.

Table 9-2: PM_{2.5} Objectives

	Time Period	Objective	To be Achieved by
UK Objectives	Annual mean	25µg/m ³	2020
	3 year running annual mean	15% reduction in concentrations measured at urban background Sites	Between 2010 and 2020
European Obligations	Annual mean	Target value of 25µg/m ³	2010
	Annual mean	Limit value of 25µg/m ³	2015
	Annual mean	Stage 2 indicative Limit value of 20µg/m ³	2020
	3 year Average Exposure Indicator (AEI) (a)	Exposure reduction target relative to the AEI depending on the 2010 value of the 3 year AEI (ranging from a 0% to a 20% reduction)	2020
	3 year Average Exposure Indicator (AEI)	Exposure concentration obligation of 20µg/m ³	2015

Note: (a) The 3 year annual or AEI is calculated from the PM_{2.5} concentration averaged across all urban background monitoring locations in the UK e.g. the AEI for 2010 is the mean concentration measured over 2008, 2009 and 2010.

Planning Policy

National Policy

- 9.2.12 The National Planning Policy Framework (NPPF) was published in March 2012 (Ref 9-9). It sets out the Government's planning policies for England and how they are expected to be applied. In relation to conserving and enhancing the natural environment, paragraph 109 states that:

"The planning system should contribute to and enhance the natural and local environment by.... preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability."

- 9.2.13 Paragraph 124, also states that:

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

- 9.2.14 Paragraph 203 goes on to say:

"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."

Planning Practice Guidance

- 9.2.15 The Planning Practice Guidance (PPG) is a 'live' document originally published in March 2014. The PPG supports the NPPF (Ref 9-10). Paragraph 001, Reference 32-001-20140306 of the PPG provides a summary as to why air quality is a consideration for planning:

"... Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values. It is important that the potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have been exceeded or are near the limit... The local air quality management (LAQM) regime requires every district and unitary authority to regularly review and assess air quality in their area. These reviews identify whether national objectives have been, or will be, achieved at relevant locations, by an applicable date... If national objectives are not met, or at risk of not being met, the local authority concerned must declare an air quality management area and prepare an air quality action plan... Air quality can also affect biodiversity and may therefore impact on our international obligations under the Habitats Directive... Odour and dust can also be a planning concern, for example, because of the effect on local amenity."

- 9.2.16 Paragraph 002, Reference 32-002-20140306, of the PPG concerns the role of Local Plans with regard to air quality:

"... Drawing on the review of air quality carried out for the local air quality management regime, the Local Plan may need to consider:

- *the potential cumulative impact of a number of smaller developments on air quality as well as the effect of more substantial developments;*

- *the impact of point sources of air pollution.; and*
- *ways in which new development would be appropriate in locations where air quality is or likely to be a concern and not give rise to unacceptable risks from pollution. This could be through, for example, identifying measures for offsetting the impact on air quality arising from new development including supporting measures in an air quality action plan or low emissions strategy where applicable."*

9.2.17 Paragraph 005, Reference 32-005-20140306, of the PPG identifies when air quality could be relevant for a planning decision:

"... When deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.

Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area.

Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.

Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.

Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."

9.2.18 Paragraph 007, Reference 32-007-20140306, of the PPG provides guidance on how detailed an assessment needs to be:

"Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific."

9.2.19 Paragraph 008, Reference 32-008-20140306, of the PPG provides guidance on how an impact on air quality can be mitigated:

"Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact...Examples of mitigation include:

- *the design and layout of development to increase separation distances from sources of air pollution;*
- *using green infrastructure, in particular trees, to absorb dust and other pollutants;*
- *means of ventilation;*

- *promoting infrastructure to promote modes of transport with low impact on air quality;*
- *controlling dust and emissions from construction, operation and demolition; and*
- *contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development.”*

9.2.20 Paragraph 009, Reference 32-009-20140306, of the PPG provides guidance on how considerations about air quality fit into the development management process by means of a flowchart. The final two stages in the process deal with the results of the assessment:

“Will the proposed development (including mitigation) lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or national objectives for pollutants or fail to comply with the requirements of the Habitats Regulations.” If Yes:

“Consider how the proposal could be amended to make it acceptable or, where not practicable, consider whether planning permission should be refused.”

Reading Borough Council Local Policy

9.2.21 Reading Borough Council (RBC) ‘Reading Borough Local Development Framework: Core Strategy adopted in January 2008 as amended in January 2015’, sets out how planning and development will achieve the Reading 2020 vision for the town (Ref 9-11). Policy CS34 on ‘Pollution and Water Resources’ relates to air quality and states:

“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 effects 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.”

9.2.22 RBC’s draft Local Plan will replace the current development plans, such as the Core Strategy, with a new plan setting out how Reading will develop up to 2036 (Ref 9-12). Policy EN15 on Air Quality states:

- 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 significantly 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 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.”

Reading Borough Council Air Quality Action Plan

9.2.23 The RBC Air Quality Action Plan sets out current and new policies and measures to address air quality issues in order to work toward meeting the air quality objectives for NO₂ (Ref 9-13). The measures are broken down into 'Air Pollution Transport Measures', 'Air Pollution Other Sources', 'Air Pollution Development Control' and 'Air Pollution Other Measures'. Measures within the action plan include:

- Continue to implement "Quality Travel for Reading" including a new cycling strategy;
- Continue to work with Reading buses to reduce air quality impacts and greenhouse gas emissions per passenger kilometre from the Reading bus fleet, setting targets for emissions reductions;
- Investigate mechanisms to reduce the impact of Heavy Goods Vehicles (HGVs) on local air quality in Reading; and
- Ensure through the planning process that future development does not result in any future deterioration of air quality where possible.

Wokingham Borough Council Local Policy

9.2.24 Wokingham Borough Core Strategy was adopted in January 2010 (Ref 9-14). The Core Strategy sets out the vision for how the borough will develop in the period to 2026 and how the council aims to protect and enhance the good quality of the life enjoyed in the borough.

9.2.25 Core Strategy Policy CP1 – *Sustainable development* states that planning permissions will be granted for developments proposals that:

- "1) Maintain or enhance the high quality of the environment;*
- 2) Minimise the emission of pollutants into the wider environment; ..."*

9.2.26 Wokingham Borough Sustainable Environmental Strategy 2010-2020 aim is to *"improve the quality of life, now and for future generations, by respecting our environment and protecting it from the impact of our activities and growth"* (Ref 9-15). The strategic priority *"Take Action - Minimising waste, pollution and greenhouse gas emissions"* strives to improve air quality in the borough in the next 10 years. The borough expects to succeed if, by 2020, *"there are no areas within the borough where nitrogen dioxide concentrations in the air exceed national air quality objectives."*

9.3 Methodology

Existing Conditions

9.3.1 Information on existing air quality has been obtained by collating the results of monitoring carried out by the RBC. Background concentrations for the site have been defined using the national pollution maps, published by Defra, adjusted using local background monitoring data (Ref 9-16).

Construction Impacts

9.3.2 During construction, the main potential effects are dust annoyance and locally elevated concentrations of PM₁₀. 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.

- 9.3.3 Separation distance is also an important factor. Large dust particles (greater than 30 µm), responsible for most dust annoyance, will largely deposit within 100 m of sources. Intermediate particles (10-30 µm) can travel 200 – 500 m. Consequently, significant dust annoyance is usually limited to within a few hundred metres of its source. Smaller particles (less than 10 µm) are deposited slowly and may travel up to 1 km; however, the impact on the short-term concentrations of PM₁₀ occurs over a shorter distance. This is due to the rapid decrease in concentrations with distance from the source due to dispersion.
- 9.3.4 The Institute of Air Quality Management (IAQM) has issued revised guidance on the assessment of dust from demolition and construction (Ref 9.1). The IAQM guidance recommends that the risk of dust generation is combined with the sensitivity of the area surrounding the site to determine the risk of dust impacts from construction and demolition activities. Depending on the level of risk (high, medium, low or negligible) for each activity, appropriate mitigation is selected.
- 9.3.5 In accordance with the IAQM, the dust emission magnitude is defined as either large, medium or small (**Table 9-3**) taking into account the general activity descriptors on site and professional judgement.

Table 9-3: Criteria for Dust Emission Magnitude.

Dust Emission Magnitude	Activity
Large	Demolition >50,000 m ³ building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20 m above ground level
	Earthworks >10,000 m ² site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously, >8 m high bunds formed, >100,000 tonnes material moved
	Construction >100,000 m ³ building volume, on site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty soil type (e.g. clay), >100 m unpaved roads
Medium	Demolition 20,000 - 50,000 m ³ building demolished, dusty material (e.g. concrete) 10-20 m above ground level
	Earthworks 2,500 - 10,000 m ² site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4 m – 8 m high bunds, 20,000 - 100,000 tonnes material moved
	Construction 25,000 - 100,000 m ³ building volume, on site concrete batching

Dust Emission Magnitude	Activity
	Trackout 10 - 50 HDVs out / day, moderately dusty surface material, 50 -100 m unpaved roads
Small	Demolition <20,000 m ³ building demolished, non-dusty material, <10 m above ground level, work in winter
	Earthworks <2,500 m ² site area, non-dusty soil, <5 earth moving vehicles active simultaneously, <4 m high bunds, <20,000 tonnes material moved
	Construction <25,000 m ³ , non-dusty material
	Trackout <10 HDVs out / day, non-dusty soil, < 50 m unpaved roads

- 9.3.6 The sensitivity of the study area to construction dust impacts is defined based on the examples provided within the IAQM 2016 guidance (**Table 9-4**), taking into account professional judgement.

Table 9-4: Area Sensitivity Definitions.

Area Sensitivity	People and Property Receptors	Ecological Receptors
High	>100 dwellings, hospitals, schools, care homes within 50 m 10 – 100 dwellings within 20 m Museums, car parks, car showrooms within 50 m PM ₁₀ concentrations approach or are above the daily mean objective.	National or Internationally designated site within 20 m with dust sensitive features / species present
Medium	>100 dwellings, hospitals, schools, care homes within 100 m 10 – 100 dwellings within 50 m Less than 10 dwellings within 20 m Offices/shops/parks within 20 m PM ₁₀ concentrations below the daily mean objective.	National or Internationally designated site within 50 m with dust sensitive features / species present Nationally designated site or particularly important plant species within 20 m
Low	>100 dwellings, hospitals, schools, care homes 100 - 350m away 10 – 100 dwellings within 50 – 350 m Less than 10 dwellings within 20 – 350 m Playing fields, parks, farmland, footpaths, short term car parks, roads, shopping streets	Nationally designated site or particularly important plant species 20 – 50 m Locally designated site with dust sensitive features within 50 m

Area Sensitivity	People and Property Receptors	Ecological Receptors
	PM ₁₀ concentrations well below the daily mean objective.	

Road Traffic Impacts

Sensitive Locations

- 9.3.7 Relevant sensitive locations are places where members of the public might be expected to be regularly present over the averaging period of the objectives. For the annual mean and daily mean objectives that are the focus of this assessment, the proposed locations are considered to be sensitive receptors. Worst case locations are those closest to busy roads or roads with a significant change in traffic. Of these, locations where more than one road influences air quality or vehicles slow are considered to be the most sensitive.
- 9.3.8 Based on the above criteria, twelve existing properties have been identified as residential receptors for the assessment. The locations of existing residential receptors were chosen to represent locations where impacts from road traffic related to the proposed development are likely to be the greatest and where changes in traffic meet specific criteria for assessment (see below). These locations are described in **Table 9-5** and shown in **Figure 9.1 (Appendix 9-4)**. Receptors were modelled at a height of 0 m, 1.5 m and 4.5 m, representing basement, ground and first floor exposure.
- 9.3.9 Apart from receptor R1, no sensitive locations, i.e. residential properties, were identified in close proximity of the Application Site or the TVP P&R site. Bright Horizons Waterside Day Nursery and Preschool is located outside the Reading AQMA approximately 850 m northeast of the Application Site, in Thames Valley Park Drive. The indicative criteria for requiring an air quality assessment includes a change in Light Duty Vehicles (LDVs) flows of more than 100 Annual Average Daily Traffic (AADT) within or adjacent to an AQMA or more than 500 AADT elsewhere. The increase in traffic flow brought about by the development on Thames Valley Park Drive are below threshold for an assessment to be necessary outside an AQMA (predicted maximum increase of 223 AADT) and, therefore, the impacts on Bright Horizons Waterside Day Nursery and Preschool have been scoped out of this assessment.
- 9.3.10 Concentrations have also been predicted at one monitoring site, 176 London Road, in order to verify the modelled results (see **Appendix 9-1** for further details on model verification).

Table 9-5: Description of receptor locations

Receptor	Location	Height
R1	Napier Road, Reading RG1 8DF	1.5
R2	Patriot Place (Basement)	0
R3	Elite House, 179 King's Road	1.5
R4	Montpelier House, 165 Kings Road	1.5
R5	284 King's Road	1.5
R6	Crossway Point (Basement)	0
R7	23 King's Road (Basement)	0
R8	239 London Road	1.5

Receptor	Location	Height
R9	Flat Above 2 Wokingham Road	4.5
R10	Flat Above 106-112 London Road	4.5
R11	14-19 London Road	1.5
R12	147 London Road	1.5

Impact Predictions

9.3.11 The following scenarios have been modelled (see Transport Chapter for more details):

- 2016 existing baseline – for model verification
- Scenario 1 – Effects of the MRT Route Only
- Scenario 2 – Effects of the MRT Route and Thames Valley Park (TVP) P&R Combined
- Scenario 3 – Effects of the MRT Route with TVP P&R in the Baseline

9.3.12 Predictions have been carried out using the ADMS-Roads dispersion model (v4.1). The model requires the user to provide various input data, including the AADT flow, the proportion of Heavy Duty Vehicles (HDVs, i.e. Heavy Good Vehicles and buses), road characteristics (including road width and street canyon height, where applicable), and the vehicle speed. It also requires meteorological data. The model has been run using 2016 meteorological data from Farnborough meteorological station, which is considered suitable for this area.

9.3.13 AADT flows and the proportions of HDVs, for roads adjacent to the site and relevant receptors, have been provided by the project's transport consultants PBA (see Transport chapter for more details). Traffic speeds were based on local speed restrictions, taking into account congestion and proximity to junctions. Traffic data used for this assessment have been summarised in **Appendix 9-2**.

9.3.14 The development opening year is expected to be 2021. Future traffic data for the year 2021 has been combined with 2019 emission factors and background concentrations in order to provide a conservative assessment of the effects of the proposed development as road traffic emissions are predicted to decline with time (see **Appendix 9-3** Future Year Emission Factors for further details on the selection of future year NO_x emission factors for this assessment).

9.3.15 Traffic emissions were calculated using the Emission Factor Toolkit (EFT) v7.0. The traffic data were entered into ADMS-Roads, along with speed data to provide combined emission rates for each of the road links entered into the model. Model verification has been carried out utilising 2016 emission factors and background concentrations to compare against 2016 monitoring data.

Assessment Criteria

Construction

9.3.16 The IAQM 2014 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. With appropriate mitigation in place, and in accordance with the IAQM guidance, the residual effect of construction on air quality is assessed as not significant.

9.3.17 Based on the dust emissions magnitude (**Table 9-3**) and the area sensitivity (**Table 9-4**), the risk of dust impacts is then determined (**Table 9-6**), taking into account professional judgement.

Table 9-6: Risk of Dust Impacts

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High	Medium	Low
Medium	Medium	Medium	Low
Low	Low	Low	Negligible

Human Health Impacts

- 9.3.18 The relevant objectives for human health are set out in paragraph 9.2.9, above. There is no official guidance in the UK on how to assess the significance of air quality impacts of existing sources on a new development. The approach developed by Environment Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) considers the change in air quality as a result of a proposed development on existing receptors (Ref 9-17).
- 9.3.19 The guidance sets out three stages: determining the magnitude of change at each receptor, describing the impact, and assessing the overall significance. Impact magnitude relates to the change in pollutant concentration; the impact description relates this change to the air quality objective.
- 9.3.20 **Table 9-7** sets out the impact change descriptors, whilst **Table 9-8** sets out how the changes are assessed in relation to the air quality objectives.

Table 9-7 Impact Magnitude for Changes in Ambient Pollutant Concentrations

Magnitude (% Change in Concentration)	Annual Mean NO ₂ and PM ₁₀ (40 µg/m ³)	Annual Mean PM _{2.5} (25 µg/m ³)	Annual Mean of 32 µg/m ³ equating to 35 days above 50 µg/m ³ for PM ₁₀
Very Large (>9.5%)	≥3.8 µg/m ³	≥2.375 µg/m ³	≥3.04 µg/m ³
Large (>5.5% - ≤9.5%)	>2.2 – ≤3.8 µg/m ³	>1.375 – ≤2.375 µg/m ³	>1.76 – ≤3.04 µg/m ³
Moderate (>1.5% - ≤5.5%)	>0.6 – ≤2.2 µg/m ³	>0.375 – ≤1.375 µg/m ³	>0.48 – ≤1.76 µg/m ³
Small (>0.5% - ≤1.5%)	>0.2 – ≤0.6 µg/m ³	>0.125 – ≤0.375 µg/m ³	>0.16 – ≤0.48 µg/m ³
Negligible (≤0.5%)	≤0.2 µg/m ³	≤0.125 µg/m ³	≤0.16 µg/m ³

Table 9-8 Impact Descriptor for Changes in Concentrations at Receptor

Concentration with the development in place in relation to Objective / Limit Value	Change in Concentration				
	Imperceptible	Small	Medium	Large	Very Large
> 109.5 % (a)	Negligible	Moderate adverse	Major adverse	Major adverse	Major adverse
>102.5% - ≤109.5% (b)	Negligible	Moderate adverse	Moderate adverse	Major adverse	Major adverse
>94.5% - ≤102.5% (c)	Negligible	Minor adverse	Moderate adverse	Moderate adverse	Major adverse

Concentration with the development in place in relation to Objective / Limit Value	Change in Concentration				
	Imperceptible	Small	Medium	Large	Very Large
>75.5% - ≤94.5% (d)	Negligible	Negligible	Minor adverse	Moderate adverse	Moderate adverse
≤75.5% (e)	Negligible	Negligible	Minor adverse	Moderate adverse	Moderate adverse

Where concentrations increase the impact is described as adverse and where it decreases as beneficial.

(a) NO₂ or PM₁₀: > 44µg/m³ annual mean; PM_{2.5} >27.5 µg/m³ annual mean; PM₁₀ >35.2 µg/m³ annual mean (days)

(b) NO₂ or PM₁₀: > 40.8 – ≤ 44µg/m³ annual mean; PM_{2.5} > 25.5 – ≤27.5 µg/m³ annual mean; PM₁₀ >32.64 – ≤35.2 µg/m³ annual mean (days)

(c) NO₂ or PM₁₀: > 38 – ≤40.8 µg/m³ annual mean; PM_{2.5} >23.75 – ≤25.5 µg/m³ of annual mean; PM₁₀ >30.4 – ≤32.64µg/m³ annual mean (days)

(d) NO₂ or PM₁₀: >30 – ≤38 µg/m³ annual mean; PM_{2.5} >18.75 – ≤23.75 µg/m³ annual mean; PM₁₀ <24 – ≤ 30.4 µg/m³ annual mean (days)

(e) NO₂ or PM₁₀: ≤30 µg/m³ annual mean; PM_{2.5} ≤18.75 µg/m³, annual mean; PM₁₀ ≤24 µg/m³ annual mean (days)

9.3.21 The IAQM and EPUK approach states that the assessment of significance should be based on professional judgement, taking into account the following factors:

- Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance;
- The magnitude of the changes and the descriptions of the impacts at the receptors i.e. **Tables 9-7** and **9-8** findings;
- Whether or not an exceedance of an objective or limit value is predicted to arise in the operational study area (where there are significant changes in traffic) where none existed before or an exceedance area is substantially increased;
- Whether or not the study area exceeds an objective or limit value and this exceedance is removed or the exceedance is reduced;
- Uncertainty, including the extent to which worst-case assumptions have been made; and
- The extent to which an objective or limit value is exceeded.

9.3.22 Where impacts can be considered in isolation, moderate or major impacts may be considered to be a significant environmental effect, whereas negligible or minor impacts would not be considered significant. The overall effect however, needs to be considered in the round taking into account the changes at all of the receptor locations, with a judgment made as to whether the overall effects are significant or not

9.4 Baseline

LAQM

9.4.1 RBC has investigated air quality within its area as part of its responsibilities under the LAQM regime. An Air Quality Management Area (AQMA) has been declared due to exceedances of the annual mean NO₂ objectives. The AQMA comprises Reading town centre and extends out along major roads including the A33 and A327.

Monitoring

Nitrogen Dioxide

9.4.2 RBC carries out monitoring of NO₂ concentrations at a number of locations across the borough. The closest and most representative locations are described in **Table 9-9** and shown in **Figure 9.2**.

Table 9-9: Measured NO₂ concentrations (2011-2016)

ID	Site Type	Within AQMA	Annual Mean (µg/m³)					
			2011	2012	2013	2014	2015	2016
Automatic Site								
AURN Reading New Town	UB	N	27	25	27	27	22	34 ^a
Diffusion Tubes								
Kings Oak Flats	R	Y	33	37	39	36	31	33
276 Kings Road	R	Y	33	36	34	36	31	32
162 London Rd*	R	Y	45	47	48	49	46	42
419 London Road	R	Y	41	47	49	45	41	42
Objective		40						

R= Roadside; UB = Urban Background

*Used for model verification

2011-2014 data taken from the RBC Updating and Screening Assessment 2015; 2015 data taken from the RBC Annual Status Report 2016. 2016 data obtained from Local Authority EHO

^a Data extracted from AURN network https://uk-air.defra.gov.uk/data/flat_files?site_id=REA5

- 9.4.3 Measured concentrations at the Automatic Urban and Rural Network Station (AURN) urban background station have been below the limit values for the past 5 years. Given the location of the Application Site, away from major roads, the concentrations are expected to be similar, or lower, to the AURN station.
- 9.4.4 Measured concentrations at the London Road monitoring locations, within the AQMA, have regularly exceeded the NO₂ annual mean objective across the 2011-2016 time period. There is no clear trend in measured concentrations at the majority of monitoring locations.
- 9.4.5 The data for Reading New Town AURN for 2016 appears to be out of place with the other monitored data as it shows an increase of over 50% since 2015. This could be due to low data capture.

Particulates (PM₁₀ and PM_{2.5})

- 9.4.6 PM₁₀ and PM_{2.5} monitoring is carried out using three monitors within the Borough. The closest and most representative location is the AURN station. Data for this site is presented in **Table 9-9**.

Table 9-9: Measured PM₁₀ and PM_{2.5} Concentrations (2011-2016)

Site Site ID	Site Type	2011	2012	2013	2014	2015	2016
PM ₁₀ Annual Mean (µg/m³)							
AURN	UB	19	18	13	14	12	13
Objective		40					
PM ₁₀ Number of days > 50µg/m³							
AURN	UB	8	8	-	0	0	3

Site Site ID	Site Type	2011	2012	2013	2014	2015	2016
Objective		35					
PM _{2.5} Annual Mean (µg/m³)							
AURN	UB	10	9	8	8	6	9
Objective		25					

Data taken from the RBC Annual Status Report 2016

- 9.4.7 PM₁₀ and PM_{2.5} measured concentrations have been below the objective throughout the last 5 years.

Background Concentrations

- 9.4.8 In addition to these measured concentrations, estimated background concentrations for the site have been obtained from the national maps provided by Defra (Ref 9-14) (shown in [Table 9-10](#)). Defra background concentrations were adjusted based on the Reading New Town local background AURN (see [Appendix 9-1](#) for further details).

Table 9-10: Annual mean background concentrations (µg/m³)

Year	Grid reference	Annual Mean (µg/m ³)		
		NO ₂	PM ₁₀	PM _{2.5}
2016	472_173	21.6	12.3	7.3
	472_173	22.5	12.3	7.3
2019	472_173	19.8	11.9	7.0
	472_173	20.6	11.8	7.0
Objective		40	40	25

- 9.4.9 The background concentrations are well below the relevant objectives.

9.5 East MRT (Scenario 1)

Potential Effects

Construction Effects

- 9.5.1 The main potential effects during construction are dust deposition and elevated PM₁₀ concentrations. The following activities have the potential to cause emissions of dust:
- Site preparation including delivery of construction material, erection of fences and barriers;
 - Earthworks including digging foundations and landscaping;
 - Materials handling such as storage of material in stockpiles and spillage;
 - Construction and implementation of supporting structures; and
 - Disposal of waste materials off-site.
- 9.5.2 Typically, the main cause of unmitigated dust generation on construction sites is from demolition and vehicles using unpaved haul roads, and off-site from the suspension of dust from mud deposited on local roads by construction traffic. The main determinants of unmitigated dust annoyance are the weather and the distance to the nearest receptor.

- 9.5.3 Based on the IAQM criteria (**Table 9-3**), the dust emission magnitude is considered to be medium. The study area is considered to be of low sensitivity (**Table 9-4**). Appropriate mitigation corresponding to a low risk site is therefore required during the construction phase (**Table 9-6**). With appropriate mitigation in place the construction impacts are described as not significant.

Operational Effects

- 9.5.4 Predicted concentrations of nitrogen dioxide, PM₁₀ and PM_{2.5} at worst-case existing receptors, both with and without the development in place, are presented in **Table 9-11**.

Table 9-11: Predicted concentrations of nitrogen dioxide, PM₁₀ and PM_{2.5} at existing receptors

Receptor	2021 Baseline			2021 With Development		
	Annual Mean (µg /m³)					
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}
R1	22.1	12.1	7.1	22.8	12.2	7.2
R2	31.9	13.9	8.2	31.9	13.9	8.2
R3	32.0	13.9	8.2	31.8	13.9	8.2
R4	30.3	13.6	8.0	30.2	13.6	8.0
R5	30.8	14.0	8.2	30.6	13.9	8.2
R6	24.7	12.8	7.5	24.7	12.8	7.5
R7	24.9	12.8	7.5	24.9	12.8	7.5
R8	36.5	15.1	8.8	36.4	15.1	8.8
R9	31.2	14.1	8.3	31.3	14.1	8.3
R10	33.7	14.6	8.5	33.7	14.6	8.5
R11	27.5	13.6	8.0	27.5	13.6	8.0
R12	27.1	13.3	7.8	27.1	13.3	7.8
Limit values	40	40	25	40	40	25

- 9.5.5 The predicted NO₂, PM₁₀ and PM_{2.5} concentrations in 2021 without and with the proposed development in place are below the relevant objectives at all existing receptor locations.

- 9.5.6 The changes in annual mean concentrations are presented in **Table 9-12**.

Table 9-12: Change in predicted concentrations brought about by the development

Receptor	NO ₂	PM ₁₀	PM _{2.5}
	Annual Mean (µg/m ³)	Annual Mean (µg/m ³)	Annual Mean (µg/m ³)
R1	0.68	0.09	0.05
R2	0.05	0.01	0.01
R3	-0.11	-0.02	-0.01
R4	-0.11	-0.02	-0.01
R5	-0.11	-0.02	-0.01
R6	-0.04	-0.01	0.00
R7	-0.03	-0.01	0.00
R8	-0.05	-0.01	-0.01
R9	0.02	0.00	0.00
R10	-0.03	-0.01	0.00
R11	-0.02	0.00	0.00
R12	-0.02	0.00	0.00

9.5.7 Based on the impact magnitude descriptors presented in **Table 9-7**, the changes in annual mean nitrogen dioxide range from negligible to moderate. Moderate changes occur at receptor R1. Negligible changes occur at the remaining receptors. Changes in annual mean PM₁₀ and PM_{2.5} concentrations are described as negligible for all receptors.

9.5.8 Using the criteria set out in **Table 9-8**, the impacts are described as negligible for all pollutants at all receptor locations.

Mitigation and Enhancement

Construction

9.5.9 The following standard low risk mitigation measures from the IAQM 2014 guidance are recommended. These should be included within a Construction Environmental Management Plan (CEMP) and agreed with RBC.

Communication

- 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.
- 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.

Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process.

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.

Operational

- 9.5.10 In overall terms, the operational effects of the proposed development are judged to be not significant. This judgement is made in accordance with the methodology, in particular that the proposed development does not give rise to any exceedances of the air quality strategy objectives and a conservative assessment has been carried out. No additional traffic mitigation measures are therefore required.

Residual Effects

Construction Effects

- 9.5.11 With appropriate mitigation in place the residual effect of construction is assessed as not significant.

Operational Effects

- 9.5.12 The residual operational air quality effects of the proposed development are judged to be not significant. The impact of the proposed development is considered to be not significant in relation to human health impacts.

9.6 East MRT and Thames Valley Park & Ride Combined (Scenario 2)

Potential Effects

Construction

- 9.6.1 This scenario includes the construction of the TVP P&R in addition to the East MRT. The dust emission magnitude is still regarded as medium and the study area is considered to be of low sensitivity (**Table 9-4**). Appropriate mitigation corresponding to a low risk site is therefore required during the construction phase (**Table 9-6**). With appropriate mitigation in place the construction impacts are described as not significant.

Operational Effects

- 9.6.2 Predicted concentrations of nitrogen dioxide, PM₁₀ and PM_{2.5} at worst-case existing receptors, both with and without the development in place, are presented in **Table 9-13**.

Table 9-13: Predicted concentrations of nitrogen dioxide, PM₁₀ and PM_{2.5} at existing receptors

Receptor	2021 Baseline			2021 With Development		
	Annual Mean (µg /m³)					
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}
R1	22.1	12.1	7.1	22.8	12.2	7.2
R2	31.9	13.9	8.2	32.0	13.9	8.2
R3	32.0	13.9	8.2	31.8	13.9	8.2
R4	30.3	13.6	8.0	30.2	13.6	8.0
R5	30.8	14.0	8.2	30.6	13.9	8.2
R6	24.7	12.8	7.5	24.7	12.8	7.5
R7	24.9	12.8	7.5	24.9	12.8	7.5
R8	36.5	15.1	8.8	36.2	15.1	8.8
R9	31.2	14.1	8.3	31.2	14.1	8.3
R10	33.7	14.6	8.5	33.8	14.6	8.5
R11	27.5	13.6	8.0	27.5	13.6	8.0
R12	27.1	13.3	7.8	27.1	13.3	7.8
Limit values	40	40	25	40	40	25

- 9.6.3 The predicted NO₂, PM₁₀ and PM_{2.5} concentrations in 2021 without and with the proposed development in place are below the relevant objectives at all existing receptor locations.
- 9.6.4 The changes in annual mean concentrations are presented in **Table 9-14**.

Table 9-14: Change in predicted concentrations brought about by the development

Receptor	NO ₂	PM ₁₀	PM _{2.5}
	Annual Mean (µg/m ³)	Annual Mean (µg/m ³)	Annual Mean (µg/m ³)
R1	0.68	0.09	0.05
R2	0.11	0.02	0.01
R3	-0.11	-0.02	-0.01
R4	-0.12	-0.02	-0.01
R5	-0.13	-0.03	-0.02
R6	-0.04	-0.01	0.00
R7	-0.04	-0.01	0.00
R8	-0.31	-0.07	-0.04
R9	0.00	0.00	0.00
R10	0.01	0.00	0.00
R11	-0.01	0.00	0.00
R12	0.00	0.00	0.00

9.6.5 Based on the impact magnitude descriptors presented in **Table 9-7**, the changes in annual mean nitrogen dioxide range from negligible to moderate. Small changes occur at receptor R8 and moderate changes occur at receptor R1. Negligible changes occur at the remaining receptors. Changes in annual mean PM₁₀ and PM_{2.5} concentrations are described as negligible for all receptors.

9.6.6 Using the criteria set out in **Table 9-8**, the impacts are described as negligible for all pollutants at all receptor locations.

Mitigation and Enhancement

Construction

9.6.7 The standard low risk mitigation measures set out in **Section 9.5.9** are recommended for the East MRT.

Operational Effects

9.6.8 In overall terms, the operational effects of the proposed development are judged to be not significant. This judgement is made in accordance with the methodology set out in **Section 9.3.18**, in particular that the proposed development does not give rise to any exceedances of the limit values and a conservative assessment has been carried out. No additional traffic mitigation measures are therefore required.

Residual Effects

Construction

9.6.9 With appropriate mitigation in place the residual effect of construction is assessed as not significant.

Operational Effects

- 9.6.10 The residual operational air quality effects of the proposed development are judged to be not significant. The impact of the proposed development is considered to be not significant in relation to human health impacts.

9.7 East MRT with Thames Valley Park & Ride in the Baseline (Scenario 3)

Potential Effects

Construction

- 9.7.1 In this scenario the TVP P&R is expected to be already built, and, therefore includes the construction of the East MRT (same as scenario 1). The dust emission magnitude is still regarded as medium and the study area is considered to be of low sensitivity (**Table 9-4**). Appropriate mitigation corresponding to a low risk site is therefore required during the construction phase (**Table 9-6**). With appropriate mitigation in place the construction impacts are described as not significant.

Operational Effects

- 9.7.2 Predicted concentrations of nitrogen dioxide, PM₁₀ and PM_{2.5} at worst-case existing receptors, both with and without the development in place, are presented in **Table 9-15**.

Table 9-15: Predicted concentrations of nitrogen dioxide, PM₁₀ and PM_{2.5} at existing receptors

Receptor	2021 Baseline			2021 With Development		
	Annual Mean (µg /m³)					
	NO ₂	PM ₁₀	PM _{2.5}	NO ₂	PM ₁₀	PM _{2.5}
R1	22.1	12.1	7.1	22.8	12.2	7.2
R2	31.8	13.9	8.2	32.0	13.9	8.2
R3	31.9	13.9	8.2	31.8	13.9	8.2
R4	30.2	13.6	8.0	30.2	13.6	8.0
R5	30.7	13.9	8.2	30.6	13.9	8.2
R6	24.7	12.8	7.5	24.7	12.8	7.5
R7	24.9	12.8	7.5	24.9	12.8	7.5
R8	36.3	15.1	8.8	36.2	15.1	8.8
R9	31.2	14.1	8.3	31.2	14.1	8.3
R10	33.7	14.6	8.5	33.8	14.6	8.5
R11	27.5	13.6	8.0	27.5	13.6	8.0
R12	27.1	13.3	7.8	27.1	13.3	7.8
Limit values	40	40	25	40	40	25

- 9.7.3 The predicted NO₂, PM₁₀ and PM_{2.5} concentrations in 2021 without and with the proposed development in place are below the relevant objectives at all existing receptor locations.
- 9.7.4 The changes in annual mean concentrations are presented in **Table 9-16**.

Table 9-16: Change in predicted concentrations brought about by the development

Receptor	NO ₂	PM ₁₀	PM _{2.5}
	Annual Mean (µg/m ³)	Annual Mean (µg/m ³)	Annual Mean (µg/m ³)
R1	0.69	0.09	0.05
R2	0.15	0.03	0.02
R3	-0.05	-0.01	0.00
R4	-0.07	-0.01	-0.01
R5	-0.07	-0.01	-0.01
R6	-0.01	0.00	0.00
R7	-0.01	0.00	0.00
R8	-0.12	-0.03	-0.01
R9	0.03	0.01	0.00
R10	0.09	0.02	0.01
R11	0.04	0.01	0.01
R12	0.04	0.01	0.01

9.7.5 Based on the impact magnitude descriptors presented in **Table 9-7**, the changes in annual mean nitrogen dioxide range from negligible to moderate. A moderate change occurs at receptor R1. Negligible changes occur at the remaining receptors. Changes in annual mean PM₁₀ and PM_{2.5} concentrations are described as negligible for all receptors.

9.7.6 Using the criteria set out in **Table 9-8**, the impacts are described as negligible for all pollutants at all receptor locations.

Mitigation and Enhancement

Construction

9.7.7 No further mitigation is required.

Operational Effects

9.7.8 In overall terms, the operational effects of the proposed development are judged to be not significant. This judgement is made in accordance with the methodology set out in **Section 9.3.18**, in particular that the proposed development does not give rise to any exceedances of the limit values and a conservative assessment has been carried out. No additional traffic mitigation measures are therefore required.

Residual Effects

Construction

9.7.9 With appropriate mitigation in place the residual effect of construction is assessed as not significant.

Operational Effects

9.7.10 The residual operational air quality effects of the proposed development are judged to be not significant. The impact of the proposed development is considered to be not significant in relation to human health impacts.

9.8 Cumulative Effects

Construction

- 9.8.1 Potential cumulative construction effects could occur should construction of additional development sites occur at the same time as the proposed development.
- 9.8.2 Significant cumulative effects are unlikely to occur as each development is anticipated to employ similar dust mitigation techniques such that the individual construction phase effect should be not significant, alone or in combination.

Operational Effects

- 9.8.3 The future year traffic data utilised within the assessment includes committed development in the area (see Transport Chapter for more detailed information). The assessment therefore includes consideration of cumulative impacts arising from committed developments in the area in 2021.

9.9 Summary

- 9.9.1 The air quality effects associated with the construction and operation of the proposed East MRT scheme have been assessed.
- 9.9.2 Construction phase effects are judged to be negligible when appropriate mitigation measures are applied through a CEMP.
- 9.9.3 Concentrations of NO₂, PM₁₀ and PM_{2.5} have been predicted for a number of worst-case locations representing existing properties adjacent to the road network impacted by the proposed Development. The Application site is generally located away from sensitive residential receptors, except for Kings Reach Meadows Association (receptor R1).
- 9.9.4 Predicted annual mean concentrations of the named pollutants are below the relevant air quality strategy objectives, whether the development proceeds or not, with and without the TVP P&R and in combination with the TVP P&R. Therefore, the overall air quality effects of the development are judged to be not significant.

9.10 References

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10 Hydrology and the Water Environment

10.1 Introduction

- 10.1.1 This chapter has been produced by Peter Brett Associates LLP (PBA) to consider the impact of the proposed development in relation to hydrology and the water environment. This provides an overview of the baseline conditions, the potential impacts of the development and proposed mitigation to address this.
- 10.1.2 The National Planning Policy Framework (NPPF) seeks to ensure that flood risk is taken into account at all stages of the planning process, to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk.
- 10.1.3 A site-specific Flood Risk Assessment (FRA) is required for development within Flood Zones 3 'High Probability' or Zone 2 'Medium Probability' of river/sea flooding, and for all proposals that are of an area of 1 hectare or greater in Flood Zone 1 'Low Probability'. Accordingly, an FRA incorporating a surface water drainage strategy, has been prepared to accompany the future planning application, in accordance with relevant national and local planning policy, and should be referred to when reviewing this Chapter (see Appendix 10-1).
- 10.1.4 A comprehensive Water Framework Directive (WFD) Compliance Statement has been compiled to accompany the planning application. This indicates that the proposed works will not detrimentally impact the WFD status/potential of nearby designated water bodies, will not impede their ability to achieve good ecological status/potential, and will not prevent against achieving WFD and River Basin Management Plan (RBMP) objectives. The WFD Compliance Statement is provided in Appendix 10-2.

10.2 Policy Context

National Planning Policy

- 10.2.1 The aim of water policy in England and Wales is to protect both public health and the environment by maintaining and improving the quality of natural waters. These include surface water bodies (e.g. rivers, streams, lakes, ponds) and groundwater.
- 10.2.2 The NPPF and accompanying PPG sets out the Government's national policy on development and flood risk. The NPPF aims are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk. In exceptional circumstances where new development is necessary in flood risk areas the policy also aims to ensure it is safe, without increasing flood risk elsewhere, and where possible, reducing flood risk overall.
- 10.2.3 The NPPF advocates the use of a risk based sequential test, in which new development is directed towards the areas of lowest risk of flooding. The different areas of flooding are defined by the following Flood Zones:
- Flood Zone 1: 'Low Probability' of flooding (less than 1 in 1,000 annual probability of river or sea flooding in any year);
 - Flood Zone 2: 'Medium Probability' of flooding (between a 1 in 100 and 1 in 1,000 annual probability of river flooding or between a 1 in 200 and 1 in 1,000 annual probability of tidal flooding in any year);
 - Flood Zone 3a: 'High Probability' (1 in 100 or greater annual probability of river flooding or 1 in 200 or greater annual probability of sea flooding in any year); and

- Flood Zone 3b: The functional floodplain (where water is stored in times of flood, including water conveyance routes, annual probability of 1 in 20 or greater in any given year).
- 10.2.4 In addition, PPG specifies the type of land use, defined by its flood risk vulnerability that is appropriate in each Flood Zone. For example, more sensitive developments that would be most severely affected in the event of flooding, such as hospitals, should not be permitted in areas at high probability of flooding, although leisure and tourism developments may be allowed in Flood Zone 3a.
- 10.2.5 In February 2016 the Environment Agency (EA) released new guidance 'Flood risk assessments: climate change allowances'. This provides contingency allowances for potential increases in peak river flow, rainfall intensity and sea level.
- 10.2.6 The peak river flow allowances table provides a range of allowances based on percentile (i.e. the degree of certainty of an event occurring, based on the range of climate change scenarios assessed through scientific investigations). The provided allowances are also subject to the vulnerability classification of the proposed use and the river basin district of the site, although the overriding influence at the site is tidal and therefore the interaction of the sea level rise impacts are the most significant factor when considering the associated flood risk.

Regional and Local Planning Policy

- 10.2.7 The River Basin Management Plan (RBMP) – Thames River Basin District was prepared under the Water Framework Directive (WFD) and originally released in December 2009 by the EA/DEFRA as the first of a series of six-year planning cycles. The RBMP was recently updated in December 2015 at the end of Cycle 2 to set out the aims of the subsequent six-year cycle to 2021. The RBMP makes clear that, although there has been great progress in protecting water bodies in the Thames Basin, a range of challenges still remain.
- 10.2.8 The key issues include:
- physical modification of water bodies;
 - pollution from water industry sewage works;
 - diffuse pollution from towns, cities and transport;
 - changes to the natural flow and level of water;
 - negative effects of invasive non-native species rural activities; and
 - pollution from rural areas.
- 10.2.9 At present, because of these issues and the higher environmental standards required by the WFD, only 39 of a total 498 surface water bodies were currently classed (2015) as good or better ecological status.
- 10.2.10 In order to meet WFD targets, the quality of all water bodies must be protected and enhanced.
- 10.2.11 Within Reading Borough Council (RBC), local planning policy is contained within the Local Development Framework 'Core Strategy', adopted January 2008, with alteration adopted January 2015. Policy 'CS35: Flooding' states:

"Planning permission will not be permitted for development in an area identified as being at high risk of flooding, where development would reduce the capacity of the flood plain to store floodwater, impede the flow of floodwater or in any way increase the risks to life and property arising from flooding."

10.2.12 Local planning policy within Wokingham Borough Council (WBC) is contained within Local Development Framework Adopted Core Strategy Development Plan Document' dated January 2010. Policy CP1 – Sustainable Development states:

'Planning permission will be granted for development proposals that avoid increasing (and where possible reduce) risks of or from all forms of flooding (including from groundwater).

It is essential that future development is planned carefully... steering it away from areas that are most at risk from flooding and ensuring that it does not exacerbate existing flooding problems.

It is essential that the developer/ applicant consider the possible change in flood risk over the lifetime of the development because of climate change.

SUDS can be used to minimise the risk and impact of flooding. Developers will be expected to provide and fund effective SUDS maintenance regimes. New development should be designed to be resilient to flooding as appropriate';

10.2.13 Both RBC and WBC are defined as a 'Lead Local Flood Authority' ('LLFA') under the Floods and Water Management Act 2010. The first step of the Flood Risk Regulations is for LLFAs to produce a Preliminary Flood Risk Assessment (PFRA) providing a high level overview of flood risk from all sources within a local area, including consideration of surface water, groundwater, ordinary watercourses and canals. A PFRA was prepared for each Borough Council and released in June 2011.

10.3 Consultation

10.3.1 The main issues raised in the EA response to the scoping report include the following and have been used to inform the FRA (and the following ES Chapter):

- Use of the EA hydraulic model to provide a site-specific assessment of flood risk, to include updates to the base line model to make it fit to use for a site specific FRA.
- Application of the new Climate Change allowances (released February 2016) to be incorporated into the design of the development, with flood risk mitigation design standards built to at least the 35% allowance.
- Further details of site topography, with details of where land raising will be occurring and where any required flood plain compensation will be provided.
- Provision of any floodplain compensation to be 'level for level' and a betterment in flood risk should be provided if possible. Justification should be provided where voids are used.
- The soffit of the proposed bridge over the River Kennet to be built to a height appropriate to the outcome of the analysis completed with the new Climate Change allowances. The EA expect the soffit level to be set at least to the 1 in 100 plus 35% allowance level, as stated above, if the analysis of the upper allowance shows significant impacts on the site, it will be for the applicant to justify which allowance they have applied to this development.

10.3.2 Extensive liaison occurred with RBC, both in terms of progressing the design and – specifically in relation to flood risk – discussion on the suitability and location of ground within the vicinity to provide floodplain compensation.

10.4 Methodology

Sources of Information

10.4.1 The principal activities undertaken to determine the baseline conditions include site walkover surveys, review of the EA's national datasets, liaison to obtain the EA hydraulic modelling of the local watercourses and available flood data, and review of the available RBC and WBC information, including the SFRA and PFRA.

10.4.2 The key sources of information can be summarised as follows:

- EA online flood maps (<http://maps.environment-agency.gov.uk/wiyby/>);
- EA Product 4 flood data (EA reference BE_1310_01, dated July 2016);
- EA Product 7 flood data (received April 2016), providing the EA Thames (Reading Complex Change) 1D-2D hydraulic model, re-run by PBA to generate flood levels based on the new EA climate change allowance requirements;
- The RBC Strategic Flood Risk Assessment (SFRA), released in March 2009;
- The RBC PFRA, released in June 2011.
- The WBC SFRA dated February 2012;
- The WBC PFRA dated June 2011;
- EA Catchment Data Explorer Cycle 1 (2009) and 2 (2015) data.

10.4.3 The assessment considers the potential effects of the site on surface water quality, water supply, flood risk, and surface water drainage as a result of the development.

10.4.4 The EA confirmed that their detailed hydraulic modelling of the River Thames and River Kennet provides the 'best available' data in respect of flood risk associated with the watercourses in the vicinity of the site. A review of the model outputs confirmed that the River Thames was the dominant flood risk in the vicinity and exceeded the equivalent peak flood levels on the River Kennet for a specified annual probability flood event.

EA Hydraulic Model Data

10.4.5 The outputs from the EA Thames model provides the basis for defining floodplain extents, categorising the proposed route in accordance with the Flood Zones set out in the NPPF and assessing flood risk impacts. The hydraulic model is also the baseline for informing the design of flood mitigation measures, following adjustment to take into account the new EA guidance on climate change allowances.

10.4.6 The EA climate change allowances guidance specifies that 'essential infrastructure' in the Thames River Basin district requires consideration of the following peak river flow allowances (subject to Flood Zone – see 'Baseline' section):

- Flood Zone 2 (land west of Kennetmouth): +35% to +70%
- Flood Zone 3b ((land east of Kennetmouth): +70%

10.4.7 The EA have previously advised in their scoping response, that "*flood risk mitigation design standards built to at least the 35% allowance*". PBA accordingly re-ran the EA Thames (Reading Complex Change) 1D-2D hydraulic model using the new climate change peak river

flow allowances for the (1 in 100 annual probability) +35% and +70% scenarios to inform mitigation requirements.

- 10.4.8 In hydrology, the sensitivity or importance of each receptor is based on its considered value, for example as an ecological habitat, as a source of drinking water or as a recreational resource.
- 10.4.9 Criteria for assessing the significance of the potential effects have been based on a qualitative assessment of the receptor sensitivity and the predicted magnitude of change from the baseline as a result of the development. Receptor sensitivity has been defined as shown in **Table 10-1** and the criteria used to assess the magnitude of change are set out in **Table 10-2**.

Significance Criteria

- 10.4.10 An assessment of the significance of an effect has been made by firstly considering sensitivity of the receptor (i.e. its importance and ability to tolerate and recover from change) and, secondly, by considering the likely magnitude of the effect (i.e. its spatial extent and duration). By combining sensitivity and magnitude, the significance of the effect can be established. If significant negative effects are identified, mitigation measures have been proposed to reduce the significance.
- 10.4.11 The sensitivity of a receptor is characterised by its ability to tolerate and recover from changes in the environment as well as its importance to society (i.e. protection under a statutory designation or economic value). **Table 10-1** shows the criteria used to determine receptor sensitivity.

Table 10-1: Sensitivity/Value of Receptor

Sensitivity/value of a Receptor	Description	Example
High	Attribute with a high quality and rarity, local scale and limited potential for substitution. Attribute with a medium quality and rarity, regional or national scale and limited potential for substitution. Attribute highly sensitive to change.	Examples include: Receiving watercourse classified as High or Good Ecological status/potential under WFD Site protected under EU or UK wildlife legislation (SAC, SPA, SSSI). Species protected under EU or UK wildlife legislation Site located within a Groundwater Source Protection Zone (SPZ) inner or outer protection zone (Zone 1), NPPF Flood Risk Vulnerability Classification “Essential Infrastructure” or “Highly Vulnerable” Environment Agency current groundwater quantitative and chemical qualities defined as Good Human receptors (construction workers and residents)
Medium	Attribute with a medium quality and rarity, local scale and limited potential for substitution.	Examples include: Floodplain providing a moderate volume of storage

Sensitivity/value of a Receptor	Description	Example
	Attribute reasonably tolerant of change.	Receiving watercourse classified as Good or Moderate Ecological status/potential under WFD NPPF Flood Risk Vulnerability Classification "More Vulnerable"
Low	Attribute with a low quality and rarity, local scale and limited potential for substitution. Attribute tolerant of modest change.	Examples include: Environment Agency current river ecological quality defined as Poor / Bad and chemical quality defined as Fail Floodplain with limited existing development. Receiving watercourse classified as Poor Ecological status/potential under WFD NPPF Flood Risk Vulnerability Classification "Less Vulnerable"
Negligible	Attribute of very limited quality and tolerant of substantial change.	Examples include: Floodplain essentially rural in nature, characterised by agricultural land use NPPF Flood Risk Vulnerability Classification "Water Compatible"

10.4.12 Determination of the magnitude of change to the receptors as a result of the proposed development has been undertaken based upon the criteria set out in **Table 10-2**.

Table 10-2: Magnitude of Impact

Magnitude of Impact	Description	Example
High	Results in a loss of attribute and/or quality and integrity of the attribute. Following development, the baseline situation is fundamentally changed.	Examples include: Change in ecological and/or chemical qualities of the surface water. Large change in: - water quality of receiving watercourse; - NPPF Flood Risk Vulnerability Classification; - surface water flood risk; - fluvial flood risk; - water supply volume; and - foul drainage volume.
Medium	Results in impact on integrity of attribute, or loss of part of attribute. Following development, the	Examples include: Contribution of a significant proportion of the effluent in the receiving river, but insufficient to change its qualities. Moderate change in: water quality of receiving; watercourse;

Magnitude of Impact	Description	Example
	baseline situation is noticeably changed.	■ NPPF Flood Risk Vulnerability Classification; ■ surface water flood risk; ■ fluvial flood risk; ■ water supply volume; and ■ foul drainage volume.
Low	Results in some measurable change in attribute's quality or vulnerability. Following development, the baseline situation is largely unchanged with barely discernible differences.	Examples include: Measurable changes in attribute, but of limited extent/duration. Small change in: ■ water quality of receiving watercourse; ■ NPPF Flood Risk Vulnerability Classification; ■ surface water flood risk; ■ fluvial flood risk; ■ water supply volume; and ■ foul drainage volume.
Negligible	The impacts are unlikely to be detectable or outside the norms of natural variation.	

10.4.13 The significance of a potential effect has been derived based upon the sensitivity of the receptor and the magnitude of the change. The significance of the effect has then been determined using the matrix presented at **Table 10-3**. The significance of an effect can be beneficial, neutral or adverse. The significance of an effect has also been, as appropriate, qualified based on the likelihood of an impact occurring (using a scale of certain, likely or unlikely) and the confidence in the accuracy of the assessment.

Table 10-3: Determining Significance of Effect

		Sensitivity of Receptor			
		High	Medium	Low	Negligible
Magnitude of Impact	High	Severe/Major	Major/Moderate	Moderate/Minor	Not Significant
	Medium	Major/Moderate	Moderate	Minor	Not Significant
	Low	Moderate/Minor	Minor	Minor	Not Significant
	Negligible	Not Significant	Not Significant	Not Significant	Not Significant

10.4.14 Temporary impacts are considered to occur in the construction phase and permanent impacts in the operational phase (albeit that the impact may first occur during construction i.e. change of surface material).

10.4.15 The significance of residual impacts (i.e. the environmental impacts that remain after the incorporation of mitigation measures) has been assessed through consideration of their

magnitude, duration and nature (i.e. reversible or irreversible) and also the geographic context (i.e. highly localised or widespread). The significance criteria are set out in Chapter 5.

- 10.4.16 In the absence of 'industry standard' significance criteria for the consideration of water, hydrology and flood risk impacts, a qualitative approach, based upon available knowledge, experience and professional judgement, has been employed.

Assumptions, Uncertainties and Limitations

- 10.4.1 The hydraulic modelling used to assess floodplain extents is based on a limited amount of calibration data and there is an inherent degree of uncertainty associated with the design flood levels, which typically exceed all recorded events due to the extreme nature of the 'design event'. However, it is noted that the watercourses in the vicinity of the site are subject to a long and reliable period of record from the nearby locks.
- 10.4.2 The hydraulic modelling of climate change allowances has been undertaken using industry-standard methods and with no wider modification of the EA River Thames base model. In addition, model sensitivity testing has been undertaken to understand the potential impact upon design flood levels caused by variation of model input parameters.
- 10.4.3 On this basis, the flood levels estimated using the model are considered to be sufficiently robust to inform the FRA and preparation of this chapter of the ES.

10.5 Baseline Conditions

Hydraulic Setting

- 10.5.1 The proposed route is located near the River Thames which flows west to east, north of the site. The western end of the proposed route (at the junction with Napier Road) lies a minimum of 250m south of the watercourse, and the route gets progressively closer to the channel as it moves east until it crosses over the River Kennet at its confluence with the River Thames at Kennetmouth. On the east side of Kennetmouth, the proposed MRT route runs on the north side of the railway line, alongside the River Thames channel, until it meets the TVP P&R facility
- 10.5.2 The River Kennet is the second major watercourse in the Reading area. The Kennet flows through the centre of Reading, partly as the Kennet and Avon Canal. After passing through Blake's Lock, the River Kennet flows under two railway bridges and the listed Horseshoe Bridge at Kennetmouth before it outfalls into the River Thames
- 10.5.3 In this location, the Caversham Lakes lies on the north side of the River Thames; a series of lakes created by gravel extraction works between Caversham and Sonning Eye which incorporate a marina and the Redgrave Pinsent Rowing Lake, which opened in 2006.
- 10.5.4 The River Thames passes through Caversham Lock approximately 1.2km upstream of the proposed route, and Sonning Lock approximately 3.5km downstream. Sonning Lock maintains a Standard Head Water Level (SHWL) within the upstream reach at a level of 35.15m AOD for navigation purposes.
- 10.5.5 Baseline conditions relating to groundwater and wider 'hydrogeology' are detailed in Section 11 'Land'.

Fluvial

- 10.5.6 The EA 'Flood Map for Planning' shows that the western part of the proposed route lies within Flood Zone 2 'Medium Probability' (between 1 in 100 (1%) and 1 in 1000 (0.1%) annual probability of river flooding). The eastern part of the proposed route lies within Flood Zone 3 'High Probability' (greater than 1 in 100 (1%) annual probability river flooding).

- 10.5.7 Analysis of the detailed hydraulic modelling outputs confirms that the proposed MRT route west of Kennetmouth is unaffected in the 1 in 20 (5%) annual probability scenario, although the event does impact across King's Meadow and encroaches on a short length of Napier Road at a maximum flood level of 36.86m AOD.
- 10.5.8 In the modelled 1 in 100 annual probability event, the Tesco Extra store and car park are largely unaffected, but Kings Meadow to the west is significantly impacted and floodwater from this area spills onto Napier Road and backs up into the lower lying land further east. Flooding on Napier Road at this location is at a maximum level of 37.17m AOD, which results in a maximum depth of 270mm (based on a surveyed road centreline of 36.9m AOD). At Kennetmouth the 1 in 100 annual probability flood level is 36.71m AOD, falling to approximately 36.63m AOD near the TVP P&R. This compares to existing ground levels at approximately 36.0m AOD, indicated maximum flood depths of typically 600-700mm on the land east of the Kennetmouth.
- 10.5.9 The extreme 1 in 1000 (0.1%) annual probability event has a significant impact on the area, with flooding extending across the majority of the Tesco Extra store and surrounding car park. A maximum flood level of 37.62m AOD is generated in the Napier Road/Tesco Extra area – approximately 450mm higher than the 1 in 100 annual probability flood level. At Kennetmouth the extreme 1 in 1000 annual probability flood level is 37.0m AOD, falling to approximately 36.63m AOD near the TVP P&R. This compares to existing ground levels at approximately 36.0m AOD, indicated maximum flood depths of typically 600-700mm.
- 10.5.10 The TVP P&R lies wholly within Flood Zone 1 'Low Probability' and is on land at above 39.0m AOD; significantly above the modelled 1 in 100 annual probability floodplain by approximately 2 metres.

Reservoirs

- 10.5.11 The EA 'Risk of Flooding from Reservoirs' map shows that the Kennetmouth area is located within the floodplain in the event of a breach of Whiteknights Lake (the only designated reservoir in the Reading area), located 1.7km south-east of the site.
- 10.5.12 However, the risk of flooding from reservoir breach is very small as all large raised reservoirs are inspected and supervised by reservoir panel engineers.

Surface Water

- 10.5.13 The EA Surface Water Flood Map indicates that the majority of the site is at 'Very Low' (less than 1 in 1000 (0.1%)) risk of flooding from surface water sources, with some isolated areas of 'Low' (between 1 in 1000 (0.1%) and 1 in 100 (1%)) risk of flooding from surface water sources.
- 10.5.14 The proposed route runs over ground currently occupied by scrub/vegetation or landscaping. As such, the natural drainage mechanism would be via infiltration or overland runoff into the nearby watercourses (either directly, or via the local drainage system serving the Tesco car parking area).

Water Quality

- 10.5.15 The EA Catchment Data Explorer application provides details of the ecological and chemical water body classifications for the WFD designated water bodies within the vicinity of the site, in line with the RBMP for the Thames River Basin District (2015).
- 10.5.16 The RBMP sets out a Programme of Measures (POM) which needs to be undertaken in order for each water body to maintain or reach 'good' status/potential by 2015 in accordance with the Water Framework Directive (WFD) with extensions granted where applicable. The plan

also sets out the various standards that each water body has to meet in order to be classified as having 'good' status/potential.

- 10.5.17 The site is situated within three WFD designated water bodies: the Kennet and Holy Brook, Thames (Wallingford to Caversham), and Thames (Reading to Cookham). All water bodies lie within the South Chilterns operational catchment.
- 10.5.18 The Kennet and Holy Brook, Thames (Wallingford to Caversham) and Thames (Reading to Cookham) waterbodies are noted as being 'heavily modified' water bodies. These are water bodies which have been significantly physically modified to support various uses which provide valuable social and economic benefits. Removing these modifications would result in major negative effects on the social and economic benefits that these uses bring.
- 10.5.19 The heavily modified water bodies (HMWB) designation is therefore applied if achieving 'good' status would require changes to the water body's hydromorphology that would have significant adverse effects on the social or economic activity. HMWB are therefore required to achieve 'good' ecological potential, an objective similar to 'good status', but which takes into account the constraints imposed by the social and/or economic uses.
- 10.5.20 The data identifies the Kennet and Holy Brook, Thames (Wallingford to Caversham) and Thames (Reading to Cookham) water bodies to have overall classifications of 'moderate' potential through Cycle 1 in 2009, remaining consistent through to Cycle 2 in 2015.
- 10.5.21 This is further broken down into ecological potential and chemical status. All water bodies are currently classified as 'moderate' ecological potential, and 'good' chemical status. The Kennet and Holy Brook water body has not met its objective of good potential by 2027, however the Thames (Wallingford to Caversham) and Thames (Reading to Cookham) water bodies have achieved their WFD objectives of moderate potential by 2015.

Projected Future Baseline

- 10.5.22 The hydrological regime may change as a result of the predicted impacts of climate change.
- 10.5.23 Peak fluvial flows and peak rainfall intensities are predicted to increase as a result of climate change. Should such changes materialise, rates of surface water run-off and flood flows within the River Thames and River Kennet would increase.
- 10.5.24 The EA guidance 'Flood risk assessments: climate change allowances' (February 2016) provides allowances for increases in peak rainfall intensity of between +20% and +40%, indicating an increased demand on the surface water drainage arrangements and potentially a resultant increase in the flood risk from the receiving watercourse (unless appropriately mitigated).
- 10.5.25 The FRA considers the potential impact of climate change upon the baseline fluvial regime, in accordance with the EA guidance. 'As discussed in the 'methodology' section, the proposals require consideration of the following peak river flow allowances:
- Flood Zone 2 (land west of Kennetmouth): +35% to +70%
 - Flood Zone 3b ((land east of Kennetmouth): +70%
- 10.5.26 PBA has re-run the EA Thames hydraulic model using the new climate change peak river flow allowances.
- 10.5.27 The modelled 1 in 100 annual probability +35% climate change allowance flood event is marginally less severe than the extreme 1 in 1000 annual probability flood event (flood levels at Kennetmouth are approximately 80mm lower).

10.5.28 The modelled 1 in 100 annual probability +70% climate change allowance flood event is more severe than the extreme 1 in 1000 annual probability flood event (flood levels at Kennetmouth are approximately 140mm higher).

10.5.29 In relation to water quality of the Thames and Kennet catchment, it is anticipated that this would either be maintained or improve in line with the long term objectives of the RBMP.

10.6 East MRT Site

Potential Effects

10.6.1 This section describes the potential effects of the proposed development upon hydrology and drainage during both the construction and operational phases of the **East MRT only**. Both adverse and beneficial effects, and their significance, are considered.

10.6.2 The principal receptors that may be affected by the proposals are:

- The River Thames;
- The River Kennet;
- The Caversham Lakes;
- Users of the river(s) and adjacent footpaths for amenity and travel;
- Existing development/infrastructure/third party assets/land in the vicinity and downstream of the proposed development.

10.6.3 The proposals include measures to prevent, reduce and offset significant adverse effects upon hydrology and drainage. These measures are embedded within the design philosophy that underpins the proposals. Being effectively 'built-in' to the proposals from the outset, the assessment of impact significance includes consideration of these measures.

10.6.4 In addition to measures embedded within the design process, development activities and associated effects are also controlled through ensuring legislative compliance and applying industry-standard/best practice (i.e. ensuring that the proposals do not increase flood risk elsewhere, thereby complying with the requirements of the NPPF).

10.6.5 A summary of the mitigation measures embedded/'built-in' to the proposals is set out below:

Construction:

- i. The use of best practice construction techniques and implementation of a Construction Environmental Management Plan (CEMP) to control/mitigate impacts upon hydrology and drainage and demonstrate no detriment to WFD designated water bodies;
- ii. The consenting/permitting process (via the EA and Lead Local Flood Authority) and associated method statements for works within the watercourse corridors;

Operation:

- i. Incorporation of flood compensation measures to mitigate the impact of the development on floodplain storage. This includes three areas of ground lowering to provide compensatory floodplain storage to counter any losses in floodplain storage capacity caused by the proposed new structure as follows (areas will be made good and reseeded/replanted on completion):

- a. Lowering of an earth embankment to the immediate north-east of the Tesco store;
 - b. A cutting into the embankment at the eastern end of the East MRT (where the land rises out of the floodplain near the new TVP P&R site);
 - c. A shallow scrape of land (<250mm) immediately east of Kennetmouth.
- ii. Incorporation of effective design to minimise the 'floodable footprint' of the proposals. This includes construction of the east section as a viaduct over a floodable area, incorporation of flood culverts under the East MRT embankment west of Kennetmouth (to maintain hydraulic connectivity into flood storage areas) and setting of bridge soffit levels above reference flood levels and any navigation requirements;
 - iii. Provision of a surface water management strategy to control surface water flows for up to and including the 100-year design standard (including an allowance for the predicted impacts of climate change) such that flood risk downstream is not adversely affected (in accordance with national planning policy);
 - iv. Surface water management infrastructure designed in accordance with CIRIA C753 'The SuDS Manual' and guidance set out by the Lead Local Flood Authority such that the surface water run-off regime replicates that existing prior to development;
 - v. Implementation of SuDS 'treatment train' principles as set out in CIRIA C753 to provide pollution control;

Construction Stage Effects

- 10.6.6 Development works, including earthworks operations, have the potential to impact upon the surface water drainage regime which, in turn, may impact upon sensitive locations in the vicinity of the site.
- 10.6.7 Construction activities will include the clearance of vegetation, topsoil stripping and stockpiling, establishment of compound areas, excavation and site levelling/re-profiling to create development platforms, preparation of site roads and construction of foundations. Compaction of the ground caused by construction plant and an increase in the extent of impermeable surfaces associated with access roads and compound areas has the potential to impact upon the surface water drainage regime and increase surface water run-off from the site.
- 10.6.8 Construction activities also have the potential to give rise to the contamination of surface water and groundwater resulting from spilled hydrocarbons/petrochemicals from construction plant and the mobilisation of silts and contaminants during soil stripping and earthworks operations, potentially leading to increased silt loading in watercourses.
- 10.6.9 There is potential for an increase in silt and mobilised soil matter to enter the River Kennet and River Thames water courses which could potentially impact the WFD designations. The use of best practice construction techniques and implementation of CEMP will mitigate against this. The impacts of construction will be temporary in nature, limited to the construction phase, and will not cause detriment to the existing or future WFD potential of the designated water bodies in the vicinity of the site. Construction of the East MRT and resultant impacts on the WFD designated water bodies is therefore **Not Significant**.
- 10.6.10 The eastern part of the East MRT will be constructed within the Functional Floodplain, while the area west of Kennetmouth is within the floodplain when climate change allowances are considered. Construction works have the potential to affect flood storage and flood flows/flood routing processes as a result of temporary measures to control/manage river flows and

construction activities and earthworks operations within the floodplain. Construction of the East MRT therefore has the potential to increase flood risk locally and downstream.

Operation Effects

- 10.6.11 The proposed development will give rise to an increase in the impermeable area within the site, thereby increasing surface water run-off rates to the receiving watercourses (River Thames and River Kennet). This has the potential to increase flood risk to existing development/infrastructure/third party assets/land downstream of the proposed development.
- 10.6.12 There is the potential for the contamination of surface water entering the receiving watercourses (River Thames and River Kennet), resulting from the flushing of silts and hydrocarbons from areas of hardstanding.
- 10.6.13 The WFD Compliance Assessment (Appendix 10-2) has comprehensively detailed the potential effects on the WFD water bodies in the vicinity of the East MRT. Without additional mitigation measures included, there is the potential for introduction of pollutants to Berkshire Downs Chalk WFD groundwater body through piling activities.
- 10.6.14 The potential effects of the proposed development are therefore not expected to cause any change to the existing potential of the surface water WFD designated water bodies, but could result in some deterioration of the poor status of the WFD designated groundwater body without the incorporation of appropriate mitigation measures. Mitigation measures have been described below.

Mitigation

- 10.6.15 This section sets out the measures employed to mitigate the potential effects outlined above.

Construction

- 10.6.16 The potential effects of construction activities upon the surface water drainage/run-off regime can be controlled using measures set out within a CEMP. This includes the provision of temporary measures to intercept and control surface water run-off from worked areas/construction zones, together with the appropriate phasing/delivery of components of the 'permanent' surface water management infrastructure incorporated within the development proposals.
- 10.6.17 The use of environmental management controls and procedures as set out in the CEMP will control diffuse pollution. This includes 'temporary' measures to route surface water run-off from 'worked' areas to a sump/silt trap before discharge to receiving waters so that silt loading does not increase.
- 10.6.18 The implementation of measures set out in the CEMP and as required by Conditions imposed upon Permits/Consents for works within watercourse corridors will control the potential impacts of construction works upon flood storage and flood flows/flood routing processes such that flood risk locally and downstream is not increased.
- 10.6.19 The WFD Compliance Assessment (Appendix 10-2) demonstrates that impacts upon the relevant surface water bodies that occur during the construction phase will be temporary, limited to the construction phase, and will not result in a long term impact nor detriment of the relevant WFD water bodies, nor their ability to meet WFD or RBMP objectives. The temporary impacts can be managed and mitigated through adopting best practice construction techniques, defined by measures detailed within the CEMP.
- 10.6.20 The impact upon the WFD designated groundwater body that underlies the site, Berkshire Downs Chalk, could have minor adverse effects without appropriate mitigation. In order to prevent against introducing additional pollutants to the groundwater body through piling

activities, they will be installed in accordance with EA guidance for piling in potentially contaminated sites.

Operation

10.6.21 The development incorporates a number of mitigation elements to demonstrate that (i) the impact of the proposals on fluvial floodplain storage and flow routes is minimised, and (ii) additional floodplain storage is provided through ground lowering elsewhere to offset any losses in storage. These are summarised below:

- Flood compensation measures through ground lowering are provided along the route of the East MRT to mitigate the detrimental impact on floodplain storage capacity, resulting in a net gain in storage capacity over the site;
- The East MRT embankment on the west side of Kennetmouth incorporates culverts to maintain hydraulic connectivity into the surrounding landscaped areas, which provide a flood storage function in severe flood events (exceeding the 1 in 100 annual probability event);
- The East MRT is constructed as a viaduct on the east side of the River Kennet, with the floodplain impacts minimised to the small non-floodable support structure along this section;

10.6.22 The new EA climate change guidance requires consideration of increases in peak river flow in the range of +35% to +70%. The FRA summarised the basis for mitigation proposals as follows:

- The bridge soffit is over 4 metres above the 'upper end' 1 in 100 annual probability +70% climate change allowance scenario flood level and, therefore, significantly in excess of EA requirements in relation to flood risk; and
- The proposed bridge corresponds with the adjacent structures, providing headroom clearance of 6.8 metres above Standard Head Water Level at the centre of the navigation channel, exceeding any navigations requirements in this reach of the watercourses.

10.6.23 The impacts of the proposed development were quantified through the incorporation of the proposals (proposed structure and flood compensation mitigation measures) in a 'post-development scenario' version of the River Thames hydraulic model. This confirmed that any impacts are limited to the immediate route of the East MRT and no impacts to dwellings (a maximum detriment of 35mm was located in an isolated location west of Kennetmouth, otherwise the main impact was a reduction in flood levels of between 30mm and 90mm within the Tesco car park area, in the 1 in 100 annual probability +35% climate change allowance scenario). In conclusion, the technical analysis demonstrates that the effects of the proposed development are **Not Significant**.

10.6.24 Full details of the proposed surface water strategy are set out in the FRA (Appendix 10-1). The technical analysis demonstrates that peak runoff rates are to be limited to no greater than greenfield runoff rates and as such the receiving watercourses are not adversely affected by the proposals, such that the effects of the proposed development are **Not Significant**.

10.6.25 Some aspects of the proposed development could result in deterioration of the current WFD potential of designated water bodies without mitigation measures in place. Appropriate additional mitigation measures have subsequently been described, and they include designing piling in accordance with EA guidance on piling in potentially contaminated areas.

10.6.26 The WFD Compliance Assessment (Appendix 10-2) shows that with embedded mitigation measures and the above additional mitigation measure, the proposed development will not negatively impact the surface water or groundwater WFD designated water bodies, nor their ability to achieve or maintain WFD or RBMP objectives. The proposed method of surface water management, included as an embedded mitigation measure and detailed above, will

control surface water quality through the implementation of measures as part of the SuDS treatment train.

Residual Effects

Construction

10.6.27 Following the implementation of 'built-in'/embedded mitigation measures as set out above, it is concluded that the residual effects associated with the construction stage are **Not Significant**.

Operation

10.6.28 Following the implementation of 'built-in'/embedded mitigation measures as set out above, it is concluded that the residual effects in respect of hydrology, flood risk and surface water drainage associated with the post-completion stage are **Not Significant**. There is therefore no requirement for additional mitigation measures over and above those embedded into the design of the development proposals.

10.6.29 Following the implementation of embedded mitigation measures and additional mitigation measures as set out above, it is concluded that the residual effects associated with the operation of the development are **Not Significant** with regards to WFD.

10.7 Combined Site (East MRT and Thames Valley Park Park & Ride)

Potential Effects

10.7.1 This section describes the potential effects of the proposed development upon hydrology and drainage during both the construction and operational phases of the **combined site (East MRT and Thames Valley Park P&R)**. Both adverse and beneficial effects, and their significance, are considered.

10.7.2 As the TVP P&R is in an area at 'Low' probability of river flooding, the potential effects and receptors are the same as for the 'East MRT only' scenario. The only notable mitigation measure embedded/'built-in' to the proposals – beyond those outlined in the East MRT only scenario – is the surface water management infrastructure to be designed in accordance with CIRIA C753 'The SuDS Manual' and guidance set out by the Lead Local Flood Authority such that the surface water run-off regime from the TVP P&R replicates that existing prior to development.

Construction

10.7.3 Construction activities will include the clearance of vegetation, topsoil stripping and stockpiling, establishment of compound areas, excavation and site levelling/re-profiling to create development platforms, preparation of site roads and construction of foundations. Compaction of the ground caused by construction plant and an increase in the extent of impermeable surfaces associated with access roads and compound areas has the potential to impact upon the surface water drainage regime and increase surface water run-off from the East MRT site.

10.7.4 Construction activities also have the potential to give rise to the contamination of surface water and groundwater resulting from spilled hydrocarbons/petrochemicals from construction plant and the mobilisation of silts and contaminants during soil stripping and earthworks operations, potentially leading to increased silt loading in watercourses.

10.7.5 The eastern part of the East MRT will be constructed within the Functional Floodplain, while the area west of Kennetmouth is within the floodplain when climate change allowances are considered. Construction works have the potential to affect flood storage and flood flows/flood

routing processes as a result of temporary measures to control/manage river flows and construction activities and earthworks operations within the floodplain.

- 10.7.6 Construction of the East MRT therefore has the potential to increase flood risk locally and downstream. The TVP P&R is located outside the fluvial floodplain and construction works will therefore have no impact on flood storage or flood flows/flood routing processes.

Operation

- 10.7.7 The combined proposed developments will give rise to an increase in the impermeable area within the combined site, thereby increasing surface water run-off rates to the receiving watercourses (River Thames and River Kennet). This has the potential to increase flood risk to existing development/infrastructure/third party assets/land downstream of the proposed development.
- 10.7.8 There is the potential for the contamination of surface water entering the receiving watercourses (River Thames and River Kennet), resulting from the flushing of silts and hydrocarbons from areas of hardstanding.
- 10.7.9 In accordance with requirements of the EA and LLFA, the TVP P&R incorporates a surface water drainage strategy, based on on-site attenuation and controlled discharge to the River Thames and to the surface water sewer beneath the A3290. The accompanying FRA (WSP, March 2016²⁰) states that *“the Proposed Development will discharge at a maximum rate of 5.8l/s for the 1% annual probability rainfall event including an allowance for climate change. In order to ensure surface water discharged to the surface water sewer network is restricted to the greenfield runoff rate, surface water attenuation will be required within the Proposed Development”*. On this basis, the effect of the proposed TVP P&R facility will be **Not Significant**.
- 10.7.10 Implementation of SuDS ‘treatment train’ principles facilitates the control of diffuse pollution. As a result of the implementation of such measures, the effects of the East MRT proposed development are **Not Significant**. It is noted that no detailed information in relation to the proposed measures on the TVP P&R are included within the associated FRA and therefore this element is contingent on the detailed design of the drainage arrangements.

Mitigation and Enhancement

- 10.7.11 This section sets out the measures employed to mitigate the potential effects outlined above.

Construction Stage

- 10.7.12 No further mitigation measures are required over and above those previously stated for the East MRT and TVP P&R proposed developments.

Operation

- 10.7.13 No further mitigation measures are required over and above those previously stated for the East MRT and TVP P&R proposed developments.

²⁰ WSP | Parsons Brinckerhoff, 2016, Thames Valley Park, Park & Ride: Flood Risk Assessment

Residual Effects

Construction

- 10.7.14 Following the implementation of 'built-in'/embedded mitigation measures as set out above, it is concluded that the residual effects associated with the construction stage are **Not Significant**.

Operation

- 10.7.15 Following the implementation of 'built-in'/embedded mitigation measures as set out, it is concluded that the residual effects in respect of hydrology, flood risk and surface water drainage associated with the post-completion stage are **Not Significant**.

10.8 Cumulative Effects

- 10.8.1 The identified committed development schemes that are being considered within this EIA are all of a nature or scale such that an FRA is required or will already have been undertaken. This would need to comply with NPPF, PPG and other relevant local policies and the final scheme will need to demonstrate that the proposed development does not have any adverse impact on flood risk/surface water runoff rates and water quality.
- 10.8.2 On this basis it is considered that the development of the committed development schemes will not give rise to any likely significant cumulative effects.

10.9 Summary

- 10.9.1 A site-specific Flood Risk Assessment (FRA) was completed for the scheme due to the proposed development being located in an area classified as within Flood Zones 3 'High Probability' and Zone 2 'Medium Probability' of river/sea flooding. The FRA has concluded that the users of the proposed bridge will be safe and there will be no increase in flood risk elsewhere; thus meeting the requirements of the National Planning Policy Framework (NPPF). Residual effects associated with the development, during both construction and operation phase, have been categorised as **Not Significant**.
- 10.9.2 A comprehensive Water Framework Directive (WFD) Compliance Statement has been compiled to accompany the planning application. This concludes that the proposed works will not detrimentally impact the WFD status/potential of nearby designated water bodies, will not impede their ability to achieve good ecological status/potential, and will not prevent against achieving WFD and River Basin Management Plan (RBMP) objectives. The scheme is therefore compliant with WFD, with residual effects of the construction and operation phase being categorised as **Not Significant**.
- 10.9.3 The combined site (East MRT and Thames Valley Park P&R) has been assessed above and within the FRA and WFD Compliance Statement, with regards to flood risk and potential effect on WFD. The residual effects of the construction and operation phases are assessed to be **Not Significant**.

WSP | Parsons Brinckerhoff, 2016, Thames Valley Park, Park & Ride: Flood Risk Assessment

11 Ground Conditions

11.1 Introduction

11.1.1 This chapter considers the potential direct and indirect effects on human health, the environment and the proposed development with respect to ground contamination and ground stability. In particular, it considers the potential effects from the disturbance of ground contamination on human health and the environment, and the effects of potentially contaminated ground or groundwater conditions on the proposed development. It also recognises the effects of the geological setting of the site in relation to the development and presents an assessment of such hazards being present at the application site.

11.1.2 The chapter describes the baseline conditions existing at the application site and surroundings, the potential direct and indirect effects of the ground conditions, the methods used to assess the impacts, the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been employed.

11.1.3 Features referred to within this chapter are presented on Figure 1 in Appendix 11-1

11.1.4 As described, other direct effects of the proposed development on the ground have been excluded from this assessment. The elements excluded from this assessment and the reasons for their exclusion are:

- **Geo Conservation** There are no designated geological or geomorphological sites or features of conservation value in the area affected by the proposed scheme. Given that the proposed development will have no material change on the geology and geomorphology of the application site and its vicinity, there are no likely significant effects. There is no assessment of the impact of the scheme on geo conservation in the ES.
- **Mineral Resources** Although the River Terrace Deposits represent a potential mineral resource, the application site does not fall within any mineral consent or safeguard area. On this basis, there are no likely significant effects and there is no assessment of the impact of the scheme on mineral resources in the ES.
- **Unstable Ground** The application site is situated on slightly undulating ground with no noted features with the exception of two disused gravel pits recorded in the eastern part of the application site. The geology and geomorphological setting of the application site is such that the potential for unstable ground to be present is, in general, very low. The presence of the historical gravel pits is not considered to have a significant effect on the ground conditions or the wider environment during either the construction phase or in the long term. On this basis, there are no likely significant effects and this aspect was scoped out from the ES.

11.1.5 The assessment in this chapter is based on the information in the following reports: -

- Proposed MRT Scheme, East Reading Mass Rapid Transit Scheme Phase 1 Ground Condition Assessment (Contamination and Geotechnical) (PBA, 2017a) provided in Appendix 11-2;
- Proposed MRT Scheme, East Reading Mass Rapid Transit Scheme Phase 2 Ground Condition Assessment (PBA, 2017b) provided as Appendix 11-3; and
- Thames Valley Park and Ride, Reading, Berkshire Phase 1 Land Contamination Assessment (WSP, 2016) provided as Appendix 11-4.

- 11.1.6 Reference should also be made to other chapters in this Environmental Statement including, but not limited to the Chapters 9 and 10 on Air Quality and Hydrology and Flood Risk respectively.

11.2 Policy Context

- 11.2.1 Government policy on land contamination aims to prevent new contaminated land from being created and promotes a risk based approach to addressing historical contamination. With regard to historical contamination, regulatory intervention is held in reserve for land that meets the legal definition and cannot be dealt with through any other means, including through planning. Land is only considered to be “contaminated land” in the legal sense if it poses an unacceptable risk.

Legislation

- 11.2.2 UK legislation on contaminated land is principally contained in Part 2A of the Environmental Protection Act, 1990 (which was inserted into the 1990 Act by section 57 of the Environment Act 1995).
- 11.2.3 Part 2A was introduced in England on 1 April 2000 and provides a risk-based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment. The broad approach, concepts and principles behind land contamination management adopted by the Part 2A regime are applied to the determination of planning applications.
- 11.2.4 The role of the planning system is to control future development and land use. The assessment of risk arising from contamination and remediation requirements should be considered on the basis of both the current and proposed use. Current use includes any use that has planning permission but is as yet unimplemented. The underlying approach to identifying and dealing with risk and the broad policy objective of safeguarding human health and the environment are similar for both the Planning and Part 2A regimes.
- 11.2.5 The Regulations and Statutory Guidance that accompanied the Act, has been revised with the issue of The Contaminated Land (England) (Amendment) Regulations (SI 2012/263) and the Contaminated Land Statutory Guidance for England (DEFRA, 2012).
- 11.2.6 The guidance includes a definition of 'risk', where a risk is said to be a combination of:
- the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land; and
 - the scale and seriousness of such harm or pollution if it did occur.
- 11.2.7 The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (SI 2015/810) provide that, for certain activities, where there is an imminent risk of environmental damage, steps must be taken to prevent such damage, and if environmental damage has already occurred, the operator of the activity must prevent further damage. The duties are backed up with criminal sanctions for breaches of the Regulations.
- 11.2.8 Controlled Waters are rivers, estuaries, coastal waters, lakes and groundwater, but not perched waters. The Environmental Permitting (England and Wales) Regulations 2016 (SI 2010/1154) bring together 12 amendments to the Environmental Permitting (England and

Wales) Regulations 2010, as well as amendments made by other legislation. Under the Regulations, groundwater activities relate to inputs of pollutants to groundwater.

11.2.9 The Regulations transpose the Groundwater Directive 1980 (hereafter GWD), the Water Framework Directive 2000 (hereafter WFD) and Groundwater Daughter Directive 2006 (hereafter GWDD). The GWD remained in force until its repeal in December 2013.

11.2.10 The GWDD was enacted by the Groundwater Regulations (2009), which were subsumed by the Environmental Permitting Regulations (2010) which provide essential clarification including on the four objectives specifically for groundwater quality in the WFD:

- Achieve 'Good' groundwater chemical status by 2015, commonly referred to as 'status objective';
- Achieve Drinking Water Protected Area Objectives;
- Implement measures to reverse any significant and sustained upward trend in groundwater quality, referred to as 'trend objective'; and
- Prevent or limit the inputs of pollutants into groundwater, commonly referred to as 'prevent or limit' objectives

11.2.11 The Water Act 2003 (Commencement No.11) Order 2012 amends the test for 'contaminated land' which relates to water pollution so that pollution of controlled waters must now be "significant" to meet the definition of contaminated land.

National Planning Policy

11.2.12 Section 11, Paragraphs 120 and 121 of the National Planning Policy Framework (NPPF) (DCLG, 2012) describe the policy considerations the Government expects Local Planning Authorities (LPA) to have in regard to land affected by contamination when preparing policies for development plans and in taking decisions on applications. After remediation under planning, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990.

11.2.13 For planning purposes, the NPPF requires that the assessment of risks arising from contamination and remediation requirements should be considered on the basis of the current environmental setting, the current land use, and the circumstances of its proposed new use. The NPPF stipulates that planning policies and decisions should require that "the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation"; and that "after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990; and adequate site investigation information, prepared by a competent person, is presented.

11.2.14 A Phase 1 Ground Condition Assessment (Desk Study) is identified as being the minimum requirement under the NPPF Clause 121 and the definition of "Site Investigation Information" given in the Glossary Page 56, to support any planning application on a site that might be potentially affected by contamination. Similarly, a desk study and site reconnaissance is the minimum information that should be provided for a site potentially at risk from ground instability.

Local Planning Policy

11.2.15 Reference has been made to Policy – CS34: Pollution and Water Resources contained in Reading Local Development Framework Core Strategy Document (adopted 2008 & altered 2015) reads: -

- *“Development will only be permitted where it would not be damaging to the environment through air, land, noise or light pollution; where it would preserve or ideally enhance ground and surface water quality; and where existing water resources, sewerage and wastewater treatment infrastructure are adequate to support the proposed development.*
- *Proposals for development that are sensitive to the effects 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.*
- *Development will be permitted on land affected by contamination where it can be demonstrated, to the satisfaction of the LPA, that the contamination can be satisfactorily remediated so that it is suitable for the proposed end use.”*

11.2.16 Reference has been made to the RBC document entitled “Planning Applications Validation Information Requirements Checklists & Guidance” dated December 2016 which states that a Contaminated Land Survey & Report is required

“Where contamination is known or suspected or the development site is in the vicinity of such land, and ground-works are proposed; or, where there is a vulnerable or sensitive end user i.e. Residential, Schools, Nurseries, Hospitals and Allotments. This information is required to determine the existence of contaminated land, its nature and the risks it may pose to the proposed development and whether remedial measures are feasible to satisfactorily reduce the contamination to an acceptable level. A desk study listing current and historic uses of the site and adjoining land, together with a site reconnaissance shall be provided, to determine the likelihood of contamination. In addition, where contamination is known or suspected or the site is in the vicinity of such land, a preliminary conceptual site model (showing all potential pathways between contaminants and receptors – known as pollutant linkages) shall be provided, together with a preliminary risk assessment of these pollutant linkages.”

11.2.17 The Berkshire Guide to Developing Potentially Contaminated Land includes a checklist for information to be included for each phase of investigation.

11.2.18 Wokingham Borough Council (WBC) has published a Contaminated Land Strategy (4th revision) dated October 2015 which contains a section entitled “Dealing with Contaminated Land under the Planning Regime” which states: -

Where potential development sites are identified as lying on within a certain distance of potentially contaminated land the Development Management team will consult with the Environmental Quality team. The team will consider whether further investigation into potential contamination is required and if necessary will recommend that conditions are imposed. The conditions will ensure that an appropriate investigation takes place followed, where necessary, by remediation to ensure that the land is made suitable for its intended use. In certain circumstances the team will recommend refusal of an application if insufficient information on contamination has been provided with the application

The Council has drafted a document entitled ‘A Developer’s Guide to Potentially Contaminated Land’ which will be made available to all developers upon request. This document, to an extent, replaces PPS23 which was withdrawn as part of the Government’s review of planning guidance. It is intended to include the guide as an appendix to a supplementary planning document shortly up for review. All specialist reports submitted to comply with contaminated

land conditions will be reviewed by the Environmental Quality Team who will make recommendations as to whether the relevant conditions may be discharged

11.3 Consultation

- 11.3.1 The EIA Scoping Opinion from RBC queried/noted the absence of contaminated land and mitigation in the proposed scope of the EIA: Construction Impacts (6.2.8).
- 11.3.2 Although a scoping reply was received from RBC Environmental Protection there was nothing relating to land contamination.
- 11.3.3 The scoping response from the Environment Agency (EA) included a section on Contaminated Land which reads: -

Item 3.2 Development Description states that the development will include associated infrastructure. Since the Archaeological section paragraph 7.9.18 refers to deep foundations and piling activities causing disturbance we request clarification if these are general or specific comments about the foundation solutions for this development. In order for the risk to be assessed to the Principal Aquifer under this site it is important that the EIA should include the proposed use of this parcel of land. We, therefore, require clarification if the associated infrastructure includes buildings or underground car parks.

In addition to the historic landfill the wider area has been used as railway land; for household gas production and as a 'depot'. Therefore, the EIA should at least highlight the potential risk of mobilising contamination from these historic activities.

It is important that we are informed of a) the proposed location of the new bridge over the River Kennet b) the proposed use of the historic landfill site and if there is likely to be a need for piling and c) if part of the site coincides with a former depot where tanks (potentially storing fuel) are labelled on historic maps.

- 11.3.4 The scoping response from WBC in response did not contain any additional comments in relation to contamination.
- 11.3.5 PBA made a request to RBC for any geoenvironmental related information held by the Council for the application site and its immediate surroundings. The Senior Technical Officer for Environmental Protection of Reading Borough Council carried out a search on the Council's database with relation to contamination records. The letter refers to a number of records of potential source of contamination including former gas works, gravel pit, biscuit factory, railway sidings, a warehouse and a historical landfill. A copy of the information provided by RBC Environmental Health Department is reproduced in Appendix 7 of the Phase 1 report (PBA, 2016 in Appendix 11-1).
- 11.3.6 PBA made a request to the EA for any geoenvironmental related information held by the EA for the application site and its immediate surroundings. According to the documents provided by the EA the historical landfill at Napier Road has received 'semi-inert materials including; wood, paper, cardboard, plasterboard and plastic and the documents that landfill has a soil cover. A copy of the information provided by the EA is reproduced in Appendix 8 of the Phase 1 report (PBA, 2016 in Appendix 11-1).

Guidance / Best Practice

- 11.3.7 This ES adopts a tiered approach to ground condition assessment and the assessment is underpinned by the following guidance and/or best practice: -
- Contaminated Land Report 11 (CLR 11) 'Model Procedures for the Management of Land Contamination' (DEFRA/EA, 2004);

- BS 5930:2015 “Code of practise for site investigations” (BSI, 2015); and,
- BS 10175:2011+A1:2013 “Investigation of contaminated sites – code of practice” (BSI, 2011).

11.3.8 Where third party reports are used by PBA, any additional commentary regarding the guidance used in such reports is provided.

11.3.9 Position statements describing the EA’s approach to managing and protecting groundwater updating the EA’s Groundwater Pollution Prevention Principles (GP3), were launched on 14 March 2017.

11.4 Methodology

Study Area

11.4.1 The Study Area for this Chapter comprises the land within the planning application red line boundary for both the East MRT and the TVP P&R schemes plus the land immediate (adjoining) land for identification of specific current and historic land uses.

11.4.2 Depending on the type of data a search radius of between 250m and 1km is used depending on the zone of influence, for example only landfill sites within 250m of the site boundary will be identified because gas migration is unlikely over a greater distance.

Baseline Data Collection

11.4.3 Both the East MRT and TVP P&R schemes benefit from Phase 1 ground condition reports (PBA, 2017a and WSP, 2016, appendices 11-2 and 11-4 respectively). The Phase 1 scope of work is summarised below: -

- Site walkover survey of accessible areas, to document the current land use and site setting;
- Review of available historical maps to identify former land uses and potential contaminative activities on and surrounding the site;
- Request for contaminated land information held by RBC and WBC;
- A review of relevant publicly available information relating to hydrological features, hydrogeology, neighbouring land use, ecologically sensitive uses and geology in order to establish the environmental setting of the site;
- The development of a preliminary conceptual site model (CSM) following the source-pathway-receptor contaminant linkage approach; and
- An outline of the environmental risks with respect to ground, groundwater and ground gas conditions, which may potentially arise as liabilities or constraints associated with the development of the site.

11.4.4 The East Existing Site Layout scheme also benefits from site specific data obtained from an intrusive investigation (PBA, 2017b (appendix 11-3)), which comprised: -

- 10o exploratory holes (all located within Zone D).
- Chemical laboratory analysis of 25 soil samples, 5 groundwater and 3 surface water samples.

Temporal Scope

- 11.4.5 The assessment has considered the potential for surface and subsurface geological and hydrogeological effects as a result of the proposed development during both the temporary construction phases and permanent operational phase.

Assumptions & Uncertainties

- 11.4.6 This assessment is in part based on published information which is generic to an area rather than specific to the development site. Where this is the case professional experience has been used to inform the assessment in terms of likelihood and degree of contamination associated with the identified land uses.
- 11.4.7 Further information on site specific ground conditions will be collected to inform detailed design.
- 11.4.8 For the purpose of this assessment, it is assumed that any soil and groundwater remediation (if required) is undertaken as a single event as part of enabling works in advance of construction works. There are potential issues associated with undertaking phased remediation in that the untreated areas can re-contaminate an adjacent treated area. Mitigation measures such as gas protection membranes and/or barrier water supply pipe may be identified because risk management measures but will be implemented as part of phase specific construction.

Assessment Methodology

- 11.4.9 The presence of contamination in land can present risks to human health and the environment, which adversely affect or restrict the beneficial use of land. Without appropriate mitigation, the presence of substances with potential to cause harm to human health, property or the wider environment may severely limit or altogether preclude development and the beneficial use of land.
- 11.4.10 The approach adopted for the identification of potential effects associated with ground conditions is to compare an estimated **risk** associated with the proposed development (considering separately the Construction Phase and Operational Phase (including any embedded mitigation in each phase)) with the corresponding estimated risk associated with the existing baseline conditions.
- 11.4.11 Risk is based on a consideration of both:
- the magnitude of the potential consequence (i.e. severity) taking into account both the potential severity of the hazard and the sensitivity of the receptor.
 - the magnitude of probability (i.e. likelihood) taking into account both the presence of the hazard and receptor and the integrity of the pathway.
- 11.4.12 Details of the methodology used for risk assessment are given in the guidance notes included in the Phase 1 report for the East MRT scheme (PBA, 2017a in Appendix 11-2). As an overview, for a risk to exist there needs to be one or more hazard – pathway – receptor linkages. Each Conceptual Site Model (CSM) for baseline, construction phase and operational phase considers:
- The principal **hazards**. The contaminants must be present in, on or under the land in a form and quantity that poses a hazard. The potential contamination sources are identified from a review of information on land use. The importance of the land use in terms of anticipated magnitude and extent of contamination is classified in one of five bands with a Very High classification associated with land uses such as hazardous waste

landfill sites. The classification banding is presented in Table 1 of the methodology (refer to PBA, 2017a in Appendix 11-2).

- The classification can be refined if site specific ground condition data is available, as is the case for part of the East MRT scheme;
- The principal **pathways**. The potential exposure and migration pathways between the identified hazard(s) and receptor(s) are identified and can be refined if site specific ground condition data is available; and
- The principal **receptor(s)**. A receptor is something that could be adversely affected by a contaminant, for example, a person, an ecosystem or controlled waters. The assessment considers those receptors identified in statutory guidance (DEFRA, 2012). The importance of the receptor is classified in one of five bands with a Very High classification associated with receptors of national or international importance. The classification banding is presented in Table 2 of the methodology (refer to PBA, 2017a in Appendix 11-2).

11.4.13 Potential effects are identified using the matrix presented in Table 11-1.

Table 11-1 Matrix for Identifying Potential Effect (Based on the change from Baseline Risk)

Risk (Scheme Phase)	Potential Effect					
	Very High	Severe Adverse	Major Adverse	Moderate Adverse	Minor Adverse	Negligible
	High	Major Adverse	Moderate Adverse	Minor Adverse	Negligible	Minor Beneficial
	Moderate	Moderate Adverse	Minor Adverse	Negligible	Minor Beneficial	Moderate Beneficial
	Low	Minor Adverse	Negligible	Minor Beneficial	Moderate Beneficial	Major Beneficial
	Very Low	Negligible	Minor Beneficial	Moderate Beneficial	Major Beneficial	Major Beneficial
		Very Low	Low	Moderate	High	Very High
Risk (Baseline)						

11.4.14 A “Scheme Phase” is the construction phase, the construction phase with mitigation (if required), the operational phase, and the operational phase with mitigation (if required).

11.4.15 For example, if a pollutant linkage is estimated as having a Low risk in the baseline conditions and a High risk during construction phase then of a Moderate Adverse effect would be identified.

11.4.16 Severe, Major and Moderate Adverse Effects are identified as Significant and potentially key factors in the decision making process.

11.4.17 The mitigation measures required to address possible unacceptable risks during both the Construction Phase and the Operational Phase are then identified and the effects of including the mitigation measures in both the construction and operational phases assessed once more through comparison with the baseline. The residual effects are identified by comparing the

estimated risk associated with the proposed development with the mitigation measures in place with the corresponding risk associated with the existing baseline conditions

11.4.18 Table 11-2 presents a description for potential effect in respect of the ground conditions drawing upon the generic significance criteria provided in Table 5-1.

Table 11-2 Descriptions of Significance of Potential Effect for Ground Conditions

Potential Effect	Example Description for Land
Major Beneficial	Significant reduction in environmental risk to humans or aquatic flora and fauna. Significant improvement in water resources (surface water and groundwater quality and / or flow).
Moderate Beneficial	Moderate, but still significant in an EIA context, reduction in environmental risk to humans or aquatic flora and fauna. Minor, but still significant in an EIA context, improvement in water resources (surface water and groundwater quality and / or flow).
Minor Beneficial	Minor reduction of environmental risk to surface water resources, aquatic fauna, flora or air quality. No appreciable risk to human health (construction workers or end users).
Negligible	No appreciable increase in environmental risk to water resources, aquatic flora and fauna and human health. Any very low negative effects are reversible.
Minor Adverse	Minor environmental risk to surface water resources, aquatic fauna, flora or air quality. No appreciable risk to human health (construction workers or end users).
Moderate Adverse	Local environmental risk to water resources, aquatic fauna and flora, and/ or humans (construction workers and/ or end users) requiring monitoring and local remedial works.
Major Adverse	Significant local environmental risk to water resources, aquatic fauna and flora, and/ or humans (construction workers and/ or end users) giving rise to the possibility of permanent harm and requiring monitoring and more extensive local or site wide remedial works.
Severe Adverse	Significant regional/national environmental risk to water resources, aquatic fauna and flora, and/ or humans (construction workers and/ or end users) giving rise to permanent harm and therefore requiring extensive monitoring and remedial works.

11.5 Baseline Conditions

11.5.1 For the purposes of this chapter the East MRT scheme has been subdivided into six zones designated A to G (refer to Figure 11.1 in Appendix 11.1 for zone boundaries).

11.5.2 Part of Zone G is within the planning application boundary for the TVP P&R scheme (Figure 11.1 in Appendix 11.1 also shows these boundaries).

11.5.3 This Chapter also considers the land proposed for flood compensation, two parcels of which (referred to as “compensation areas East of Kennetmouth” in Chapter 10) are within Zone F

and two parcels of which (referred to as “compensation areas West of Kennetmouth” in Chapter 10) are north of the Tesco superstore (refer to Figure 11.1 in Appendix 11.1 for location and boundaries).

Potential Sources of Contamination (PSC)

11.5.4 Potential Sources of Contamination are identified based on the known historical and current land use. The PSC identified on each zone and immediately adjacent are summarised below:

- Zone A – south eastern part within area of former railway land (PSC A), northern extent within area of former tanks (PSC B);
- Zone B - within area of former railway land (PSC A), north western part within area of former tanks (PSC B), Tesco refuelling station adjacent to northern boundary (PSC C);
- Zone C - within area of former railway land (PSC A), all except western end within area of historical landfill (PSC D);
- Zone D – within area of former railway land (PSC A), all except eastern end within area of historical landfill (PSC D);
- Zone E – no PSC identified;
- Zone F – no PSC identified;
- Zone G – western half within a historical gravel pit (PSC E), disused Highways compound in the eastern end (PSC F), fly-tipping and sharps (PSC G);
- TVP P&R – northern and western half within a historical gravel pit (PSC E), disused Highways compound in the eastern end (PSC F), fly-tipping and sharps (PSC G), former allotment gardens in south eastern part (PSC H); and
- Flood Compensation West of Kennetmouth – it is understood that the material in the mounds was generated from the Tesco Superstore development and is potentially affected by contamination (PSC I).

11.5.5 The following text lists each potential source of contamination identified, together with the assigned relative contamination source importance based on the land use potential to generate contamination.

- PSC A (former railway land and ground level raising) – Contamination Source Importance is Moderate.
- PSC B (former tanks) - Contamination Source Importance is Moderate – it is noted that the Tesco Superstore built in the early 1990s is located on the majority of the former Depot and Tanks.
- PSC C (refuelling station off-site) - Contamination Source Importance is Moderate.
- PSC D (historical landfill) – EA records “semi-inert materials including wood, paper, cardboard, plasterboard and plastic” - Contamination Source Importance is Moderate.
- PSC E (historical gravel pit) - Contamination Source Importance is Moderate.
- PSC F (disused Highways compound) - Contamination Source Importance is Low.
- PSC G (fly-tipping and sharps) - Contamination Source Importance is Low.

- PSC H (allotments) - Contamination Source Importance is Low.
- PSC I (material from development of Tesco Superstore) - Contamination Source Importance is Moderate.

Potential Contaminants of Concern

11.5.6 From the available information, the following potential Contaminants of Concern are identified:

- Hydrocarbons (fuels, oils, solvents) – spills and bulk storage
- Poly Aromatic Hydrocarbons – ash and clinker
- Ground Gases – generated by natural Alluvium
- Vapours – could be generated by petroleum impacted soils and waters (worst case localised around the filling station)
- Metals (Arsenic, Cadmium, Chromium, Lead, Mercury) – fill materials of unknown origin
- Inorganic (potentially aggressive ground attacking construction materials) – fill materials of unknown origin
- Asbestos – fill materials of unknown origin

Geology

11.5.7 A summary of the published natural ground conditions from the Phase 1 reports (PBA 2017a and WSP 2016) is presented below: -

- Superficial Geology – Alluvium. The base is typically about 3.5 to 4.0m below ground level (bgl) and described as CLAY and SILT locally peaty or organic with traces of decaying organic matter, flint gravel and shells. Locally with rare layers of peat (up to 2.1m thick).
- Superficial Geology - River Terrace Deposits (RTD). The base is typically about 6.0mbgl and described as SAND and GRAVEL in variable proportion locally with a thin layer of clayey sandy silt
- Solid Geology - White Chalk Subgroup. The base is typically more than 25.0m bgl and described as White Chalk with flints. Recovered as remoulded chalk with fragments of weak chalk becoming rubbly and blocky with depth.

11.5.8 Superficial deposits are not present under the majority of Zone G (the exception being the very eastern end), the majority of the TVP P&R site (the exception being the eastern end and southern boundary) and the eastern half of Zone F, which includes one of the flood compensation parcels east of Kennetmouth.

11.5.9 Historical records for exploratory holes in Zones C, D and flood compensation area west of Kennetmouth record Made Ground, a number of which have descriptions that include ash and clinker.

11.5.10 A summary of the site specific ground conditions on Zone D from the Phase 2 report (PBA 2017b) is presented below: -

- Made Ground was encountered at all the locations investigated and was found to comprise principally black, brown and grey SAND with variable proportions of ash and clay and gravel. The gravel size fractions comprised flint, and chalk, and fragments of

brick, concrete, glass, clicker and rare cinder. Locally the Made Ground contained cobble size fragments of brick and concrete. The Made Ground was found to be between 1.55 and 2.20 m deep. Olfactory and visual signs of unusual solids and liquids were not noted during in the investigation;

- Alluvium was encountered at all the locations where the Made Ground was fully penetrated. The Alluvium was typically found to comprise grey, blue, green and brown CLAY or SILT with sand particles and shell fragments. Locally the Alluvium contained rare flint gravel. Typically, the Alluvium was found to be between about 0.9 and 1.7 m thick extending to between 2.5 and 3.9 m depth, corresponding to reduced levels of between about 32.4 and 35.6 m OD. At one historical borehole (SU77SW310) the Alluvium was found to be 0.2 m thick, and
- The River Terrace Deposits were found to be typically between about 1.5 and 3.6 m thick and locally in the historical borehole (SU77SW81) up to 4.9 m thick. The base of the River Terrace Deposits was encountered between about 5.4 and 8.0 m depth, corresponding to a reduced level of between about 29.5 and 31.9 m OD.

11.5.11 The report also provides the following information: -

- In general, the measured concentrations of potential contaminants are below the selected assessment values appropriate for land use as commercial land use. Asbestos was not detected in any of the 25 soil samples tested.
- The measured concentrations of potential contaminants are in general below the selected assessment criteria for assessing potential groundwater impacts on surface waters and the UK drinking water quality standards.
- The measured concentrations of ground gases indicate slightly elevated concentrations of Carbon Dioxide (maximum recorded concentration of 6.5%v/v) and Methane (maximum concentration of 0.3%v/v) and corresponding depleted oxygen concentrations.

Summary of Baseline Contamination Sources

11.5.12 Potential contamination sources have not been identified on Zones E and F. Without a source of contamination there are no Pollutant Linkages requiring risk assessment.

11.5.13 Potential contamination sources have been identified on the remaining zones in the East MRT Scheme, the TVP P&R land and the flood compensation land west of Kennetmouth.

11.5.14 All of the identified historical land uses have been assessed as having a Moderate potential to generate contamination.

11.5.15 Although the site specific ground condition data for Zone D indicates the absence of contamination, the source classification of Moderate has been retained as a worst case assumption that allows for unforeseen ground conditions.

Hydrogeology

11.5.16 Where recorded in the published information, groundwater strikes were recorded between 1.8 and 4.5 m bgl and rose to between about 0.3 and 2.9 m bgl. During the site investigation groundwater was encountered within the Superficial Deposits between 2.0m and 3.6m bgl. On completion of the fieldwork the recorded groundwater levels were between 1.6m and 2.4m bgl corresponding to reduced level of between about 34.5 and 35.5m OD

11.5.17 The Alluvium and River Terrace Deposits are classified as Secondary A Aquifers. Although the Superficial deposits are not present under the majority of Zone G (the exception being the very eastern end), the majority of the TVP P&R site (the exception being the eastern end and

southern boundary) and the eastern half of Zone F, which includes one of the flood compensation parcels east of Kennetmouth all the land in both schemes is assessed as having these deposits as a worst case assumption.

11.5.18 The White Chalk Subgroup which underlies the entirety of combined site is classified as a Principal Aquifer. Bedrock is present at the ground surface under the majority of Zone G (the exception being the very eastern end), the majority of the TVP P&R site (the exception being the eastern end and southern boundary) and the eastern half of Zone F, which includes one of the flood compensation parcels east of Kennetmouth.

11.5.19 The majority of the application site is within a Source Protection Zone (SPZ) 3 – Total Catchment – the SPZ is associated with abstraction at Reading University approximately 2.2km to the south. Although a small part of the western end of Zone G and the TVP P&R scheme are not within the SPZ all the land in both schemes is assessed as being within the SPZ as a worst case assumption.

11.5.20 There is an active groundwater abstraction license for the Waterside Centre shown as within the TVP P&R site and approximately 30m north of Zone G. The abstraction identified as Potable. There is one other active license within 1km and a further nine within 2km.

Hydrology

11.5.21 Zones D and F are bounded to the north by the River Thames. Zone A is the furthest from the river which is approximately 300m to the north.

11.5.22 The River Kennet passes through the application site (Zone E) and joins the River Thames at this location. The River Thames and River Kennet are both classified by the EA as Primary River. Both rivers are identified as Very Good and Good (Grades A and B) Biological and Chemical Quality, respectively. There are no surface water abstraction records within 1km.

11.5.23 It is expected that the groundwater in the Alluvium, River Terrace Deposits and the White Chalk Subgroup are in hydraulic continuity with the water in the adjacent rivers.

Ecological Systems

11.5.24 When considering whether an ecological system is a viable receptor requiring assessment the guidance given in Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (Defra, 2012) has been used. As there are no national and international statutory environmental designations recorded within 2000m of the site boundary there are no relevant receptors to which significant harm or the significant possibility of such harm could occur. On this basis this receptor is not considered further for contaminated land assessment.

11.5.25 It is noted that Zone D and the flood compensation area west of Kennet Mouth are located in a Local Wildlife Site known as “The Coal, Kennetmouth and Kings Meadow East”. For the purposes of this chapter this receptor is identified as being of Low Importance. Low value receptors will not generate impacts that will be identified as “Significant”. It should be noted the statement regarding ecological systems does not purport to be an ecological risk assessment.

Property – Crops/Produce and Domestic Animals/Livestock

11.5.26 When considering whether this constitutes a viable receptor requiring assessment the guidance given in Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (Defra, 2012) has been used.

11.5.27 Neither crops/produce nor domestic animals/livestock are present on or immediately adjacent to the sites. As relevant receptors to which significant harm or the significant possibility of such harm could occur have not been identified this receptor is not considered further.

Property – Buildings (any structure or erection)

11.5.28 When considering whether this constitutes a viable receptor requiring assessment the guidance given in Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (Defra, 2012) has been used. A relevant receptor is one to which significant harm or the significant possibility of such harm could occur.

11.5.29 Whilst it is noted that in the scoping response RBC identified the site as being in an area of archaeological importance, there are no current international or national building or ancient monument designations identified on or immediately adjacent to the subject sites. It should be noted the statement regarding historic building and ancient monuments does not purport to be a formal assessment.

11.5.30 The future land use will include structures and as such consideration is given to the potential for structural failure, substantial damage or substantial interference with any right of occupation.

Summary of Potential Receptors and Assigned Importance

11.5.31 The following text summarises the potential receptors considered and the assigned sensitivity/value.

- Human Health – Very High
- Shallow Groundwater (Superficial) – Moderate
- Deep Groundwater (Bedrock) – Very High
- Surface Water – Very High
- Property (Buildings) - Low
- Property (Animal or Crop) - Eliminated as a receptor in respect of the baseline assessment but future landscaping is proposed and will be incorporated in the “During Operation” assessment as a receptor of Very Low sensitivity.
- Ecological Systems – although eliminated in Phase 1 for the purposes of the contaminated land assessment, Zone D and the flood compensation land west of Kennet Mouth are located within The Coal, Kennetmouth and Kings Meadow East Local Wildlife Site – and therefore Ecological Systems will be incorporated into this Chapter as a receptor of Low sensitivity.

Risk Assessment for Baseline Conditions

11.5.32 Based on a source-pathway-receptor model, the risks relating to the existing baseline conditions have been assessed in PBA 2017a and 2017b and are summarised in in Table 11-3. Criteria for the definition of consequence and likelihood are given in PBA 2017 a and b.

Table 11-3 Risk Level for Each Receptor Associated with Land Contamination Baseline Conditions

Receptor	Risk	Justification
Human Health (On Site)	Low	It is assumed that children could access the site, particularly Zone D which is within the local wildlife site. Based on the expected nature and scale of contamination the potential consequence would be Medium. The likelihood of the consequence being realised is considered to be Unlikely given the transient nature of use and limited access to those areas without hardstanding due to dense vegetation.
Human Health (Neighbours)	Low	As above
Groundwater (Shallow)	Low	The Superficial Deposits are designated as Secondary A Aquifers. Based on the expected nature and scale of contamination the potential consequence would be Mild. Leaching is considered viable in areas without hard surfacing and a Low likelihood of the consequence being realised has been assigned. The assignment of Low is justified because there is a pollution linkage and circumstances are possible under which pollution could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter-term.
Groundwater (Deep)	Moderate	Based on the very high sensitivity/value of the receptor and the expected nature and scale of contamination the potential consequence would be Medium. As there is hydraulic continuity with the overlying aquifer a Low likelihood of the consequence being realised has been assigned. The assignment of Low is justified because there is a pollution linkage and circumstances are possible under which pollution could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter-term.
Surface Waters	Moderate	Based on the very high sensitivity/value of the receptor and the expected nature and scale of contamination the potential consequence would be Medium. A Low likelihood of the consequence being realised has been assigned because although the receptor is on site/adjacent there is no evidence of direct discharge and run-off is limited by vegetation. The assignment of Low is justified because there is a pollution linkage and circumstances are possible under which pollution could occur. However, it is by no means certain that even over

Receptor	Risk	Justification
		a longer period such an event would take place, and is less likely in the shorter-term.
Property (Buildings)	Low	There are no structures currently present. There is hardstanding, car parking and highways in some areas and where present the potential consequence is assessed as Mild with a Low probability of the consequence being realised.
Property (Animal /Crop)	Very Low	Based on the expected nature and scale of contamination the potential consequence is Mild with the probability of the consequence being realised assessed as Unlikely.
Ecology	Very Low	Based on the expected nature and scale of contamination the potential consequence is assessed as Minor with the probability of the consequence being realised assessed as Unlikely.

11.6 East MRT Site

Potential Effects without Mitigation

- 11.6.1 The features of the proposed development that are relevant to the assessment of the effects related to ground contamination are those that would change the baseline risk associated with a pollutant linkage.
- 11.6.2 The potential effects without any mitigation for the construction phase and the operational phase have been identified through the continued use of a source-pathway-receptor model.
- 11.6.3 The approach adopted is to identify the risk to each receptor and use Table 11-1 to assign a potential effect based on the identified risk relative to the baseline risk.

Potential Effects During Construction

- 11.6.4 The risks related to the construction phase have been assessed and are presented in Table 11.4 below with respect to each of the potential receptors identified unless the receptor is eliminated for this phase.
- 11.6.5 The in-ground elements considered during the construction phase are those that are temporary in duration. The permanent placement of the imported materials for ground level raising and piled foundations for the viaduct element are permanent and considered during the operational phase.
- 11.6.6 During construction phase, contamination could be introduced to the site through spillages or losses from temporary chemical/ fuel storage. As any contamination generated in this way will be small scale relative to the potential historical contamination and the assessment does not consider these as separate sources.
- 11.6.7 The construction phase will include enabling works involving vegetation clearance and where necessary top soil removal. In addition, the flood compensation land to the west of

Kennetmouth requires a cut (the excavation) of 3,845m³ and the compensation areas in Zone F requires a cut (the excavation) of approximately 600m³.

- 11.6.8 It should be noted that the consequence element of the risk assessment is the same for baseline and for the subsequent phases of development. Only the likelihood (or probability) of the consequence occurring changes. During the construction phase the work will introduce potential contamination sources (temporary refuelling storage) and remove any surface covering exposing the existing ground.

Table 11.4 Construction Phase Risks and Potential Effects (without mitigation)

Receptor	Assessed Risk	Justification	Potential Effect
Human Health – Onsite	Moderate	During construction phase access is normally restricted to the site and children would be excluded. The probability of an event is increased from Unlikely to Likely on the basis that the soils will be exposed and increased presence during construction works.	Minor Adverse
Human Health – Neighbour	Moderate	The probability of an event is increased for some pathways on the basis that the soils will be exposed and greater migration potential.	Minor Adverse
Groundwater Shallow Aquifer	Moderate	The probability of an event is increased to High on the basis that the soils will be exposed allowing greater infiltration and the possibility of leaching.	Minor Adverse
Groundwater Deep Aquifer	High	The probability of an event is increased to High on the basis that the soils will be exposed allowing greater infiltration and the possibility of leaching.	Minor Adverse
Surface waters	High	The probability of an event is increased to High on the basis that the soils will be exposed allowing greater infiltration and also run-off.	Minor Adverse
Property – Buildings	N/A	The current hard surfacing will be removed	N/A
Property (Animal/Crop)	N/A	In general, this receptor will be removed during enabling works. The exceptions are the flood compensation west of Kennetmouth and Zone D which are considered in Ecology below.	N/A
Ecology	Low	Enhancement measures are proposed in the Local Wildlife Site and understood to include vegetation clearance and construction of the flood compensation.	Minor Adverse

During Operational Phase

- 11.6.9 The ground level raising and creation of the embankment on Zones C and D will require the importation of materials as fill.
- 11.6.10 The viaduct element (located on Zone F) will be supported on piled foundations.
- 11.6.11 The operational phase will not involve significant activities with fuel or chemical storage and therefore will not introduce ground contamination.
- 11.6.12 The risks related to the development during the operational phase without the implementation of mitigation have been assessed and are presented in Table 11.5 with respect to each of the potential receptors identified.

Table 11-5 Operational Phase Risks and Potential Effects (without mitigation)

Receptor	Assessed Risk	Justification	Potential Effect
Human Health – onsite	Moderate	There will be an increase in hardstanding over the application site which would prevent exposure to ground contamination, however, where landscaping is proposed the probability has been increased from Unlikely to Low to reflect the increase in the use of the land (more public access) introduced by the proposed development.	Minor Adverse
Human Health – offsite	Low	The assessed risk is the same as baseline.	Negligible
Groundwater – Shallow Aquifer	Low	The assessed risk is the same as baseline for areas of landscaping. For areas of additional hardstanding the potential for infiltration and leaching is reduced and this decreases the likelihood of a pollution event.	Negligible
Groundwater – Deep Aquifer	Moderate	Piles for the viaduct are likely to penetrate the deep aquifer and increase the potential for migration of contaminants. The probability of harm increases without appropriate mitigation in choice of pile design. It should be noted that contamination sources have not been identified on Zones E and F.	Minor Adverse
Surface Waters	Moderate	The CSM is the same as that for the baseline.	Negligible
Ecology	Very Low	The CSM is the same as that for the baseline.	Negligible
Property – Buildings	Low	The CSM is the same as that for the baseline.	Negligible

Receptor	Assessed Risk	Justification	Potential Effect
Property – Animal and Crops	Very Low	The CSM is the same as that for the baseline.	Negligible

Mitigation and Enhancement

11.6.13 The measures proposed to mitigate the identified potential effects of the proposed East MRT scheme related to land contamination are discussed in this section with respect to the potential receptors used throughout this assessment.

11.6.14 It is anticipated that suitably worded planning conditions will secure that appropriate ground investigation be undertaken prior to development, to determine the nature of the ground conditions, refine the Conceptual Site Model, review the risk assessments, and to enable any remediation or specific mitigation measures in respect of land contamination to be agreed with the regulatory authority and implemented. It is a presumption that all construction activity will commence after full ground investigation has been carried out, in accordance with good practice, statutory controls and in order to meet the intended end use.

11.6.15 A Construction Environmental Management Plan (CEMP) will be prepared, secured by a suitably worded planning condition, for the Proposed Development and this will include specific measures as appropriate, for the protection of controlled waters during construction and will therefore provide adequate control for any effects that arise during construction.

Site Workers

11.6.16 The risk to site workers during the construction works relates to the risk of skin contact, inhalation and ingestion of contaminated material. In accordance with current health and safety legislation, the contractor will be required to adopt measures to mitigate the risk to site workers. Such measures will include:

- Informing site workers of the contamination and the potential health effects from exposure through site induction and 'tool box talks';
- The provision of appropriate protective clothing and equipment to be worn by site workers;
- The provision by the contractor of a suitably experienced geoenvironmental engineer either on-call or with a watching brief for the visual and olfactory assessment of the material, and sampling and testing for verification purposes, to adopt measures to manage any unidentified sources of contamination;
- Raising above ground of any temporary accommodation above ground level to allow free ventilation and prevent gas ingress and confined space entry controls including gas monitoring;
- The adoption of good standards of hygiene to prevent prolonged skin contact, inhalation and ingestion of soils during construction; and
- The selection of appropriate methods of working to limit disturbance of contaminated soil, where possible.

11.6.17 There is a possibility that sources of contamination may be encountered during the site clearance or ground works that have not been identified to date. Should visual and olfactory

examination of any unusual solid materials or liquids encountered during the following construction works identify areas of contamination, specific management procedures will be adopted. These procedures will allow for the short-term storage of the suspected material in stockpiles and/or storage tanks while verification testing for potential contamination is carried out. The storage area will be contained to minimise the potential for contamination to migrate and affect other areas of the site. Once the nature, location and extent of the contamination have been identified appropriate remediation or mitigation measures will be adopted and agreed with the statutory authorities. Although these cannot be identified at this time the main emphasis will be on methods of isolating or treating the affected materials.

Site Users/Neighbours

11.6.18 Measures will be adopted to mitigate the risk to site neighbours associated with air borne or settled dust and gases arising from areas of potentially contaminated land. Such measures will include the selection of appropriate methods to reduce disturbance of the existing near-surface soils, such as the spraying of stockpiles and other large unsealed surfaces to limit the risk of generating air borne dust, and covering of excavated materials undergoing treatment to reduce the release of odours and vapours.

11.6.19 The assessment of dust is covered in detail in Chapter 9 Air Quality.

Controlled Waters

11.6.20 The principal risk to ground and surface waters during construction will result from the migration of contaminants during enabling works such as the removal of the existing areas of hardstanding and vegetation/top soil clearance and the excavation of soil for the flood compensation. The contractor will be required to adopt measures to mitigate the risk to ground and surface waters associated with contaminated surface water run-off. Such measures will follow the pollution prevention guidelines (CIRIA, 2001).

11.6.21 Any chemicals/fuels introduced to the site during construction will be appropriately stored to prevent uncontrolled release.

11.6.22 Chemical storage locations and stockpiles will be sited away from the river.

11.6.23 Depending on the construction technique used pile foundations may introduce vertical pathways for the migration of contamination. To mitigate this risk, the selection of pile types and the design and construction of pile foundations will be informed by an assessment utilising EA guidance (EA, 2001 - archived).

11.6.24 Excavated soils will ideally be reused on-site and will require testing and suitability assessment. This would form part of a site materials and waste management strategy which

would be drafted prior to construction and would focus on the re-use, recycling and reduction of waste spoil.

- 11.6.25 Any additional soil materials that are to be imported to the site will be certified and/or tested in accordance with an agreed earthworks specification to minimise the potential for contaminative materials to be introduced to the site.

Ecology and Wildlife

- 11.6.26 No specific measures are required to mitigate potential effects to ecology and wildlife other than those outlined above.

During Operation

Site Maintenance Workers

- 11.6.27 Service trenches will be backfilled with clean materials.

Site Users

- 11.6.28 To reduce the potential risk of ingestion and uptake of contaminants by future site users, a layer of clean soil cover will be provided in areas of soft landscaping, if contamination is identified. The depth and form of soil cover required will be agreed with RBC and will depend on the concentrations of the potential contaminants.

Controlled Waters

- 11.6.29 The increased hardcover will reduce the risk associated with infiltration and potential mobilisation/ migration of contaminants.
- 11.6.30 Depending on the type of pile adopted, foundations may introduce pathways for the vertical migration of contamination. To mitigate this risk, the selection of pile types and the design and construction of pile foundations will be informed by an assessment utilising EA guidance (EA, 2001 - archived).
- 11.6.31 The principal risk to soils and controlled waters following construction will result from the potential migration of pollutants associated with uncontrolled/accidental spillages or discharges from the development activities. Measures will be proposed to mitigate against such risk and will follow best practice, such as the use of trapped gulley's, interceptors etc.

Ecology and Wildlife

- 11.6.32 The measures to mitigate the risk to offsite users, ground and surface waters described above will effectively mitigate the risk to ecology and wildlife. The detailed design will include the provision of a suitable thickness of a growing medium in landscaping areas to allow the establishment of plants.

Built Environment

The appropriate design of concrete and in ground materials are to be specified and will be sufficient to mitigate the risks of chemical attack and permeation during the lifetime of the completed development.

- 11.6.33 The development detailed design will include consideration of potential unstable ground (compressibility) issues to address both total and differential settlement.

Residual Effects (after mitigation)

11.6.34 The likely risks with mitigation for construction phase and operation phase have been re-assessed through the continued use of a source-pathway-receptor model and a revised CSM. The approach adopted is to identify the risk to each receptor and use Table 11-1 to assign a residual effect based on the assessed risk post mitigation relative to baseline risk.

During Construction

11.6.35 The risks related to the construction phase have been assessed and are presented in Table 11-6 below with respect to each of the potential receptors identified.

Table 11-6 Construction Phase Risks with Mitigation and Residual Effects

Receptor	Assessed Risk	Justification	Residual Effect
Human Health	Low	Mitigation measures to reduce exposure through PPE and work practices reduce the risk to construction workers from Moderate. Mitigation measures to reduce exposure through dust and vapour management reduce the risk to Neighbours from Moderate.	Minor Beneficial
Groundwater – Shallow Aquifer	Very Low	Further intrusive investigation will be undertaken to ascertain actual ground conditions. If contamination is identified with the potential to cause harm to Controlled Water, remediation involving the selective removal of impacted land will reduce contaminant loads.	Negligible or Minor Beneficial if contaminant load is reduced
Groundwater – Deep Aquifer	Low	Further intrusive investigation will be undertaken to ascertain actual ground conditions. If contamination is identified with the potential to cause harm to Controlled Water, remediation involving the selective removal of impacted land will reduce contaminant loads. The proposed mitigation for pile construction will be protective of the Chalk aquifer.	Negligible or Minor Beneficial if contaminant load is reduced
Surface Waters	Low	Mitigation measures to manage possible introduction of contamination and uncontrolled runoff. Further intrusive investigation to ascertain actual ground conditions and if contamination is identified with the potential to cause harm to Controlled Water, the selective removal will reduce contaminant loads.	Minor Beneficial
Ecology and Wildlife	Very Low	Further intrusive investigation to ascertain actual ground conditions will inform whether specific mitigation measures to manage contamination are required.	Negligible

Receptor	Assessed Risk	Justification	Residual Effect
Built Environment	-	Receptor not present	-

During Operation

11.6.36 The risks to each of the potential receptors identified during the operational phase have been assessed and are presented in Table 11-7.

Table 11-7 Operational Phase Risks with Mitigation and Residual Effects

Receptor	Assessed Risk	Justification	Residual Effect
Human Health – onsite	Low	The risk is the same as Baseline. Although the scheme will increase the number of people accessing the site there is an increase in hardstanding and covering created by the imported materials which reduces potential for exposure to the underlying soils.	Negligible
Human Health – offsite	Low	The risk is the same as Baseline.	Negligible
Groundwater – Shallow	Very Low	The increase in hardstanding and covering created by the imported materials reduces the potential for exposure, infiltration and leaching and therefore the probability of the consequence being realised is reduced. Further intrusive investigation will be undertaken to ascertain actual ground conditions. If contamination is identified with the potential to cause harm to Controlled Water, remediation involving the selective removal of impacted land will reduce contaminant loads causing a permanent benefit.	Minor Beneficial
Groundwater – Deep	Low	The proposed mitigation for pile design will be protective of the Chalk aquifer. The increase in hardstanding and covering created by the imported materials reduces the potential for exposure, infiltration and leaching and therefore the probability of the consequence being realised is reduced. Further intrusive investigation will be undertaken to ascertain actual ground conditions. If contamination is identified with the potential to cause harm to Controlled Water, remediation involving the selective removal of impacted land will reduce	Minor Beneficial

Receptor	Assessed Risk	Justification	Residual Effect
		contaminant loads causing a permanent benefit.	
Surface Waters	Low	The increase in hardstanding and covering created by the imported materials reduces the potential for exposure, infiltration and leaching and therefore the probability of the consequence being realised is reduced. Further intrusive investigation will be undertaken to ascertain actual ground conditions. If contamination is identified with the potential to cause harm to Controlled Water, remediation involving the selective removal of impacted land will reduce contaminant loads causing a permanent benefit.	Minor Beneficial
Ecology and Wildlife	Very Low	As a minimum the situation would be the same as baseline. The proposed mitigation in landscaped areas would remove the risk	Negligible
Built Environment	Very Low	The proposed mitigation would remove the risk.	Minor Beneficial

11.7 Combined Site (East MRT and Thames Valley Park & Ride)

11.7.1 Based on current programme information the advance works for the East MRT scheme (utility diversion and enabling works such as vegetation clearance) will overlap with the end of the construction phase of the TVP P&R scheme.

11.7.2 The TVP P&R scheme will be operational during the construction works for the East MRT scheme.

Potential Effects

11.7.3 There are no additional potential effects identified for the combined site scenario.

Mitigation and Enhancement

11.7.4 There are no additional mitigation or enhancement measures identified for the combined site scenario.

Residual Effects

11.7.5 There are no additional residual effects identified for the combined site scenario.

11.8 Cumulative Effects

11.8.1 The search of planning applications within the last 3 years using a 1km radius of the proposed development returned 28 results, of which 24 are not considered further on the basis that (a) four were for applications that had been withdrawn or refused, (b) one is for an additional storey, (c) one is for minor amendments to the second phase of development already under construction and (d) 18 for change or use, refurbishment or conversions which either do not include ground disturbance or only minor disturbance. Of the remaining four applications one is 0.9km from the application site and which is considered to be beyond the zone influence for contamination migration given the small size of the site and residential use.

11.8.2 Three are located on Suttons Business Park and pertinent information presented below: -

- Application 152354 is for a site approximately 100m south which was part of agricultural trial fields. From Google Earth it can be seen that the site has been cleared. The information presented includes a Phase 1 and 2 report which states that no contamination has been revealed and remediation was not recommended.
- Application 161666 is for a site approximately 200m southwest. From Google Earth it can be seen that the site has been cleared. The information presented on the planning portal includes a Phase 1 report which states that historically the site was part of the agricultural trial fields and identified as a Low risk.
- Application 161066 is for a site approximately 200m southwest. From Google Earth it can be seen that the site has been cleared. The information presented on the planning portal includes a Phase 1 report which states that historically the site was part of the agricultural trial fields and identified as a Low risk.

11.8.3 Additionally, the planning permissions will have conditions attached requiring appropriate measure to mitigate any potentially adverse ground conditions effects.

11.8.4 Based on the above it is considered that cumulative potential adverse effects with respect to ground conditions are not significant.

11.9 Summary

11.9.1 An assessment of the ground conditions has been undertaken to identify the likely significant effects of the proposed development on human and non-human receptors in relation to ground contamination.

11.9.2 The approach adopted for the identification of potential effects associated with ground conditions is to compare an estimated risk associated with the proposed development (considering separately the Construction Phase and Operational Phase (including any embedded mitigation in each phase)) with the corresponding estimated risk associated with the existing baseline conditions.

11.9.3 For a risk to exist there needs to be one or more hazard – pathway – receptor linkages. The potential contamination sources are identified from a review of information on land use. The importance of the land use in terms of anticipated magnitude and extent of contamination is classified in one of five bands with a Very High classification associated with land uses such as hazardous waste landfill sites. The classification can be revised if there is site specific data on ground conditions which there is for part of the application site. The majority of the

application site is located on land which is considered to have a Moderate potential for contamination to be present based on historical land use.

- 11.9.4 The receptors considered in the assessment are those receptors identified in statutory guidance (DEFRA, 2012). The importance of the receptor is classified in one of five bands with a Very High classification associated with receptors of national or international importance. Human health, groundwater and the Chalk aquifer and surface waters have all been identified as receptors of high importance/sensitivity.
- 11.9.5 The proposed development can change (increase) the risk associated with ground conditions for a particular pollutant linkage by increasing the probability of a consequence occurring due to the creation of exposure pathways. The proposed development can also impact ground conditions through the introduction of potential sources of contamination such as mobile refuelling facilities.
- 11.9.6 Provided that the proposed intrusive investigation works and mitigation measures are adopted the potential effect on sensitive receptors is assessed to be Negligible. Some minor beneficial effects are likely to be realised associated with a reduction in contaminant load if remediation is undertaken.
- 11.9.7 It is concluded that the potential effects associated with ground contamination do not pose an unacceptable constraint to the proposed development.
- 11.9.8 It is considered that cumulative potential adverse effects with respect to ground conditions are not significant

11.10 References

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- Statutory Instrument 2009 No. 2902 The Groundwater (England and Wales) Regulations 2009
- Statutory Instrument 2010 No. 675 The Environmental Permitting (England and Wales) Regulations 2016
- Statutory Instrument 2012 No. 264 (C. 8) The Water Act 2003 (Commencement No. 11) Order 2012
- Statutory Instrument 2012 No.263 Contaminated Land (England) (Amendment) Regulations
- Statutory Instrument 2015 No. 810 The Environmental Damage (Prevention and Remediation) (England) Regulations 2015
- WBC, 2015 Contaminated Land Strategy (4th revision) Wokingham Borough Council (WBC)
- WSP, 2016 Thames Valley Park and Ride, Reading, Berkshire Phase 1 Land Contamination Assessment prepared by WSP UK Ltd. (WSP)