

Appendix H.5: Lighting Assessment

East Reading Mass Rapid Transit Scheme

Lighting Assessment

On behalf of



Reading
Borough Council

Project Ref: 28791/3011 | Rev: 03 | Date: October 2018



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1 Introduction

1.1 Background

- 1.1.1 Peter Brett Associates LLP, now part of Stantec (PBA), has been requested to prepare a Lighting Assessment on behalf of Reading Borough Council Highways and Transport Department (RBC) to support full planning application for the East Reading Mass Rapid Transit (East MRT) public transport route to the east of Reading.

1.2 Site Location and Context

- 1.2.1 A site location plan is provided at **Appendix A** 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.
- 1.2.2 The Proposed Development straddles the administrative areas of RBC and Wokingham Borough Council (WBC), the boundary of which is defined by the River Kennet.
- 1.2.3 The Application Site is located to the south of the River Thames and to the north of the Great Western Main Line Railway that is raised on an embankment. The western end of the Application Site is located south of a retail superstore and its car park and the eastern end is immediately to the west of the Thames Valley Business Park.
- 1.2.4 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.
- 1.2.5 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 railway bridge over the River Kennet and a footbridge allowing access over the River Kennet for the Thames Path National Trail. To the south of the railway, there is a gas storage facility.
- 1.2.6 The eastern area of the Application Site (within Wokingham Borough) where the Proposed Development would connect with the proposed 'Thames Valley Park and Ride' (TVP P&R) to the west of Thames Valley Business Park would be on undeveloped flood plain adjacent to the River Thames. The Thames Valley Park Rowing Club and Wokingham Waterside Canoe & Kayak Centre are in close proximity to the north-east. There are also temporary moorings along the western 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.

1.3 Proposed Development

- 1.3.1 This Lighting Assessment has been prepared in respect of a planning application associated with the following:
- "Construction of a segregated fast-track public transport, pedestrian and cycle bridge and viaduct, comprising concrete bridge structure supported by concrete columns, steel beams and reinforced soil embankment, together with new footway links and existing footway alterations, junction improvements and landscaping"*
- 1.3.2 The route will be graded up to the height of the bridge structure crossing over the River Kennet. The new route is approximately 0.9 km in length.
- 1.3.3 The General Arrangement Plan for the Proposed Development is included in **Appendix B**.

- 1.3.4 The East MRT scheme offers a segregated fast track public transport, pedestrian and cycle route that will support enhanced accessibility and continued sustainable growth in Reading, Wokingham Borough and the wider area. The overall 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.
- 1.3.5 As the Proposed Development straddles the two Local Planning Authority areas of RBC and WBC, the planning application will be submitted to both RBC and WBC for determination.
- 1.3.6 The Proposed Development will include:
- creation of a new route for public transport only, including cycle path and footway between Napier Road and the A3290 at Thames Valley Park proposed Thames Valley Park and Ride;
 - the erection of a new bridge over the River Kennet;
 - formation of a new T-junction with Napier Road;
 - connection to the proposed TVP P&R;
 - development of new and improved footpath links to Tesco and the towpath; and
 - associated infrastructure and landscaping.
- 1.3.7 The East MRT scheme is a segregated fast track public transport, pedestrian and cycle route that will support enhanced accessibility and continued sustainable growth in Reading, Wokingham Borough and the wider area.

1.4 Aims and Objectives

- 1.4.1 The key aims and objectives of this lighting assessment are to:
- identify national and local planning policy and guidance as relevant to lighting for the proposed development;
 - establish the minimum lighting levels required to construct and operate a safe, secure and energy efficient development;
 - assess the potential effects of exterior artificial lighting required for the proposed development; and
 - establish design objectives for the lighting design to minimise obtrusive light to within guideline levels.

1.5 Lighting Assessment Approach

- 1.5.1 The purpose of the assessment is to establish the potential effects of obtrusive light from external lighting associated with the proposed development on existing and future sensitive receptors within and surrounding the Application Site.
- 1.5.2 A concept external lighting design has been prepared and the ground level illuminance levels modelled to allow a quantitative assessment of obtrusive light to sensitive receptors.
- 1.5.3 The modelled illuminance levels from the concept lighting design have been reviewed against the obtrusive lighting limitations set out in the Institute of Lighting Professionals (ILP)

“Guidance on the Reduction of Obtrusive Light” (2011) and Bat Conservation Trust (BCT)
Guidance: *“Bats and artificial lighting in the UK (2018)”*

- 1.5.4 It should be noted that the terms ‘light pollution’ and ‘obtrusive light’ are used interchangeably to mean light shining where it is not intended or wanted.

2 Legislation, Planning Policy and Guidance

2.1 Introduction

- 2.1.1 This Chapter sets out the relevant legal, planning policy and guidance in relation to obtrusive light that will influence the approach and scope of the lighting assessment.

2.2 Legislation

Clean Neighbourhoods and Environment Act, 2005

- 2.2.1 The Clean Neighbourhoods and Environment Act 2005 (CNEA) amended Section 79 of the Environmental Protection Act 1990 by extending the statutory nuisance regime to include light nuisance, by stating the following:

“(fb)...artificial light emitted from premises so as to be prejudicial to health or a nuisance...”

- 2.2.2 It should be noted that street lighting is not likely to qualify as Statutory Nuisance as street lights are not located on a ‘premises’. Nevertheless, they can cause adverse effects and are therefore considered during the planning process.

2.3 Planning Policy

National Planning Policy Framework, 2018

- 2.3.1 The National Planning Policy Framework (NPPF) was updated on the 24th of July 2018 and supersedes the existing policy within the previous NPPF (March, 2012). The revised NPPF includes a number of references to the need to consider the effects of artificial lighting.

- 2.3.2 Paragraph 180 of the NPPF states:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.” (Page 52)

National Planning Practice Guidance, 2014

- 2.3.3 The UK Government's National Planning Practice Guidance (NPPG) (March 2014) for England presents specific guidance on light pollution in Paragraphs 001 – 006 of ID 31. **Table 2.1** sets out how these paragraphs are relevant to the impact assessment of the development, and how each has been considered.

Table 2.1: Review of National Planning Policy Guidance ID31

NPPG ID 31 Paragraph	Relevance to the development
Paragraph 1: When is light pollution relevant to planning?	There is potential for light from the proposed development to be obtrusive to people and wildlife or detract from the enjoyment of the night sky.

NPPG ID 31 Paragraph	Relevance to the development
(Reference ID: 31-001-20140306)	Therefore, obtrusive light from the proposed development has been considered further within this assessment.
Paragraph 2: What factors should be considered when assessing whether a development proposal might have implications for light pollution? (Reference ID: 31-002-20140306)	This assessment considers where, when and how the light shines as the development has the potential to adversely affect the use or enjoyment of nearby buildings or open spaces. The assessment considers the impact of artificial light on sensitive receptors.
Paragraph 3: What factors are relevant when considering where light shines? (Reference ID: 31-003-20140306)	This assessment considers the potential for light intrusion affecting receptors outside the site boundary which can lead to annoyance to people, compromise existing dark landscapes and affect natural systems.
Paragraph 4: What factors are relevant when considering when light shines? (Reference ID: 31-004-20140306)	This assessment considers the potential effects of when lighting is required for the proposed development. This can minimise obtrusive light that can affect wildlife and enjoyment of the night sky.
Paragraph 5: What factors are relevant when considering how much the light shines? (Reference ID: 31-005-20140306)	This assessment considers the minimum requirements to construct and operate the proposed development safely and securely. The Environmental Zone of the site is established to ensure there is an appropriate level of lighting for the ambient lighting conditions. Due to the type of development, attention should be given to particular groups (e.g. the safety of pedestrians and cyclists).
Paragraph 6: What factors are relevant when considering possible ecological impact? (Reference ID: 31-007-20140306).	This assessment specifically considers the effects obtrusive lighting may have on wildlife.

2.4 Guidance

- 2.4.1 Relevant guidance on obtrusive light, ecology and British Standards has been set out below and considered as part of the Lighting Assessment.

Design

- ILP TR23 Lighting of Cycle Tracks.
 - Sustrans guidance on lighting cycle routes.
- 2.4.2 Both standards were reviewed within the lighting design approach for guidance purposes, although adoption of the British Standards were used as a priority.

Obtrusive Light

- 2.4.3 Guidance on obtrusive light is set out within the Institution of Lighting Professionals (ILP) Guidance Notes for the Reduction of Obtrusive Light, 2011 and ILP Professional Lighting Guide 04: Guidance on Undertaking Environmental Lighting Impact Assessments, 2013. Further details are provided in **Appendix C**.

Ecological

- 2.4.1 Guidance on obtrusive light in relation to bats as issued by the Bat Conservation Trust is listed below, further detail is provided in **Appendix C**:
- Bat Conservation Trust – Guidance Note 08/18: Bats and artificial lighting in the UK (September, 2018);
 - Statement on the Impact and Design of Artificial Light on Bats (May, 2011);
 - Landscape and Urban Design for Bats and Biodiversity (2012); and
 - Artificial Lighting and Wildlife Interim Guidance: Recommendations to Help Minimise the Impact of Artificial Lighting (2014).

British Standards

- 2.4.2 BS EN 5489-1:2013 Code of Practice for the design of road lighting – Part 1: Lighting of roads and public amenity areas; defines lighting classes for road lighting aimed at the visual needs of road users, and it considers environmental aspects of road lighting.

2.5 Local Planning Policy

Development Plan

- 2.5.1 The Application Site is predominantly located within the administrative area of RBC 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).
- 2.5.2 The Application Site is also partially located within WBC where the adopted development plan comprises:
- Core Strategy (adopted January 2010); and
 - Managing Development Delivery (MDD) Local Plan (adopted February 2014).

2.6 Planning Application Validation Checklist

Reading Borough Council

- 2.6.1 All proposals involving the provision of publicly accessible developments, in the vicinity of residential property, a Listed Building or a Conservation Area, Local Wildlife Site, green link or

watercourse where external lighting would be provided or made necessary by the development require details on external lighting.

2.6.2 Details should include the following as relevant:

- hours of operation;
- an isolux contour map showing light intrusion to 1 lux;
- light levels;
- column heights; layout plan with beam orientation,
- a schedule of equipment
- a description of the measures such as hoods and cowls that have been provided to avoid glare;
- impact on nearby dwellings or roads and use of planting to mitigate effect

Wokingham Borough Council

2.6.3 Proposals involving the provision of publicly accessible developments, in the vicinity of residential property, a listed building or a conservation area, sensitive natural area or the open countryside, where external lighting would be provided or made necessary by the development, should be accompanied by details of external lighting and the proposed hours when the lighting would be switched on. These details shall include a layout plan with beam orientation and a schedule of the equipment in the design.

2.7 Reading Borough Council

Local Transport Plan

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

2.7.2 *"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."*

2.7.3 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'.

2.7.4 The LTP states that RBC should "... work with Wokingham Borough Council to deliver an East Reading Transport Link and associated Park & Ride facilities"

2.7.5 The LTP notes that: *"An East MRT system must be designed to meet a set of standards above and beyond a quality local bus route. 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."*

Core Strategy

- 2.7.6 RBC's Core Strategy sets out the key policies in the area. It was adopted in 2008, and revised in January 2015. The RBC Core Strategy includes the following policy, addressing issues around lighting and Pollution/ Water Resources Development.

Policy CS34: Pollution and Water Resources Development

- 2.7.7 Policy CS34 details that development will only be permitted where:

[...]

- it will not be damaging to the environment through air, land, noise or light pollution;
- 2.7.8 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.

Reading Central Area Action Plan

Adopted in January 2009, this action plan sets out the policies in the centre of Reading. The proposed development is situated to the east of this area, and the policies that relate to lighting are in reference to the tall buildings in the Centre of Reading, therefore are not applicable.

Sites and Detailed Policies Document

- 2.7.9 Adopted in 2015, this document provides detailed policies for the borough. The following policies are of relevance to lighting.

DM4: Safeguarding Amenity

- 2.7.10 Development will not cause a significant detrimental impact to the living environment of existing or new residential properties, in terms of:

- Visual dominance and overbearing effects of a development;
- Artificial lighting; and
- Crime and safety.

DM16: Provision of Open Space

- 2.7.11 The provision of open space shall satisfy the most urgent need in terms of the type of open space to be provided in a particular location having regard to the size of the site and shall be subject to considerations of particular site specific deficiencies. New open space should:

- Be accessible to the general public and be designed so as to feel that it is part of the public and not the private realm; and
- Create a safe environment, appropriately considering lighting and layout to reduce the fear of crime.

2.8 Wokingham Borough Council

Local Transport Plan

- 2.8.1 Wokingham's third Local Transport Plan (LTP) provides details of how the Council intends to improve transport and accessibility over the period 2011-2026.
- 2.8.2 Within the document Policy PT8 Park & Ride states that: *"The council will promote the use of Park & Ride services and will support the future introduction of new sites in the borough where feasible."*
- 2.8.3 The document specifically identifies a number of supported schemes including: *"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."*
- 2.8.4 Policy SP1: Support for Major Infrastructure states 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."*
- 2.8.5 The document supports the policies within the Core Strategy and the projects detailed within those policies, including: *"High quality express bus services or mass rapid transit along the A4 and A329 corridors"*

Core Strategy

- 2.8.6 WBC's Core Strategy was adopted in January 2010 and sets the key strategic policies for the district. Whilst there are no particular policies relating to lighting for new developments, although one policy relates to sustainable development:

CP1 – Sustainable development

- 2.8.7 Policy CP1 states that planning permission will be granted for development proposals that:
- maintain or enhance the high quality of the environment; and
 - minimise the emission of pollutants into the wider environment;

Sustainable Design and Construction: Supplementary Planning Document (SPD) (May 2010)

- 2.8.8 The SPD contains 'Sustainability Issue 9: Air, Noise and Light Pollution and Land Affected by Contamination' which states: *"Where significant impacts from pollution to or from the proposed development is likely or probable, an assessment of existing levels of pollution will be required to be submitted alongside the planning application"*.
- 2.8.9 The existing levels of light pollution are to be addressed through this lighting assessment for the proposed development.
- 2.8.10 Measures to reduce light pollution are discussed within the SPD including:
- provision of lighting only where necessary;
 - directing light downward, minimising the upward spread of light beyond horizontal;
 - ensuring the main beam angle of lights - directed towards a potential observer - is below 70 degrees;

- uniform lighting, avoiding bright and dark spots which interfere with visibility and can cause glare; and
- ensuring lighting systems are energy efficient, by considering energy demand and automated controls.

Managing Development Delivery Local Plan

- 2.8.11 The Managing Development Delivery (MDD) local plan was adopted in 2014. There are no specific policies relating to lighting.
- 2.8.12 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.

3 Baseline Conditions

3.1 Introduction

- 3.1.1 This section of the report establishes the existing external lighting conditions of the Application Site and the surrounding area that form the 'baseline conditions'.

3.2 Existing Lighting

Desk Based Study

- 3.2.1 A desktop review of the Application Site and surrounding area was undertaken to identify potential light sensitive receptors (see **Section 3.3**) and to establish the Environmental Zone classification for the Application Site in accordance with the ILP's Guidance Notes for Obtrusive Light (2011).
- 3.2.2 The following sources of publicly available information were reviewed:
- Google Street View (accessed October 2018);
 - Ordnance Survey Mapping (accessed October 2018); and
 - Defra Multi-Agency Geographic Information for the Countryside (MAGIC) Map Application (accessed October 2018).
- 3.2.3 Although the desk based information enables a framework to be established for the assessment, the Street View is not up to date and therefore cannot be relied upon as being definitive. In addition, the majority of the Application Site is away from the highway network and therefore Street View is not available.
- 3.2.4 Therefore, in order to have a definitive understanding of the existing lighting conditions of the Application Site a lighting survey was undertaken.

Lighting Survey

- 3.2.5 A lighting survey was undertaken on 20th April 2017 to establish the existing lighting conditions of the Application Site. The desk based survey, detailed above, identified that the characteristics of the Application Site have not changed since the time of the survey. Therefore, the lighting survey undertaken on this date is considered valid to inform the baseline conditions.
- 3.2.6 The lighting survey recorded night time views in a series of photographs from pre-determined viewpoints. The viewpoint locations were chosen to represent light sensitive receptors and were based on a selection of the locations established in the Landscape and Visual Assessment (see Chapter 12 Landscape and Visual of the ES). A location plan of the viewpoints taken for the lighting survey is included as **Appendix E**.
- 3.2.7 At each viewpoint, the view was studied to record the principle lighting features, obtrusive light and comment on any other light sources not visible in the photographs but relevant to the assessment.
- 3.2.8 The night-time survey was undertaken on Thursday 20th April 2017 between approximately 19:00 and 22:30. The moon phase at the time of the survey was Last Quarter with some cloud coverage and temperatures at 8°C.

- 3.2.9 A summary of the existing lighting conditions within and surrounding the Application Site is provided in **Table 3.1**.

Table 3.1: Lighting Conditions Surrounding the Application Site - Sensitive Receptors

Viewpoint No.	Location	Description of Lighting Conditions
1	River Kennet South / Cholmeley Road	Column mounted Light emitting diode (LED) lighting was located along the Kennet & Avon Canal path (approx. 5 m in height) to illuminate the footpath/cycle path. Light intrusion was observed into the River Kennet channel. LED lighting is visible in the distance in a northerly direction along the Thames Path. See photo Location 1 in Appendix E .
2	Thames Path West of River Kennet Mouth	The level of light is low at this location, due to tree canopy screening light from sources of light along the River Thames from moored boats and Thames Valley Park. Low level amenity lighting on moored boats across the river was visible, along with column mounted LED luminaires on the distant footpath. Column mounted High Pressure Sodium (HPS) road lights were visible at the Thames Valley Park. Passing trains on the Great Western Mainline provide intermittent light at this location. See photo Location 2 in Appendix E .
3	Thames Path East of River Kennet Mouth	A single LED luminaire, column mounted at approximately 6 m in height is the primary light source at this location, providing concentrated, white light on the Thames Path. Light intrusion was observed into the River Thames. Beyond the site location in a westerly direction was sky glow over Reading Town Centre. See photo Location 3 in Appendix E .
4	Thames Path North of Tesco Extra	Minimal lighting was observed from within the site. The car park/retail store lighting from the Tesco Extra is fully screened by vegetation along the River Thames. HPS lighting was visible in the distance (eastwards) from Thames Valley Park Drive. Red signage lighting was visible from Oracle's office building in distance, as part of the Thames Valley Park. Orange sky glow was visible from the urban area looking eastwards which is likely to be from the East Reading area. See photo Location 4 in Appendix E .
5	Thames Meadow East of Waterside Centre	Thames Valley Park Drive is lit by HPS column street lighting, approximately 10 m in height. The light from these columns intrude onto the Thames Valley floodplain. Car park lighting illuminates the Wokingham Waterside Centre which is directly to the east of the site. In the distance to the west, The Blade Office building in Reading Town Centre can be seen, providing a source of white office lighting. Above this, sky glow is visible above Reading town centre. See photo Location 5 in Appendix E .

3.3 Sensitive Receptors

- 3.3.1 Sensitive receptors within and immediately around the site that have been considered during the assessment are presented in **Table 3.2**.

Table 3.2: Sensitive Receptors

Sensitive Class	Receptors and sensitivity
Existing residents	There are no residential properties in direct proximity to the Application Site. Residents at Luscinia View, to the west of Tesco/ Napier Road junction are located approximately 10 m from the Application Site and are sensitive to light intrusion, glare and sky glow. Residents on Liverpool Road and Cholmeley Road are within approximately 130 m of the site although are screened by trees, a gas storage facility and the Great Western Mainline are therefore scoped out of the lighting assessment.
Motorist, cyclists & pedestrians	The following receptors have been identified that are sensitive to the effects of glare: - Napier Road; - A3290/Thames Valley Park Drive; - Users of Thames Path National Cycle Route/Trail; - Users of Kennet & Avon Canal National Cycle Route/ footpath; - River users on River Thames/ River Kennet; and - Future users of the East MRT.
Railway	Users of the Great Western Mainline Railway are sensitive to the effects of glare.
Heritage	A Grade II Listed Railway Bridge is located approximately 10 m from the Application Site but is not sensitive to obtrusive light and therefore has been scoped out of the assessment.
Wildlife	The Coal, Kennetmouth and Kings Meadow Local Wildlife Site (LWS), a non-statutory area of nature conservation importance. Bat Assemblage: at least eight species of bat use the Application Site, whilst activity levels are highest along the River Thames and Kennet and adjacent woodland/tree lines. Soprano pipistrelle and common pipistrelle were the most common species of bat recorded. The river corridors are an important foraging/commuting habitat for bats. Due to the semi-urban setting, the majority of bats are fairly light tolerant although some are not tolerant so light intrusion should be kept to a minimum.

3.4 Environmental Zone

- 3.4.1 The Institution of Lighting Professionals (ILP) Guidance Notes for the Reduction of Obtrusive Light (GN01:2011) sets out exterior lighting controls for Environmental Zones. The Environmental Zone classifications are presented in **Table 3.3**.

- 3.4.2 The Environmental Zone classification for the Application Site has been undertaken drawing on a desk study of the Application Site and evidence gathered during the site visit. The Application Site is on the fringes of an industrial/suburban area with each section characterised by different zones, and therefore has been split accordingly.
- 3.4.3 It is therefore considered that the development western part of the Application Site, (within RBC's boundary) between the Tesco/ Napier Road Junction and the Kennet Mouth can be classified to be within **Environmental Zone E3**, suburban, medium district brightness. The eastern section of the Application Site (within WBC's boundary) from the Kennet Mouth to the Thames Valley Park roundabout can be classified within **Environmental Zone E2**, village or relatively dark outer suburban locations.
- 3.4.4 The ILP provides limitations for obtrusive light for each Environmental Zone in terms of the upward lighting ratio; light intrusion and luminaire intensity (see **Appendix C**).

Table 3.3: Environmental Zones for Exterior Lighting Control as Described in the ILP Guidance, 2011

Zone	Surrounding	Lighting Environment	Examples
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically dark	National Parks, Areas of Outstanding Natural Beauty etc.
E2	Rural	Low district brightness	Village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night-time activity

3.5 Future Baseline

- 3.5.1 The TVP P&R is already permitted development and site clearance works are complete. Future baseline conditions therefore consider the conditions when the TVP P&R has been constructed and is operational.
- 3.5.2 The expected operational hours of the TVP P&R will be 07:00-19:00, and the proposed lighting will only be turned on during these hours of operation. The lighting is expected to be mounted on 5 m columns with warm light in accordance with PD CEN/TR 13201-1:2004 Road Lighting – Part 1: Selection of Lighting Classes.
- 3.5.3 The operating hours of the footway and cycleway within the East MRT are expected to be 24 hours therefore the lighting will be turned on at all times, to maximise safety and security of the users of this route.

4 Thames Valley Park & Ride

4.1 Introduction

- 4.1.1 Planning permission has been granted for the TVP P&R to the west of the River Kennet, though a separate application to East MRT. The proposed TVP P&R is located adjacent to the eastern section of the East MRT, and therefore has similar lighting design considerations and environmental constraints. Planning permission was granted on 10th November 2016 (application Ref: 161596).

4.2 Lighting Design

- 4.2.1 A Lighting Strategy for the TVP P&R sets out environmental considerations, lighting concept and additional requirements to be adopted during the development of a lighting design for the TVP P&R. The Lighting Strategy is included in **Appendix D**. Lighting classes for the TVP P&R are proposed to be designed according to 'PD CEN/TR 13201-1:2004 Road Lighting – Part 1: Selection of Lighting Classes' and 'Institute of Lighting Engineers Guidance'. It will use 8 m lighting columns and warm LED lighting where possible. Some of the key design principles of relevance are:

Lighting / Security – A lighting strategy should be implemented to enable vehicles and pedestrians to travel in and around the site safely. Similarly measures such as CCTV should be included to increase the overall security of the Application Site.

Minimise Visual Impact – Use existing landscaping and provide additional areas where possible to help screen the facility and minimise visual impact.

Maintain Ecology and Environment – Develop proposals sensitive to the existing environment. Protected trees to be maintained and as much of the existing landscaping screening the frontage of the site retained.

4.3 Impact of TVP P&R

- 4.3.1 A design and access statement prepared by WSP Parsons Brinkerhoff to support the TVP P&R Facility (June 2016) outlined the main considerations in this report that also has relevance to the East MRT application. The design and access statement is attached as **Appendix D** and the key issues are outlined below:

Concerns about the riverside towpath

The TVP P&R site would not involve the removal or alteration of the Thames riverside towpath.

Loss of amenity space

The existing site is largely overgrown and difficult to access – the Thames riverside would be undeveloped and remain usable as amenity space.

Visual impact on the riverside

Mitigation measures would be employed to screen the TVP P&R site from the riverside, including planting and landscaping as is deemed necessary to protect riverside views.

Site would block the proposed road to Tesco

The car park access road would retain an alignment option for the East MRT should this be developed in future. The development of the TVP P&R does not jeopardise the potential development of the East MRT.

5 Lighting Requirements

5.1 Introduction

- 5.1.1 This chapter sets out the external lighting requirements of the proposed development during construction and operation.
- 5.1.2 Two standards have been used for the lighting design of the proposed development: British Standard BS EN 13201-2:2015 for the road junction; bus carriageway; and the of the footway and cycleway. BS 5489-1:2013 has been used for the car park aspect of the development.

5.2 Construction Lighting Requirements

- 5.2.1 There will be no night time working outside of agreed standard working hours unless agreed with RBC and WBC. Working during darkness may however be required during winter months when the days are shorter and lighting is required.
- 5.2.2 The general lighting requirement is predictable for fixed elements of the construction works such as the site office, compound, welfare facility. Future construction compound locations will be established through the development process. Potential locations for construction compounds have been considered at the Tesco car park and on the TVP P&R sites, whilst cranes are required temporarily to construct the bridge.
- 5.2.3 A lighting strategy should be implemented to enable vehicles and pedestrians to travel in and around the site safely.
- 5.2.4 Task specific lighting to maintain safety around excavation areas, water management areas, and other specific activities will vary according to weather conditions, programme and the particular tasks being undertaken. Areas in proximity to the rivers near the Application Site may require additional lighting to maintain safety.
- 5.2.5 The construction lighting specification will be defined at the detailed design stage and it will be mitigated to reduce the light spill into sensitive receptors.

5.3 Operational Lighting Requirements

Overview

- 5.3.1 Operational lighting is required throughout the Proposed Development to complete activities safely and reduce crime.
- 5.3.2 Given the scale and nature of the development operational lighting is required along the length of the Application Site, varying in type and location depending on the lighting requirements and sensitive receptors. The operational lighting requirements have been divided into the following six sections of the scheme:
- East MRT/Napier Road junction;
 - Tesco car park;
 - East MRT conflict area;
 - East MRT west (RBC) footway and cycleway;
 - East MRT bridge/viaduct footway and cycleway; and

- East MRT east (WBC) footway and cycleway.
- 5.3.3 New lighting columns mounted within the RBC boundary will be provided in accordance with RBC standards with LED luminaires to complement the limited existing LED lighting columns at locations along the Thames Path. New lighting columns and luminaires mounted within the WBC boundary will be provided with LED luminaires in accordance with WBC standards. Along the bridge/viaduct section of the scheme, lighting will be provided via an LED rail that will be mounted to the top rail of the bridge parapet.
- 5.3.4 The benefits of installing LED lighting are that it is directional, reducing the amount of obtrusive light, and uses less energy when compared to high pressure sodium luminaires.
- 5.3.5 **PBA Drawing 28791/2009/CIV/012** illustrates the proposed lighting design for the Proposed Development, which includes isolux contours, location of lighting columns and light levels (attached as **Appendix F**). Additional details including column heights, mitigation measures to limit light intrusion, beam orientation and a schedule of equipment is included in the following sections.

East MRT/Napier Road Junction

- 5.3.6 The lighting design in this section of the development will be designed in accordance with BS EN 13201-2:2015 C3 class. Due to its nature as a road junction, it is considered as a conflict area. This area extends from the existing roundabout to the existing zebra crossing on Napier Road. It also continues 25m along the East MRT.
- 5.3.7 Since this section of the Application Site is located within RBC public highway, all external lighting will be linked to the Mayflower Central Management System (CMS) to support the operation of lighting when required and therefore reduces energy consumption. Lighting will remain switched on during the hours of darkness to maintain safety and security of users of this junction. Operational hours of the lighting for Napier Road will be controlled by RBC street lighting department and likely match the existing operational hours.
- 5.3.8 New lighting columns will be mounted along the proposed road junction at a height of 6 m as specified within the RBC Street Lighting Specification at the back of footway or within the verge where there is no footway. Columns to be installed will be hot dipped galvanised according to BS EN ISO 1461. New luminaires for the street lighting design of the junction are proposed to be Holophane VMAX. Existing luminaires located along the junction that are not currently LED will be replaced with Holophane VMAXs as part of this scheme.
- 5.3.9 Beam orientation will focus light towards the road junction to reduce the amount of light intrusion into the surroundings of Napier Road.
- 5.3.10 The illustrative drawing attached in **Appendix F** shows light intrusion back onto the residential receptors to the west of the junction. Shields are proposed on the luminaires to mitigate this which limits light intrusion to 1 lux. The light shields can be attached to the front and back of the luminaires and differ in sizes between the standard depth of 15 mm and increase in 15 mm increments up to a maximum of 60 mm in depth. The shields can also be retrofitted to the luminaires after the columns are installed. The specification for light shields will be identified at detailed design stage and can be retrospectively added to columns post construction.

Tesco Car Park

- 5.3.11 This area of land is owned and managed by Tesco PLC (Tesco). The external lighting has been designed to replicate the existing car parking strategy to complement the existing lighting. The car park has been considered as a 'Heavy traffic surface car park' class as per BS 5489-1:2013.

- 5.3.12 As the supermarket is a 24 hour operated store, it is expected that the car parking lighting will be utilised in darkness in line with the opening hours of Tesco, to maximise safety and security of staff and customers. This means car park lighting will be reduced when the store is closed.
- 5.3.13 The height of columns for the Tesco car park design are proposed to be 6 m. All new luminaires are proposed to be Holophane VMAX while the existing spherical luminaires will be retained in the car park.
- 5.3.14 Beam orientation will face into the access road and new car parking bays to reduce the amount of intrusion into the surrounding environment.
- 5.3.15 To reduce the impact of the car park lighting on the MRT footway and cycleway and other light sensitive areas, light shields can be attached to the luminaires. The light shields can be attached to the front and back of the luminaires and differ in sizes between the standard depth of 15 mm and increase in 15 mm increments up to a maximum of 60 mm in depth. The shields can also be retrofitted to the luminaires after the columns are installed. The specification for light shields will be identified at detailed design stage and can be retrospectively added to columns post construction.

East MRT conflict area

- 5.3.16 Although lighting is predominantly provided to accommodate for the footway and cycleway of the East MRT route, an initial (180 m) stretch of the bus carriageway will be lit. This is to allow for bus drivers' eyes to acclimatise to lighting required for the proposed pedestrian (zebra) crossing located east of the Napier Road junction. The lighting design in this section of the development will be designed in accordance with a C3 class of BS EN 13201-2:2015.
- 5.3.17 The East MRT conflict area is within the RBC boundary, therefore the lighting will be linked to the Mayflower CMS. Operational hours of the lighting for the East MRT will be controlled by RBC's street lighting department.
- 5.3.18 The height of new columns along the East MRT conflict area will be 6 m as specified within the RBC Street Lighting Specification. Columns will be installed along the back of the footway and cycleway of the East MRT or within the verge were no footway is proposed. The columns will be hot dipped galvanised according to BS EN ISO 1461. New luminaires for the street lighting design of the conflict area are proposed to be Holophane VMAX.
- 5.3.19 Beam orientation will focus light towards the conflict area to reduce the amount of light spill into the surroundings.
- 5.3.20 Shields are proposed on the luminaires to mitigate light spill onto the surrounding areas. The light shields can be attached to the front and back of the luminaires and differ in sizes between the standard depth of 15 mm and increase in 15 mm increments up to a maximum of 60 mm in depth. The shields can also be retrofitted to the luminaires after the columns are installed. The specification for light shields will be identified at detailed design stage and can be retrospectively added to columns post construction.

East MRT west (RBC) footway and cycleway

- 5.3.21 A dedicated footway and cycleway is located on the northern side of the East MRT. The west section is defined as the area of footway and cycleway from the east end of the conflict area in the west to the beginning of the bridge section of the East MRT route. The lighting design for the East MRT footway and cycleway has been designed to a BS EN 13201-2:2015 P5 Class. This pedestrian lighting class has been identified to support safe and secure use for pedestrians and cyclists. The proposed lighting scheme will also aid CCTV requirements.

- 5.3.22 The west section of the footway and cycleway is located within the RBC boundary; therefore, lighting will be linked to the Mayflower CMS. Operational hours of lighting for the East MRT footway and cycleway will be controlled by RBC from the Mayflower CMS. It is assumed that the lighting will be operational for all hours of darkness maximise safety and security of users of the footway and cycleway.
- 5.3.23 The footway and cycleway will be illuminated with column mounted LED luminaires, proposed as Holophane VMAX as per the East MRT conflict area. The height of new columns along the proposed footway and cycleway will be 6 m as specified within the RBC Street Lighting Specification. Columns to be installed along the back of the footway and cycleway and hot dipped galvanised according to BS EN ISO 1461.
- 5.3.24 Beam orientation will focus light towards the footway and cycleway to reduce the amount of light spill into the surroundings.
- 5.3.25 The geometric design of the East MRT route has been designed in accordance with TD 9/93 Highway Link Design of the Design Manual for Roads and Bridges (DMRB) and there are no departures to standards. Therefore, it is considered that bus drivers' judgement and on board bus lights are sufficient for the carriageway not to be lit.
- 5.3.26 The illustrative drawing attached in **Appendix F** shows backlight intrusion onto the ecological receptors to the west of the River Kennet. Shields are proposed on the luminaires to mitigate light intrusion into the surrounding areas. The light shields can be attached to the front and back of the luminaires and differ in sizes between the standard depth of 15 mm and increase in 15 mm increments up to a maximum of 60 mm in depth. The shields can also be retrofitted to the luminaires after the columns are installed. The specification for light shields will be identified at detailed design stage and can be retrospectively added to columns post construction.

East MRT bridge/viaduct footway and cycleway

- 5.3.27 A dedicated footway and cycleway is located on the northern side of the East MRT. The bridge/viaduct section is located in between the east and west footway and cycleway sections. The lighting design for the East MRT footway and cycleway has been designed to a BS EN 13201-2:2015 P5 Class. This pedestrian lighting class has been identified to support safe and secure use for pedestrians and cyclists. The proposed lighting scheme will also aid CCTV requirements.
- 5.3.28 The bridge/viaduct section of the footway and cycleway is located within both the RBC and WBC boundary. At this current stage of the application, it has been assumed that the lighting will be linked to WBC's Telensa CMS and the lighting for the East MRT bridge/viaduct footway and cycleway will be controlled by WBC street lighting department. It is assumed that the lighting will be operational for all hours of darkness maximise safety and security of users of the footway and cycleway.
- 5.3.29 The footway and cycleway will be illuminated with a LED rail, proposed as DW Windsor Garda Anti-Climb which will be attached to the top rail of the bridge parapet. The height of the LED rail along the bridge/viaduct section will be between 1.4 m and 1.5 m, which will be confirmed at detailed design.
- 5.3.30 The illustrative drawing attached in **Appendix F** shows backlight intrusion onto the ecological receptors of the river crossing at the River Kennet. The LED modules within the LED rail will light towards the footway and cycleway to reduce the amount of light spill into the surroundings.

- 5.3.31 The geometric design of the East MRT route has been designed in accordance with TD 9/93 of the DMRB and there are no departures to standards. Therefore, it is considered that bus drivers' judgement and on board bus lights are sufficient for the carriageway not to be lit.

East MRT east (WBC) footway and cycleway

- 5.3.32 A dedicated footway and cycleway is located on the northern side of the East MRT. The east section of the footway and cycleway extends from the east end of the bridge/viaduct section to the proposed access of the proposed TVP P&R. The lighting design for the East MRT footway and cycleway has been designed to a BS EN 13201-2:2015 P5 Class. This pedestrian lighting class has been identified to support safe and secure use for pedestrians and cyclists. The proposed lighting scheme will also aid CCTV requirements.
- 5.3.33 The east section of the footway and cycleway is located within the WBC boundary; therefore, lighting will be linked to the Telensa CMS and will be controlled by the WBC street lighting department. It is assumed that the lighting will be operational for all hours of darkness to maximise safety and security of users of the footway and cycleway.
- 5.3.34 The footway and cycleway will be illuminated with column mounted LED luminaires, proposed as Holophane VMAX. The height of new columns along the proposed footway and cycleway will be 6 m as specified within the WBC Street Lighting Specification. Columns to be installed along the back of the footway and cycleway and adhere to the WBC Street Lighting Specification.
- 5.3.35 Beam orientation will focus light towards the footway and cycleway to reduce the amount of light spill into the surroundings.
- 5.3.36 The geometric design of the East MRT route has been designed in accordance with TD 9/93 of the DMRB and there are no departures to standards. Therefore, it is considered that bus drivers' judgement and on board bus lights are sufficient for the carriageway not to be lit.
- 5.3.37 The illustrative drawing attached in **Appendix F** shows backlight intrusion onto the ecological receptors adjacent to the River Thames channel. Shields are proposed on the luminaires to mitigate light intrusion into the surrounding areas. The light shields can be attached to the front and back of the luminaires and differ in sizes between the standard depth of 15 mm and increase in 15 mm increments up to a maximum of 60 mm in depth. The shields can also be retrofitted to the luminaires after the columns are installed. The specification for light shields will be identified at detailed design stage and can be retrospectively added to columns post construction.

6 Assessment of Lighting Proposals

6.1 Introduction

- 6.1.1 This chapter summarises any potential effects from the exterior lighting which will be required for the proposed development (as identified in **Chapter 4**), on sensitive receptors (identified in **Chapter 3**).

6.2 Construction

- 6.2.1 Generally, construction lighting tends to lead to more obtrusive lighting than operational lighting because of its temporary nature, and the type of lighting equipment used. For ease of deployment and use, construction lighting tends to be mobile, and focus on providing the widest coverage of light from the fewest possible units in order to minimise time spent maintaining and installing the equipment. This, along with the fact that it is often poorly directed or installed, can result in temporary effects of glare, light intrusion and sky glow if good practice measures are not employed.
- 6.2.2 As outlined in **Chapter 4**, night working will be avoided in the construction phase of the development to minimise the effects on the surrounding area and sensitive receptors, whilst winter months with shorter daylight hours will inherently require more artificial lighting.
- 6.2.3 It is anticipated that any potential effects from obtrusive light associated with the construction phase lighting, can be mitigated through employment of appropriate good practice measures by the contractor.

6.3 Operation

Conformity with ILP Guidance

- 6.3.1 The proposed external lighting for Tesco/Napier Road junction, Tesco car park and East MRT footway and cycleway of the proposed development is more likely to create obtrusive light and therefore has been modelled to confirm the obtrusive light limitations applicable to Environmental Zone E2/Environmental Zone E3 are met.
- 6.3.2 The drawing in **Appendix F** shows the modelled ground level horizontal illuminance contours associated with the design of lighting for the Tesco/Napier Road junction, Tesco car park and East MRT footway. **Table 6.1** demonstrates the characteristics of each area in relation to the requirements in terms of sky glow, light intrusion and luminaire intensity. No lighting is proposed to be mounted to buildings and therefore building luminance pre-curfew has not been assessed.

Table 6.1: Lighting Characteristics of Site

Location	Environmental Zone	Light Intrusion (into Window) Ev (lux)	Luminaire Intensity I [candelas]	Building Luminance pre -curfew
East MRT/ Napier Road Junction	E3	7.7	G4	N/A
Tesco Car Park	E3	N/A	G4	

Location	Environmental Zone	Light Intrusion (into Window) Ev (lux)	Luminaire Intensity I [candelas]	Building Luminance pre -curfew
East MRT conflict area				
East MRT west (RBC) Footway and Cycleway	E2	N/A	G4	
East MRT bridge/viaduct Footway and Cycleway	E2	N/A	G1	
East MRT east (WBC) Footway and Cycleway	E2	N/A	G4	

- 6.3.3 As illustrated in **Table 6.1**, light intrudes into the windows of Luscinia View to a level of 7.7 lux, which is explained in more detail below. The other two aspects of the site are not located within close proximity to residential property and therefore do not need to be considered further.

East MRT/Napier Road Junction

- 6.3.4 For the East MRT/Napier Road Junction, in all cases the 1 lux contour (delineated by the red line on the lighting plan in **Appendix F**) for light intrusion does not approach existing bedroom windows of Luscinia View apartments and therefore would not exceed the post-curfew limit of 2 lux associated with Environmental Zone E3.
- 6.3.5 However, as indicated in **Table 6.1**, the light intrusion into the windows of the apartments at Luscinia View does not exceed the pre-curfew limit of 10 lux, but does exceed the post-curfew limit of 2 lux, with 7.7 lux entering the bedroom windows here. This however is in absence of any mitigation measures such as shields which could be installed here to significantly reduce light intrusion from the rear of these luminaires. It is not possible to model the decrease in lux level from the shield but due to the directional nature of LED lights, it is expected that it would limit light intrusion to within acceptable levels. Any light intrusion would also be limited by the existing vegetation planted in this area.
- 6.3.6 The proposed LED lighting that will illuminate the access junction are angled downwards to the achieve the outcomes presented in **Table 6.1**. These will therefore meet the upward light limitations required for Environmental Zone E3, referenced in **Appendix C**.

Tesco Car Park

- 6.3.7 There are no proposed lighting units located at the eastern side of the Tesco car park which affect the neighbouring wildlife reserve (depicted in **Appendix F**).

East MRT Footway and Cycleway

- 6.3.8 The bridge/viaduct section of the footway and cycleway (to the River Kennet) is lit to British Standard P5 and as such the 1 lux contour does not approach the Great Western Mainline to the south, or the wildlife reserve to the north of the East MRT route. As the bridge crosses the

River Kennet, the 1 lux contour does minimally approach into the river. However, the lighting would not exceed the post curfew limit of 2 lux associated with Environmental Zone E3.

- 6.3.9 The eastern section of the footway and cycleway is located within Environmental Zone E2 and therefore ILP post curfew limit reduces to 1 lux. The 1 lux contour does not approach any sensitive areas in this section and is therefore acceptable. Minor intrusion occurs on the bridge over the River Kennet (1 lux).

Assessment of Sensitive Receptors

- 6.3.10 The lighting design for the scheme once operational will include the following measures to minimise any adverse significant effects are experienced as a result of external lighting required for the East MRT development, as outlined above:
- The bus route has no lighting requirements;
 - Lighting columns along the northern extent of the route only;
 - Lighting columns to provide directional lighting to face away from the more sensitive areas (including The Coal, Kennetmouth and Kings Meadow East LWS and Henley Road Pit LWS);
 - Lighting has the capacity to be control through RBC's Mayflower or WBC's Telensa centralised management system; and
 - Inclusion of a shield on the back of lighting columns to further reduce any light back intrusion. Where there are areas which light intrudes along the southern side of the viaduct, front light shields will also be installed.
- 6.3.11 **Table 6.2** outlines the impact that the proposed lighting design will have upon existing and proposed receptors identified in **Table 3.1**.

Table 6.2: Impact of Proposed Lighting Design on Identified Sensitive Receptors

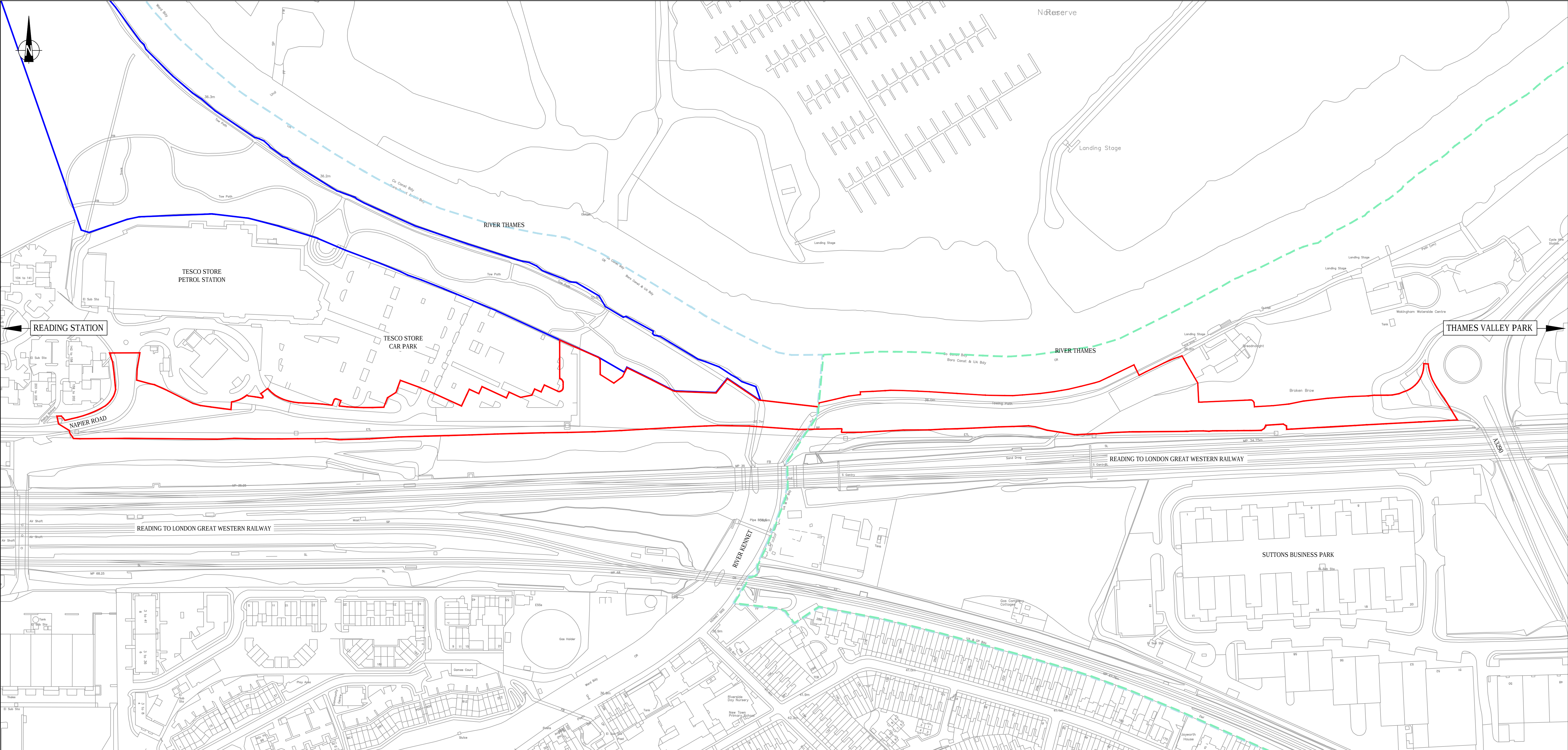
Sensitive Receptors	Impact of Proposals
Existing residents	The bedroom windows on Luscinia View that face the access junction for the development onto Napier Road are already affected by light intrusion from existing street lighting. Lighting is in place on the western side of the Tesco/Napier Road junction. Lighting columns along this section are proposed to be in the same location as they existing, therefore the impact on the neighbouring apartments at Luscinia View will be negligible. The proposed development requires lighting in the same locations as existing lighting, therefore no additional adverse impact is to be expected for the residents of these apartments. SON variety columns will be replaced with LED lighting. This also include the use of lighting shields to reduce lighting impacts below Environmental Zone 3 limits. The residential properties on Liverpool Road and Cholmeley Road are of sufficient distance away from the development that no lighting obtrusion is likely to reach them. They are also already adequately screened.

Sensitive Receptors	Impact of Proposals
Great Western Mainline	There is potential for glare to train drivers and users during the development's operation. However, the Great Western Mainline is raised at a greater height than the height of the luminaires installed on the bridge and so vertical glare is not expected to occur. The luminaires proposed have also been designed in accordance with RBC specifications and have an installed intensity class of G4 (in accordance with BS EN 13201-2:2015) in order to restrict glare and control obtrusive light to observers.
Motorist, cyclists & pedestrians	Existing receptors have been identified that are sensitive to the effects of glare: - Napier Road. - A3290/Thames Valley Park Drive. - Users of Thames Path National Cycle Route/Trail. - Users of Kennet & Avon Canal National Cycle Route/ footpath. - River users on River Thames/ River Kennet e.g. boat owners, rowers etc. - Future users of the East MRT The street lighting has been designed to RBC standards to reduce adverse impacts of glare to users of Napier Road and the A3290. There would be an overall benefit associated with lighting to motorist, cyclists and pedestrians due to street lighting. Footway and cycleway users will have a well-lit route which forms an improvement on current conditions where the route is not lit between the Tesco Supermarket and the eastern boundary of the site. Pedestrians and cyclists will have a significantly safer and more secure route than exists currently. The proposed development will include a more direct crossing of the River Kennet especially for cyclists, and divert away from the poorly lit Thames Path. River users unlikely to be using river at night, also no light was observed to intrude into River Thames from the lighting modelling undertaken. Future users of the footway/cycle way will have conditions improved compared to existing lighting conditions. Greater lighting will be adequately positioned to maximise safety and security.
Wildlife	The proposed lighting results in light intrusion into the River Kennett. However, the level of luminance is under 1 lux at ground level therefore acceptable in relation to BCT guidance – limiting the impact and design of artificial light on bats. Changes in lighting levels will result in a temporary, negative ecological impact, caused during construction only. This impact will occur in areas where compounds are located and / or night works take place and as such, will be of small magnitude and easily reversible following construction works.

7 Conclusions and Recommendations

- 7.1.1 The Proposed Development will introduce new light sources into a site determined as having two levels of district brightness. These are ILP Environmental Zone 3 (Suburban) for the western section of the site and ILP Environmental Zone 2 (Rural) for the eastern section of the site.
- 7.1.2 The aspiration of the applicant is to specify high lighting standards for the scheme that is efficient, safe and secure for people utilising the East MRT route for walking and cycling, and bus drivers using the proposed junctions onto Napier Road and Thames Valley Drive.
- 7.1.3 The luminaires required for the Proposed Development have been modelled to determine levels of obtrusive light (lighting intrusion, glare and sky glow) and to determine mitigation measures for sensitive receptors such as local residents, the ecological receptors, users of the existing Thames Path and train drivers on the Great Western Mainline.
- 7.1.4 During the construction period lighting for construction will be phased through the development to target only temporal effects. Night time working will be avoided where possible to minimise effects on receptors.
- 7.1.5 It is anticipated that any potential effects from obtrusive light associated with the construction phase lighting, can be mitigated through employment of appropriate good practice measures by the contractor.
- 7.1.6 An assessment of the proposed lighting design for the East MRT has been undertaken, and has concluded that there is likely to be minimal light intrusion to the identified receptors. Lighting shields will be utilised to support the reduction of the potential for impact to identified receptors below guidance levels.
- 7.1.7 Based on the modelling undertaken, lighting levels for the proposed external lighting associated with the East MRT footway and cycleway, Tesco/ Napier Road Junction and Tesco Car Park is demonstrated to be within the design limitations set out for Environmental Zone E3/E2, with the exception of one location. Where standards are not met, mitigation measures can be undertaken to bring the lux levels below the design limitations.
- 7.1.8 The Proposed Development is not expected to have a material impact on the identified receptors.

Appendix A Site Location Plan



NOTES:

- 1. DO NOT SCALE FROM THIS DRAWING, IF IN DOUBT PLEASE REQUEST FURTHER INFORMATION.
- 2. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.

KEY:

- PLANNING APPLICATION RED LINE BOUNDARY
- OTHER LAND IN APPLICANTS CONTROL
- READING BOROUGH COUNCIL BOUNDARY
- WOKINGHAM BOROUGH COUNCIL BOUNDARY

C	RED LINE BOUNDARY AMENDED	04.10.18	LC	LC	SM
B	RED LINE BOUNDARY AMENDED	28.05.18	LC	LC	SM
A	COUNCIL BOUNDARIES ADDED	30.06.17	SF	SE	SE
Mark	Revision	Date	Drawn	Chkd	Appd

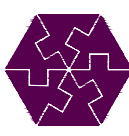
SCALING NOTE: Do not scale from this drawing. If in doubt, ask.
UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake his own investigation where the presence of any existing sewers, services, plant or apparatus may affect his operations.

Drawing Issue Status
FOR PLANNING

EAST READING MASS RAPID TRANSIT

SITE LOCATION PLAN

Client

**Reading**
Borough Council
Working better with you

Date of 1st Issue 22.06.2017	Designed LC	Drawn SF
A1 Scale 1:1500	Checked SE	Approved SM
Drawing Number 28791/2009/CIV/002		Revision C



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Appendix B General Arrangement Plan

Appendix C ILP Obtrusive Light Limitations for Exterior Lighting Installations

Table C-1: Obtrusive Light Limitations for Exterior Lighting Installations – General Observers

Environmental Zone	Sky Glow ULR [Max%]	Light intrusion (into Windows) Ev [Lux]		Luminaire Intensity I [candelas]		Building Luminance pre-curfew
		Pre Curfew	Post Curfew	Pre Curfew	Post Curfew	Average L [cd/m ²]
E0	0	0	0	0	0	0
E1	0	2	0(1*)	2500	0	0
E2	2.5	5	1	7500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	

Definitions

ULR = Upward Light Ratio of the Installation is the maximum permitted percentage of luminaire flux for that goes directly into the sky.

Ev = Vertical Illuminance in Lux and is measured flat on the glazing at the centre of the window

I = Light Intensity in Cd

L = Luminance in Candelas per Square Metre Cd/m²

Curfew = The time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by the local planning authority.

(1) Upward Light Ratio – Some lighting schemes will require the deliberate and careful use of upward light – e.g. ground recessed luminaires, ground mounted floodlights, festive lighting – to which these limits cannot apply. However, care should always be taken to minimise any upward waste light by the proper application of suitably directional luminaires and light controlling attachments.

(2) Light Intrusion (into Windows) – These values are suggested maxima and need to take account of existing light intrusion at the point of measurement. In the case of road lighting on public highways where building facades are adjacent to the lit highway, these levels may not be obtainable. In such cases where a specific complaint has been received, the Highway Authority should endeavour to reduce the light intrusion into the window down to the post curfew value by fitting a shield, replacing the luminaire, or by varying the lighting level.

(3) Luminaire Intensity – This applies to each source in the potentially obtrusive direction, outside of the area being lit. The figures given are for general guidance only and for some sports lighting applications with limited mounting heights, may be difficult to achieve.

(4) Building Luminance – This should be limited to avoid over lighting, and related to the general district brightness. In this reference building luminance is applicable to buildings directly illuminated as a night-time feature as against the illumination of a building caused by spill light from adjacent luminaires or luminaires fixed to the building but used to light an adjacent area.

Reproduced from the ILP Publication: Guidance Notes for the Reduction of Obtrusive Light – ILP, GN01:2011

Table C-2: Obtrusive Light Limitation for Exterior Lighting Installations – Road Users

Road Classification (1)	Threshold Increment (TI)	Veiling Luminance (Lv)
No road lighting	15% based on adaptation luminance of 0.1cd/m ²	0.04
ME6/ME5	15% based on adaptation luminance of 1cd/m ²	0.25
ME4/ME3	15% based on adaptation luminance of 2cd/m	0.40
ME2/ME1	15% based on adaptation luminance of 5cd/m ²	0.84
TI = Threshold Increment is a measure of the loss of visibility caused by the disability glare from the obtrusive light installation Lv = Veiling Luminance is a measure of the adaptation luminance caused by the disability glare from the obtrusive light installation (1) = Road Classifications as given in BS EN 13201 – 2: 2003 Road lighting Performance requirements. Limits apply where users of transport systems are subject to a reduction in the ability to see essential information. Values given are for relevant positions and for viewing directions in path of travel. For a more detailed description and methods for determining, calculating and measuring the above parameters see CIE Publication 150:2003.		

Appendix D TVP P&R Application Documents

Thames Valley Park Park & Ride

Lighting Strategy

Balfour Beatty Living Places

06 July 2018



Notice

This document and its contents have been prepared and are intended solely as information for Balfour Beatty Living Places and use in relation to inform planning submission

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This document has 21 pages including the cover.

Document history

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Client signoff

Client	Balfour Beatty Living Places	
Project	Thames Valley Park	Park & Ride
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Introduction

This report is intended to provide information to planners on the design strategy which will be adopted during development of a lighting design for Thames Valley Park and Ride Site. It includes for mitigation measures which can be adopted to minimise environmental impact.

2. Environmental Considerations

2.1. General

As with any development, there are several environmental factors that are required to be considered as part of the design process of any exterior lighting installation not limited to:

- Light spill/trespass into the surrounding area & properties
- Light spill into the night sky contributing to the effect referred to as 'Sky Glow'
- Visual impact of the lighting apparatus during the daylight hours
- Effects of lighting on flora & fauna
- Energy usage & CO₂ production of proposed installation.

These factors can differ in impact and severity depending on location. To adequately assess the lighting requirements, the following sections will consider environmental constraints in the context of proposed lighting.

2.2. Environmental Zone

The Institution of Lighting Professionals (ILP) document "Guidance notes for the reduction of obtrusive light sets out the various Environmental Zones (GN01) as shown in Table 1 below:

Table 1 – Table 1 Environmental Zone Classification – ILP Guidance Notes for the reduction of obtrusive light.

Environmental Zones			
Zone	Surrounding	Lighting Environment	Example
E0	Protected	Dark	UNESCO Starlight Reserves, IDA Dark Sky Parks
E1	Natural	Intrinsically Dark	National Parks, Areas of Outstanding Natural Beauty etc
E2	Rural	Low district brightness	Villages or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Small town centres or suburban locations
E4	Urban	High district brightness	Town/city centres with high levels of night time activity

Once the Environmental Zone has been selected from Table 1, Table 2 should be consulted to provide the constraints which the lighting design should not exceed.

Table 2 – Table 2 GN01 Obtrusive light limitations for exterior lighting installations.

Obtrusive Light Limitations for Exterior Lighting Installations – General Observers						
Environmental Zone	Sky Glow ULR [Max %] (1)	Light Intrusion (Into Windows) EV [lux] (2)		Luminaire Intensity I [candelas]		Building Luminance Pre-curfew (4)
		Pre-Curfew	Post-Curfew	Pre-Curfew	Post-Curfew	Average L [cd/m ²]
E0	0	0	0	0	0	0
E1	0	2	0 (1*)	2,500	0	0
E2	2.5	5	1	7,500	500	5
E3	5.0	10	2	10,000	1,000	10
E4	15	25	5	25,000	2,500	25

ULR = Upward Light Ratio of the Installation is the maximum permitted percentage of luminaire flux that goes directly into the sky.

EV = Vertical Illuminance in Lux measure flat on the glazing at the centre of the window.

I = Light Intensity in Candelas (cd)

L = Luminaire in Candelas per Square Metre (cd/m²)

Curfew = the time after which stricter requirements (for the control of obtrusive light) will apply; often a condition of use of lighting applied by the local planning authority. If not otherwise stated 23.00hrs is suggested.

*** = Permitted only from** Public road lighting installations.

To the South of the site, there is considerable & extensive development with an abundance of exterior lighting installations, from public highway lighting, to the private exterior lighting installations within the business parks. To the north lies the River Thames, Thames & Kennet Marina and Caversham Lakes.

When referencing the Environmental Zones, they are often grouped as E1/E2 & E3/E4. Depending on the viewpoint, it could be suggested that the site could be viewed as either an E2 if considering the northern boundary i.e. the river etc, or an E4 if looking at the Southern boundary and the railway, business parks etc. GN01:2011 says *“Where an area to be lit lies on the boundary of two zones, the obtrusive light limitation values used should be those applicable to the most rigorous zone”*. To that end, the site must be considered as being within an E2 environmental zone.

There are few properties that would likely experience obtrusive light from the site, as any residential properties are separated from the site by the railway and business parks; however, the proximity of the site to the railway and natural surroundings towards the river should be considered as the biggest potential receptors of any unwanted spill light.

2.3. Flora & Fauna

It is understood from a report undertaken in 2015 that bats may be present in the vicinity of the proposed Park and Ride site. The impact of lighting on bats can take different forms, from illumination of the roost - delaying their emergence and effectively reducing feeding opportunities, to causing bats to avoid illuminated areas completely.

The 2015 report suggests the presence of up to 3 different species of bat in the vicinity of the proposed site. Call recordings characteristic of the following were species were found:

- Common Pipistrelle *Pipistrellus pipistrellus*
- Soprano Pipistrelle *Pipistrellus pygmaeus*
- Noctule *Nyctalus noctula*

Lighting will be designed to minimise the impact on bats, by selecting luminaires with minimal upward light. It is important that bat foraging routes are known to avoid selecting unsuitable positions for lighting apparatus. It is also important to be aware of bat species present as mitigation can be guided by an understanding of the species that might be affected.

2.4. Landscape & Visual Impact

The proposed site is situated at a level of approximately 40m above Ordinance Datum with the flat landscape of the River Thames and the Thames and Kennet Marina on the boundary to the North. Much of the local area to the north & west of the site is situated at a similar level being within the Thames flood plain.

The vegetation currently situated within the site boundary offers a 'visual curtain' which screens much of the views from and of the site.

2.5. Energy

It is proposed that LED luminaires shall be used to maximise energy efficiency whilst achieving the required lighting levels in accordance with the appropriate standards.

3. Lighting Concept

3.1. Lighting Standards – Park & Ride Site

The following standards shall be considered and referred to during the design process:

- BS5489-1:2013 Code of practice for the design of road lighting. Part 1: Lighting of roads and public amenity areas.
- PD CEN/TR 13201-1:2014 Road Lighting Part 1: Guidelines on selection of lighting classes
- BS EN 13201-2:2015 Performance Requirements
- BSEN1264-2:2014 Light & Lighting – Lighting of Work Places. Part 2: Outdoor Work Places
- Guidance Notes for the Reduction of Obtrusive Light GN01:2011
- Wokingham Borough Council (WBC) Street Lighting Specification

* List is non-exhaustive

Table 3 – Table 5.9 Parking Areas – Taken from BSEN1264-2:2014.

Ref no.	Type of area, task or activity	E_{min}	U_o	GRL	R_a	Remarks
5.9.1	Light Traffic, e.g. parking areas of shops, terraced & apartment houses; cycle parks	5	0.25	55	20	
5.9.2	Medium traffic, e.g. parking areas of department stores, office buildings, plants, sports & multipurpose building complexes	10	0.25	50	20	
5.9.3	Heavy Traffic, e.g. parking areas of schools, churches, major shopping centres, major sports & multipurpose building complexes	25	0.25	50	20	

Due to the nature of a Park & Ride, with the near constant movement of vehicles and pedestrians around the site, it is proposed to light the park & ride site to Reference no. 5.9.3 from the table above, with the following qualitative figures:

$E_{MIN} = 25 \text{ lux}$
 $U_o = 0.25$
 $G_{RL} = 50$
 $R_a = 20$

3.2. Lighting Standards – Access Road

The access road shall provide a link to the site from the roundabout at the A3290 and will terminate past the site entrance in a turning circle for the buses. It is envisaged to be a slow speed road with a mix of Pedestrians, cyclists and motorised vehicles.

Using PD CEN/TR 13201-1:2014 the lighting class required is established as being for pedestrian and low speed areas (P class).

“The lighting classes P are intended predominantly for pedestrians and cyclists for use on footways and cycleways, and drivers of motorised vehicles at low speed on residential road, shoulder or parking lanes, and other road areas lying separately or along a carriageway of a traffic route or a residential road” (Taken from PD CEN/TR 13201-1:2014)

To determine which P class (P1-P6) and therefore what lighting levels are appropriate, application of weighting values to a set of parameters is required. See Appendix B for the table of parameters and weighting values (VW).

With the sum of the weighting values (VWS) calculated in Appendix B the following formula is applied:

$$P = 6 - VWS$$

We know that the sum of the weighting values (VWS) is 4 therefore,

$$\begin{aligned} P &= 6 - 4 \\ P &= 2 \end{aligned}$$

The proposed lighting level for the access road is therefore taken as being P2.

Cross referencing the known proposed P class with BSEN 13201-2:2015 Performance Requirements gives the required qualitative figures needed for compliance. These can be seen in the table below.

Table 4 – Table 3 – P Lighting classes. Taken from BSEN 13201-2:2015 Performance Requirements

Class	Horizontal illuminance		Additional requirement if facial recognition is necessary	
	$\bar{E}^a$ (Minimum maintained) lx	E_{min} (maintained) lx	$E_{V,min}$ (maintained) lx	$E_{SC,min}$ (maintained) lx
P1	15.00	3.00	5.0	5.0
P2	10.00	2.00	3.0	2.0
P3	7.50	1.50	2.5	1.5
P4	5.00	1.00	1.5	1.0
P5	3.00	0.60	1.0	0.6
P6	2.00	0.40	0.6	0.2
P7	Performance not defined	Performance not defined		

^a To provide for uniformity, the actual value of the maintained average illuminance shall not exceed 1.5 times the minimum $\bar{E}$ value indicated for the class.

3.3. Lighting Apparatus

It is understood that the Park & Ride shall be operated and maintained by the Local Authority. To that end, it is proposed that the lighting apparatus shall follow the requirements set out in Wokingham Borough Council's Street Lighting Specification where possible. Apparatus may be required to differ from Wokingham Borough Council's Street Lighting Specification for reasons of environmental mitigation or to enable lighting quality figures to be achieved without the need to install excessive numbers of lighting columns.

Wokingham Borough Council's specification is primarily aimed at Highway Lighting, and as such, requirements and methodology would require transposing and applying to the exterior lighting provision of the Park & Ride.

Table 5 – Table 1 Street Lighting Columns – Suggested Column Heights & Lantern Combinations. Taken from Wokingham Borough Council's Street Lighting Design, Adoption Process & Specification Guide

Approx. full Carriageway Width (does not include adjacent footpath or verge)	Residential Roads	Estate Distributor Roads	Main Traffic Routes
5 to 6m	5m + Type A Lantern	5m + Type A Lantern	6m
6 to 7m	6m + Type B Lantern	6m + Type B Lantern	8m + Type C Lantern
7 to 9m	6m + Type B Lantern	8m + Type B Lantern	10m + Type D Lantern
Dual Carriageways	Not normally applicable	10m + Type B Lantern	12m + Type E Lantern

3.3.1. Columns

It is envisaged that the proposed columns shall be no less than 8m in nominal height. This shall balance the visual impact of the columns (in terms of quantity required) with the ability to achieve the required lighting class and lighting qualitative figures.

See Appendix A for Wokingham Borough Council's column requirements.

The presence of multiple instances of overhead cables within the site boundary, present a considerable risk to the lighting design and the achievable lighting levels and qualitative figures. To maintain prescribed clearances to the overhead lines, mitigating methods such as columns of lower nominal heights, hinged columns to remove the need to work at height in the vicinity of overheads will be utilised in the design.

3.3.2. Luminaires

3.3.2.1. General

Table 6 – Table 3 Lantern Types

Type	Model	Gear Driver	Control / Dimmer Unit
Type A	Philips “Gen3 Mini-Iridium” 2000lm LED (Ref BGP381 1xGRN20_740WSO)	Philips Xitanium LED Driver (DALI standard)	Telensa 5-pin NEMA Telecell with integral Dimming Module & GPS positioning
Type B	Philips “Gen3 Mini-Iridium” 3000lm LED 1xGRN30_740WSO)	Philips Xitanium LED Driver (DALI standard)	Telensa 5-pin NEMA Telecell with integral Dimming Module & GPS positioning
Type C	Philips WRTL “Mini-Luma” 1B R4 DS-NW 1 8800lm NW LED (40 no. LEDS’s)	Philips Xitanium LED Driver (DALI standard)	Telensa 5-pin NEMA Telecell with integral Dimming Module & GPS positioning
Type D	Philips WRTL “Luma” 1B R3 DS-NW 1 12000lm NW LED (68no. LEDS’s)	Philips Xitanium LED Driver (DALI standard)	Telensa 5-pin NEMA Telecell with integral Dimming Module & GPS positioning
Type E	Philips WRTL “Luma” 2B R5 DS-NW 1 24000lm NW LED (120no. LEDS’s)	Philips Xitanium LED Driver (DALI standard)	Telensa 5-pin NEMA Telecell with integral Dimming Module & GPS positioning

The above table shows the accepted luminaire range to WBC for use in exterior lighting applications. It should be noted that these luminaires are primarily suited for use in highway lighting applications, and may not be suited to efficiently lighting an area such as the Park & Ride.

3.3.2.2. Access Road

It is proposed the luminaires utilised in the design of the exterior lighting installation of the access road follow the requirements in table 6 – above.

3.3.2.3. Park & Ride Site

To this end it may be necessary to deviate from the above list and utilise the use of a luminaire that has been designed with optics intended to light large areas, such as a floodlight type fitting. There are many LED floodlight solutions available (see figure 2 below for an example), combining the energy efficiency and life of LEDs, with the ability to achieve high lighting levels over a large, wide open area.

Figure 2. Philips “Clear Flood” LED Floodlight



Mounting luminaires as close to the horizontal as possible will minimise the omitted upward light.

3.3.3. Luminaire Control

All luminaires are proposed to be fitted with Telensa 5-pin NEMA Telecells with integral Dimming Module & GPS positioning. By fitting the proposed columns with the Telecells, it will allow the Authority to be able to remote manage the lighting installation as is their policy with public lighting stock.

The connection to the Local Authorities' Central Management System (CMS) would allow the dynamic control over the lighting. It is not clear as to whether the site shall be gated/locked at the end of each day's timetable therefore allowing the lighting to be turned off during non-operational hours. With the CMS link operational decisions such as this can be made later, as the system would allow the Authority to monitor, dim and even switch off luminaires as appropriate.

Table 7 – Table 4 Controls

Application	Control Type	Lux Setting
Street Light	Telensa 5-pin NEMA Telecell with integral Dimming Module & GPS positioning	Remotely controlled by WBC
Illuminated Sign	Telensa Telecell	Remotely controlled by WBC

3.3.4. Electrical Requirements

It is proposed that lighting apparatus is serviced by means of a feeder pillar containing a metered Distribution Network Operator (DNO) electrical service. This enables a central point of supply with a network of private underground cables servicing the lighting installation. The proposed electrical infrastructure shall be laid in a fully ducted system, offering mechanical protection to the supply cables. This will also aid future maintenance, as cables can be quickly pulled and replaced if necessary without the need for civils works.

3.3.5. Positioning of Apparatus

Lighting apparatus will be located and aligned to minimise the impact of obtrusive light to receptors as far as is practicable. Factors which limit location of lighting apparatus will include:

- London to Reading railway line to the south of the site;
- River Thames to the north of the site;
- Daytime appearance of the site;
- Properties which may be affected by obtrusive light;
- Presence of light susceptible species;
- Statutory Utilities plant including gas main and overhead power transmission lines.

It should be noted that positioning of apparatus is likely to be restricted by the parking bays. Where this is the case, columns will be located on the boundary of parking bays and protection to the columns from impact damage should be provided.

4. Additional Requirements

4.1. CCTV

Liaison is required with any design of the CCTV to establish that the lighting levels are suitable for the operation of the cameras, and to ensure that no luminaire causes glare to any of the camera locations inhibiting their view & picture quality.

4.2. Maintenance Activities

The proposed LED luminaires should require minimum maintenance over their life. Compliance with the Electrical Regulations BS7671 will require an electrical test and inspection every 6 years. These inspections and tests could be programmed to minimise disruptions to the operation of the site.

5. Conclusion

Lighting will be designed to meet the needs of users whilst remaining as sympathetic to the environment as practical. This will be achieved through careful luminaire selection and positioning to achieve a balance of adequate lighting with environmental mitigation.

Appendices

Appendix A. Columns

A.1. Table 2 Street Lighting Columns – Column & Bracket Specifications. Taken from Wokingham Council’s Street Lighting Design, Adoption Process & Specification Guide

Column Height	Tower Wagon Access/Safety	Column Type	Outreach Bracket
5m	Good	Aluminium Lighting Company “Conical” tapered aluminium post top column	Lantern to be post top mounted
	Poor	Aluminium Lighting Company mid-hinged “Conical” tapered aluminium post top column	Lantern to be post top mounted
6m	Good	Aluminium Lighting Company “Conical” tapered aluminium post top column	Lantern to be post top mounted
	Poor	Aluminium Lighting Company mid-hinged “Conical” tapered aluminium post top column	Lantern to be post top mounted
8m	Good	Aluminium Lighting Company “Conical” tapered aluminium post top column. Column to be suitable to support “Class B” signage	Lantern to be post top mounted unless otherwise specified by WBC Where a bracket is required then the column shall be fitted with an Aluminium Lighting Company detachable straight aluminium bracket with no uplift. Bracket normally 1m projection unless otherwise specified.
	Poor	To be confirmed	To be confirmed
10m	Good	Aluminium Lighting Company “Conical” tapered aluminium post top column. Column to be suitable to support “Class B” signage	Lantern to be post top mounted unless otherwise specified by WBC Where a bracket is required then the column shall be fitted with an Aluminium Lighting Company detachable straight aluminium bracket with no uplift. Bracket normally 1.5m projection unless otherwise specified.
	Poor	To be confirmed	To be confirmed
12m	Good	Aluminium Lighting Company “Conical” tapered aluminium post top column. Column to be suitable to support “Class B” signage	Lantern to be post top mounted unless otherwise specified by WBC Where a bracket is required then the column shall be fitted with an Aluminium Lighting Company detachable straight aluminium bracket with no uplift. Bracket normally 2m projection unless otherwise specified.
	Poor	To be confirmed	To be confirmed

Appendix B. Lighting Standards

B.1. Table 4 – Parameters for the selection of lighting class P. Taken from PD CEN/TR 13201-1:2014

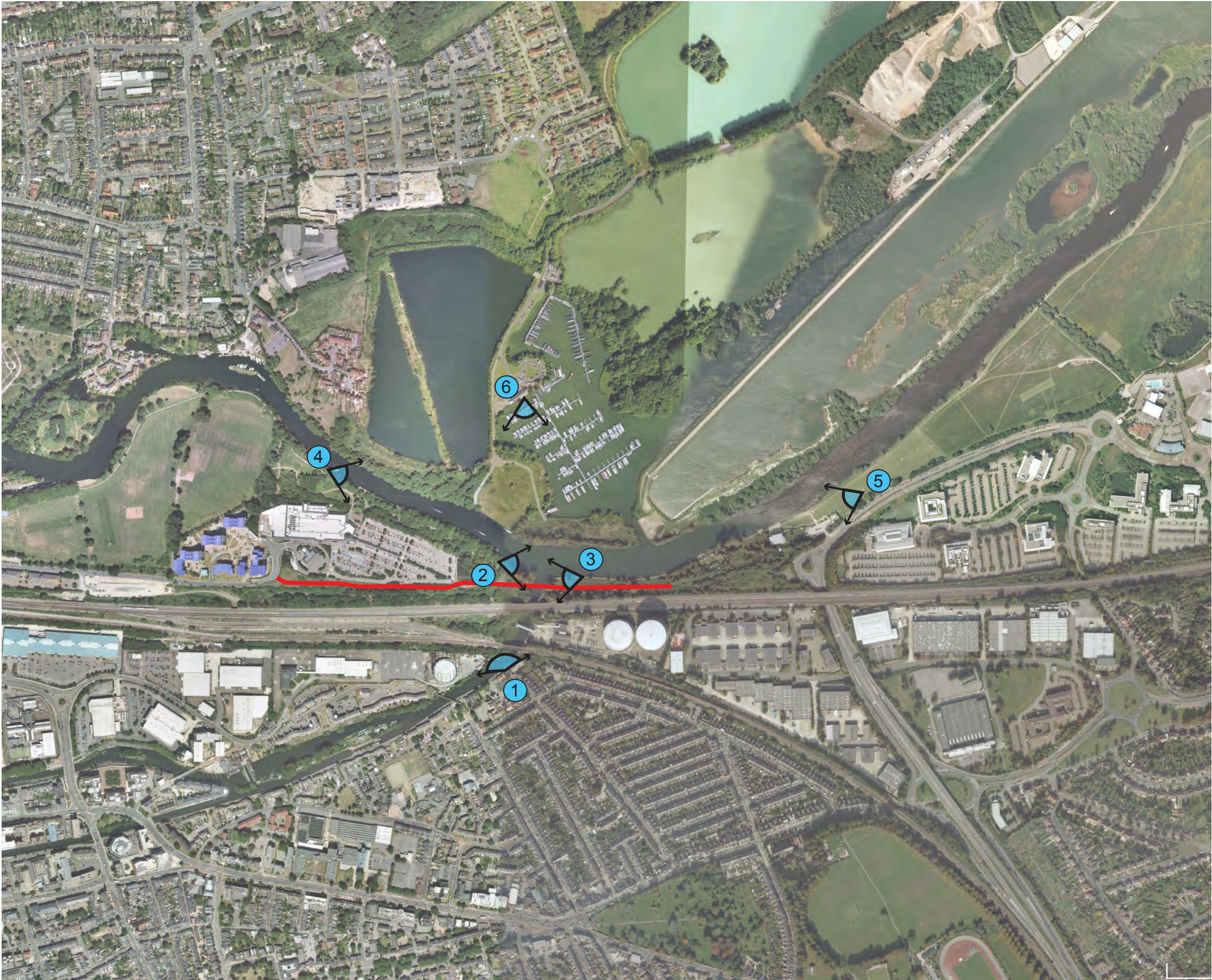
Parameter	Options	Description ^a	Weighting Value V_w
Travel Speed	Low	$v \leq 40\text{km/h}$	1
	Very Low (walking speed)	Very low, walking speed	0
Use Intensity	Busy		1
	Normal		0
	Quiet		-1
Traffic composition	Pedestrians, cyclists and motorised traffic		2
	Pedestrians and motorised traffic		1
	Pedestrians and cyclists only		1
	Pedestrians only		0
	Cyclists only		0
Parked vehicles	Present		1
	Not present		0
Ambient luminosity	High	Shopping windows, advertisements, expressions, sports fields, station areas, storage areas	1
	Moderate	Normal situation	0
	Low		-1
Facial recognition	Necessary		Additional requirements ^b
	Not necessary		No additional requirements

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Appendix E Application Site Photographs & Location Plan



LEGEND:

 MRT line

 Photograph locations

EAST READING MRT

VIEWPOINT LOCATION PLAN



READING BOROUGH COUNCIL

Mark	Revision			
REV	Date	01.04.2016		
	Scale	AS SHOWN		
	Drawn	RJ		
	Checked	NJ		

Drawing No.
28791-3009-01



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East Reading Mass Rapid Transit Scheme

Lighting Assessment – Appendix E

On behalf of



Document Control Sheet

Project Name: East Reading Mass Rapid Transit Scheme
Project Ref: 28791
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Revision	Date	Description	Prepared	Reviewed	Approved
Final	30 th June	Final	AS	NY	JR

This report has been prepared by Peter Brett Associates LLP ('PBA') on behalf of its client to whom this report is addressed ('Client') in connection with the project described in this report and takes into account the Client's particular instructions and requirements. This report was prepared in accordance with the professional services appointment under which PBA was appointed by its Client. This report is not intended for and should not be relied on by any third party (i.e. parties other than the Client). PBA accepts no duty or responsibility (including in negligence) to any party other than the Client and disclaims all liability of any nature whatsoever to any such party in respect of this report.

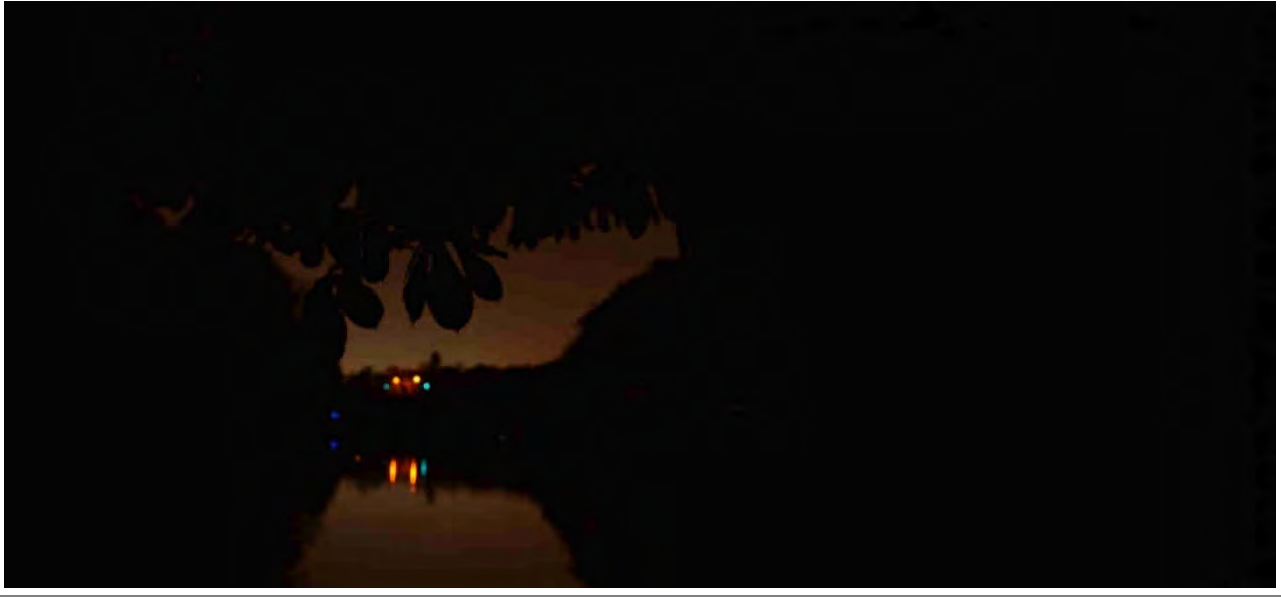
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Appendix A

Viewpoint 1 View From Kennet & Avon Canal looking North	Qualitative description of existing lighting
	Daytime visit: <u>Screening:</u> Full screening from viewpoint, by multiple railway bridges. <u>Topography:</u> Flat. <u>Vegetation, building/structures:</u> Victorian Railway bridges / viaducts in the foreground, deciduous trees. <u>Potential light sources:</u> Street lighting along Kennet side – column and mounted. <u>Primary Receptors:</u> Users of the public right of way/ wildlife in the River Kennet.
	Night-time visit <u>Light features in Site & surroundings:</u> Lighting from column mounted LED lighting along the PROW River Kennet towpath. <u>Principle light sources:</u> LED column lighting illuminating tow path alongside River Kennet. <u>Light intrusion, glare, aura and sky glow:</u> Light screened by deciduous trees, light intrusion into River Kennet, which reflects/ scatters light. Glare limited by trees, no sky glow.

Viewpoint 2	Qualitative description of existing lighting
 Insufficient lighting for photos	Daytime visit: <u>Screening:</u> Site screened by trees and embankment along the River Thames. <u>Topography:</u> Flat. <u>Vegetation, building/structures:</u> Metal fencing along the Thames National Path, deciduous trees exist along the riverside. <u>Potential light sources:</u> High Pressure Sodium lighting from Thames Valley Park. <u>Primary Receptors:</u> Users of Thames National Path, wildlife in woodland adjacent. Night-time visit <u>Light features in Site & surroundings:</u> Very faint light from Thames Valley Park, unable to view in photos. <u>Principle light sources:</u> Lighting on moored boats, distant footpath column lights (LED) and distant high pressure sodium street lighting. <u>Light intrusion, glare, aura and sky glow:</u> N/a

Viewpoint 3 View from Thames Path – West of River Kennet (looking east)		Qualitative description of existing lighting
		Daytime visit: <u>Screening:</u> Partially screened by hedgerows and trees (likely to be removed to accommodate for the development). <u>Topography:</u> Flat. <u>Vegetation, building/structures:</u> Large willow tree, scrubland and long grasses. Existing footbridge crossing the River Kennet mouth, Great Western Mainline bridge/ viaduct and train line. <u>Potential light sources:</u> LED lighting along Thames Path. <u>Primary Receptors:</u> Users of Thames Path, train drivers using the Great Western mainline.
		Night-time visit <u>Light features in Site & surroundings:</u> LED column lighting illuminating the Thames Path. <u>Principle light sources:</u> LED column lighting (mounted), shielded by willow tree. <u>Light intrusion, glare, aura and sky glow:</u> Light intrudes into River Thames, and sky glow was observed towards Reading Town Centre.

Viewpoint 4 View from Thames Path looking west (adjacent to Tesco)	Qualitative description of existing lighting
	Daytime visit: <u>Screening:</u> Full screening from site, due to deciduous trees and distance from site. <u>Topography:</u> Flat. <u>Vegetation, building/structures:</u> Metal fencing along the Thames National Path, deciduous trees exist along the riverside. <u>Potential light sources:</u> High pressure sodium lighting from Thames Valley Park, LED lighting from Thames Path at River Kennet. <u>Primary Receptors:</u> Users of Thames Path, wildlife in woodland.
	Night-time visit <u>Light features in Site & surroundings:</u> Minor lighting from distant Thames Valley Park and waterside centre, sky glow above East Reading. <u>Principle light sources:</u> High pressure sodium and coloured lighting from Waterside centre and Thames Valley Park, and on moored boats. <u>Light intrusion, glare, aura and sky glow:</u> Orange sky glow from the east, likely to be eastern suburbs of Reading. No light intrusion or glare.

Viewpoint 5 View from open space between Thames Path and Thames Valley Park Drive	Qualitative description of existing lighting
	Daytime visit: <u>Screening:</u> Fully screened – site lies beyond the waterside centre and Thames Valley Park roundabout. Screened by buildings and mature woodland. <u>Topography:</u> Flat. <u>Vegetation, building/structures:</u> Fully mature hedgerows and trees along the riverside, Waterside Centre building in the centre, and central Reading office buildings can be viewed in the distance. <u>Potential light sources:</u> Column street lighting on Thames Valley Park Drive. Operational lighting on Waterside Centre building, office lighting. <u>Primary Receptors:</u> Users of Thames Path and open space on the riverside.
	Night-time visit <u>Light features in Site & surroundings:</u> High Pressure Sodium street column lighting along Thames Valley Park Drive, spherical white lighting on/ adjacent to Waterside Centre. Light glow from Reading. <u>Principle light sources:</u> High Pressure Sodium street column lighting along Thames Valley Park Drive, spherical white lighting on/ adjacent to Waterside Centre, and office lighting from The Blade building in Reading Town Centre. <u>Light intrusion, glare, aura and sky glow:</u> Sky glow over Reading Town Centre and West Reading.

Appendix F East MRT Lighting Design Drawing

