

Designs for Lighting Ltd

Lighting Impact Assessment

Prepared by Designs for Lighting Ltd for ARCADIS

Jaguar Land Rover Halewood

Eastlands Car Park



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1 Introduction

1.1 Outline

- 1.1.1 Arcadis (UK) Limited has been commissioned by Jaguar Land Rover to provide environmental studies to support works for improving on-site efficiencies, capabilities and resilience at Jaguar Land Rover Halewood.
- 1.1.2 Jaguar Land Rover proposes to create 1589 temporary parking spaces (inclusive of 304 existing temporary spaces) on and around the existing Eastlands car park (see images below). This will free up other areas of the site for future development associated with increased market demands. The proposals will include the replacement of the existing Eastlands car park and surrounding land within the fence-line with hard-standing marked with parking spaces. An indicative plan of the proposals is presented in **Images 1 and 2**.
- 1.1.3 This report has been prepared by Designs for Lighting Ltd; a specialist exterior lighting consultancy with knowledge and experience in lighting impact assessments and mitigation. The purpose of this report is to assess the effects resulting from artificial lighting that will be required for safe and secure operation of the **Proposed Development** which involves the construction of a temporary car park as detailed in paragraph 1.1.2.
- 1.1.4 The **Application Site** is situated at the north east side of the Jaguar Land Rover Halewood site and was previously unused land. Currently the **Application Site** is facilitating a temporary park and ride based employee car park. See **Appendix 1** for an area plan and red line drawing showing the location of the **Proposed Development**. Note that this lighting impact assessment applies solely to the **Application Site** and the **Proposed Development** associated with it.
- 1.1.5 The location of the site is within an industrial area, situated approximately 1.5 miles North East of Liverpool John Lennon airport. Access to the site is via the A561 & the A562.
- 1.1.6 Industrial sites are located west of the **Application Site** and span a distance of approximately 2 miles. Located east of the site areas of grassland and natural screening caused by trees, this obscures the visibility of the **Application Site** from the East. Network Rail's Liverpool to Warrington train line runs parallel to the Jaguar Land Rover Site at the north boundary.
- 1.1.7 This report assesses the current effects from obtrusive light associated with existing uses, and the potential effects of obtrusive light that could arise from artificial lighting of the **Proposed Development**. The principal objective is to identify the impact associated with obtrusive light on various sensitive receptors, propose suitable mitigation and assess likely significant residual effects.
- 1.1.8 Obtrusive light or light pollution is any light that strays to areas other than where it is intended and can include light intrusion (spill light) into neighbouring properties, upward light (which can create sky glow) and visual source intensity (glare). It can also create effects upon ecological receptors in the area, particularly with respect to bat roosts and foraging corridors.
- 1.1.9 The Lighting Impact Assessment considers the maximum adverse scenario in relation to proposed artificial lighting, in order to assess the significance of the potential effects on identified receptors.
- 1.1.10 A lighting strategy has been prepared (410-DFL-LS-001_B_EASTLANDS) and should be read in conjunction with this document.

Image 1 Identification of proposed Eastlands car park within Jaguar Land Rover Site

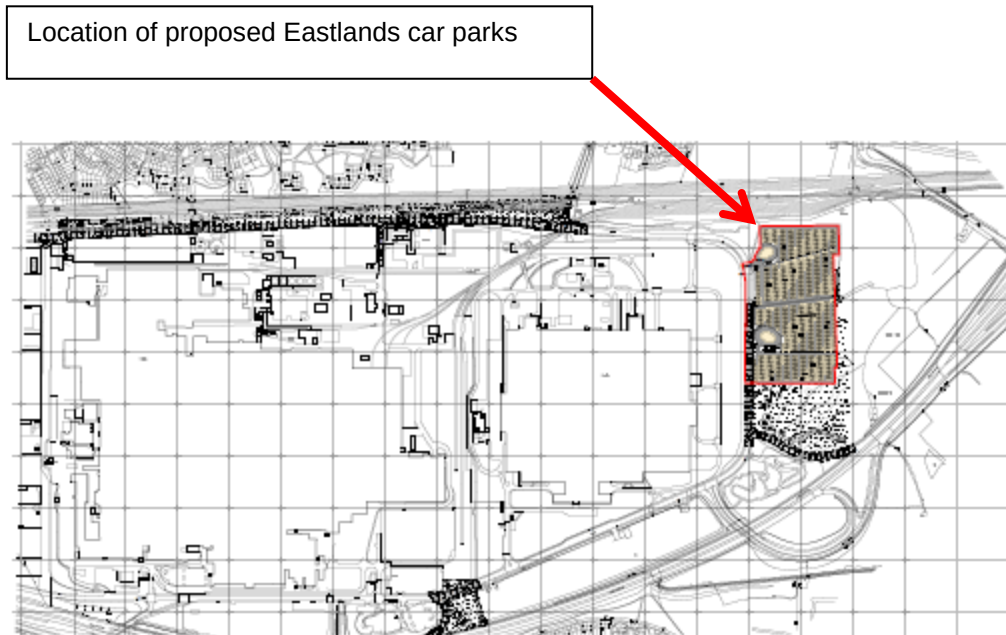


Image 2 Indicative layout of proposed Eastlands car parks



2 Legislative and Policy Framework

2.1 National Policy and Legislation

Environmental Protection Act 1990 / Clean Neighbourhoods and Environment Act 2005

- 2.1.1 Since 2005, artificial light was incorporated as a potential statutory nuisance. An amendment to section 79 of the Environmental Protection Act 1990, contained within the Clean Neighbourhoods and Environment Act 2005 states:

“Artificial light emitted from premises so as to be prejudicial to health and nuisance constitutes a ‘Statutory Nuisance’ and it shall be the duty of every local authority to cause its area to be inspected from time to time to detect any statutory nuisances which ought to be dealt with under section 80 and, where a complaint of a statutory nuisance is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint”.

National Planning Policy Framework: 2012 DCLG

- 2.1.2 The National Planning Policy Framework (NPPF) sets out the governments planning policies for England and how they are expected to be applied and provides a framework for local plans. Under the broad heading of “Achieving Sustainable Development”, Chapter 11 “Conserving and enhancing the natural environment” deals with obtrusive light in clause 125 which states”

“By encouraging good design, planning policies and decisions should limit the impact from artificial light on local amenity, intrinsically dark landscapes and nature conservation.”

- 2.1.3 In the glossary, “Pollution” is defined as

“...anything that affects the quality of land, air water or soils which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions including...light”

2.2 Local Policy

2.2.1 There are a number of local authority policies that should be considered, these are:

- Knowsley Unitary Development Plan Saved Policies
- Knowsley Local Plan Core Strategy (Adopted January 2016)

2.2.2 Although these policies should be considered, there are only two that make reference to lighting in their environmental strategies, these are:

Knowsley Unitary Development Plan- Policy ENV3: Light Pollution.

2.2.3 Knowsley Council are the relevant local authority with respect to the location of the **Application Site**, they provide guidance on light pollution within their Environmental Protection and Nature Conservation Strategy, which forms part of their Unitary Development Plan. The policy states:

“The lighting of developments is important for security and safety reasons. However, different forms of lighting, from street lighting to security lighting, increasingly and unnecessarily pollute today’s environment. Poorly designed or badly aimed lights that are responsible for ‘sky-glow’ can have detrimental effects on wildlife, astronomical interests, highway safety and reduce the feeling of remoteness in rural areas. The Council may in some cases use conditions to require that lighting is orientated away from residential properties or from nearby amenity or countryside areas.”

2.3 Relevant British Standards

2.3.1 The most applicable British Standards for lighting that relate to the proposed development are:

- BS EN 12464-2: 2014- *Lighting of Work Places (Outdoor work places)* – This guidance is important as it contains guidance for task lighting of Industrial based tasks.
- BS5489-1: 2013 – *Code of practice for the design of road lighting.* – This guidance is applicable to the approach roads and internal roads that help to facility the transportation of goods.

2.4 Guidance

Guidance Notes for the Reduction of Obtrusive Light; 2011 Institution of Lighting Professionals (ILP)

- 2.4.1 Guidance notes produced by the Institution of Lighting Professional are among the most commonly referenced guidance notes for good practice within the lighting design industry.
- 2.4.2 Obtrusive light (or sometimes referred to as light pollution) refers to any light emitted in a direction in which it is not required or wanted and as such is detrimental to other users. The assessment has been carried out in accordance with the published guidance documents from the ILP. The quantitative limits are the same for both guidance documents. They quantify the levels of direct upward light, light intrusion, viewed source intensity and glare regarded as acceptable for varying environmental zones. Light intrusion refers to the spilling of light beyond the boundary of the area to be lit. This includes the intrusion of light into bedroom windows. Sky glow refers to the brightening of the sky above towns cause by direct or reflected upward light. Glare refers to the uncomfortable brightness of a light source when viewed against a dark background. Figure 1 illustrates the different types of obtrusive light.

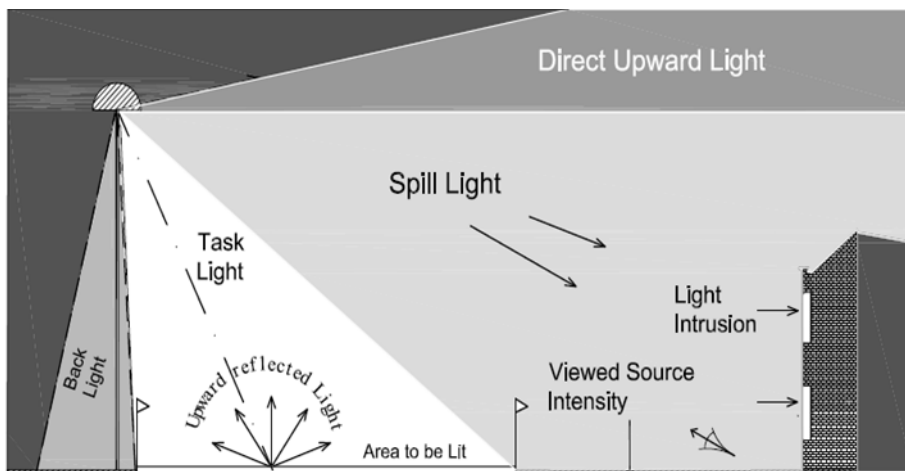


Figure 1 Obtrusive light diagram

Professional Lighting Guide PLG 04 “Guidance on Undertaking Environmental Lighting Impact Assessments” Institution of Lighting Professionals (ILP):2013

- 2.4.3 PLG 04 is used to ensure that the lighting impact assessment is correctly carried out:

“...this document is designed to provide an explanation of, and guidance on, the process for producing a Lighting Assessment...to remove or minimise environmental problems”.

3 Assessment Methodology and Significance Criteria

3.1 Methodology

- 3.1.1 The methodology employed for this assessment is appropriate to the location of the **Proposed Development**. It includes a desk-top survey, and a site visit during which the baseline conditions are assessed. In addition, the potential effects of the proposed lighting are evaluated through the use of appropriate assessment criteria. (Outlined in **Section 3**)
- 3.1.2 The methodology takes guidance from the Institution of Lighting Professionals PLG 04 document "Guidance on Undertaking Environmental Lighting Impact Assessments".
- 3.1.3 The desk-top study involves research into relevant local and national legislation, policy and guidance relating to obtrusive light. It also involves consultation with relevant parties and studying of ordnance survey maps, plans and aerial photography views to identify likely receptor locations prior to the site visit.
- 3.1.4 Research undertaken during the desk-top study is used to clearly define the assessment locations which form the basis of the site visit. Baseline conditions are also assessed in these locations, along with the extent of any receptor viewpoints in the direction of existing artificial lighting and potential artificial lighting associated with the **Proposed Development**.

3.2 Study Area

- 3.2.1 The study area includes the site of the **Proposed Development**, the adjacent railway line, surrounding roadways and nearby residential dwellings where Human Residential Receptors are identified.
- 3.2.2 The study area is detailed in **Appendix 2**.

3.3 Surveys

- 3.3.1 Site surveys were carried out in the daylight and at night to assess the existing baseline lighting and its effect on surrounding receptors, as well as to assess the potential effect from the artificial lighting associated with the **Proposed Development**. During the survey, the **Application Site** was visited, as well as a number of adjacent off-site locations.
- 3.3.2 The visit allowed an assessment of potential receptor types and locations to be made, the night- time visual scene was recorded in accordance with guidance from the ILP document PLG04 (as detailed in **Section 2**).

3.4 Potential Effects from Artificial Light

- 3.4.1 There are a limited number of potential effects that arise from artificial lighting. These are as follows:

Effects from light intrusion through windows on residents

- 3.4.2 Light intrusion (or light spill) is the term for the spilling of light beyond the boundary of the area being lit. The ILP Guidance Notes places a limit on the amount of vertical Illuminance which falls upon the centre of a dwelling window. The suggested maxima values quoted are relative to the amount of light measured as a baseline without the presence of the obtrusive light source.

Effects from viewed source intensity on residents and sightseers

- 3.4.3 **Table 1** below advises limits on luminaire intensity or viewed source intensity from luminaires to an observer. The greatest problems are usually encountered from poorly aimed floodlights or security lighting, or from lighting which is located too close to properties.

Effects from upward light (or sky glow)

- 3.4.4 Light emitted above the horizontal either directly from luminaires or indirectly as reflected light from surfaces such as the landscape or buildings, has the potential to cause sky glow. The ILP "Guidance Notes for the Reduction of Obtrusive Light" places limits on the percentage of direct upward light emitted from the luminaires in their installed attitude, which is dependent upon the environmental zone in which the **Application Site** lies.

- 3.4.5 Indirect upward light is subject to material reflectance properties. It is not easily quantifiable, but is unlikely to be as significant as direct upward light and is not an assessment criterion used in the ILP guidance notes.

Effects from disability glare on transport users

- 3.4.6 The proposed lighting strategy includes requirements for lighting to be installed such that glare is minimised in accordance with the ILP guidance notes.

3.5 Obtrusive light limitations

- 3.5.1 In the absence of suitable statutory guidance, it is proposed that the Institution of Lighting Professionals (ILP) "Guidance notes for the reduction of obtrusive light" GN01:2011 is used, in order to provide suitable assessment criteria against which to assess the impacts of artificial lighting.
- 3.5.2 The relevant criteria of upward light, light intrusion and direct source intensity are discussed below and **Table 1** sets limits for each criterion.

Table 1 Obtrusive light criteria relating to each Environmental Zones

Environmental Zones	Sky Glow ULR (Max %)	Light Trespass (into Windows) E_v (lux)		Source Intensity I (k_{cd})		Building Luminance Average, 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*)	2.5	0	0
E2	2.5	5	1	7.5	0.5	5
E3	5	10	2	10	1.0	10
E4	15	25	5	25	2.5	25

Notes to Table:

- *ULR (Upward Light Ratio) is the maximum permitted percentage of luminaire flux that goes directly into the sky;*
- *E_v is Vertical Illuminance in Lux;*
- *I is Light Intensity in Candelas;*
- *L is Luminance in Candelas per square metre; and*
- *Curfew refers to a time when the local planning authority has agreed that the lighting installation should be switched off; this typically refers to 23h00 – 07h00.*
- *(*) Permitted only from Public road lighting installations.*

3.6 Classification of Environmental Zone

3.6.1 The ILP Guidance Notes Guide quantify the levels of Obtrusive light regarded as acceptable for varying environmental zones E0 to E4 as defined in **Table 2**:

Table 2 Environmental Zones

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

3.6.2 Because of the location and the perceived level of luminance around the surrounding environment, the environmental zone is assessed to be **E3**.

3.7 Significance Criteria

3.7.1 The significance of an effect from artificial lighting will be based upon the sensitivity of the receptor and the magnitude of change at that receptor due to the revised conditions.

3.7.2 The sensitivity of the receptor has been classified as High, Medium, or Low according to the descriptions provided in **Table 3**

3.7.3 The magnitude of change is determined as being High, Medium, Low or Negligible and descriptions for each are provided in **Table 4**

3.7.4 The significance criteria are derived from the combination of the relevant receptor sensitivity and the magnitude of change which that receptor will experience as an effect from the lighting of the **Proposed Development**. These significance criteria are shown in **Table 6** and they can be either beneficial or adverse effects.

Table 3 Criteria for Receptor Sensitivity

Sensitivity	Description of Criteria
High	The environment is fragile and an impact is likely to leave it in an altered state from which recovery would be difficult or impossible. Human (Amenity) – receptors which are sensitive to a change in lighting such that the quality of life would be affected (i.e. lighting is designated a statutory nuisance) Human (Safety) - receptors where a change in the lighting has the potential to either dramatically improve or reduce safety (for pedestrians, drivers or workers). Ecological – where a change in the lighting affects the habitats, breeding or feeding of fauna (e.g. protected habitats or other special areas) or growth patterns of fauna / crops.
Medium	The environment has a degree of adaptability and resilience and is likely to accommodate the changes caused by an impact, although there may still be some residual modification as a result. Human (Amenity) – receptors which are sensitive to a change in lighting however not such that the quality of life would be affected. Human (Safety) - receptors where a change in the lighting has the potential to either improve or reduce safety (for pedestrians, drivers or workers). Ecological – where a change in the lighting affects the movement or feeding patterns of fauna but the receptor can adapt.
Low	The environment is adaptable and is resilient to change. Nearly all impacts can be absorbed within it without modifying the baseline conditions. Human (Amenity) – receptors which would not noticeably be aware of a change in lighting. (i.e. in areas of medium to high luminance) Human (Safety) - receptors where a change in the lighting has limited potential to affect safety (for pedestrians, drivers or workers). Ecological – area with limited wildlife.
Negligible	Receptor has little or no night-time activity

Table 4 Criteria for Magnitude of Change

Magnitude of Change	Description of Criteria
High	A large change compared to the natural variations in background levels. A clear breach of limits and standards may occur. For example, levels of obtrusive light in the form of sky glow, light trespass or glare towards a receptor which exceeds the limits set within the ILP guidance for a higher environmental zone might classify as a high magnitude of change.
Medium	Change which is noticeable and may be a breach of limits and standards. In terms of the limits set in the ILP guidance this might equate to exceeding the limit but within the limits set for the next Environmental Zone.
Low	Change which, when compared to background levels, is only just noticeable.
Negligible	Change is not noticeable.

Table 5 Sensitivity of Receptor Matrix

Magnitude of Change	Sensitivity of Receptor				
		High	Medium	Low	Negligible
	High	Major	Major	Moderate	Negligible
	Medium	Major	Moderate	Minor to Moderate	Negligible
	Low	Moderate	Minor to Moderate	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Table 6 Significance Criteria

Significance Criteria	Significance Criteria
Major beneficial	Substantial reduction in obtrusive light at sensitive receptors and/or users of the Application Site such that large scale improvements to visual amenity, human safety or health is delivered. Significantly improves ecological habitats
Moderate beneficial	Moderate reduction in obtrusive light at sensitive receptors and/or users of the Application Site such that noticeable improvements to visual amenity, human safety or health are delivered. Improves ecological habitats
Minor beneficial	Minor reduction in obtrusive light at sensitive receptors and/or users of the Application Site such that perceptible improvements to visual amenity, human safety or health is delivered; perceptible improvement to ecological habitats.
Neutral/Not significant	No appreciable effect on sensitive receptors. Effects are reversible.
Minor adverse	Minor increase in obtrusive light at sensitive receptors and / or users of the Application Site such as an increase in Glare, Light Trespass to properties, increase in Sky Glow or effects on flora and fauna. Effects are reversible or temporary.
Moderate adverse	Moderate increase in obtrusive light at sensitive receptors and / or users of the Application Site such as an increase in Glare, Light Trespass to properties, increase in Sky Glow or effects on flora and fauna. Requires monitoring and local remedial work. For example, lighting which is visible and causes nuisance to a sensitive receptor outside the Application Site .
Major adverse	Major increase in obtrusive light at sensitive receptors and / or users of the Application Site such as an increase in Glare, Light Trespass to properties, increase in Sky Glow or effects on flora and fauna. Requires extensive remedial works. For example a floodlighting installation which directs light into the eyes of oncoming motorists causing disability glare and potential reduction in visual performance leading to an increased risk of collision.

3.8 Assumptions and Limitations

- 3.8.1 It is assumed that the proposed lighting will be designed by qualified and competent lighting professionals, in compliance with relevant lighting design standards; mentioned in **Section 2** above.
- 3.8.2 The assessment is limited to the lighting conditions as found at the time of the survey. It is assumed that these conditions are representative of the typical conditions on the site.

4 Baseline Conditions

4.1 Site Description and Context

- 4.1.1 The Eastlands site is situated on the north east side of the Jaguar Land Rover / Getrag plant; it currently facilitates the use of a temporary staff park and ride car park.
- 4.1.2 On the east boundary of the **Application Site**, there is an area of forestation, it is understood that an ecological survey has been undertaken for this land and the conclusions are that there are no concerns relating to lighting.
- 4.1.3 The Liverpool to Warrington railway line runs adjacent to the north boundary of the **Application Site**; this separates the **Application Site** from the adjacent residential areas located north of the railway line.
- 4.1.4 The Proposed Development is for Jaguar Land Rover proposes to create 839 temporary parking spaces on and around the existing Eastlands car park (see images below) and a further 750 temporary spaces immediately to the south of this. Existing Lighting
- 4.1.5 The **Application Site** is currently illuminated by portable tower flood lighting positioned sporadically around the site. Luminaire tilt angles are currently above 10° due to the orientation of the towers and the requirement to ensure that the middle of the temporary car parking facility is illuminated.
- 4.1.6 Within the car park there is a bus passenger shelter area that has a low number of amenity lighting bulkheads installed on the underside the shelter. In comparison with the flood lighting, these luminaires contribute a low level of amenity light for the passengers using the waiting shelter.
- 4.1.7 There was no other lighting found within the **Application Site**.
- 4.1.8 Images of the **Application Site** and existing baseline lighting conditions are provided in **Appendix 4**.

4.2 Baseline Survey Information

- 4.2.1 The site survey was undertaken on February 15th 2016, the weather was fair with minimal cloud cover and the first quarter of the moon was visible (*Lunar Calendar 2016*). The survey involved assessing the baseline artificial lighting; identifying sensitive receptors; and assessing potential effects of the proposed lighting on the identified sensitive receptors.
- 4.2.2 During the site survey an assessment into the visibility of the **Proposed Development** from surrounding residential properties was undertaken. There are some isolated residential areas north of the site where views of the **Application Site** are restricted by natural screening.
- 4.2.3 Due to the perceived level of luminance and suburban location of the environment surrounding the **Application Site**, the area is categorised as an Environment Zone Category **E3** in accordance with the ILP Guidance Notes. (See **Table 2**)
- 4.2.4 Vertical illuminance measurements were recorded at the site boundaries; these are detailed in **Appendix 3**. The highest vertical illuminance recorded was: 10.32 lux, the lowest: 0.06 lux. A plan shows the measurement locations taken at the site boundaries. (See **Appendix 3**)

4.3 Sensitive Receptors

- 4.3.1 As part of the baseline review, the survey area was visited to identify potential sensitive receptors to artificial light. This includes consideration towards potential human and ecological receptors.
- 4.3.2 It is understood that an ecological assessment carried out by a third party concluded that there are not likely to be ecological receptors affected by artificial lighting of the **Proposed Development**.
- 4.3.3 Human residential receptors were identified north west of the **Application Site**. However, they are unlikely to experience views of the site due to natural screening the distance to the site. Additionally, they are further separated from the site by the Liverpool to Warrington railway line, which is also shielded by natural screening provided through trees.

- 4.3.4 Train drivers on the adjacent Liverpool to Warrington railway line are identified as human (safety) receptors immediately north of the **Application Site**. There is dense natural screening between the **Application Site** and the railway line which is highly likely to provide an effective level of light shielding. In addition, there is a medium level of luminance surrounding the railway line due to the nearby roadway lighting, so effects caused by lighting of the **Proposed Development** are unlikely to be greater in significance than the existing baseline lighting conditions.
- 4.3.5 **Table 7** summarises the receptor location and sensitivity.

Table 7 Summary of receptor locations and sensitivity

Receptor Type	Receptor Location (See Appendix 2)	Description	Sensitivity
Human- Residential	Loc 1	Aldersgate Drive	Medium
Human- Safety	Loc 2	Railway Line	Medium

5 Lighting Requirements

5.1 Artificial Lighting requirements

- 5.1.1 The **Proposed Development** will require artificial lighting to facilitate safe and secure operation both during the construction and operation phase.
- 5.1.2 Artificial lighting shall be designed in compliance with **BS 5489-1: 2013** (*Lighting of Roads and Public Amenity Areas*) & **BS EN 12464-2: 2014** (*Lighting of Outdoor Work Places*).
- 5.1.3 A lighting strategy has been prepared which provides more details. (0410-DFL-LS-001_A)

6 Potential Effects

6.1 Potential Effects from Construction Artificial Lighting (without mitigation)

- 6.1.1 As a result of the use of construction lighting (i.e. without mitigation) during the development process, there is a potential of Obtrusive Light due to poorly designed or installed lighting equipment, in the form of;
 - Light spill into windows
 - Upward light causing sky glow
 - Glare due to high light source intensity from floodlights
 - Intrusive light affecting ecology
- 6.1.2 The potential effects from construction lighting without mitigation are likely to be of **Moderate** significance.

6.2 Potential Effects from Operational Artificial Lighting (without mitigation)

- 6.2.1 As a result of the exterior lighting detailed above (i.e. without mitigation), there is a potential of Obtrusive Light due to poorly designed or installed lighting equipment in the form of;
 - Light spill into windows
 - Upward light causing sky glow
 - Glare due to high light source intensity from floodlights
 - Intrusive light affecting ecology
- 6.2.2 The potential effects from construction lighting without mitigation are likely to be of **Moderate** significance.

7 Scope of Mitigation

7.1 Mitigation by Design - Construction

- 7.1.1 Many of the potential effects of artificial lighting can be effectively mitigated by a suitable lighting strategy, good design and selection of suitable lighting equipment. The following paragraphs detail the best practice strategy for the **Proposed Development** during the Construction phase.
- 7.1.2 Construction lighting will be detailed and controlled by the Construction Maintenance Plan.
- 7.1.3 When construction is taking place during the hours of darkness, lighting in compliance with *BS EN 12464-2: 2014* should be implemented. Lighting is most likely to be provided by mobile lighting towers. Where possible, the luminaires should be focussed in to the site to limit the possibility of obtrusive light occurring.
- 7.1.4 Where construction does not take place during the hours of darkness, construction lighting should be switched off, unless required for security lighting, at which point, the minimum illuminance level required for security lighting should be implemented.

7.2 Mitigation by Design - Operation

- 7.2.1 Many of the potential effects of artificial lighting can be effectively mitigated by a suitable lighting strategy, good design and choice of suitable lighting equipment and the lighting design being carried out by a suitably qualified and competent professional. The following paragraphs detail good lighting practices to be applied to the design of the artificial lighting required within the **Proposed Development** during the Operation phase.
- 7.2.2 Exterior lighting of the **Proposed Development** will comply with guidance outlined above for lighting of roadways and outdoor work places. (*BS 5489-1:2013 & BS EN 12464-2:2014*)
- 7.2.3 The proposed lighting strategy would be to use high quality luminaires throughout the scheme ensuring that light is focussed downwards onto the floor or other surfaces in the horizontal plane, minimising the potential for direct upward light. Luminaires of this type are designed to ensure that they are optically efficient, thus reducing the amount of light spilled onto the vertical plane, thereby helping to reduce the potential for obtrusive light.
- 7.2.4 Where luminaires are installed close to the **Application Site** boundaries, the designer shall ensure that luminaires are orientated away from the boundary, especially on the north side of the site, where light could affect train drivers on the adjacent Liverpool to Warrington railway line.
- 7.2.5 Lighting shall be adaptive to the volume of vehicular and pedestrian traffic movement within the car park. Where static lighting is used, the equipment shall have an automatic control system to ensure it is switched on and off in conjunction with sunrise & sunset. The luminaires shall be manually switched on or off in accordance with the volume of traffic within the car park.
- 7.2.6 Security lighting requires some vertical illuminance in order to help CCTV cameras reproduce detail to a good standard. Security lighting should be carefully designed to ensure that vertical illuminance does not fall outside of the required areas.

8 Residual Effects Assessment

- 8.1.1 The effects associated with the lighting strategy would be minimised by the application of the mitigation measures outlined above. With the implementation of mitigation, it can be deduced that light intrusion into residential properties and the adjacent hotel will be minimal.
- 8.1.2 The mitigation applied specifically to security and loading bay lighting will be effective for reducing obtrusive light, so it is important that these measures are followed.
- 8.1.3 The application of the above mitigation measures would ensure that light intrusion, light source intensity (glare) and upward light onto surrounding receptors is minimised, resulting in the residual effects detailed in **Table 8**.

Table 8 Significance of Effects (after mitigation)

Environmental Effect	Sensitivity of Receptor	Impact Magnitude	Nature of Impact Permanent / Temporary	Residual Effects
Construction				
Direct Source Luminance or Glare	Medium	Low	Temporary	Moderate / Minor
Sky Glow or Upward Light	Low	Low	Temporary	Minor
Disability Glare	Low	Low	Temporary	Minor
Light Intrusion	Medium	Low	Temporary	Moderate / Minor
Operation				
Direct Source Luminance or Glare	Medium	Low	Permanent	Moderate / Minor
Sky Glow or Upward Light	Low	Low	Permanent	Minor
Disability Glare	Low	Low	Permanent	Minor
Light Intrusion	Low	Low	Permanent	Negligible

9 Conclusions

9.1 Introduction

- 9.1.1 This report addresses the effects resulting from artificial lighting generated by the **Proposed Development** on the **Application Site** and its surroundings. It assesses the potential effects from obtrusive light associated with the interior and exterior lighting design for the **Proposed Development**. The principal objective is to assess likely significant residual effects.

9.2 Baseline Conditions

- 9.2.1 The **Application Site** is within a suburban environment that is populated with industry units. As such the area is adjudged to be an E3 Environmental Zone. Due to the existing artificial light installed within the boundaries of the site and the surrounding environment, the area has a medium level of ambient luminance. Lighting within the **Application Site** is currently provided by temporary portable flood lighting.

9.3 Likely Significant Effects

- 9.3.1 The requirement for artificial lighting to support the **Proposed Development** means that there could be some potential effects caused by some parts of the required lighting including Light Spill (from windows), Direct Source Luminance or Glare (onto receptor views) and sky glow or upward light.

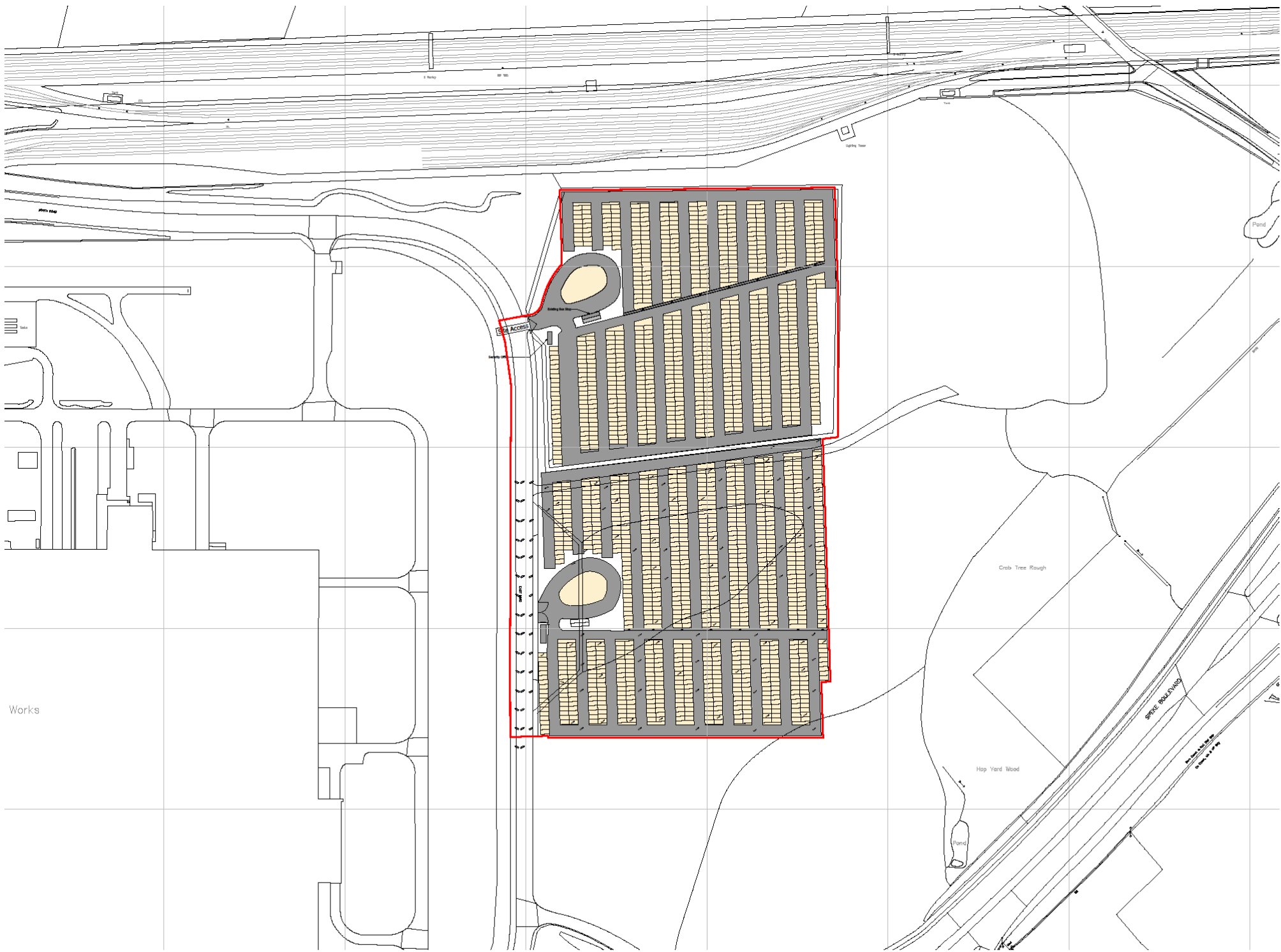
9.4 Mitigation and Enhancement

- 9.4.1 The result of incorporating the mitigations identified in section will be to reduce the significance of the potential effects to ensure that the effects are **Minor to Negligible**.

9.5 Conclusion

- 9.5.1 The residual effects following suitable mitigation from the artificial lighting installed at the **Proposed Development** are assessed to be **Minor to Negligible** significance, given the lighting strategy and the baseline conditions discovered on site during the lighting impact assessment.

10 Appendix 1 – Area Plan



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DRAFT

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Client			
			
Project			
JLR, Halewood			
19/20 MY Programme			
(SAP: L.16.551.192.100)			
Title			

Job No	1516-0353
Drawing No	
Status	Rev
Scale	A1 Date
Project Leader	Drawn By
	Checked By
	Approved for Issue By

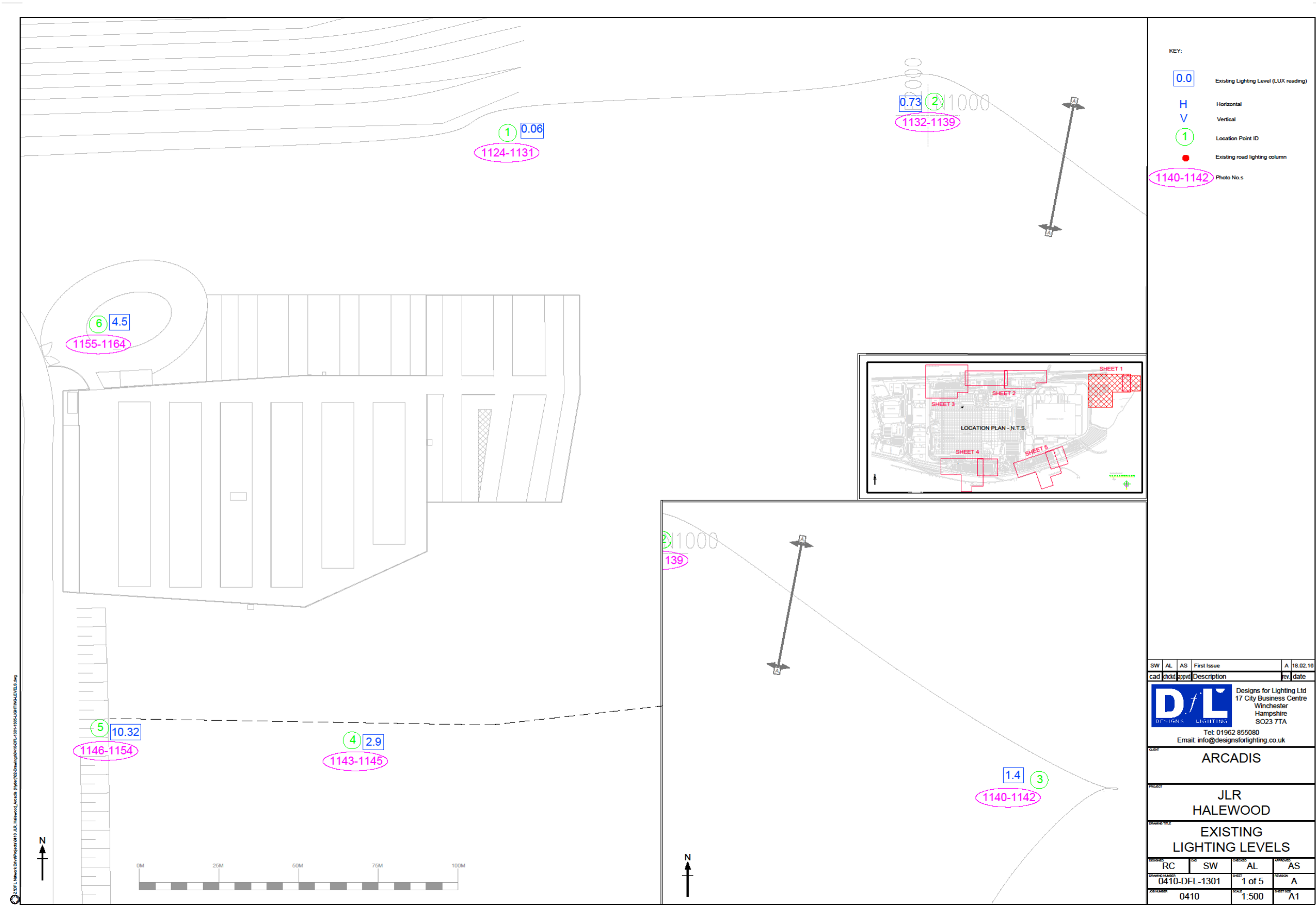
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11 Appendix 2- Study Area



12 Appendix 3- Measurement Locations & Results



13 Appendix 4: Viewpoint Images



Image Location 1 looking east.



Image location 2 looking north east.



Image location 3 looking west across the Application Site



Image location 4 looking south



Image location 4 looking north



Image location 5 looking north east



Image location 5 looking south east.



Image location 5n looking north



Image location 6 looking south west

14 Appendix 5- Receptor Locations



Key:

Location 1 – Aldersgate Drive —

Location 2- Railway line —