

EXTERIOR LIGHTING DESIGN AND IMPACT ASSESSMENT

on behalf of

ROCHDALE BOROUGH COUNCIL

for

**REDWOOD SPECIAL EDUCATIONAL NEEDS
HUB, LAND OFF HEYWOOD OLD ROAD,
MIDDLETON**

REPORT DATE: 9TH JULY 2026

REPORT NUMBER: LA103428

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Summary

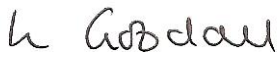
An exterior lighting design and associated light impact assessment have been prepared to accompany a planning application for Redwood Special Educational Needs Hub, Land off Heywood Old Road, Middleton. Lighting for the access road, car park, sensory courtyard and movement areas is required.

The site is located at the urban edge of Middleton and resides in Environmental Zone E2 'low district brightness. A lighting design has been prepared to demonstrate that the development meets the lighting requirements set in British Standards 5489-1:2020 (Design of Road Lighting) and 13201-2:2015 (Road Lighting Performance Requirements), 12464-2:2024 (Lighting of Outdoor Work Places) and 8300-1:2018 (Design of an accessible and inclusive built environment). Details of the lighting design, positioning of luminaires and illuminance (lux) contour plots are provided.

Illuminance light spill contour plots and an impact assessment have been completed, including consideration of vertical lux level impacts at surrounding sensitive receptors. Various best practices and embedded design mitigation measures have been included during the design process to control light and reduce levels of light spill.

The assessment demonstrates that the lighting design is appropriate and predicts insignificant effects on the surrounding environment and sensitive receptors associated with the proposed external lighting.

There is, therefore, no reason for this application to be refused on the grounds of lighting.

Prepared By	Philip Walton	Reviewed By	Lesley Goodall
Signed		Signed	
Date	9th July 2026	Date	9th July 2026
Version	Date	Change	Initials
1	3 rd March 2026	First issue	PW
2	9th July 2026	Minor text update following review	PW

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1 Introduction

- 1.1 Miller Goodall Ltd has been instructed to prepare an exterior lighting design and impact assessment to accompany a planning application for Redwood Special Educational Needs Hub, Land off Heywood Old Road, Middleton. The site lies within the administrative boundary of Rochdale Borough Council (RBC).
- 1.2 Lighting for the access road, car parks and movement areas is required. Best practice design and mitigation have been incorporated into the exterior lighting design. This includes the selection of appropriate luminaires and optics, the heights and placement positions. Measures to reduce obtrusive light and pollution are inherent to the design, meeting the requirements of the Institution of Lighting Professionals (ILP) GNI ^[1] and the British Standards Institution.
- 1.3 The lighting design has been modelled using the industry-adopted and widely used 2D lighting software Lighting Reality. The Reality Outdoor package has been used as it is suited for area design. Drawings, illuminance contour plots and the impact assessment support the design.
- 1.4 A lighting impact assessment has been undertaken, which provides a baseline review of current lighting at the development site, and an assessment of the potential lighting impacts associated with the development on nearby sensitive receptors. The assessment has been prepared in accordance with guidance issued by the Institution of Lighting Professionals and British Standards Institution.

2 Site Description

- 2.1 The site is located on unlit open land approximately 2.1 km to the northwest of Middleton at the urban edge. The site lies in the grounds of Edgar Wood Academy, built in 2022.
- 2.2 A copse of trees and Whittle Brook border the site to the north, with dwellings and a residential development currently under construction located beyond. Open land borders the site to the east, with dwellings located beyond. The external school grounds of Edgar Wood Academy border the site to the south, with the school beyond. Dwellings and Heywood Old Road border the site to the west, with dwellings and open land located beyond. The site location is shown in **Appendix A**.

¹ Institution of Lighting Professionals, 2021. Guidance Note 01 The Reduction of Obtrusive Light.

3 Proposed Development

- 3.1 The development involves the construction of a Special Educational Needs and Disabilities school (SEND school). The layout includes the school building, 64 car parking spaces, 12 space minibus drop off, a multi-use games area (MUGA), landscaping and a nature walk. Site access is off Heywood Old Road, and it will utilise the existing Edgar Wood Academy junction and access.
- 3.2 The vehicle access road, car parking, sensory yard and movement areas around the exterior of the building require lighting. The nature walk route and the MUGA are unlit.

4 Policy Context

4.1 National Planning Policy Framework

- 4.1.1 Paragraph 198 of the National Planning Policy Framework² 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.”

4.2 Planning Practice Guidance

- 4.2.1 Planning Practice Guidance (PPG) includes guidance on light pollution³. The PPG discusses when and where lighting is needed and important matters to consider in the design, such as dark sky areas and avoiding light pollution. The guidance emphasises ‘it is important to get the right light, in the right place and for it to be used at the right time’. This three-Rs phrase is often adopted in the lighting industry as the basis of good design practices.
- 4.2.2 The PPG is organised by a series of questions and answers, in addition to open-ended questions that encourage the developer and lighting designer to contemplate the design and lighting needs.

² Ministry of Housing, Communities & Local Government, 2024. National Planning Policy Framework.

³ Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government, 2019. Planning Practice Guidance, Light Pollution.

The PPG continues by outlining good practices such as limiting upward light spill and selecting appropriate luminaire for the task.

4.3 Institution of Lighting Professionals

Guidance Note 1, The Reduction of Obtrusive Light

- 4.3.1 The Institution of Lighting Professionals (ILP) GNI ^[1] provides methodologies to reduce the adverse effects of artificial light. The document identifies best practice installation and designs to limit the environmental effects of poor lighting that may lead to adverse levels of light spill, sky glow and glare to surrounding sensitive uses.
- 4.3.2 Different environments may be more tolerant of light than others. The ILP has created a series of Environmental Zone (EZ) definitions that comprise limits for pre- and post-curfew⁴. The EZ and illuminance (lux) levels for intrusion into windows (such as dwellings) are provided in **Table 1**.

Table 1: Environmental Zones

Environmental Zone & Definition	Light Intrusion (into windows) Ev (lux)	
	Pre-curfew	Post-curfew
E0: Dark sky parks, UNESCO Starlight Reserves	0	0
E1: Intrinsically dark landscapes. Examples: National Park, Areas of Outstanding Beauty	2	(1*)
E2: Low district brightness. Examples: rural, small village, relatively dark urban location	5	1
E3: Medium district brightness. Examples: small town centres or urban locations	10	2
E4: High district brightness areas. Examples: town/city centres with high night-time activity levels	25	5
Ev: Vertical illuminance		
*Permitted only from the public road light installation		
The EZ table also includes levels for sky glow, luminaire intensity (luminance) and building luminance. Sky glow, luminance and glare can be controlled through the luminaire selection and design.		
Example levels of lux include: daytime (50,000), overcast sky (5,000), sport (300), street lighting (5 to 20), full moon (0.25 to 1)		

⁴ The guide does not define a specific curfew. 23:00 to 07:00 is often taken to be curfew, which corresponds to other planning and environmental disciplines such as acoustics, and sleeping patterns of humans. A stricter curfew may apply, such as dark sky.

Professional Lighting Guide 4, Guidance on Undertaking Environmental Lighting Impact Assessments

4.3.3 ILP Professional Lighting Guide (PLG) 04 ^[5] is the industry standard document outlining the approach, content recommendations and general advice and mitigation for completing lighting impact assessments in the UK. The aim of this guidance is to outline best practice measures in lighting design and provide practical guidance on the production and assessment of lighting impacts within new developments.

4.3.4 A key requirement of the guidance is that obtrusive light impact assessment must be modelled using a maintenance factor of 1.0 in the design and results. This ensures the scheme is assessed to the full lumen output at installation, representing worst-case exposure to sensitive receptors when lumen output is at the maximum at installation, rather than the lumen output representing the design level after degradation has occurred over time.

Guidance Note 8, Bats and Artificial Lighting in the UK

4.3.5 ILP Guidance Note (GN)8 ^[6] is the only comprehensive guidance document available for assessing the potential impact on bats from artificial lighting. The document provides a comprehensive guide to how lighting impacts bats and mitigation to resolve potential issues. The guidance is clear that whilst it is the lighting designer's role to demonstrate lighting designs and minimise potential impact, the actual impact and significance to the bats should be dealt with by a professionally qualified ecologist.

4.3.6 A keynote of the guidance alludes to prevention, followed by mitigation. For example, does the area need lighting, and if so, how is it mitigated?

4.3.7 Different species of bats are impacted to different levels. There are no specific lux level thresholds for impact on bats. Bats are particularly impacted by a light source wavelength, with the 'blue' waves being the most impactful. Colour temperatures of 2700 K or 3000 K are recommended. Where feasible, it is best practice to reduce lux levels to less than 1.

4.3.8 It is not known if bats reside around the site. However, Whittle Brook is identified as an ecologically sensitive area that would benefit from not receiving excessive light spill.

⁵ Institution of Lighting Professionals, 2013. Professional Lighting Guide 4, Guidance on Undertaking Environmental Lighting Impact Assessments.

⁶ Institution of Lighting Professionals, 2023. Guidance Note 8, Bats and Artificial Lighting in the UK

- 4.3.9 The guidance states that vertical grids should be assessed above ground level, as bats would not reside at the ground. Therefore, vertical grids commence from 1 m above ground level, per industry best practice. The 2023 update of the guidance provides additional information on lux levels:

"It is acknowledged that, especially for vertical calculation planes, very low levels of light (<0.5 lux) may occur even at considerable distances from the source if there is little intervening attenuation. It is therefore very difficult to demonstrate 'complete darkness' or a 'complete absence of illumination' on vertical planes where some form of lighting is proposed on site, despite efforts to reduce them as far as possible and where horizontal plane illuminance levels are zero.

Consequently, where 'complete darkness' on a feature or buffer is required, it may be appropriate to consider this to be where illuminance is at or below 0.2 lux on the horizontal plane, and at or below 0.4 lux on the vertical plane. These figures are still lower than what may be expected on a moonlit night and are in line with research findings for the illuminance found at hedgerows used by lesser horseshoe bats, a species well known for its light adverse behaviour⁷."

- 4.3.10 Whilst it is unknown if bats are present, the ILP guidance presents the only lux limits in relation to ecology. Reference to the lux limits is made, but the ecologist will define whether it is significant, or not.

4.4 British Standards Institution Guidance

- 4.4.1 The British Standards Institution (BSI) has issued British Standard (BS) documents for lighting. Several BS documents provide luminance and illuminance levels for a variety of situations and scenarios in relation to lighting needs and use, which are guidance only.
- 4.4.2 The BS documents provide a general 'guide-to' for all aspects of lighting, such as best practice, lighting standards and other aspects, but not inclusive, such as risk assessments, colour temperature, glare control and design of lighting installations. The guidance contains lighting standards for commercial uses, including horizontal average illuminance (lux), minimum lux maintained and uniformity percentages across the lit areas and uses.

⁷ Stone, E.L., Jones, G., Harris, S. (2012). *Conserving energy at a cost to biodiversity? Impacts of LED lighting on bats*. Glob. Change Biol. 18, 2458–2465

- 4.4.3** BS 5489-1:2020 (Design of Road Lighting) and BS 13201-2:2015 (Performance Requirements) ^[8, 9] provide recommendations for street lighting standards. BS 5489 defines the overall principles of street lighting designs, and BS 13201 outlines specific performance requirements for the relevant classes of usage. These documents are relevant to this project as street lighting and pedestrian movement lighting are proposed.
- 4.4.4** BS 8300-1:2018 (Design of an accessible and inclusive built environment. External environment – code of practice)¹⁰ includes lighting standards for a variety of tasks that may be applicable to the creation of an inclusive environment, such as bus stops, stairways, footbridges, ramps, among others. Reference to this guidance is included. Many tasks in 8300 use the same standard listed in BS 5489.
- 4.4.5** BS 5489 and 8300 both include lighting levels for car parks. However, they direct the user to the car park standards defined in BS 12464. BS 12464-2:2024 (lighting of outdoor workplaces)¹¹ contains lighting standards for various commercial applications and tasks. The standards for car parks are relevant to this assessment.

5 Methodology

5.1 Consultation

- 5.1.1** The proposed lighting assessment methodology was provided to David Hughes (Senior Engineer) and the Environmental Health Department of RBC¹² for their review.
- 5.1.2** David Hughes provided agreement to the methodology. It was agreed that an exterior lighting design and impact assessment would be undertaken for the development. The methodology includes a baseline review of existing lighting, identification of tasks to be lit and standards to be applied, identification of sensitive receptors and relevant ILP and BS standards to be used. Environmental Health did not reply.

⁸ British Standards Institution, 2020. BS EN 5489-1:2020 Design of Road Lighting, Part 1 Lighting of Roads and Public Amenity Spaces – Code of Practice

⁹ British Standards Institution, 2014. BS EN 13201-2:2015 Road Lighting, Part 2: Performance Requirements

¹⁰ British Standards Institution, 2018. BS EN 8303-1:2018 Design of an accessible and inclusive built environment. External environment – code of practice

¹¹ British Standards Institution, 2024. BS EN 12464-2:2024 Light and Lighting – Lighting of Work Places, Part 2: Outdoor Work Places

¹² Email Miller Goodall Ltd. to RBC, 12th January 2026. An email reply from RBC was received on the same day.

- 5.1.3 Mr Hughes also confirmed that RBC's preferred manufacturer is Dextra Group. RBC will manage the installation and maintenance post-planning. Miller Goodall Ltd has communicated with Dextra Group to obtain relevant modelling files and product details.

5.2 Model and Assessment Approach

- 5.2.1 The lighting design has been modelled using Lighting Reality and its software package, Reality Outdoor (v2.3.1).
- 5.2.2 The potential impact on surrounding sensitive human and ecological receptors has been assessed by preparing a series of horizontal and vertical illuminance plots.
- 5.2.3 The design includes calculated maintenance factors to ensure that the correct lighting levels are maintained for the installation's lifespan. An impact assessment is then completed by applying a 1.0 maintenance factor, per the requirements of the ILP PLG4 Guidance⁵.

5.3 Environmental Zone

- 5.3.1 The site is located at the urban edge of Middleton with a mix of open land and street lighting. The site setting is determined to reside within EZ E2 *low district brightness, Examples: rural, small village, relatively dark urban location*.

5.4 Lighting Requirements

- 5.4.1 The nature walk route and MUGA will be unlit. Lighting is required for three tasks:
- The access road and a new T-junction from the existing access serving Edgar Wood Academy.
 - The car park.
 - Movement areas, including paths along the road, car park and for the building exterior and doorways, and a sensory courtyard in the centre.

- 5.4.2 **Table 2** shows the lighting standards applied and designed for.

Table 2: Relevant Lighting Requirements for this Assessment

Type of Area, task or activity	Maintained Illuminance ($\bar{E}_m$, lx)	Minimum Illuminance (E_{min} , lux)	Min Illuminance Uniformity	Min colour rendering index (R_a)	Applied at / British Standard
'Heavy Traffic' Car Park	20	–	0.25 (25%)	70	Car park / BS5489, 8300, 12464
P4 Class	5.00 – 7.50	1.00	–	70	Vehicle access, movement areas / BS 5489, 13201, 8300

5.4.3 SEND pupils require additional needs when entering and exiting a vehicle, and tasks may be more intricate (such as unfolding wheelchairs). For these reasons, the 'heavy traffic' car park lighting standard has been applied, offering additional illumination. A P4 (Pedestrian Class 4, defined in BS5489, 13201) is concluded for the main access route. Both of these lighting standards are also recommended in BS 8300-1.

5.5 Sensitive Receptors

5.5.1 Lux predictions have been assessed at three existing sensitive receptors (ESR); three human ESR and one ecological ESR, Whittle Brook to the north and northwest of the site. The land at the brook has potential ecological value, therefore, lux predictions along the brook are included to ensure a robust assessment. Environmental Engineering Partnership Ltd are the appointed ecologist. **Appendix A** shows the ESR grid positions. **Table 3** shows the locations of sensitive receptors considered in this assessment, selected as worst-case positions nearest to the lit areas.

Table 3: Sensitive Receptors

Receptor	Location and Description*	Coordinates*		Receptor Type
		X	Y	
ESR 1	Heywood Old Rd Dwellings	385121	407573	Human
ESR 2	Whittle Rise Dwellings	385247	407628	Human
ESR 3	Knight Cres Dwellings	385472	407517	Human
ESR 4	Whittle Brook	385188	407594	Ecology
ESR 5	Environment, Sky Glow	N/A		Environment
*grid reference and dwelling number represent a central location along the vertical grid line.				

5.6 Impact Criteria

5.6.1 The assessment includes lux predictions at the ground-floor (1.5 m window height) and the first floor (4 m window height) windows for vertical lux. Vertical lux intrusion at human ESR has been compared to the pre-curfew lux limits listed in **Table 1** for EZ E2 with maintenance factor 1.0. There is no lighting use during the post-curfew period, and the stricter lux limits do not require further assessment.

5.6.2 ILP bat guidance⁶ identifies a lux target. A lower limit target is listed, which applies to the most highly sensitive bat species and 'complete darkness'. It should be noted that other species may be more tolerant of light, or the bats' activity may differ in the lit area (for example, foraging, roosting, flight paths). It is not known if bats are present, but the ILP limits are the only ones available for ecology. A comparison and qualitative discussion of the two criteria below is provided. The appointed ecologist advises whether the impact is, or is not, significant in their report:

- Horizontal plane: 0.2 average lux contour.
- Vertical plane: 0.4 maximum lux.

5.7 Model Limitations and Assumptions

5.7.1 The light model does not take into account intervening vegetation, retaining walls, buildings or obstructions. Obstruction to light spill is, therefore, not accounted for in model outputs.

5.7.2 Topography is not included in the model; model predictions are based on a flat land profile.

- 5.7.3 Heywood Old Road and the access to Edgar Wood Academy are lit with streetlights. The topography survey has mapped the column positions around the development site's new T-junction access. There are two existing columns on each side of the new access road, on the north side. The light spill from these existing luminaires is an important inclusion in the lighting design to ensure a suitable comparison to the light standard and to avoid adding unnecessary columns.
- 5.7.4 The specific luminaire brand of the existing infrastructure is not known, but to provide an approximation of the potential existing light spill, the Dextra Group's Opus Column (the same used in the proposed lighting design) has been used for the existing luminaires. A separate code/colour is used in the design for these existing luminaires to differentiate existing and proposed luminaires.

6 Baseline Assessment

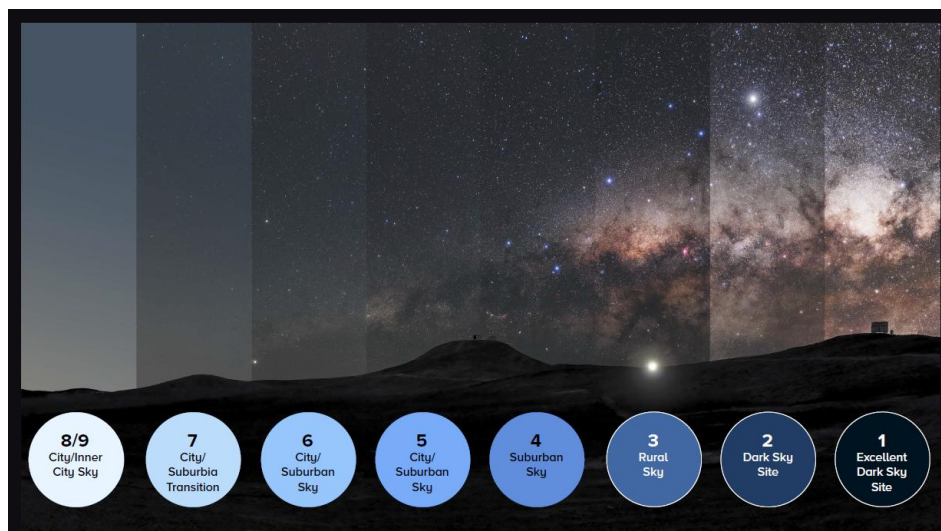
6.1 Environment and Existing Light

- 6.1.1 The site is currently an unlit field. However, the surrounding area is undergoing development. Edgar Wood Academy was built in 2022 and includes task areas, including access and car parks. An under-construction residential development, known as Whittle Rise, is located to the north, immediately beyond and adjacent to Whittle Brook. These uses are and will be lit using street light columns. The proposed development will be a continuation of the lit area using street light columns, occupying the space between the Academy and Whittle Rise.
- 6.1.2 Streetlighting is also present in the immediate surroundings of the site, consisting of Knight Crescent to the east and Heywood Old Road to the west. There are locations of unlit land, such as Bowlee Park to the southeast and the unlit fields south of the Academy.
- 6.1.3 The M62 Birch motorway services area (MSA) lies approximately 260 m to the northwest of the site. The MSA and the M62 passing it are extensively lit. The MSA includes several high mast columns holding up to 8 luminaires each.
- 6.1.4 In summary, the mixed-use local area is lit by street lighting. The land is the subject of ongoing development for school facilities, extending north from Edgar Wood Academy.

6.2 Sky Glow

6.2.1 The site is located at the urban edge of several urban settlements in the Greater Manchester region. The Light Pollution Map¹³ provides Geographic Information System (GIS) sky brightness values (sky quality meters mag/arcsec²), with comparisons of the Bortle Scale. The Bortle Scale is a 9-category classification of sky quality, based on the numerical values of sky brightness, shown in **Figure 1**.

Figure 1: Bortle Zone Sky Brightness Classification¹⁴

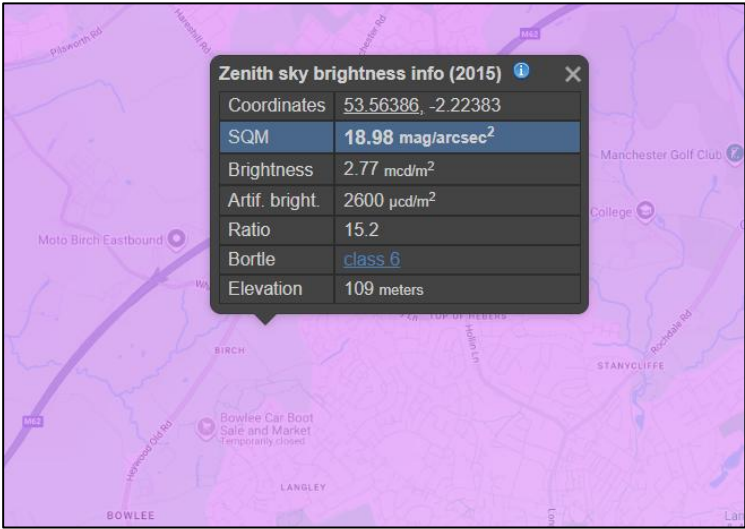


6.2.2 **Figure 2** shows the site's estimated sky quality index, 'Bortle Zone 6', corresponding to a 'city/suburban sky' rating. The local area includes a noticeable amount of existing light that obscures the natural sky.

¹³ Light Pollution Map. Available at: <https://www.lightpollutionmap.info/>

¹⁴ Image credit: Welsh Government, 2025. Good Practice Guidance: Planning for the Conservation and Enhancement of Dark Skies in Wales

Figure 2: Sky Brightness Details of the Proposed Development Site



7 Lighting Design

7.1 Equipment and Design Detail

- 7.1.1 If the development is granted planning permission, RBC will take ownership, install and maintain the lighting installation. Local authorities manage a vast network of luminaires, and to avoid waste and procurement complications, they often use a preferred manufacturer and product. This allows timely installation and maintenance as the firm is familiar with their needs, as well as allowing a backstock of products that can be kept for emergencies and deployed promptly.
- 7.1.2 RBC’s Highways Department has identified the Dextra Group as its preferred manufacturer and, thus, the product range from this manufacturer has been used in the lighting design. It is also assumed that the columns, controls and other associated infrastructure will be sourced from Dextra Group. Dextra Group have provided modelling files, as well as general advice on their products. This collaboration process will benefit a speedy procurement process, as they have the preferred lighting design on file.
- 7.1.3 Three products are used in the design:

Opus Column: these luminaires will be installed on root-mounted, steel galvanised post-top columns. Two Opus specifications are included, one for the access road and one in the car park, which reflect the different lighting standards of the two tasks. The access road columns are 8 m high with 29 m spacing on a single side arrangement (on the north side of the proposed road at the rear of the path). The car park columns are 6 m high. This is a similar setup to the existing installation at Edgar Wood Academy.

- Opus Wall: these luminaires are installed around the building façade (all sides) to aid pedestrian movement. They are positioned 2.7 m above ground level. The luminaires are placed on walls, primarily outside doors and between window positions. The positions have been selected with careful reference to the architecture drawings.
- Opus 360°: two of these luminaires are installed on root-mounted, steel galvanised post-top columns in the sensory courtyard. These luminaires provide more visual appeal, and will benefit the architectural vision to be achieved in the sensory space i.e. calming and pleasant.

7.1.4 Key details of the product and design include:

- Colour temperature: 3000 Kelvin
- Ingress Protection (IP): IP65.
- Impact Rating (IK): IK08 (Opus 360), IK09 (Opus Column), IK10 (Opus Wall).
- Colour Rendering Index (CRI): >70.
- All luminaires are installed on the horizontal plane, with a 0° tilt. All three products achieve excellent upward light control.
- All products are manufactured in the United Kingdom.

7.1.5 **Table 4** details the lighting design equipment inventory.

Table 4: Equipment Inventory

Product	Type & Optic	Lumen Output (flux klm)	Wattage (w)	Quantity	Image
Opus Column (8 m)	Post-top, Open Area	3.75	25.1	9	
Opus Column (6 m)	Post-top, Open Area	8.58	56.4	17	
Opus Wall	Post-top, Asymmetrical	0.81	7.7	24	

Product	Type & Optic	Lumen Output (flux klm)	Wattage (w)	Quantity	Image
Opus 360°	Post-top, Open Area	7.08	60.6	2	

7.2 Maintenance Factor

7.2.1 During the lifespan of a luminaire, the lumen output naturally degrades, becomes obscured by dirt, and suffers light loss. This is accounted for in the design by applying a maintenance factor (MF), which prepares the design to ensure the end-of-life lighting level is met, to account for this degradation. An adverse effect of this procedure is that the calculated MF is the design level after degradation has occurred. Consequently, the lumen output on day one of installation is higher as no degradation of the product has yet to occur.

7.2.2 The maintenance factor (f_m) is calculated by multiplying four parameters: the luminous flux factor (f_{lf}), survival factor (f_s), luminaire maintenance factor (f_{lm}) and surface maintenance factor (f_{sm}). The surface maintenance factor is for interior luminaires only; a value of 1 is applied for exterior luminaires. A description of the three relevant parameters is provided below:

- Luminous Flux Factor (f_{lf}): This value is obtained from the manufacturer’s datasheet. The value is typically displayed as median useful life L##, which is the length of time during which 50% of a population of operating LED-based luminaires of the same type have flux degraded to less than their initial luminous flux.
- Survival Factor (f_s): this describes the replacement of luminaires after they have failed. If the luminaires are replaced immediately, then a factor of 1 can be assumed. However, the ILP GN11/20 ^[15] proposes a standard value of 0.97, which represents a 3% failure rate of LED.
- Luminaire Maintenance Factor (f_{lm}): This represents the dirt build-up and other deterioration factors of the optic surface/material during the installation lifespan. Luminaire maintenance factors are defined in Annex C of BS 5489-1:2020. This parameter selection depends on whether the column height is above or below 6 m, the EZ and the cleaning schedule.

¹⁵ Institution of Lighting Professionals, 2020. Guidance Note 11, Maintenance Factor Determination of LED Luminaires

7.2.3 As the installation includes luminaires above and below 6 m, two factors are derived. The calculated maintenance factor and the one applied to the lighting design are provided in **Table 5**.

Table 5: Maintenance Factor Calculation for the Proposed Lighting

Parameter	Data Source	Value
Luminous flux factor (f_{LF})	Opus Column, Opus Wall, Opus 360	0.90
Survival factor (f_s)	ILP GN 11	0.97
Luminaire maintenance factor (f_{LM})	Taken from BS 5489-1:2020 Annex C	>6 m height, EZ E2, 72 month clean: 0.92 ≤6 m height, EZ E2, 72 month clean: 0.92
Calculation: $f_{LF} * f_s * f_{LM}$		>6m: $0.90 * 0.97 * 0.92$ ≤6 m: $0.90 * 0.97 * 0.92$
Maintenance Factor (f_m) – Final Value		>6m: 0.80 ≤6 m: 0.80

7.2.4 The ILP⁵ recommends that MF 1.0 be set to assess the potential impact on surrounding sensitive receptors, ensuring the light spill is assessed under worst-case conditions, representing day-one installation lighting levels.

7.2.5 The lighting design is initially prepared using a calculated MF and then revised to MF 1.0 for the impact assessment.

7.3 Wattage

7.3.1 The total power requirement of the design (**Table 4**) is 1,490.7 watts (1.49 kW). This assumes full operation at installation. No revisions are made for switch-off or dimming.

8 Lighting Reality Model Results

- 8.1 The Reality Outdoor output report provides equipment selections, optic images, positions and results for each calculation grid and area of use/task, shown in **Appendix B**. An AutoCAD horizontal lux contour plot and details of the design are provided in **Appendix C**.
- 8.2 **Table 6** provides a summary of the design levels achieved.

Table 6: Lighting Model Design Results

Task	Targets	Design/Result Achieved
P4 class – Junction	5.00 – 7.50 average lux, minimum 1.00 lux	Average Horizontal Lux: 7.91 Minimum: 3.97
P4 class – Access Route	5.00 – 7.50 average lux, minimum 1.00 lux	Average Horizontal Lux: 7.06 Minimum: 3.64
Car park	Average Horizontal Lux: 20 Uniformity: 0.25 (25%)	Average Horizontal Lux: 26.4 Uniformity: 0.25 (25%)
P4 Class – Pathways (East and North Facade)	P4: 5.00 – 7.50 average lux, minimum 1.00 lux	Average Horizontal Lux: 12.08 Minimum: 0.72
P4 Class – Pathways (North and West Facade)	P4: 5.00 – 7.50 average lux, minimum 1.00 lux	Average Horizontal Lux: 11.43 Minimum: 0.68

- 8.3 The design levels are met in the task area.
- 8.4 The building exterior is marginally below the minimum lux level; however, the lighting is more than sufficient in the immediate areas around the doors and canopy usage areas. Luminaires have been placed at available positions, between windows and other infrastructure. All door positions are served by a wall luminaire.

9 Impact Assessment

- 9.1 The results presented are for a typical switched-on operation. Lighting is switched off overnight; therefore, the post-curfew ILP limits¹ do not require consideration. All results and impact analysis presented are based on MF1.0.

Horizontal Lux – Human and Ecological Receptors

- 9.2 The horizontal average lux contour plot is shown in **Appendix C**. The horizontal lux at the human ESR (1 to 3) is effectively zero and mostly zero at the ecological ESR (4). The 0.2 lux marginally crosses the Whittle Brook vertical grid position, but this is associated with back spill from a single luminaire (ID 10A see Appendix C). The exceedance only occurs along a 20 m length, where the proposed road curves towards the car park opposite the new residential development at Whittle Rise.
- 9.3 Beyond the 0.2 lux line, the light contribution is effectively zero. The natural distances between proposed lighting and receptors are sufficient to ensure receptors are not impacted by light spill, without further mitigation.
- 9.4 The potential lux impact is, therefore, considered to be negligible.

Vertical Lux – Human Receptors

- 9.5 The assessment has predicted vertical lux at three human ESR for the first and second floor sensitive rooms. The results of the assessment are shown in **Table 7**.

Table 7: Vertical Lux Results at ESR Positions, Proposed Lighting

Receptor	EZ E2 Pre-curfew Limit (Lux)	ESR Vertical Lux, Height		Impact
		1.5 m	4 m	
ESR 1: Dwellings at Heywood Old Road	5	0.16	0.1	No Exceedance
ESR 2: Dwellings at Whittle Rise	5	0.02	0	No Exceedance
ESR 3: Dwellings at Knight Crescent	5	0.02	0	No Exceedance

- 9.6 The potential lux impact on human receptors is negligible and not significant. There are no operational activities required during the post-curfew period.

Vertical Lux – Ecological Receptors

9.7 The assessment has predicted vertical lux at one ecological ESR. The results of the assessment are shown in **Table 8**.

Table 8: Vertical Lux Results at ecological ESR Positions, Proposed Lighting

Receptor	ILP 'Complete Darkness' target	Vertical Lux, Height		
		1 m	3 m	5 m
ESR 4: Whittle Brook	<0.4	0.61	0.3	0.0

9.8 The potential lux contributions along Whittle Brook are low, and the design ensures the ILP limits are not exceeded, without the exception of the small area that marginally exceeds (the same area described at the horizontal lux). Street lighting at the Whittle Rise development is likely to be in closer proximity to Whittle Brook.

9.9 The requirements to include a sensitive lighting design are included as embedded mitigation from the outset of the design creation.

9.10 It is considered that the potential impact on ecology is negligible.

Sky Glow

9.11 Products used in the lighting scheme have very low upward light contributions. Sky glow contributions are controlled.

Glare

9.12 The Dextra Group products achieve a G1 rating for glare, per BS 13201. The risk of glare from the installation is insignificant.

10 Operational Control and Mitigation

10.1 Embedded mitigation has been incorporated into the creation of a light-sensitive design. No further mitigation for impact is required.

10.2 Lighting is required for school hours, and into the early evening for extracurricular activities and/or staff use. It is assumed, therefore, that lighting can be switched off overnight. Security lighting around the school building may be required, but this is insignificant in terms of a lighting impact.

- 10.3 As discussed, there is a marginal exceedance of the 'complete darkness' ILP limit in one area of Whittle Brook during standard operation. If the ecologist requires a resolution to this, a column backplate could be specified for column ID 10A; its position is shown in **Appendix C**. This would reduce backspill to below the ILP limit in the affected area. The other luminaires along the access road do not cause an exceedance due to the natural offset distance between the road and the brook.

11 Designers Risk Assessment

- 11.1 This lighting design has been prepared for a planning application. Specifics surrounding installation, connection and maintenance have yet to be defined.
- 11.2 In accordance with the Construction Design and Management Regulations 2015, the following assumptions and considerations should be noted. The Institution of Lighting Professionals has also published Guidance Note 4 (2016) '*CDM 2015 Overview*' to aid this process.
- The design and output calculations are based on the products used, presented in **Appendix B** and **Appendix C**. Any revisions to this may alter the final lighting profile and should be accounted for in a redesign.
 - The design does not account for installation or electrical installation considerations, site conditions or provide an installation or maintenance risk assessment. Future maintenance needs have been accounted for in the design.
 - The contractor shall liaise with the District Network Operator (DNO) (UK Power Networks) and/or appointed electrical engineer to organise or action electrical amendments and connections. Competent person(s) certified to handle electrical installations shall install the equipment.
 - The contractor shall identify any overhead or underground obstacles or infrastructure that may pose risk or harm associated with the installation of the design before the physical installation (i.e. utility drawings). The contractor shall consult with relevant Bodies, as necessary, upon identifying any issues.
 - Wall luminaire positions and height were determined using the elevation and section drawings (pre-application) provided by Equilibrium Architects. These should be checked with the final drawings at the time of installation.
 - The design assumes there are no obstacles. Obstacles identified in the site layout plan have been accounted for in the design via column positions (for example, structures and existing and proposed vegetation).
 - Future maintenance should be carried out according to appropriate standards, health & safety procedures and the manufacturer's requirements/standards.

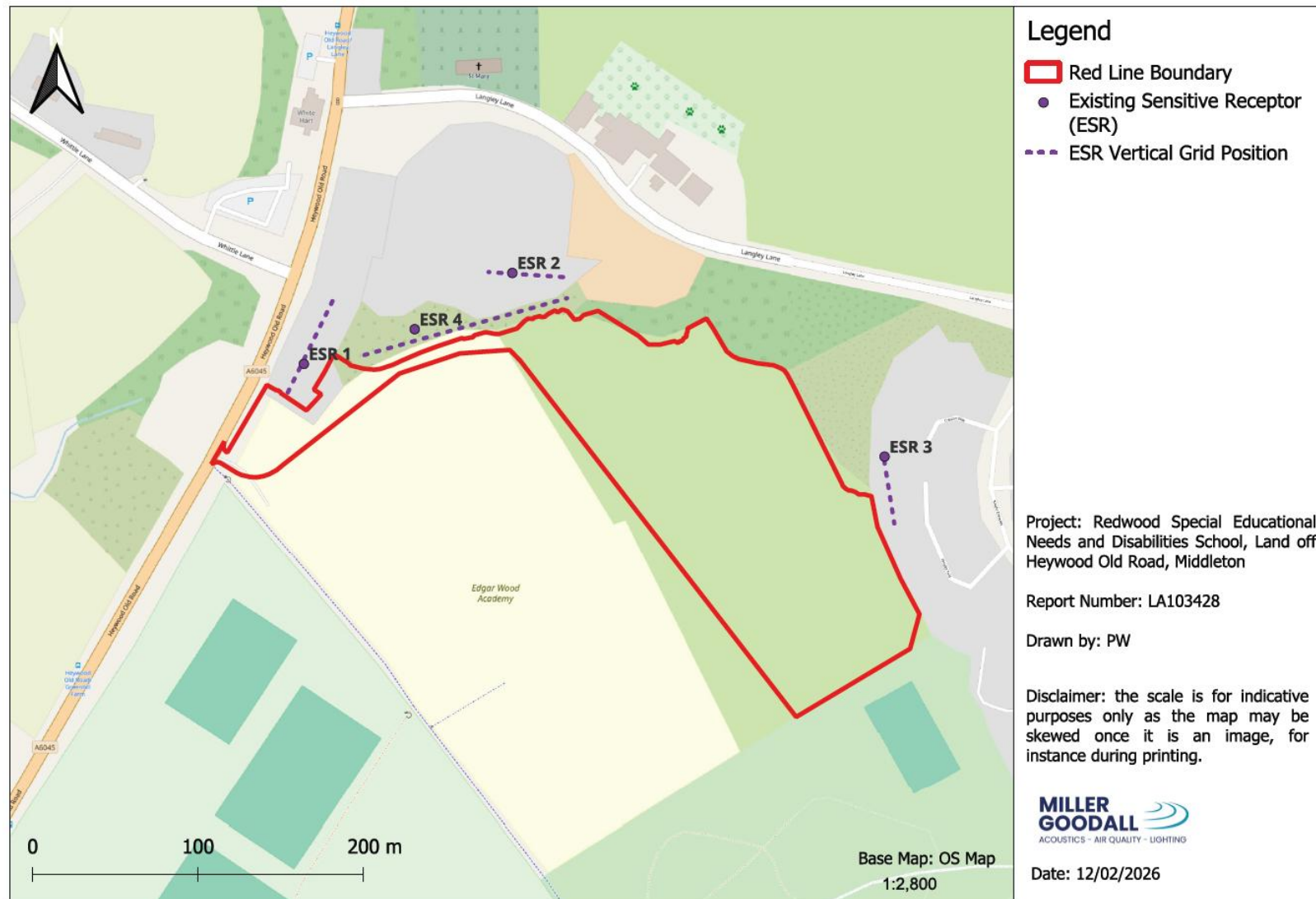
- The design does not include emergency lighting provisions. Any emergency lighting shall be designed to BS 5266 Emergency Lighting – Code of Practice by the appropriate involved party. Miller Goodall Ltd has positioned the Opus Wall at key points (such as doorway entrances). The Opus Wall can be specified with an emergency control option. Consequently, whilst an emergency is not designed for, consideration of placements and equipment is included to avoid the use of additional bulkheads at fire exit doors.

12 Conclusion and Summary

- 12.1 An exterior lighting design has been completed for the proposed Redwood Special Educational Needs Hub, Land off Heywood Old Road, Middleton.
- 12.2 The sensitive lighting design includes best practice measures and design procedures to reduce obtrusive light impacts, meeting the requirements of the Institution of Lighting Professionals guidance.
- 12.3 The assessment demonstrates an appropriate lighting design for the intended use. It indicates that there will be no impact on surrounding sensitive receptors and that the adverse effects on the surrounding environment are limited due to the inclusion of embedded mitigation and operational controls in the design creation.
- 12.4 There is no reason for the application to be refused on the grounds of lighting.

APPENDICES

Appendix A: Site Location and Receptors



Appendix B: Lighting Reality: Reality Outdoor, Design Output

DATE: 25 February 2026
DESIGNER: Miller Goodall Ltd
PROJECT No: LA103428
PROJECT NAME: Redwood SEND School, Middleton



Design drawn using AutoCAD File: ED0064-22 - Site Layout - Consultation

Lighting standards
Access Road & Movement Areas: P4 (BS5489, 13201, 8300)
Avg Lux: 5.00 to 7.50 / Minimum Lux: 1.00

Car Park: 'heavy traffic' (BS12464-2, 8300)
Avg Lux: 20 / Uniformity: 0.25

Exterior Lighting Design

Layout Report

General Data

Dimensions in Metres Angles in Degrees

Calculation Grids

ID	Grid Name	X	Y	X' Length	Y' Length	X' Spacing	Y' Spacing
1	Light Spill	385061.92	407442.94	374.62	172.31	1.50	1.50
2	Junction	385067.31	407508.23	51.96	32.77	1.48	1.49
3	Access Road	385100.26	407519.53	74.86	167.20	1.50	1.49
4	Car Park	385266.76	407554.28	103.65	56.23	1.48	1.48
5	Sensory Area	385347.90	407509.16	21.42	20.25	1.43	1.45
6	East & North (Movement Are...	385354.47	407486.55	34.52	60.00	1.44	1.46
7	North & West (Movement Are...	385349.42	407540.04	44.17	29.46	1.47	1.47
8	ESR 1 (Heywood Old Rd)	385106.94	407550.40	62.87	3.00	1.50	0.50
9	ESR 2 (Whittle Rise)	385231.79	407627.97	48.28	3.00	1.46	0.50
10	ESR 3 (Knight Cres)	385472.26	407525.30	25.99	3.00	1.44	0.50
11	Whittle Brook	385188.74	407592.70	93.69	4.00	1.49	0.50

Luminaires

Luminaire A Data

Supplier	
Type	OPUS COLUMN
Lamp(s)	LX 1605 X12 S8 C74 (Gen5)
LampFlux(klm)/Colour	3.75 3000/2
File Name	OPUCL L44 OA.LDT
Maintenance Factor	0.80
Imax70,80,90(cd/klm)	256.0, 14.7, 0.3
No. in Project	9

Luminaire B Data

Supplier	
Type	OPUS COLUMN
Lamp(s)	LX 1605 X12 S8 C74 (Gen5)
LampFlux(klm)/Colour	8.58 3000/2
File Name	OPUCL L102 OA.LDT
Maintenance Factor	0.80
Imax70,80,90(cd/klm)	256.0, 14.7, 0.3
No. in Project	17

Luminaire C Data

Supplier	
Type	OPUS WALLPACK LED
Lamp(s)	LX 1037 X3 S8 C74 GEN5
LampFlux(klm)/Colour	0.81 3000/2
File Name	OPUWP L10 AS.LDT
Maintenance Factor	0.80
Imax70,80,90(cd/klm)	150.4, 19.8, 11.6
No. in Project	24

Luminaire D Data

Supplier	
Type	OPUS 360
Lamp(s)	LX 160160X28 S8 74S
LampFlux(klm)/Colour	7.08 3000/2
File Name	OPU36 L100 OA.LDT
Maintenance Factor	0.80
Imax70,80,90(cd/klm)	129.4, 9.1, 3.2
No. in Project	2

Luminaires

Luminaire E Data - Existing Luminaires, included to aid junction light spill design

Supplier	
Type	OPUS COLUMN
Lamp(s)	LX 1605 X12 S8 C74 (Gen5)
LampFlux(klm)/Colour	3.75 4000/2
File Name	OPUCL L44 OA.LDT
Maintenance Factor	0.80
Imax70,80,90(cd/klm)	256.0, 14.7, 0.3
No. in Project	4

Layout

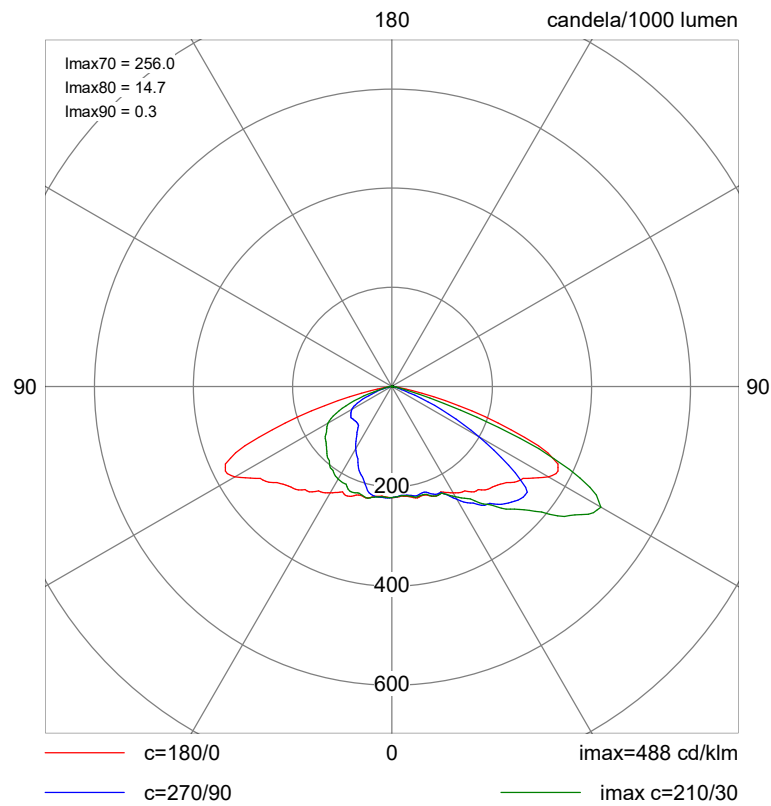
ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
1	E	385083.52	407516.10	8.00	236.00	0.00	0.00	0.50			
2	E	385082.65	407533.66	8.00	153.00	0.00	0.00	0.50			
3	E	385069.20	407510.38	8.00	153.00	0.00	0.00	0.50			
4	E	385109.89	407485.95	8.00	225.00	0.00	0.00	0.50			
5	A	385105.10	407520.06	8.00	308.00	0.00	0.00	0.50			
6	A	385127.77	407537.99	8.00	308.00	0.00	0.00	0.50			
7	A	385150.96	407555.41	8.00	305.00	0.00	0.00	0.50			
8	A	385201.92	407573.22	8.00	287.00	0.00	0.00	0.50			
9	A	385226.94	407580.33	8.00	287.00	0.00	0.00	0.50			
10	A	385254.30	407586.87	8.00	266.00	0.00	0.00	0.50			
11	B	385268.50	407553.55	6.00	40.00	0.00	0.00	0.50			
12	A	385271.34	407571.00	8.00	221.00	0.00	0.00	0.50			
13	B	385282.81	407535.65	6.00	40.00	0.00	0.00	0.50			
14	B	385317.22	407492.40	6.00	40.00	0.00	0.00	0.50			
15	B	385289.88	407557.28	6.00	220.00	0.00	0.00	0.50			
16	B	385302.15	407542.01	6.00	220.00	0.00	0.00	0.50			
17	B	385303.75	407509.31	6.00	40.00	0.00	0.00	0.50			
18	B	385334.61	407482.74	6.00	86.00	0.00	0.00	0.50			
19	B	385341.40	407503.91	6.00	6.00	0.00	0.00	0.50			
20	B	385321.90	407523.71	6.00	40.00	0.00	0.00	0.50			
21	B	385310.22	407537.55	6.00	309.00	0.00	0.00	0.50			
22	B	385341.97	407540.61	6.00	131.00	0.00	0.00	0.50			
23	C	385353.37	407537.67	2.70	131.00	0.00	0.00	0.15			
24	B	385327.12	407550.92	6.00	309.00	0.00	0.00	0.50			
25	B	385340.98	407527.46	6.00	220.00	0.00	0.00	0.50			
26	C	385359.72	407543.05	2.70	131.00	0.00	0.00	0.15			
27	B	385320.27	407507.40	6.00	223.00	0.00	0.00	0.50			
28	B	385333.08	407509.67	6.00	40.00	0.00	0.00	0.50			
29	D	385360.59	407498.28	5.00	273.00	0.00	0.00	0.00			
30	C	385369.70	407474.89	2.70	309.00	0.00	0.00	0.15			
31	C	385404.64	407499.82	2.70	309.00	0.00	0.00	0.15			
32	C	385397.75	407494.04	2.70	309.00	0.00	0.00	0.15			
33	C	385380.59	407484.08	2.70	309.00	0.00	0.00	0.15			
34	C	385375.02	407479.41	2.70	309.00	0.00	0.00	0.15			
35	C	385387.77	407490.14	2.70	309.00	0.00	0.00	0.15			
36	C	385392.87	407489.87	2.70	309.00	0.00	0.00	0.15			

Layout Continued

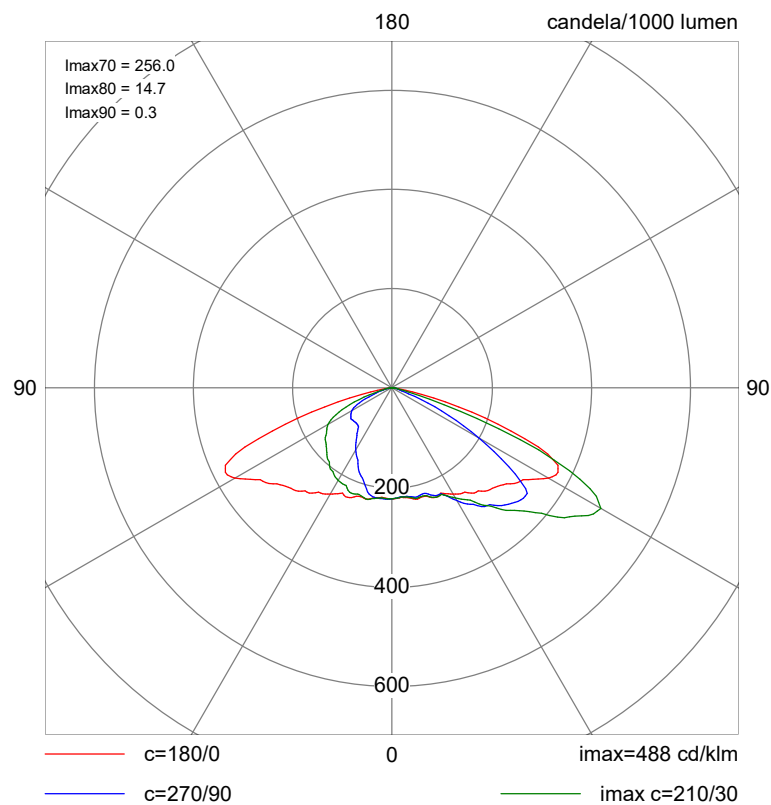
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37	C	385362.62	407479.71	2.70	220.00	0.00	0.00	0.15			
38	C	385356.86	407486.52	2.70	220.00	0.00	0.00	0.15			
39	C	385378.22	407539.83	2.70	40.00	0.00	0.00	0.15			
40	C	385371.39	407548.02	2.70	40.00	0.00	0.00	0.15			
41	C	385378.24	407534.07	2.70	40.00	0.00	0.00	0.15			
42	C	385382.90	407528.52	2.70	40.00	0.00	0.00	0.15			
43	C	385387.24	407523.32	2.70	40.00	0.00	0.00	0.15			
44	C	385391.84	407517.86	2.70	40.00	0.00	0.00	0.15			
45	C	385396.83	407511.89	2.70	40.00	0.00	0.00	0.15			
46	C	385405.51	407501.58	2.70	40.00	0.00	0.00	0.15			
47	C	385400.22	407507.91	2.70	40.00	0.00	0.00	0.15			
48	C	385366.52	407548.71	2.70	131.00	0.00	0.00	0.15			
49	B	385350.70	407490.10	6.00	139.00	0.00	0.00	0.50			
50	A	385086.84	407499.88	8.00	41.00	0.00	0.00	0.50			
51	A	385175.15	407565.55	8.00	288.00	0.00	0.00	0.50			
52	B	385293.32	407522.42	6.00	40.00	0.00	0.00	0.50			
53	D	385364.15	407513.42	5.00	286.00	0.00	0.00	0.00			
54	C	385366.72	407474.78	2.70	220.00	0.00	0.00	0.15			
55	C	385383.40	407486.41	2.70	309.00	0.00	0.00	0.15			
56	C	385374.72	407544.03	2.70	40.00	0.00	0.00	0.15			

Polar Diagrams

Luminaire A OPUS COLUMN

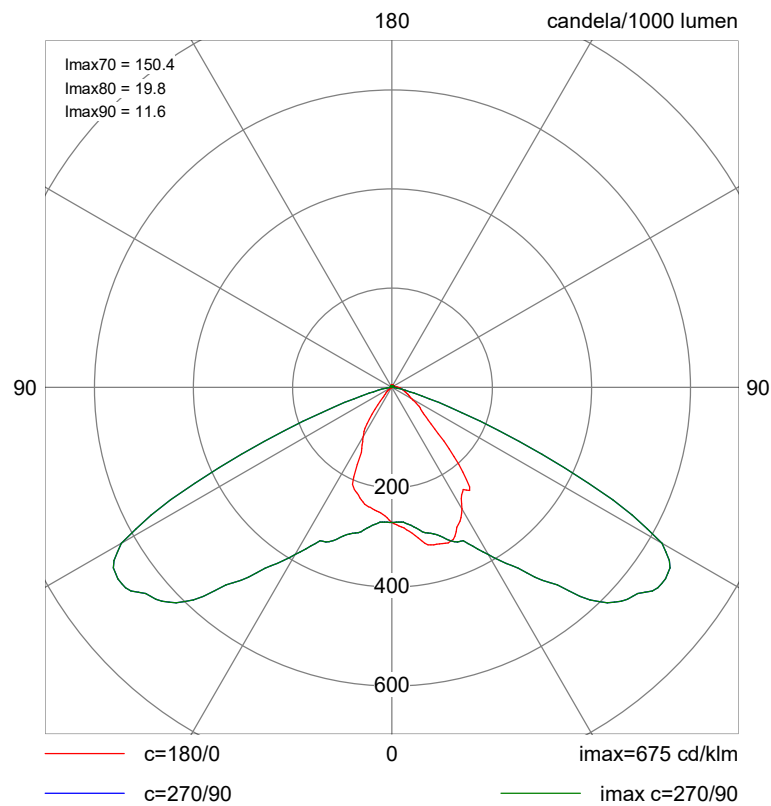


Luminaire B OPUS COLUMN

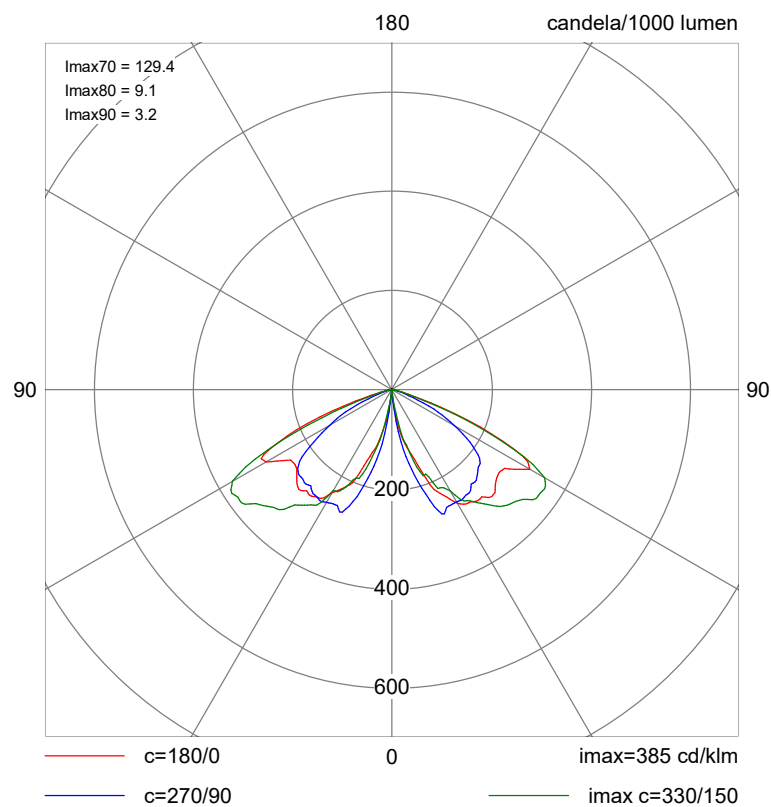


Polar Diagrams Continued

Luminaire C OPUS WALLPACK LED

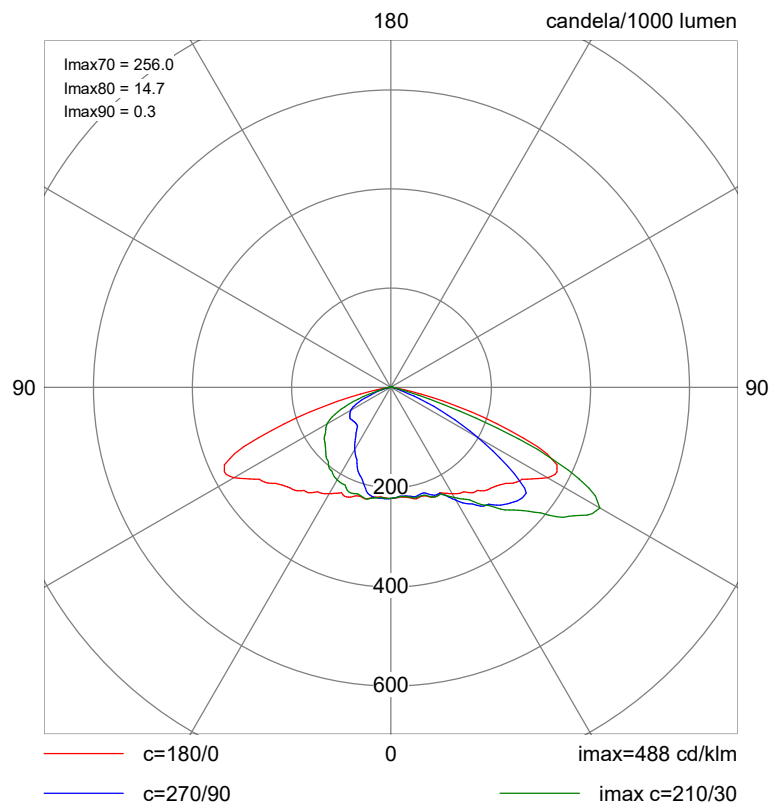


Luminaire D OPUS 360



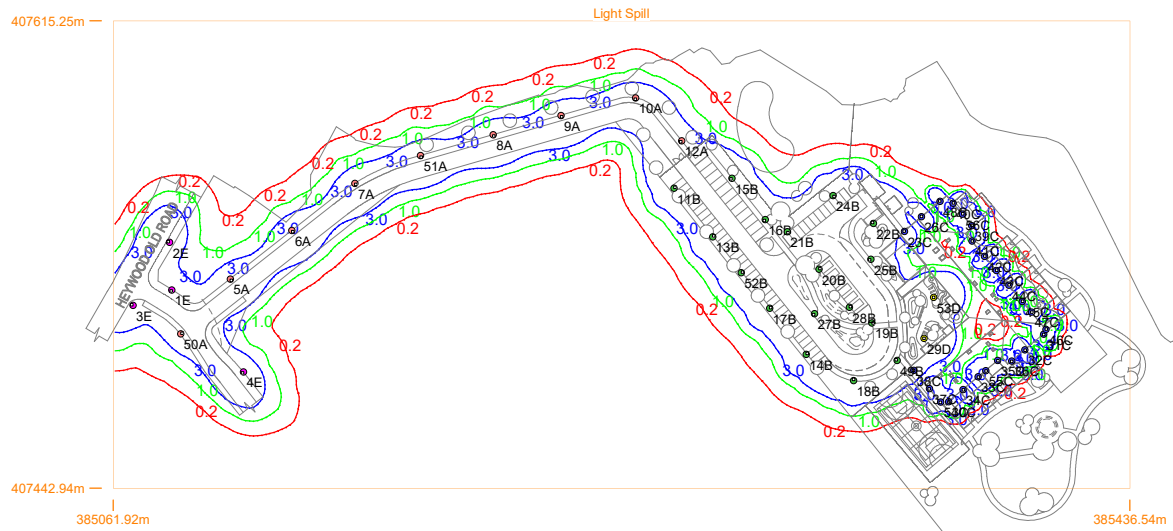
Polar Diagrams Continued

Luminaire E OPUS COLUMN



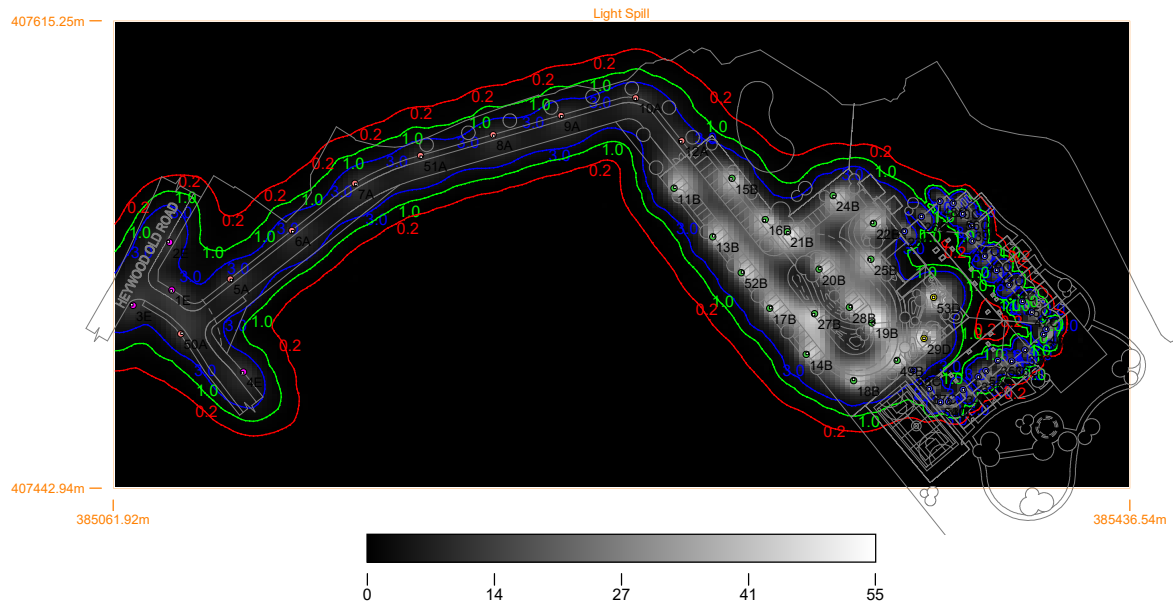
Horizontal Illuminance (lux)

Light Spill



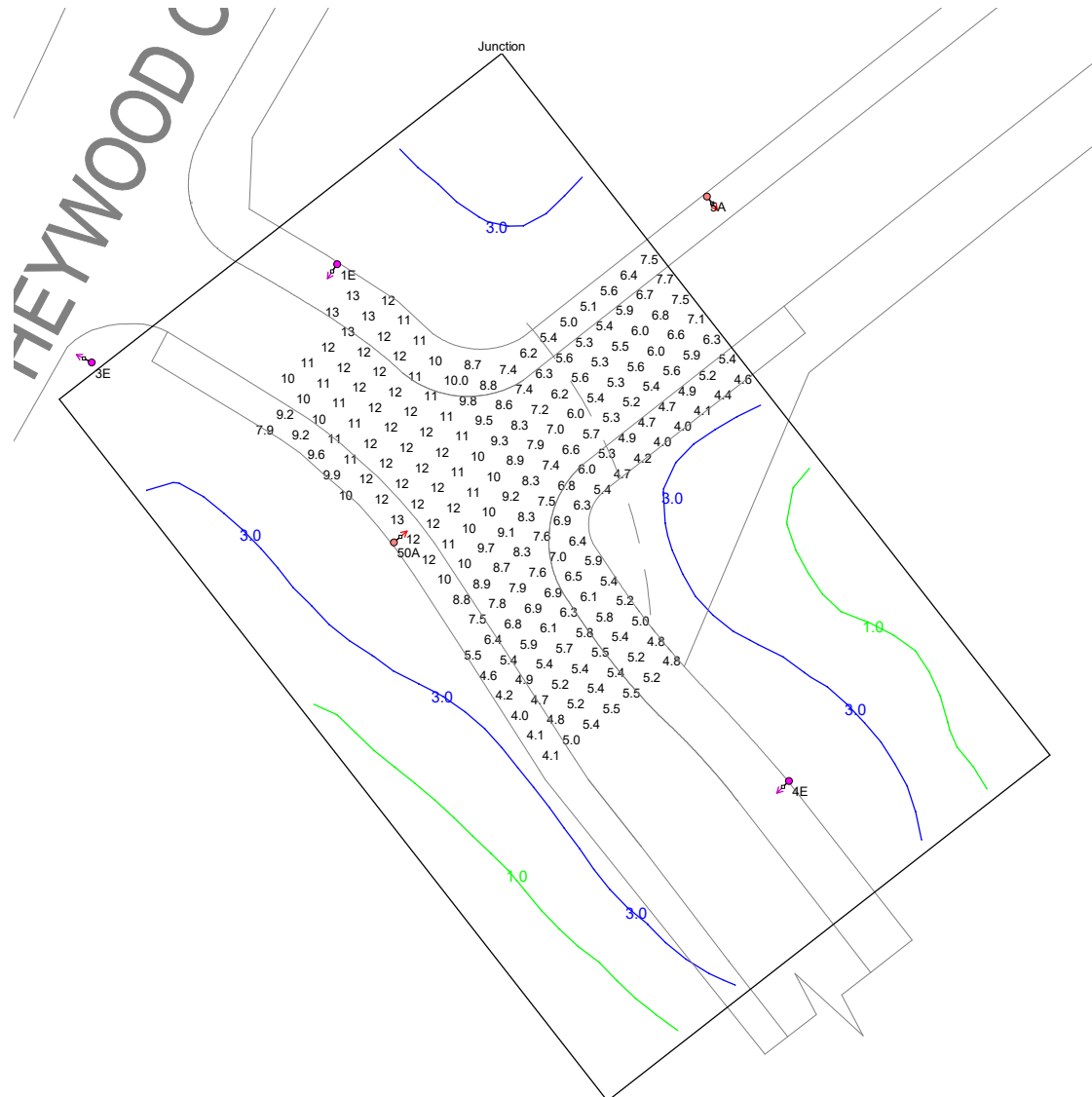
Horizontal Illuminance (lux)

Light Spill



Horizontal Illuminance (lux)

Junction

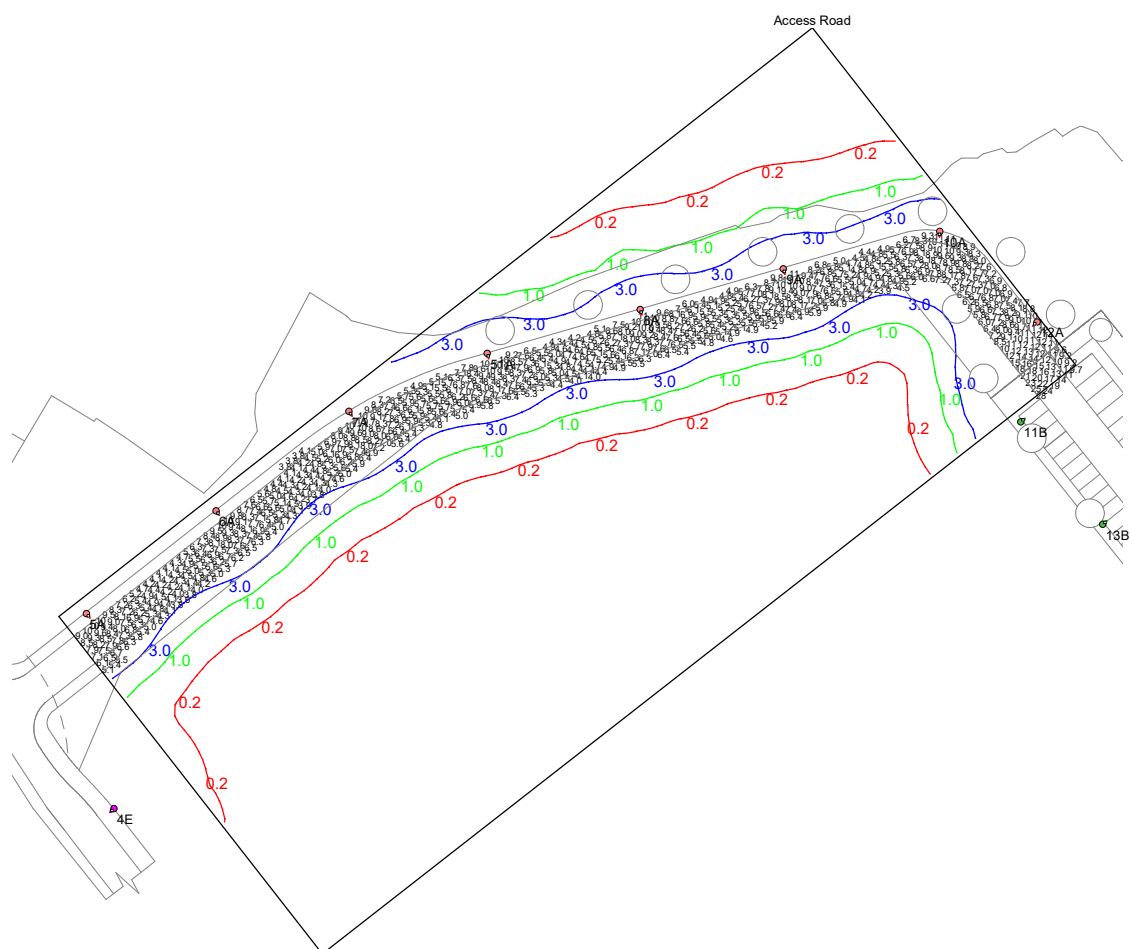


Results

Eav	7.91
Emin	3.97
Emax	13.34
Emin/Emax	0.30
Emin/Eav	0.50

Horizontal Illuminance (lux)

Access Road

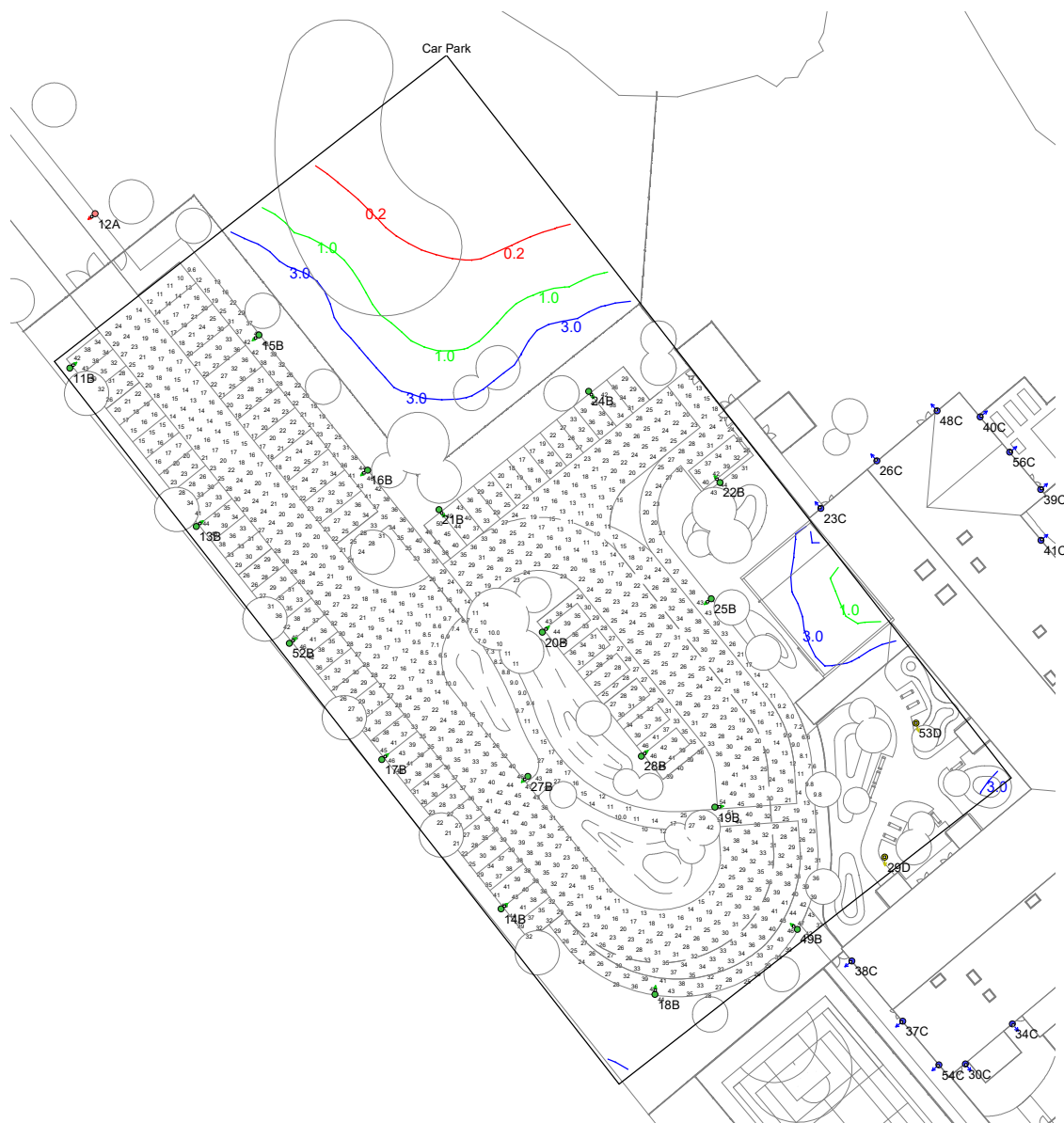


Results

Eav	7.06
Emin	3.64
Emax	27.88
Emin/Emax	0.13
Emin/Eav	0.52

Horizontal Illuminance (lux)

Car Park

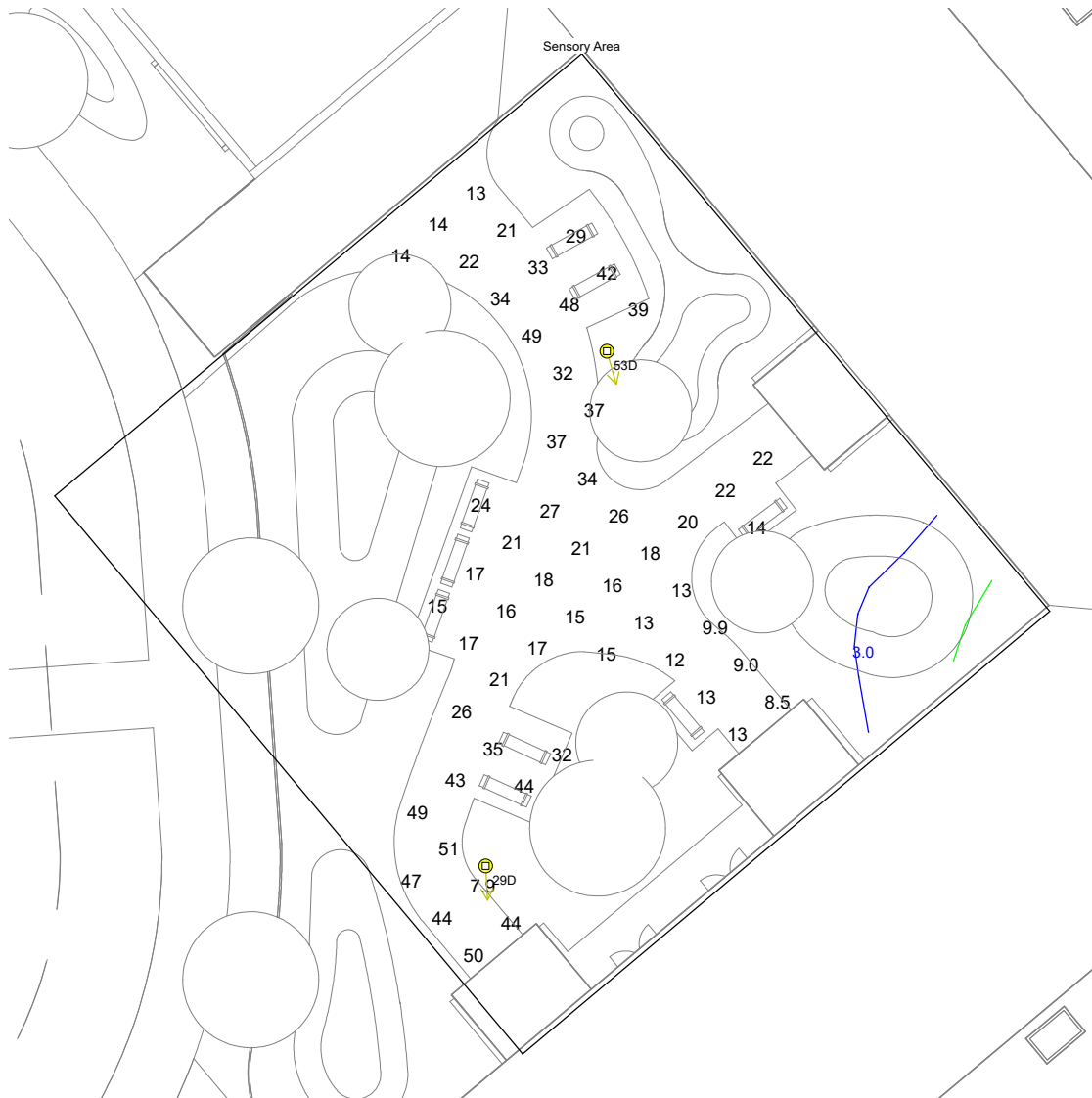


Results

Eav	26.40
Emin	6.50
Emax	53.87
Emin/Emax	0.12
Emin/Eav	0.25

Horizontal Illuminance (lux)

Sensory Area



Results

Eav	25.76
Emin	7.89
Emax	50.88
Emin/Emax	0.15
Emin/Eav	0.31

Horizontal Illuminance (lux)

East & North (Movement Area)

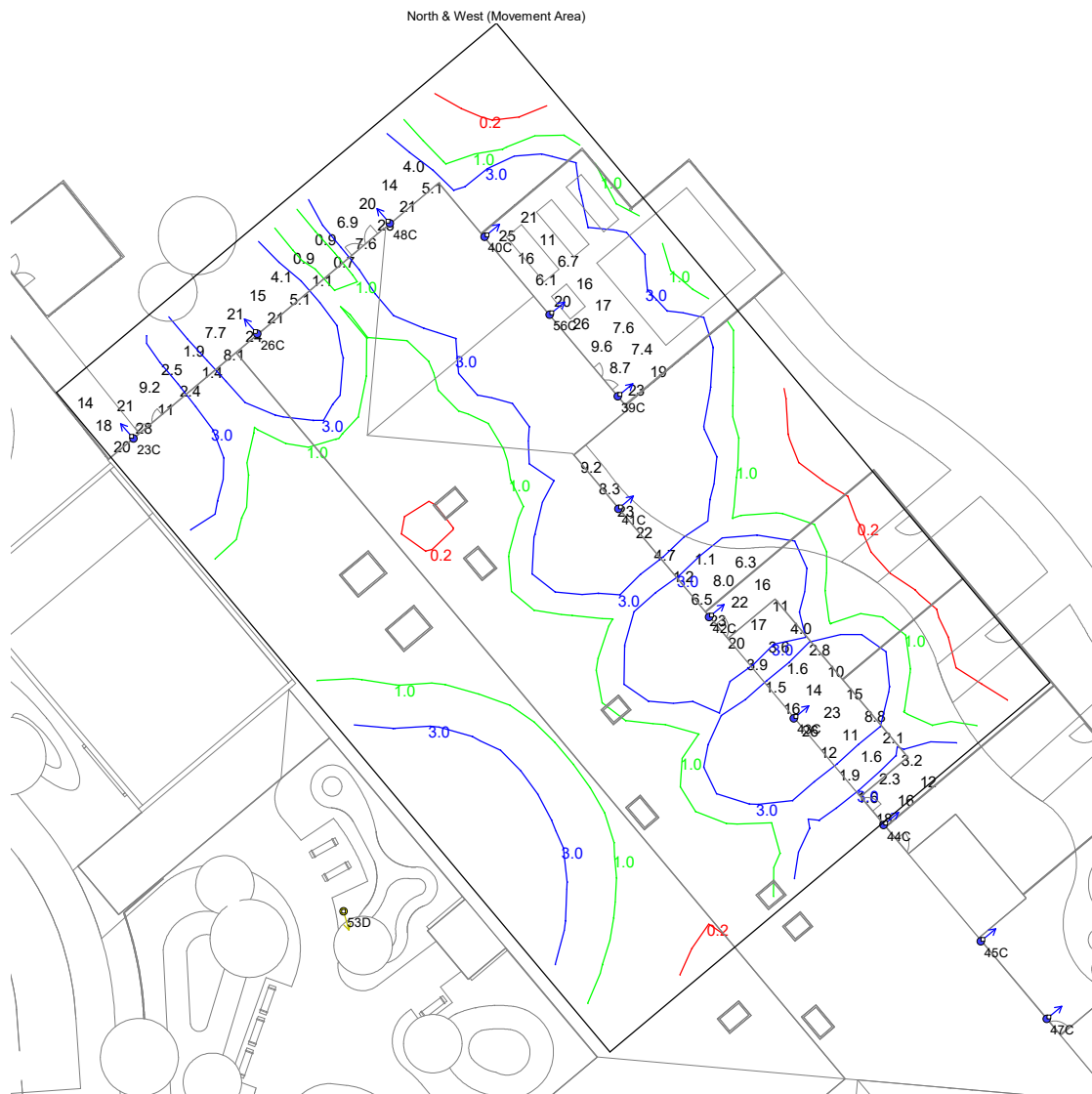


Results

Eav	12.08
Emin	0.72
Emax	41.52
Emin/Emax	0.02
Emin/Eav	0.06

Horizontal Illuminance (lux)

North & West (Movement Area)



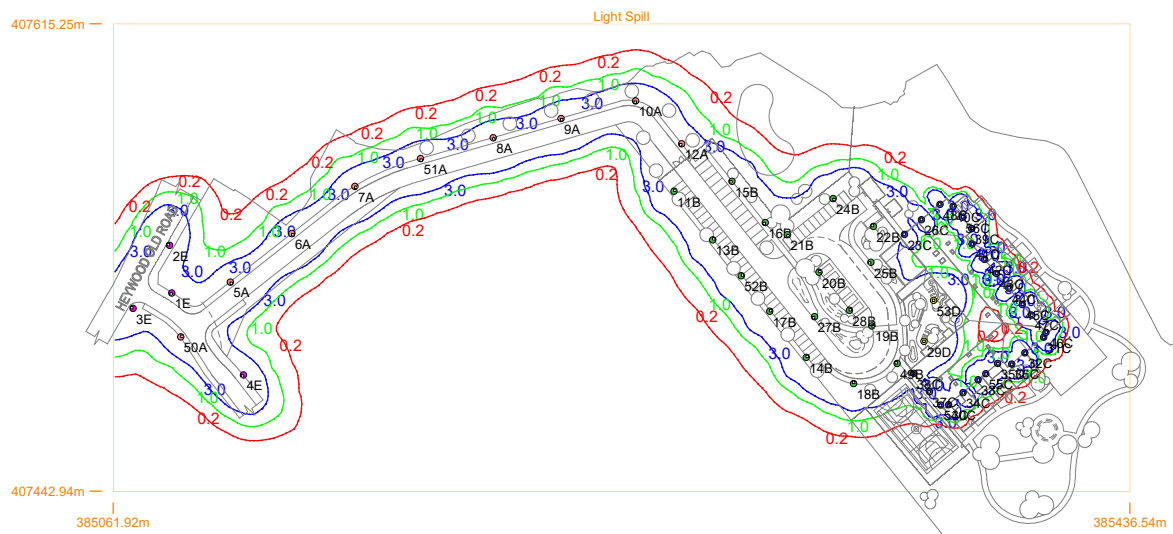
Results

Eav	11.43
Emin	0.68
Emax	27.55
Emin/Emax	0.02
Emin/Eav	0.06

**The following pages show
the results of the impact
assessment, with the
maintenance factor set to
1.0**

Horizontal Illuminance (lux)

Light Spill



Illuminance (lux)

ESR 3 (Knight Cres)

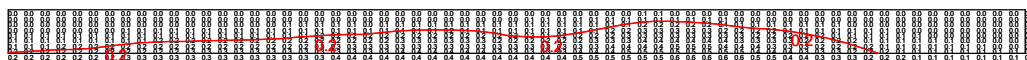
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Results

Eav	0.02
Emin	0.01
Emax	0.02
Emin/Emax	0.56
Emin/Eav	0.71

Illuminance (lux)

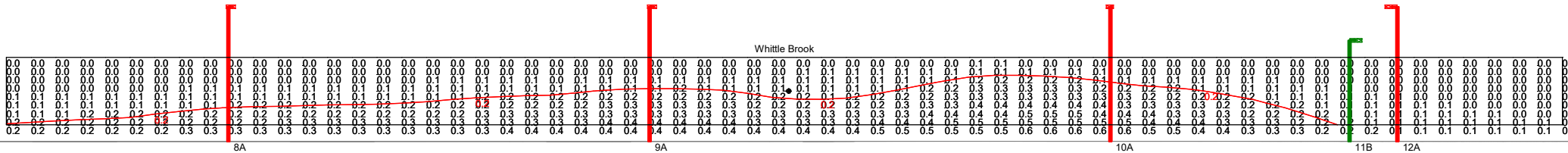
Whittle Brook



Results

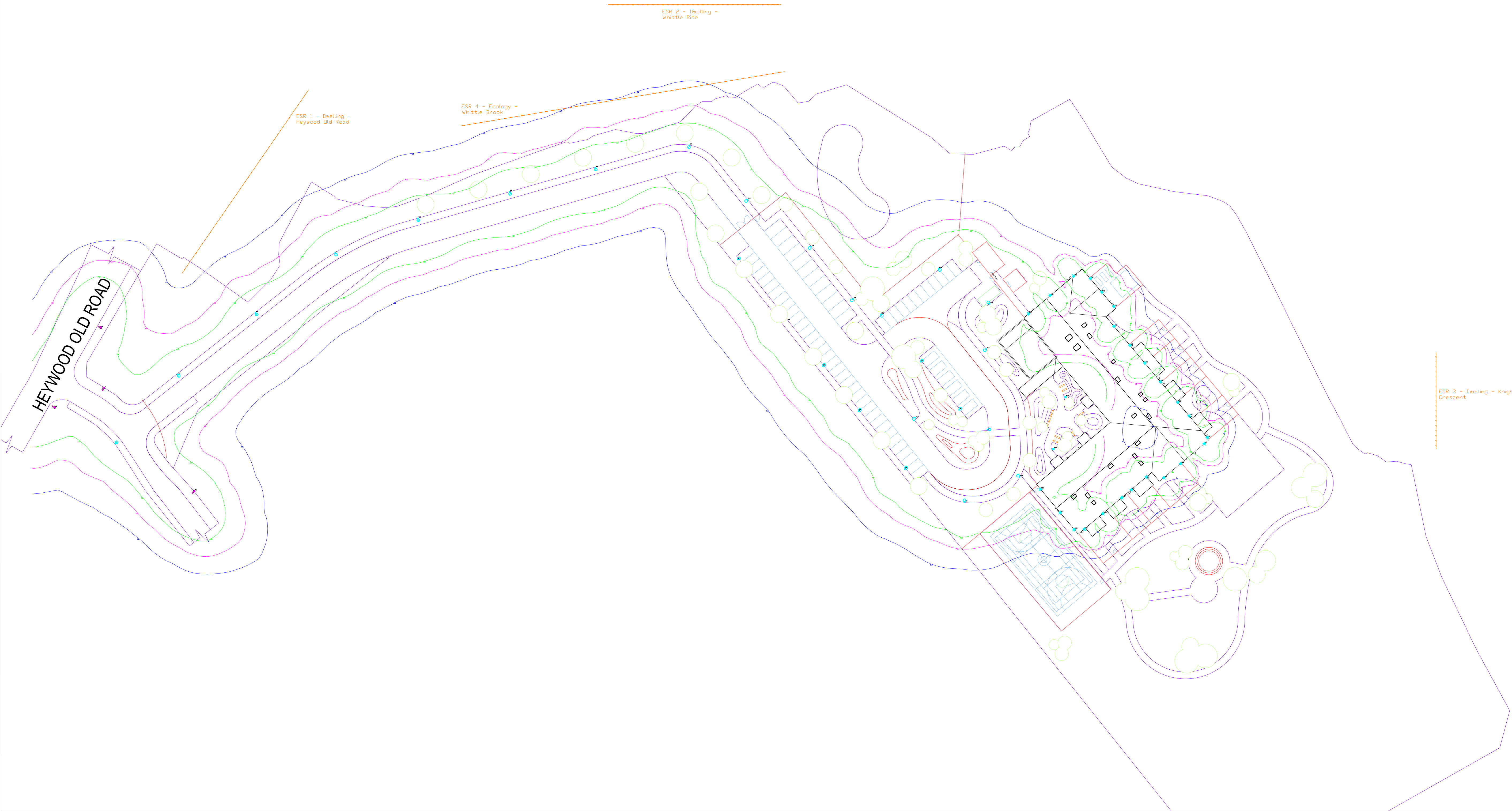
Eav	0.16
Emin	0.01
Emax	0.61
Emin/Emax	0.01
Emin/Eav	0.06

This page displays lux results for Whittle Brook. The length and position of it can be viewed in Appendix A and C. Each value represents a 0.5 m height increase. The grid is set from 1 m to 5 m



Results Whittle Brook	
Eav	0.16
Emin	0.01
Emax	0.61

Appendix C: AutoCAD Drawing, showing Design Details and Outputs



Task Area	Avg	Min	Uo: Min/Avg
Junction	7.91	3.97	0.5
Access Road	7.06	3.64	0.52
Car Park (all)	26.4	6.5	0.25
Sensory Area	25.76	7.89	0.31
E&N Movement Area	12.08	0.72	0.06
N&W Movement Area	11.43	0.68	0.06

Task Area	Maximum Lux
ESR 1 - Vertical Grid	Max V-lux (MF1.0): 0.16
ESR 2 - Vertical Grid	Max V-lux (MF1.0): 0.02
ESR 3 - Vertical Grid	Max V-lux (MF1.0): 0.02
ESR 4 Whittle Brook - Vertical Grid	Max V-lux (MF1.0): 0.61

Product	Symbol	Height (m)	Type & Optic	Lumen Output (flux klm)	Wattage	Quantity
Dextra: Opus Column		8	Post-top, Open Area	3.75	25.1	9
Dextra: Opus Column		6	Post-top, Open Area	8.58	56.4	17
Dextra: Opus Wall		2.7	Wall, Open Area	0.81	7.7	24
Dextra: Opus 360		5	Post-top, Open Area	7.08	60.6	2

Exterior Lighting Design

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The lighting design has been prepared for the development planning application. The design is subject to comment and approval by the local authority and/or overseeing organisation. **It is a preliminary design not for construction.**

Installation is subject to technical approval and sign off.

The design has been prepared in accordance with Construction Design Management Regulations 2015, Part 3 Health and Safety Duties and Roles, Duties of Designer.

See the accompany lighting impact assessment and Reality Outdoor model outputs for details of relevant CDM risks and technical details of the prepared lighting design.

Installation constraints associated with civil, electrical and engineering disciplines require further consideration post-planning and before installation. Installation and constraints must be identified in accordance with specific standard, British Standards relevant to the discipline.

The lux drawing shows horizontal lux contours as maintenance Factor 1.0. Design Levels MF 0.80.

The design includes four existing luminaires to provide sufficient existing light spill to the design. These are specified with a pink symbol 'E'. The specific luminaires are not known, the Dextra Opus Column was used as a substitute. This will require review post-planning as it affects the new junction

Lighting standard
P4 Class BS 5489&13201:
Access Road, Movement Area
Average Horizontal Lux: 5.00 to 7.50
Minimum Lux: 1.00

'Heavy Car Park' of BS 12464-2
Average Horizontal Lux: 20
Uniformity: 0.25 (25%)

Specification
Product: Opus Column, Opus Wall, Opus 360 (Open Area optic)

Colour Temperature: 3000K
IK08 (360), IK09 (Column), IK10 (Wall), IP65 (all)

Tilt angle: 0 degree
Install height: Column (8 m & 6m), Wall (2.7 m), 360 (5 m)
Mounting: Post-top steel galvanised column, root-mounted (column & 360), Wall fixture (Wall)

1	18/02/2026	Initial Issue	Pw	Pw
Rev.	Date	Purpose	Drawn by	Approved by

MILLER GOODALL
ACOUSTICS - AIR QUALITY - LIGHTING

Project: Redwood SEND School, Middleton

Client: Rochdale Borough Council

Scale @ A1: 1:150 Project Number: LA103428

Glossary of Terms

Arrangement The pattern in which the luminaires are sited in plan (e.g. regular, along one edge or around the perimeter, staggered, opposite etc).

Average Illuminance Illuminance (lux) averaged over the specified area, road

Average Luminance Luminance (cd/m^2) averaged over the specified area or solid angle

Base Plate [of the lighting column] Plate below ground level fixed to a planted lighting column to prevent the column sinking into the ground and to help prevent the column overturning

Beam Angle The total angle over which the luminous intensity of a beam drops to 50% of the peak value

Bracket A component used to support a luminaire at a definite distance from the axis of the lower straight position of a column

BS British Standard

BSI British Standards Institute

Calculation Grid A series of calculation grids set out in grid formation. Modelled at 1.5 * 1.5 m grid spacing.

Candela SI unit of luminous intensity (cd).

Carriageway That part of the road normally used by vehicular traffic

Colour Appearance The apparent colour of light emitted by a particular light source – often expressed in terms of ‘cool’ (4000 Kelvin (K)), ‘intermediate’ (3500 K) and ‘warm’ (3000 K). These terms are generalisations but are commonly used to describe light colour appearances

Colour Rendering Index (Ra) Measure of the degree to which the colour and appearance of an object appears ‘naturally’ when compared to a basis of reference e.g. artificial light, daylight.

Colour Temperature Temperature of the light measured in Kelvin (K)

Conflict Area Areas where different classes mix or cross. Examples such as road intersections, roundabouts, queuing locations, pedestrian crossings.

Contrast The difference in appearance of two or more parts of a field seen simultaneously or successively. E.g. brightness contrast, one object appearing more in dark than the other.

Curfew The time after which stricter requirements will apply. Planning conditions covering hours of operation or cessation lighting post-curfew will often be specified by a planning authority. There is no set definition of curfew and it can vary by location, however, 23:00 to 07:00 is often cited.

Disability Glare Glare that impairs the vision of objects without necessarily causing discomfort

Discomfort Glare Glare that causes discomfort without necessarily impairing the vision of an object

District Network Operator (DNO) The company responsible for the distribution of electrical energy in a predefined area

Environmental Zone Designated zone (area) where additional controls on exterior lighting are imposed

Glare Condition of vision in which discomfort or a reduction in the ability to see details or objects, caused by unsuitable distribution or range of luminance, or to extreme contrast. Measured as candela/m² (cd m²)

Horizontal Illuminance The illuminance on a horizontal plane at a specified height (ground level, unless otherwise specified)

Illuminance The amount of light (lumens) landing on a surface area. Measured as lux. The lighting of surfaces, object or surroundings so they may be seen

ILP Institution of Lighting Professionals

Light Pollution The spillage of light into areas where it is not desired

Light Trespass Light, normally measured in illuminance (lux) that impacts onto a surface outside of the area designed to be lit by the installation concerned

Lighting Column Support intended to hold one or more luminaires, consisting of a post, possibly an extension piece and a bracket.

Louvre Shield fitted to the luminaire exterior to reduce light in a particular direction. Used to reduce spill light.

Lumen SI unit of luminous flux. Luminous flux emitted in unit solid angle (steradian) by a uniform point source having a luminous intensity of 1 cd

Luminaire Apparatus which distributes, filters or transforms the light transmitted from one or more lamps. The light source i.e. LED

Luminance The amount of light that reaches the eye by reflection or direct transmission from an area

Lux SI unit of illuminance

Maintenance Factor The depreciation of light from a luminaire over its life cycle

Obtrusive Light Light outside the area to be lit that causes annoyance, discomfort, distraction or a reduction in the ability to see essential information e.g. at signal lights

Photometer Meter used to measure light. Minolta T10 is used by Miller Goodall Ltd to record illuminance (lux) levels

Sky Glow The brightening of the night sky that results from the reflection of radiation, scattered from the constituents of the atmosphere (e.g. gaseous molecules, aerosols and particulate matter), in the direction of observation

Spacing The distance between luminaires in an installation

Spill Light (stray light) Light emitted by an installation, which falls outside the boundaries that is being lit

Threshold Increment (TI) Measure of the loss of visibility caused by the disability glare of luminaires of a road lighting installation

Uniformity A measure of how evenly spread the light is across a lit area (Uo). Utilised to improve visual perception, task lighting, and to reduce dark spots and glare.

Uplighter A light placed or designed to throw illumination upwards, usually for architectural purposes

Upward Light Ratio (ULO) Proportion of the light flux of a luminaire and/or installation that is emitted at and above the horizontal when the luminaire is mounted at an installation position. A measurement of sky glow.

Vertical Illuminance The illuminance on a vertical plane at a specified point.

