

# **M3 Junction 9 Improvement**

**Scheme Number: TR010055**

## **6.3 Environmental Statement Appendix 7.7 - Technical Note Lighting Assessment of Gantry Signage**

**APFP Regulation 5(2)(a)**

**Planning Act 2008**

**Infrastructure Planning (Applications: Prescribed Forms and  
Procedure) Regulations 2009**

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M3 Junction 9 Improvement  
Development Consent Order 202[x]

**6.3 ENVIRONMENTAL STATEMENT - APPENDIX 7.7:  
TECHNICAL NOTE: LIGHTING ASSESSMENT OF GANTRY  
SIGNAGE**

|  |   |
|--|---|
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## 1 Introduction

- 1.1.1 This technical note is prepared to support the Landscape and Visual Impact Assessment (**Chapter 7**) of the **Environmental Statement (ES) (Document Reference 6.1)**. The technical note does not constitute a full lighting assessment for the entirety of the Scheme, focusing instead on the gantry mounted signage elements which are lit and ensuring these are designed appropriately in context of the South Downs National Park Dark Sky Nature Reserve. The technical note has been used to inform the LVIA conclusions. Additional consideration has been given to potential impacts for receptors outside of the South Downs National Park by reference to the Institution of Lighting Professionals' guidance documents.
- 1.1.2 Whilst lighting to highways and road signage can often be exempted from some obtrusive lighting criteria, given the proximity of the scheme to the South Downs National Park and International Dark Sky Association Dark Sky Reserve the technical note highlights several observations around typical signage lighting solutions and offers an outline design solution that seeks to minimise obtrusive light.

## 2 Standards and Guidance

2.1.1 This technical note has been provided to support the LVIA assessment and as such has a defined range of study criteria. The following documents have been used in determining the likely impacts from the proposed development.

- South Downs National Park - TLL-10, Technical Advice Note, May 2021 (SNDP TLL-10)
- Institution of Lighting Professionals (ILP). ILP Guidance Notes for the Reduction of Obtrusive Light (2021) (ILP GN01)

This publication is based on the International Commission on Illumination (CIE) Guide on The Limitation of The Effects of Obtrusive Light From Outdoor Lighting Installations, 2nd Edition:2017 and is considered the UK de facto point of reference in determining obtrusive lighting limits. The document sets out types of obtrusive light, Environmental Lighting Zones (based on the existing lighting conditions) and the respective limits on obtrusive light within each zone. The document also contains high level guidance on best practice for external lighting installations seeking to minimise obtrusive light.

- Institution of Lighting Professionals. Professional Lighting Guide 04: Guidance on Undertaking Environmental Lighting Impact Assessments (2013) (ILP PLG04)

This guidance outlines methods applicable to lighting impact assessments at various scales including identification of receptors, site surveys, photography, photometric calculations, and assessment criteria. ILP PLG04

- National Highways (formerly Highways England) Design Manual for Roads and Bridges, CD 365 Portal and cantilever signs/signals gantries (DMRB CD 365)
- The Traffic Signs Regulations and General Directions 2016 (TSRGD)

## 3 Design and Assessment

### 3.1 Methodology

3.1.1 A methodology based on those found within ILP PLG04 and South Downs National Park TLL-10 has been applied. Whilst falling outside the boundary of the South Downs National Park the structure and headings of the following sections of the document broadly follows the headings set out in Table 2 of South Downs National Park TLL-10 to allow for easy reference. These include:

- Is the lighting needed? (Section 3.2)
- What dark zone is the site in? (Section 3.3)
- Does the illuminance exceed dark zone policy? (Section 3.6 and 3.7)
- Are the predicted averages consistent with guidance standards? (Section 3.7)
- Do any Luminaires exceed any of the ILP limits for the zone? (Section 3.7)
- Does the design negatively affect the dark landscape? (Section 3.7)

### 3.2 Statement of client needs and parties comments

3.2.1 The requirement for these gantry signs to be illuminated is unclear within guidance and legislation. A decision has been made to undertake the assessments based on gantry signs being illuminated representing a worst-case scenario.

#### The requirement to illuminate signs

3.2.2 Department for Transport (DfT) circular 01/2016 relating to The Traffic Signs Regulations and General Directions 2016 (TSRGD) states the following

*“ 3.33 Previously, many traffic signs were required to be directly illuminated at night when placed within a street-lit area, either by internal or external means. These requirements have been significantly relaxed in TSRGD 2016.....*

*3.34 A new overarching regulation 8 introduces a default lighting requirement equivalent to the previous Schedule 17 item 4. The default position requires upright signs to be reflectorised, while allowing direct lighting if so desired. This applies to all traffic signs unless other conditions are specified elsewhere in the Schedules. Therefore, when assessing the applicable regulations and directions for any given sign, if illumination requirements are not specified, the default position applies.*

*3.35 From now, only those signs listed below must be directly illuminated during the hours of darkness when placed within a street lit area.*

- warning and regulatory signs at level crossings
- headroom restrictions at low bridges or structures
- warning of requirement to 'Stop' or 'Give Way' ahead (diagram 501)
- speed limit terminal signs on trunk or principal roads
- regulatory terminal signs including give way, no entry, vehicle restrictions (including for low and narrow bridges) and banned manoeuvres
- motorway entry, exit and gantry-mounted signs.

*3.36 Those signs no longer needing direct illumination must be reflectorised as a minimum.*

*3.37 It should be noted that traffic authorities may still apply direct lighting as before, should they wish to. Notwithstanding the obvious financial and environmental benefits of removing direct lighting, it is recommended that robust risk analysis should underpin any decision to do so on a case by case basis. In deciding whether to rely on reflectorisation alone, the following factors could be taken into account:*

- turning angles
- junction layouts
- one way traffic conditions
- sign mounting height
- signs mounted on the off side of the carriageway
- proportion of heavy goods vehicles and the relevance of the sign to them”

3.2.3 National Highways state within their Design Manual for Roads and Bridges (DMRB) CD 365 Portal and cantilever signs/signals gantries (2020)

*“ Illumination of signs*

*11.6 Motorway gantries shall be lit.*

*11.6.1 The light spill beneath signs for non-access gantries should be evaluated in the lighting design as their open nature on non-access gantries can create a problem in this regard*

*External lighting*

*11.7 Luminaires shall be positioned to achieve the luminance required by BS EN 12899-1 2007 [Ref 19.N] across the whole area of the sign face.”*

- 3.2.4 It is noted that National Highways are targeting “net zero carbon” by 2030, as such reducing the extent of lit signage, where not required, forms part of that process.
- 3.2.5 The gantry signs fall on a section of unlit road and being mounted above the carriageway may not achieve the desired clarity from reflectorisation alone. As such at this stage of the design the decision has been made to provide external illumination to the signs.
- 3.2.6 The reflectorisation of the sign is achieved through specification of R3B finishes. Newer retroreflective surface finishes are present that may satisfy the requirements for sign legibility without external illumination. This is discussed within the mitigation section of the report.
- 3.2.7 The assessment is progressed based on gantry signs requiring external illumination.
- 3.2.8 DMRB CD 365 states that external lighting should meet the requirements of BS EN 12899-1 2007.
- 3.2.9 Table 22 and 23 within BS EN 12899-1 2007 state requirements for externally illuminated signs. It is understood that the requirements are to be an average illuminance of 100 to 400 lux with a min/max diversity of 1/6 (0.17) This equates to the E2 sign class and UE2 Uniformity.

### **3.3 Determine existing baseline**

- 3.3.1 Understanding of the existing lighting conditions are based on a desk-based study using freely available aerial and street views, familiarity with the location from site visits, and photographic view locations, and descriptions contained within the LVIA. A night-time photographic survey was undertaken in February 2021 which included several the view locations included within this assessment as well as additional view locations providing context for the assessment. Night-time photography can be viewed in **Figure 7.13 (Landscape and Visual Photosheets Night time)** of the **ES (Document Reference 6.2)**.
- 3.3.2 Gantry signs GADS0003 and GADS004 are located on an unlit section of the M3 motorway to the south of the existing Junction 9.
- 3.3.3 The majority of light in the immediate vicinity comes from general urban highways, retail, amenity, and residential lighting from Winnall and Winchester to the west of the M3. There is limited direct view of these light sources from the gantry locations, however in wider views from the south and east the spread of Winchester is clearly visible. To the east of M3 and bordering onto South Downs National Park, lighting is present on Alresford Road for a few hundred metres after the bridge over the motorway and from St Swithun’s School. From street photography floodlighting to sports facilities at the west of St Swithun’s school appear to be poorly aimed with potential for considerable direct upward light. Further south lighting around the Chevron and DSVa compounds are other notable light sources east of the M3 and bordering South Downs National Park.



### 3.4 Environmental lighting zone

- 3.4.1 The Environmental Lighting Zones are shown on **Figure 7.3.2** of the **ES (Document Reference 6.2)**.
- 3.4.2 The site lies just outside the boundary of the South Downs National Park within which lies South Downs International Dark Sky Reserve (as designated in May 2016). The Scheme lies approximately 15km away from the Dark Skies Core (E0 Environmental Lighting Zone) and adjacent to transition zones (E1b), starting at the boundary of the South Downs National Park. The South Downs National Park Landscape Character Assessment online mapping for dark skies shows a marked increase in the district brightness from Winchester which is equal to and greater than town centres, such as Petersfield, listed as E3/E4 within the South Downs National Park Boundary.
- 3.4.3 Whilst the South Downs National Park does not include any E2 zones, transitioning immediately from E3 to E1b. Given the existing urban lighting of Winchester in the vicinity (equivalent to an E3 zone) already disrupting the 'darkness' of the area, and the currently unlit M3 corridor bordering and E1b zone of the South Downs National Park it would follow that the application site sits within a narrow band of E2.
- 3.4.4 Having noted this where receptors fall within the lower Environmental Lighting Zone the criteria for the Receptor's zone as opposed to the source should be considered, (the receptor zone criteria can only effectively be applied to Light Intrusion, Perceived Source Intensity and to a lesser degree Surface Luminance).

### 3.5 Selection of viewpoints and receptors

- 3.5.1 View locations have been identified as part of the LVIA process detailed in **Chapter 7 (Landscape and Visual)** of the **ES (Document Reference 6.1)**.
- 3.5.2 A zone of theoretical visibility (ZTV) has been applied to the gantries as the highest points within the proposed development. The identification of view locations has been based on the ZTV for gantry signs **GADS003 (Figure 7.10.10)** and **GADS004 (Figure 7.10.1)** of the **ES (Document Reference 6.2)** and key locations within South Downs National Park.

Table 7.7.1: Selection of Receptors

| View Location | Description  | Within Zone of Theoretical Visibility | Within South Downs National Park | Notes   |
|---------------|--|---------------------------------------|----------------------------------|---|
| VL 1          | Easton Lane / NCN Route 23                                   | GADS004                               | Yes                              | View from north, direct view of sign surface not possible |
| VL 6          | B3404 on bridge over M3                                      | GADS003<br>GADS004                    | Adjacent                         |   |
| VL 7          | PRoW adjacent to railway near Well House Lane                | Bordering ZTV for GADS0004            | No                               | View from north, direct view of sign surface not possible |
| VL 8          | PRoW (FP049/13/1) on crown of Magdalen Hill Down             | Bordering ZTV for GADS0004            | Yes                              |   |
| VL 10         | Whiteshute Lane / Bushfield Camp                             | GADS004                               | No                               |   |
| VL 12         | Local Winchester townscape                                   | GADS004                               | No                               |   |
| VL 13         | Long Walk close to western edge of South Downs National Park | GADS003<br>GADS004                    | Yes                              | View from north, direct view of sign surface not possible |
| VL 16         | St Swithun's School  | GADS004<br>GADS003                    | Yes                              |   |
| VL 15         | Down Farm Lane   | GADS004                               | No                               | View from north, direct view of sign surface not possible |

| View Location | Description                                    | Within Zone of Theoretical Visibility | Within South Downs National Park | Notes  |
|---------------|--|---------------------------------------|----------------------------------|--|
| VL 16         | St Swithun's School                            | GADS004<br>GADS003                    | Yes                              |  |
| VL 19b        | Open Access Land near Deacon Hill              | GADS0003<br>GADS0004                  | Yes                              |  |
| VL 20         | South Downs Way on footbridge over existing M3 | Outside of ZTVs                       | Yes                              | Included as reference point for other locations in South Down National Park. |

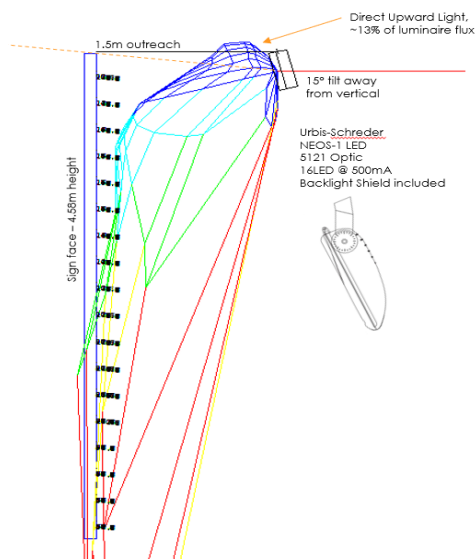
### 3.6 Lighting design

3.6.1 Proposals for illuminating the signs have been developed through an iterative design and assessment process including the luminaire manufacturer. The resulting scheme seeks to satisfy the technical requirements for illuminating the gantry signs and minimise the extent of obtrusive light.

#### Typical lighting design

3.6.2 The typical approach of mounting floodlights such that the yoke falls on the signage side and then tilting luminaires downwards to wash the face of the sign result in a significant proportion of upward light. With luminaires tested this ranged from 23% to 13% with the inclusion of rear spill shield. **Figure 7.7.1** below shows a section through this a typical arrangement in which what would normally be horizontal rear spill with luminaires mounted flat becomes upward light in this orientation. Sign illuminance results for this typical arrangement can be found within **Annex 1 (Proposed-Obtrusive) for GADS003, and Annex 2 (Proposed- Obtrusive) for GADS004.**

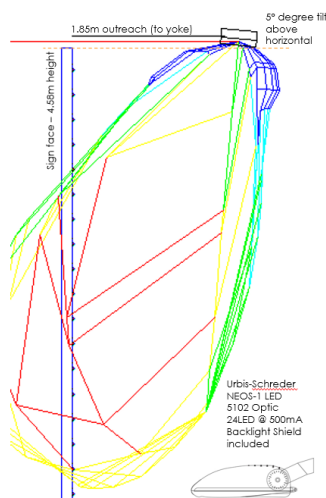
Figure 7.7.1: Typical arrangement of gantry floodlighting



### Developed lighting design

3.6.3 In order to minimise direct upward light it is desirable for luminaires to be mounted as close to horizontal as practical to achieve this the typical yoke position is moved from near the sign to the further edge allowing the luminaire to be rotated 180°. In this instance the luminaire is then able to illuminate back onto the sign from a more horizontal position. **Figure 7.7.2** below shows the relative position and photometric curve within this alternate arrangement. This approach is akin to “wall washing”, although this design utilises the same family of floodlights as the typical solution with another standard optic option within the range. This solution sees 0% direct upward light, even with a 5° tilt above horizontal. Sign illuminance results for this typical arrangement can be found within **Annex 1 (Proposed-DesignValues) for GADS003**, and **Annex 2 (Proposed-DesignValues) for GADS004**.

Figure 7.7.2: Horizontally mounted arrangement of gantry floodlighting



3.6.4 Iterations of the designs and calculations have been undertaken by both Stantec and Urbis-Schreder as a method of validating the results. Outline specifications and lighting layouts can be found in **Annex 3 (Reference (UrbisOriginal)-DesignValues)** along with the photometric calculations.

### **3.7 Assessment of effects**

#### **Obtrusive light criteria and general assessment**

##### **Vertical illuminance on premises (Light intrusion)**

3.7.1 The lighting of the gantry signs GADS0003 and GADS0004 is highly localised, with spill light falling within the carriageway, verge, and immediate environs. The nearest residential receptors are approximately 65m west of GADS0003 on Longfield Road. Calculations show a minimal contribution of 0.2lux to the rear of the properties in a fully unobstructed model. In reality the residences are separated from the M3 by two distinct bands of vegetation. Consequently, it is highly unlikely that the illumination of GADS003 will generate light intrusion to these receptors. The location of GADS004 is such that there are no sensitive properties within the immediate vicinity.

3.7.2 Light intrusion is not considered to be an effect of the Scheme.

##### **Effects on transport systems (glare) and limits on luminous intensity in viewed luminaires**

3.7.3 Whilst several receptors identified within the LVIA are located on roads these are at sufficient distance and orientation from the scheme that disability glare is not predicted. It is beyond the scope of this report to fully assess the impact on users of the M3 and adjacent A272 corridor. Illuminance levels falling beyond the signs to the carriageway with the proposed lighting solution are consistent with those seen in the typical signage lighting schemes.

3.7.4 Potential for direct view of the luminaries at either end of the sign from vehicles on the roundabout junction over the M3 north of GADS004 has been identified (very narrow views around the edge of the sign) and should be considered in detail design PCF Stage 5.

##### **Limits on luminous intensity in viewed luminaires**

3.7.5 The orientation of the luminaires is towards the sign, meaning with the exception of the end luminaries identified above direct view of the light sources is limited to narrow viewing angles from the side or below. Limits of luminous intensity are intended for locations of extended viewing duration and not temporary, transitory views. The potential for long term direct viewing of the light source is considered minimal for the viewpoints and receptors identified. This will be further considered in detail design PCF Stage 5

### Limitation of skyglow (Upward Light Ratio / Upward Flux Ratio)

3.7.6 The following limits on upward light are stated within ILP GN01.

Table 7.7.2: Condensed Summary of Upward Light Criteria from ILP GN01

| Requirements             | Environmental Light Zone |    |      |    |     |
|--------------------------|--------------------------|----|------|----|-----|
|                          | E0                       | E1 | E2   | E3 | E4  |
| Upward Light Ratio       | 0%                       | 0% | 2.5% | 5% | 15% |
| Upward Flux Ratio (Road) | N/A                      | 2  | 5    | 8  | 12  |

3.7.7 As discussed above, the outline lighting scheme proposed has been developed to avoid direct upward light. Calculations show 0% direct upward light with the current luminaire mounting locations and orientations.

3.7.8 Beyond direct upward light, consideration is also given to reflected light that constitutes the Upward Flux Ratio of a scheme. ILP GN01 states:

*" This should only be considered where an installation consists of four or more luminaires that form an installation with a defined performance requirement or specialised fauna growth lighting systems (such as those use to promote grass growth in sports stadia) and is in proximity to:*

- *Optical observatories;*
- *Lies within dark (E1) zones which abuts a protected (E0) dark sky zone"*

3.7.9 Whilst the Scheme only meets the criteria of having four or more luminaires, and does not have a defined horizontal performance illuminance, an attempt to quantify these values has been undertaken.

3.7.10 Upward flux ratio is typically calculated as reflections from horizontal surfaces, the reflected light from a vertical surface, the sign (if perfectly diffuse) would have a notable quotient above the horizontal. It is however understood that through managing the surface luminance of the signs to within the guidance of ILP GN01 best efforts are made to mitigate against skyglow, this is discussed within the following criteria section.

3.7.11 In overspill from the sign to the carriageway at a height of 5.7m to the base of the sign (11.8m to luminaires) there is an average of 2 over the study area. When applied with a carriageway reflectance of 0.1 as notional and worst case this suggests an Upward flux ratio of between 2.3 and 3.5, within the guidance for an E2 zone roadway installation.

### Limits on building façade and sign luminance

3.7.12 South Downs National Park TLL-10 addresses criteria for building luminance (stating that these should be limited to within the appropriate environmental zone) and illuminated advertisements referencing ILP Professional Lighting Guidance 05 The Brightness of Illuminated Advertisements.

3.7.13 ILP GN01 includes limits for both for building façade luminance and additional criteria for sign luminance. These values for signs differ from values stated for illuminated advertising signs within South Downs National Park TLL-10.

Table 7.7.3: Comparison of ILP GN01 and South Downs National Park TLL-10 luminance values

| Requirements   | Environmental Light Zone |                       |  |                        |                         |
|--|--------------------------|-----------------------|--|------------------------|-------------------------|
|  | E0                       | E1                    | E2   | E3                     | E4                      |
| <b>ILP GN01 Sign Luminance</b>                                 | <0.1 cd/m <sup>2</sup>   | <50 cd/m <sup>2</sup> | <400 cd/m <sup>2</sup>                           | <800 cd/m <sup>2</sup> | <1000 cd/m <sup>2</sup> |
| <b>South Downs National Park TLL-10 (over 10m<sup>2</sup>)</b> | 0                        | N/A                   | Not included in South Downs National Park TLL-10 | <300 cd/m <sup>2</sup> | <300 cd/m <sup>2</sup>  |

3.7.14 ILP GN01 has been applied as the most recent published document. ILP GN01 notes that: *"the values for signs do not apply to signs for traffic control purposes"* therefore the intensity of traffic signs could be discounted but is considered here based on the proximity to the South Downs National Park and the additional to a currently unlit section of Motorway.

3.7.15 The gantry signs have been specified with an R3B surface material. This material is retroreflective with non-Lambertian reflective properties. The reflective properties of the signage material impact both the potential reflected upward light and the sign luminance

3.7.16 Published data and standards focuses for the signage type focus on the retroreflective properties around a limited number of relative angles between the illuminating source and viewer location. These cover the typical relationship between a vehicle' headlamps as the source and the driver as the viewer.

3.7.17 These published angles do not reflect the relationship between a light source largely above the sign and therefore illuminating at steep angles and the varied viewing angles both in horizontal and vertical axis.



3.7.18 By reference to Table NA.1B in BS EN 12899-1 2007 the following nearest values have been referenced for consideration.

*“Viewing angle ( $\alpha$ ) = 1.5°*

*Angle of Entry ( $\beta_1$ ) >40° ( $\beta_2$ ) = 0*

*(minimum) Coefficient of Retroreflection*

*Blue = # (value greater than zero but not significant or applicable)*

*Gray = # (value greater than zero but not significant or applicable)*

*White = 1.5”*

3.7.19 Typical manufacturer data does not state notable deviations from these standards, only that they comply with or exceed the R3B performance criteria.

3.7.20 Given the unknowns of the material from the more extreme entry angles and viewing angles an indicative sign brightness based on the standard methodology of diffuse reflectance has been applied. It is recognised that this is an inexact approach however is intended to provide a guide to the potential lit appearance.

3.7.21 The coloured areas of the signs have been split to percentages, and then multiplied by a notional reflectance for each colour (referenced from CIBSE LG11 Surface reflectance and Colour, where colours appear darker than the guide the lowest published value has been used as an overestimate or reflectance) to gain a weighted average for the sign surface.

Table 7.7.4: Approximation of average reflectance of gantry signs.

| Colours and Approximated reflectance  | Gray<br>A2:<br>15% | Blue<br>F1: 0.17 | White<br>0.8<br>Assumed | Black<br>A1 : 0.1 | Weighted Average Reflectance |
|---------------------------------------|--------------------|------------------|-------------------------|-------------------|------------------------------|
| Percentage of GADS0003 in each colour | 38%                | 48.5%            | 12%                     | 1.5%              | 0.23                         |
| Percentage of GADS0004 in each colour | 32%                | 52.3%            | 15%                     | 0.7%              | 0.25                         |

3.7.22 Of the two signs calculated the higher average illuminance is 232lux (initial output excluding maintenance factors), which if applied through the 0.25 weighted reflectance gives the following:

$$(232\text{lux} * 0.25) / 3.14 \text{ pi} = 18.5 \text{ cd/m}^2$$



3.7.23 The  $\sim 18.5 \text{ cd/m}^2$  is within the limits of  $400 \text{ cd/m}^2$  of an E2 Environmental Zone and the  $50 \text{ cd/m}^2$  of an E1 environmental lighting zone according to ILP GN01, although exceeds suggested “advertising” intensities by reference to South Downs National Park TLL-10. Calculations show a margin for error up to a weighted average of  $\sim 0.6$  reflectance for the sign prior to approaching thresholds for an E1 environmental lighting zone.

## Assessment Summary

3.7.24 **Table 7.7.5** captures the potential impacts identified at receptors falling within the ZTV for gantries GADS003 and GADS0004.

Table 7.7.5: Summary of receptor assessment

| View location<br><i>*1 indicates location within South Downs National Park</i> | Relevant Environmental Light Zone | Assessment Criteria                                |   |   |  |
|--|-----------------------------------|--|---|---|--|
|  |                                   | Vertical Illuminance on Premises (Light Intrusion) | Limits on luminous Intensity in viewed luminaires   | Limitations on Sky Glow ULR / UFR           | Limits on Building Façade and Sign Luminance   |
| VL 1 *1  | E1a                               | N/A.<br>No property receptors at location.         | Location north of signs means limited opportunity for views of light sources. If views occur the values are anticipated to be within guidance values. | Proposed scheme has 0% direct upward light. | No direct view to lit face of signs based on view from northwest of signs and with intervening features. |
| VL 6a  | E2                                | N/A.<br>No property receptors at location.         | Location south of and at higher elevation of gantries prevents direct view of light source  | Proposed scheme has 0% direct upward light. | Based on available calculations, sign luminance falls within limits set by ILP GN01                      |

| View location<br><i>*1 indicates location within South Downs National Park</i> | Relevant Environmental Light Zone | Assessment Criteria                                |   |   |   |
|--|-----------------------------------|--|---|---|---|
|  |                                   | Vertical Illuminance on Premises (Light Intrusion) | Limits on luminous Intensity in viewed luminaires   | Limitations on Sky Glow ULR / UFR           | Limits on Building Façade and Sign Luminance  |
| VL 7   | E2 / E1                           | N/A.<br>No property receptors at location.         | A combination of the distance from the gantries, orientation of light sources and intervening features make direct visibility of light source improbable.<br><br>Based on peak luminance calculated elsewhere if views occur the values are anticipated to be within guidance values. | Proposed scheme has 0% direct upward light. | No direct view to lit face of signs based on view from northwest of signs and with intervening features.  |
| VL 8 <sup>*1</sup>   | E1a                               | N/A.<br>No property receptors at location.         | Location southeast of and at higher elevation to gantries prevents direct view of light source  | Proposed scheme has 0% direct upward light. | Intervening features and vegetation are likely to screen gantry visibility. If and where signs are visible, sign luminance falls within limits set by ILP GN01 based on available calculations. |

| View location<br><i>*1 indicates location within South Downs National Park</i> | Relevant Environmental Light Zone | Assessment Criteria                                |   |   |   |
|--|-----------------------------------|--|---|---|---|
|  |                                   | Vertical Illuminance on Premises (Light Intrusion) | Limits on luminous Intensity in viewed luminaires   | Limitations on Sky Glow ULR / UFR           | Limits on Building Façade and Sign Luminance  |
| VL 10  | E2 / E1                           | N/A.<br>No property receptors at location.         | Location southwest of and at higher elevation to gantries prevents direct view of light source.   | Proposed scheme has 0% direct upward light. | Intervening features are likely to screen gantry visibility. If and where signs are visible, sign luminance falls within limits set by ILP GN01 based on available calculations.              |
| VL 12  | E3                                | N/A.<br>No property receptors at location.         | Intervening features screen GADS0003. If and where light sources of GADS0004 are visible these are seen in the context of a lit urban foreground and are unlikely to exceed guideline values within this environmental lighting zone. | Proposed scheme has 0% direct upward light. | The location is north of GADS003 views to the lit sign are not possible. If and where GADS004 is visible, sign luminance falls within limits set by ILP GN01 based on available calculations. |

| View location<br><i>*1 indicates location within South Downs National Park</i> | Relevant Environmental Light Zone | Assessment Criteria                                |   |   |  |
|--|-----------------------------------|--|---|---|--|
|  |                                   | Vertical Illuminance on Premises (Light Intrusion) | Limits on luminous Intensity in viewed luminaires   | Limitations on Sky Glow ULR / UFR           | Limits on Building Façade and Sign Luminance   |
| VL 13 *1   | E1a                               | N/A.<br>No property receptors at location.         | Luminaires at the edge of the signs may be visible, however as presenting only as a portion of the luminaire. From broader angles glare is not anticipated based on peak luminance values calculated in the surrounds.          | Proposed scheme has 0% direct upward light. | View from the north will not have line of sight to the illuminated face of either gantry sign.               |
| VL 15  | E2 / E1                           | N/A.<br>No property receptors at location.         | Based on distance orientation and intervening features direct views of the light source are highly unlikely. If present these are anticipated to fall within guidelines by reference to calculation points at nearer locations. | Proposed scheme has 0% direct upward light. | View location is sufficiently north of the gantries that no direct view of the illuminated face is possible. |

| View location<br><i>*1 indicates location within South Downs National Park</i> | Relevant Environmental Light Zone | Assessment Criteria  |   |   |   |
|--|-----------------------------------|--|---|---|---|
|  |                                   | Vertical Illuminance on Premises (Light Intrusion)   | Limits on luminous Intensity in viewed luminaires   | Limitations on Sky Glow ULR / UFR           | Limits on Building Façade and Sign Luminance  |
| VL 16 <sup>*1</sup>  | E1b                               | Located on higher elevation. Distance and relative locations make light intrusion highly unlikely. | Located sufficiently south of Gantries, that direct view to light source not possible in current configuration. | Proposed scheme has 0% direct upward light. | If and where GADS004 is visible, sign luminance falls within limits set by ILP GN01 based on available calculations.  |
| VL 19b <sup>*1</sup>   | E1a                               | N/A.<br>No property receptors at location.   | Located sufficiently south of Gantries, that direct view to light source not possible in current configuration. | Proposed scheme has 0% direct upward light. | Whilst gantries are not visible from view location, as users progress west along Morstead Road (VL 19b) these will become visible.<br><br>If and where gantries become visible, sign luminance falls within limits set by ILP GN01 based on available calculations. |

| View location<br><i>*1 indicates location within South Downs National Park</i> | Relevant Environmental Light Zone | Assessment Criteria                                |   |   |  |
|--|-----------------------------------|--|---|---|--|
|  |                                   | Vertical Illuminance on Premises (Light Intrusion) | Limits on luminous Intensity in viewed luminaires   | Limitations on Sky Glow ULR / UFR           | Limits on Building Façade and Sign Luminance   |
| VL 20 *1   | E1a                               | N/A.<br>No property receptors at location.         | View location has clear view up M3, however falls outside of the ZTV for gantries. Direct view of light sources not possible. | Proposed scheme has 0% direct upward light. | View location has clear view up M3, however falls outside of the ZTV for gantries. Direct view of illuminated sign faces not possible. |

### Future Opportunities

- 3.7.25 As discussed in **Section 3.6**, the designs have been developed to place luminaires as close to horizontal as practical and seek to avoid direct upward light.
- 3.7.26 **Section 3.2** discusses the various legislation and guidance regarding the illumination of overhead gantry signs. Future risk assessments and appraisals of alternate reflectorisation finishes and classes may enable fixed external illumination of the signs to be removed, in which case and increased luminance of the signs will be solely dependent on retroreflection from vehicle headlamps.

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## 4 Conclusion

- 4.1.1 Whilst the scheme is designed to avoid direct upward light, reflected light and the resulting sign luminance will have an upward quantity. Within the limitation of calculating the performance of retroreflective materials in this application it is understood that sign luminance has been kept within the guidelines appropriate for the Environmental Lighting Zone in which it is located. The proposed illuminated gantry signs will add lit elements into the currently unlit (from fixed installations) M3 corridor; however this is in context of the townscape and urban edge of Winchester which includes light sources. Overall it is not anticipated to negatively affect or impede on the South Downs National Park dark skies reserve.



## **Appendix A**

### **A.1 ANNEX 1**

#### **GADS003\_Proposed-Obtrusive**

# Viewpoint

## GADS003 - Proposed Scheme

| Luminaire Schedule |     |                               |             |  |       |                  |                 |             |
|--------------------|-----|-------------------------------|-------------|--|-------|------------------|-----------------|-------------|
| Symbol             | Qty | Label                         | Arrangement | Description  | LLF   | Luminaire Lumens | Luminaire Watts | Total Watts |
| □                  | 6   | NEOS 1 LED 5102 24 XP-G3 500m | Sign Offset | NEOS 1 LED 5102 24 XP-G3@500mA<br>NW 740 230V Back Light | 1.000 | 4124             | 37.6            | 225.6       |

| Luminaire Location Summary |                               |                 |   |      |        |      |
|----------------------------|-------------------------------|-----------------|---|------|--------|------|
| LumNo                      | Label                         | Insertion Point |   |      | Orient | Tilt |
|                            |                               | X               | Y | Z    |        |      |
| 120                        | NEOS 1 LED 5102 24 XP-G3 500m | 9.025           | 0 | 10.4 | 270    | 0    |
| 121                        | NEOS 1 LED 5102 24 XP-G3 500m | 11.925          | 0 | 10.4 | 270    | 0    |
| 122                        | NEOS 1 LED 5102 24 XP-G3 500m | 14.825          | 0 | 10.4 | 270    | 0    |
| 123                        | NEOS 1 LED 5102 24 XP-G3 500m | 17.725          | 0 | 10.4 | 270    | 0    |
| 124                        | NEOS 1 LED 5102 24 XP-G3 500m | 20.625          | 0 | 10.4 | 270    | 0    |
| 125                        | NEOS 1 LED 5102 24 XP-G3 500m | 23.525          | 0 | 10.4 | 270    | 0    |

| Calculation Summary   |                 |       |        |       |      |         |         |
|-----------------------|-----------------|-------|--------|-------|------|---------|---------|
| Label                 | CalcType        | Units | Avg    | Max   | Min  | Min/Avg | Min/Max |
| Sign 1 Side 3 1       | Illuminance     | Lux   | 159.90 | 280.8 | 54.4 | 0.34    | 0.19    |
| East 100m Cd Seg1     | Obtrusive - Cd  | N.A.  | 49.80  | 249   | 8    | 0.16    | 0.03    |
| East 100m Ill Seg1    | Obtrusive - Ill | Lux   | 0.00   | 0.1   | 0.0  | N.A.    | 0.00    |
| North 100m Cd Seg1    | Obtrusive - Cd  | N.A.  | 23.49  | 103   | 0    | 0.00    | 0.00    |
| North 100m Ill Seg1   | Obtrusive - Ill | Lux   | 0.02   | 0.1   | 0.0  | 0.00    | 0.00    |
| South 100m Cd Seg1    | Obtrusive - Cd  | N.A.  | 0.13   | 1     | 0    | 0.00    | 0.00    |
| South 100m Ill Seg1   | Obtrusive - Ill | Lux   | 0.12   | 0.2   | 0.0  | 0.00    | 0.00    |
| West 65m Cd Seg1      | Obtrusive - Cd  | N.A.  | 72.53  | 613   | 9    | 0.12    | 0.01    |
| West 65m Ill Seg1     | Obtrusive - Ill | Lux   | 0.01   | 0.2   | 0.0  | 0.00    | 0.00    |
| z Ground Plane Planar | Illuminance     | Lux   | 2.52   | 66.3  | 0.0  | 0.00    | 0.00    |

| Isoline Legend    |       |
|-------------------|-------|
| Illuminance (Lux) |       |
| Color             | Value |
| Black             | 10    |
| Blue              | 50    |
| Green             | 75    |
| Yellow            | 100   |
| Red               | 125   |
| Magenta           | 150   |
| Cyan              | 175   |
| Dark Green        | 200   |
| Dark Blue         | 225   |
| Dark Red          | 250   |
| Dark Magenta      | 275   |
| Dark Cyan         | 300   |

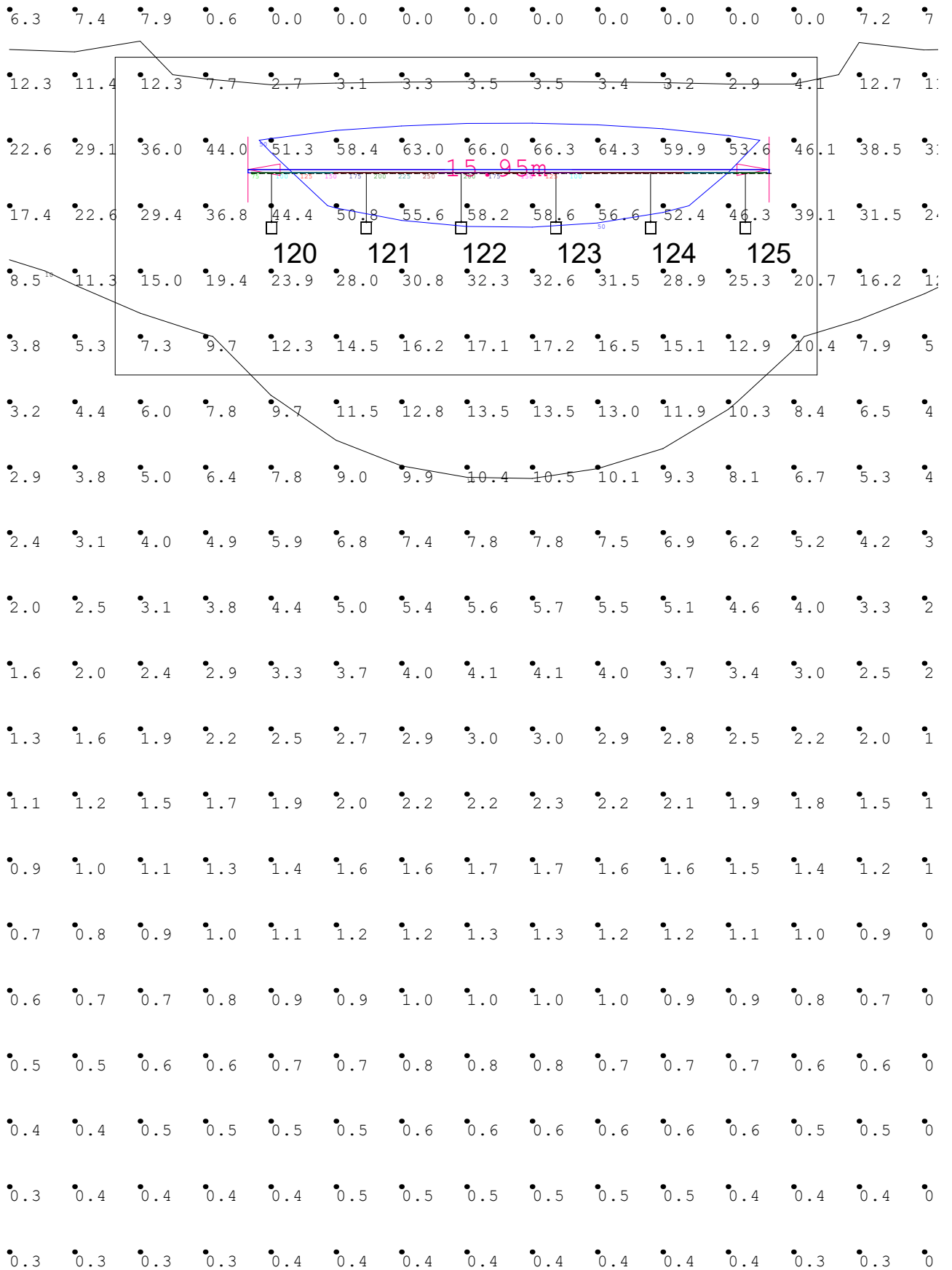
Upward Light

Area = 208.71 Sq.m  
UWLR = 0.000

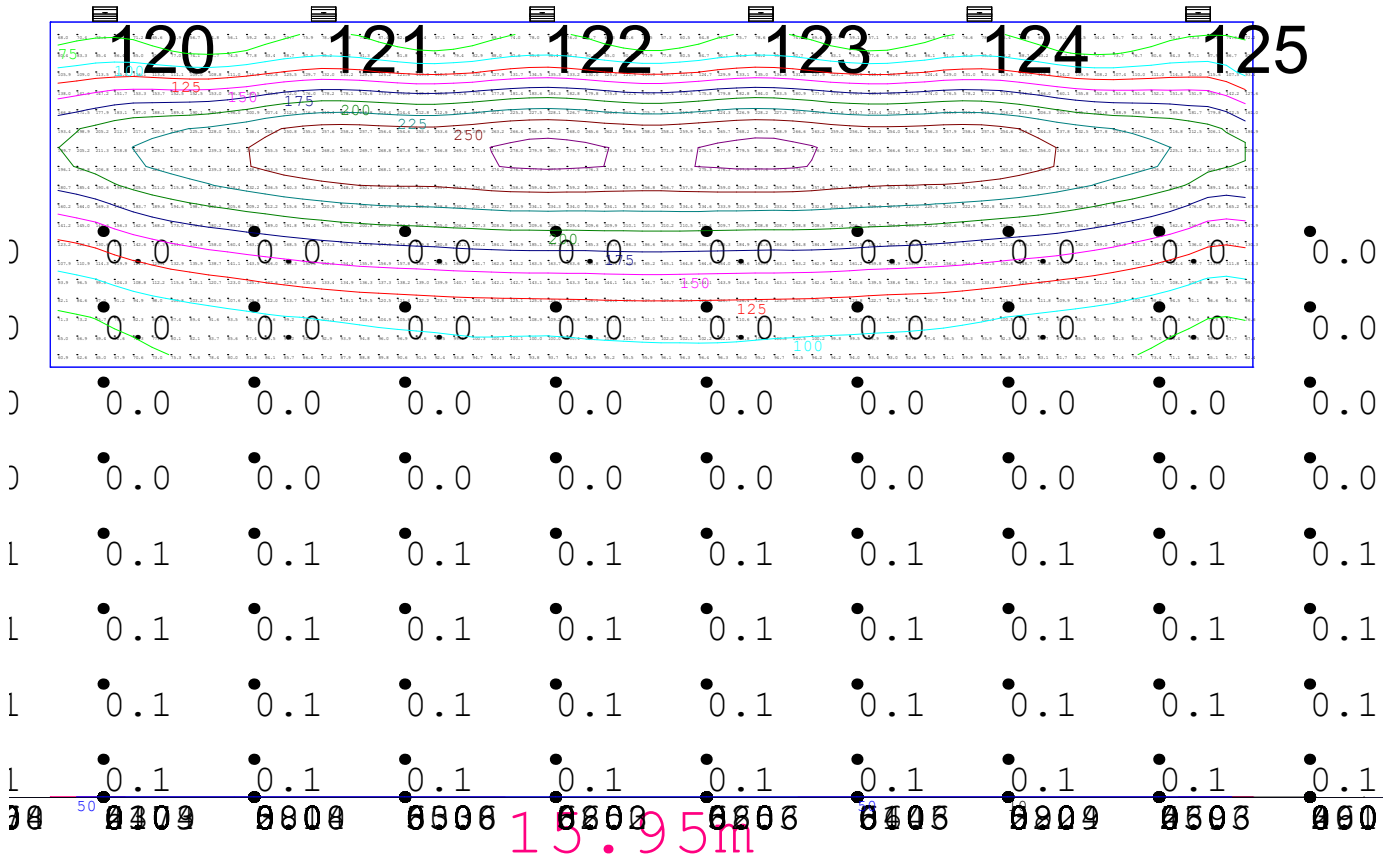
| Object Summary |           |             |
|----------------|-----------|-------------|
| Label          | Type      | Description |
| Ground Plane   | Planar    |             |
| Sign 1         | Rect-Flat |             |



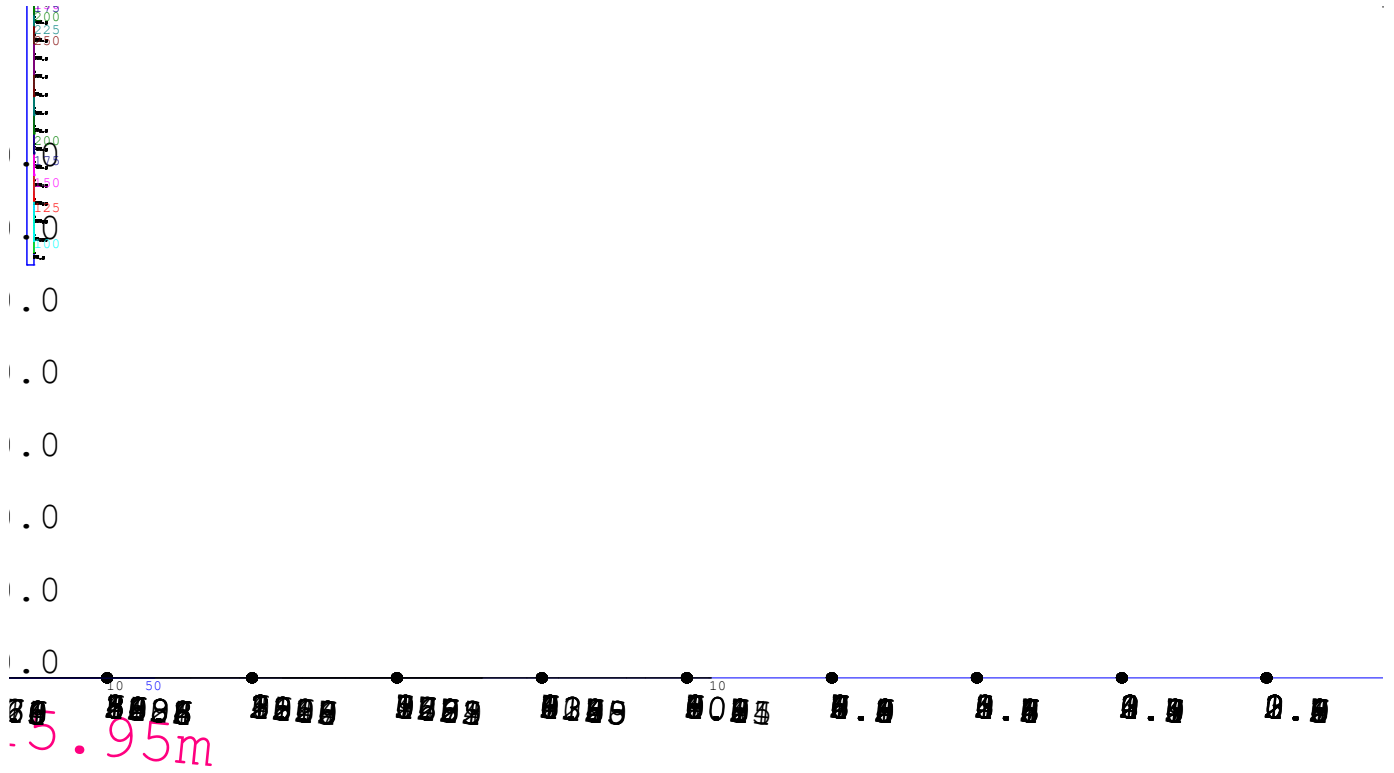
# Viewpoint - Cont.



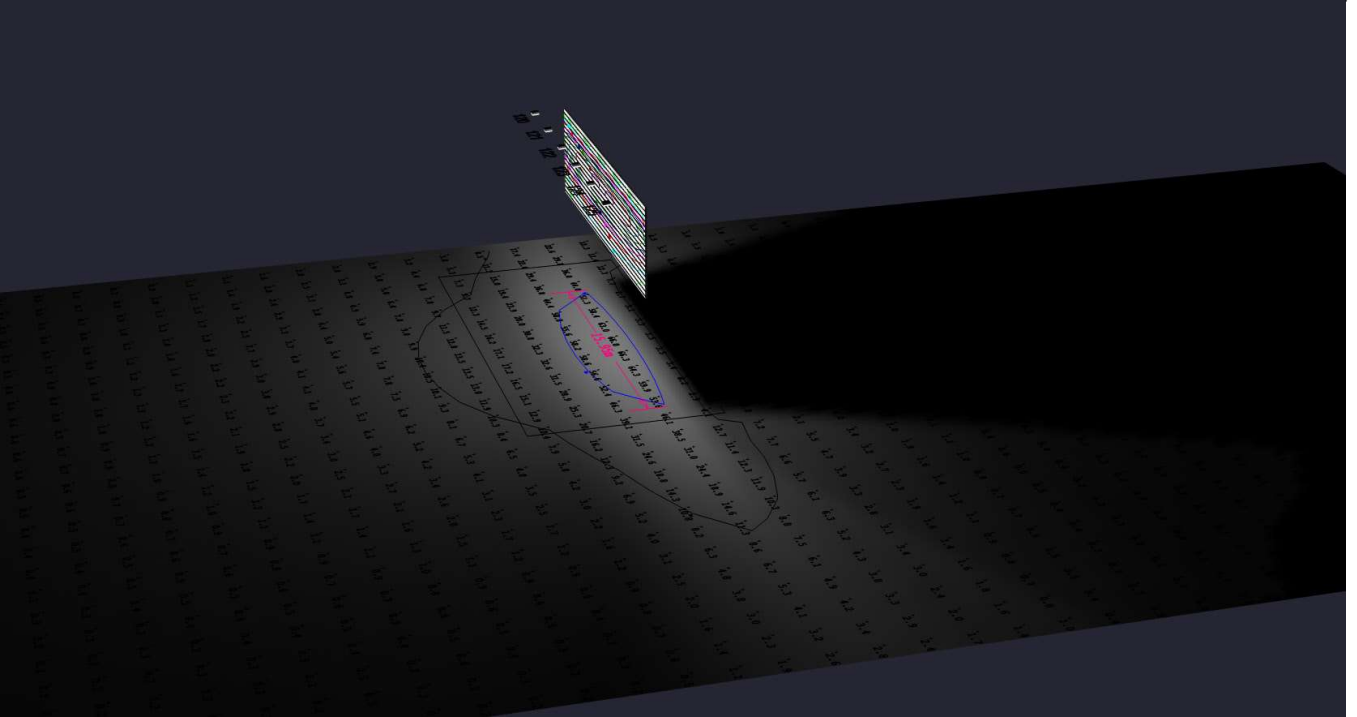
# Viewpoint - Cont.



# Viewpoint - Cont.



# Render View



Rendered View 1

M3 Junction 9

6.3 Environmental Statement Appendix 7.7 Technical Note Lighting Assessment of Gantry Signage

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## **GADS003\_Proposed-DesignValues**



# Viewpoint

## GADS003 - Proposed Scheme

| Luminaire Schedule |     |                               |             |  |       |                  |                 |             |
|--------------------|-----|-------------------------------|-------------|--|-------|------------------|-----------------|-------------|
| Symbol             | Qty | Label                         | Arrangement | Description  | LLF   | Luminaire Lumens | Luminaire Watts | Total Watts |
| □                  | 6   | NEOS 1 LED 5102 24 XP-G3 500m | Sign Offset | NEOS 1 LED 5102 24 XP-G3@500mA<br>NW 740 230V Back Light | 0.890 | 4124             | 37.6            | 225.6       |

| Luminaire Location Summary |                               |                 |   |      |        |      |
|----------------------------|-------------------------------|-----------------|---|------|--------|------|
| LumNo                      | Label                         | Insertion Point |   |      | Orient | Tilt |
|                            |                               | X               | Y | Z    |        |      |
| 120                        | NEOS 1 LED 5102 24 XP-G3 500m | 9.025           | 0 | 10.4 | 270    | 0    |
| 121                        | NEOS 1 LED 5102 24 XP-G3 500m | 11.925          | 0 | 10.4 | 270    | 0    |
| 122                        | NEOS 1 LED 5102 24 XP-G3 500m | 14.825          | 0 | 10.4 | 270    | 0    |
| 123                        | NEOS 1 LED 5102 24 XP-G3 500m | 17.725          | 0 | 10.4 | 270    | 0    |
| 124                        | NEOS 1 LED 5102 24 XP-G3 500m | 20.625          | 0 | 10.4 | 270    | 0    |
| 125                        | NEOS 1 LED 5102 24 XP-G3 500m | 23.525          | 0 | 10.4 | 270    | 0    |

| Calculation Summary   |                 |       |        |       |      |         |         |
|-----------------------|-----------------|-------|--------|-------|------|---------|---------|
| Label                 | CalcType        | Units | Avg    | Max   | Min  | Min/Avg | Min/Max |
| Sign 1 Side 3 1       | Illuminance     | Lux   | 142.31 | 249.9 | 48.4 | 0.34    | 0.19    |
| East 100m Cd Seg1     | Obtrusive - Cd  | N.A.  | 44.33  | 222   | 7    | 0.16    | 0.03    |
| East 100m Ill Seg1    | Obtrusive - Ill | Lux   | 0.00   | 0.1   | 0.0  | N.A.    | 0.00    |
| North 100m Cd Seg1    | Obtrusive - Cd  | N.A.  | 20.92  | 91    | 0    | 0.00    | 0.00    |
| North 100m Ill Seg1   | Obtrusive - Ill | Lux   | 0.01   | 0.1   | 0.0  | 0.00    | 0.00    |
| South 100m Cd Seg1    | Obtrusive - Cd  | N.A.  | 0.13   | 1     | 0    | 0.00    | 0.00    |
| South 100m Ill Seg1   | Obtrusive - Ill | Lux   | 0.09   | 0.2   | 0.0  | 0.00    | 0.00    |
| West 65m Cd Seg1      | Obtrusive - Cd  | N.A.  | 64.53  | 345   | 8    | 0.12    | 0.01    |
| West 65m Ill Seg1     | Obtrusive - Ill | Lux   | 0.01   | 0.2   | 0.0  | 0.00    | 0.00    |
| z Ground Plane Planar | Illuminance     | Lux   | 2.25   | 59.0  | 0.0  | 0.00    | 0.00    |

| Isoline Legend    |       |
|-------------------|-------|
| Illuminance (Lux) |       |
| Color             | Value |
| Black             | 10    |
| Blue              | 50    |
| Green             | 75    |
| Yellow            | 100   |
| Red               | 125   |
| Magenta           | 150   |
| Cyan              | 175   |
| Dark Green        | 200   |
| Dark Blue         | 225   |
| Dark Red          | 250   |
| Dark Magenta      | 275   |
| Dark Cyan         | 300   |

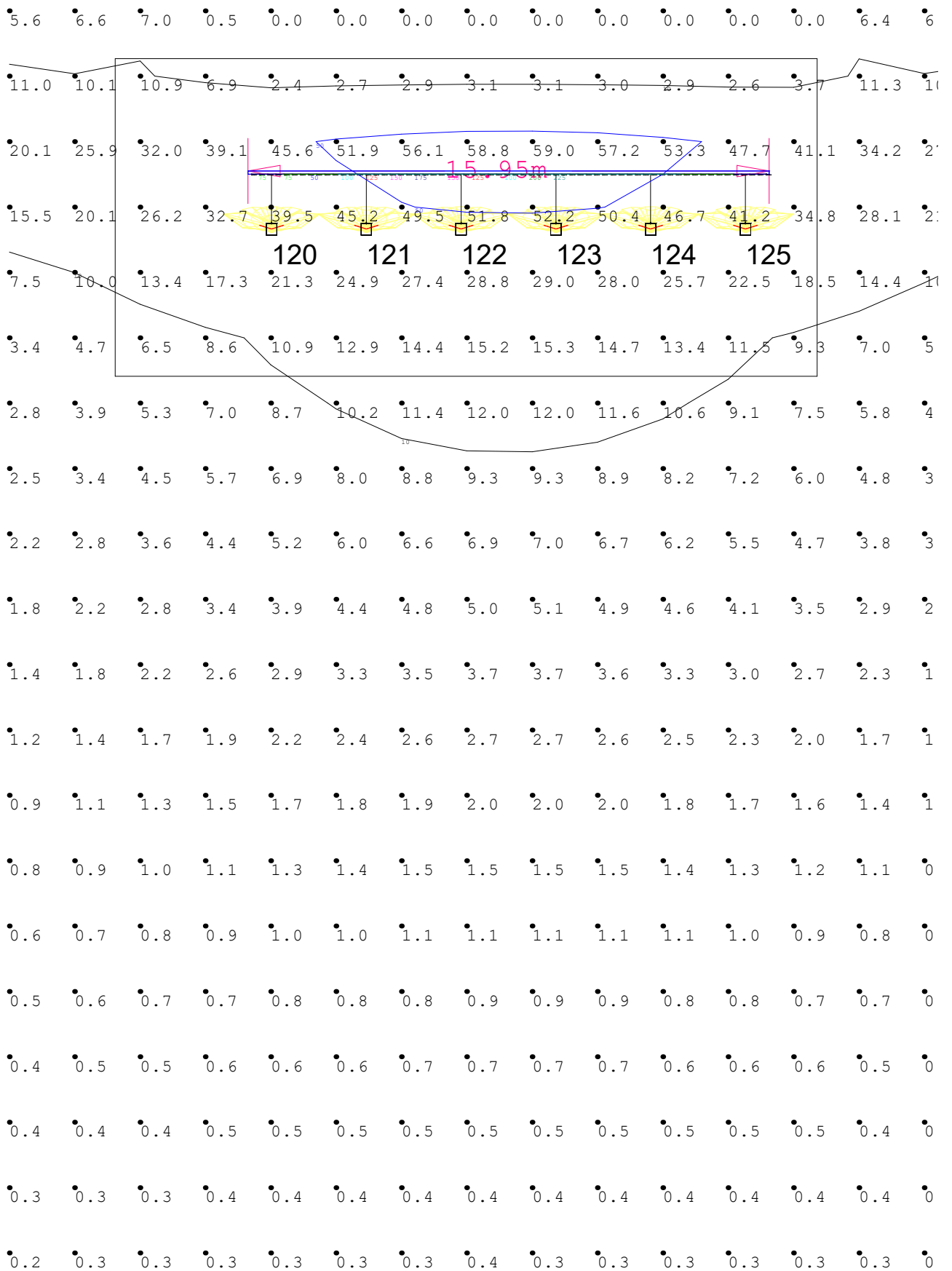
Upward Light

Area = 208.71 Sq.m  
UWLR = 0.000

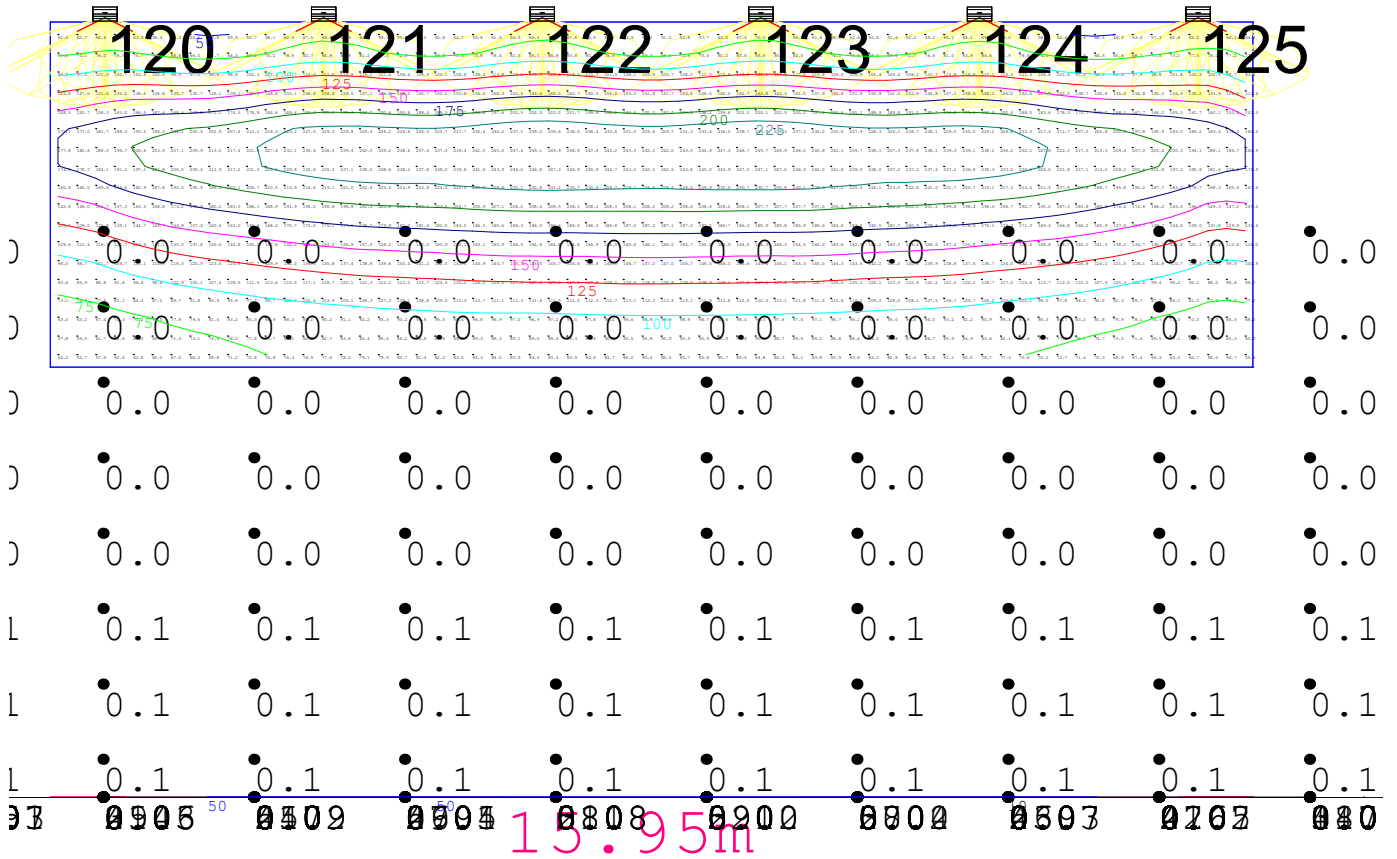
| Object Summary |           |             |
|----------------|-----------|-------------|
| Label          | Type      | Description |
| Ground Plane   | Planar    |             |
| Sign 1         | Rect-Flat |             |



# Viewpoint - Cont.

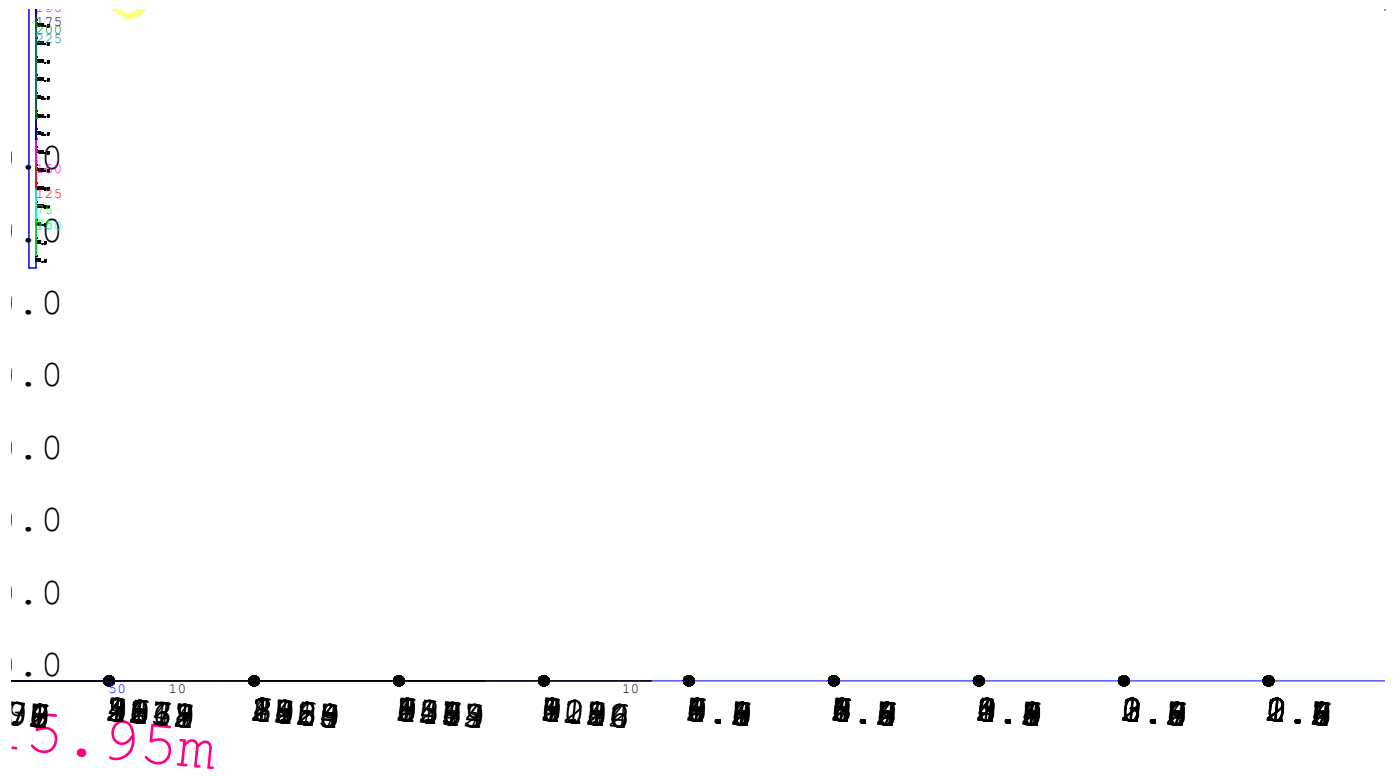


# Viewpoint - Cont.

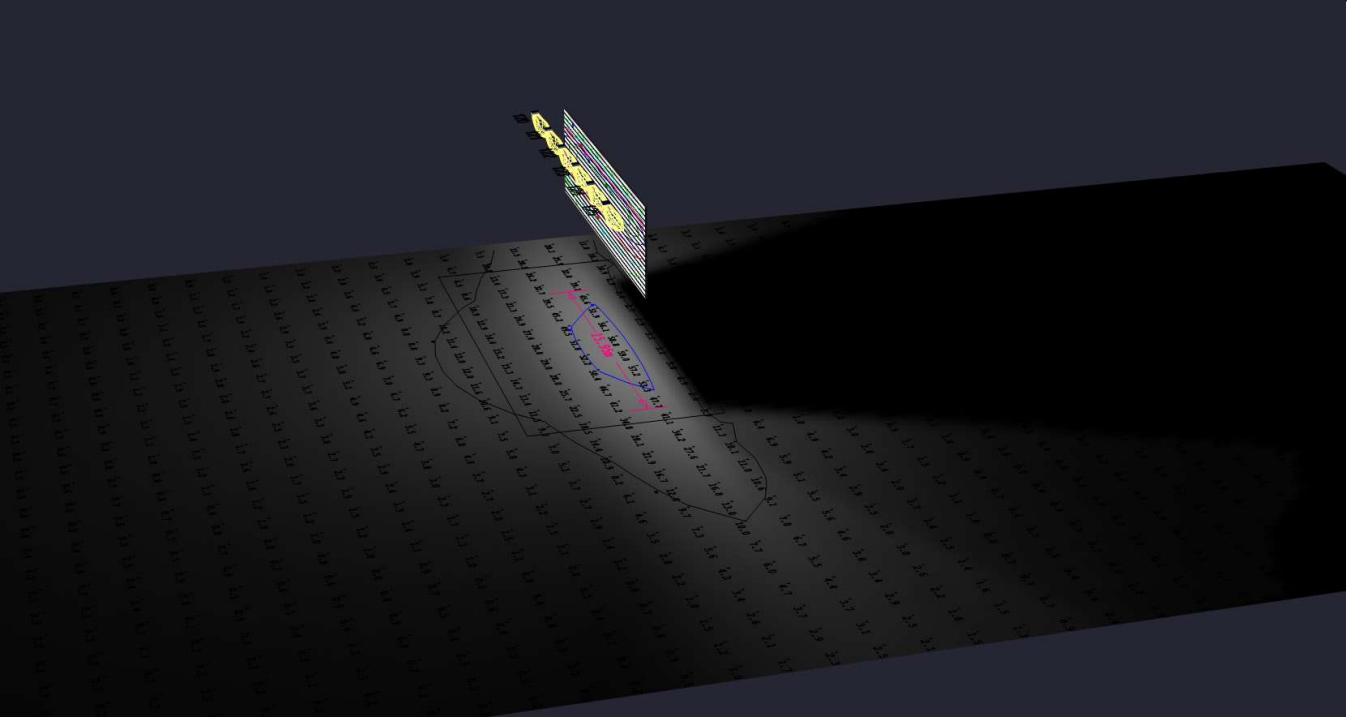


VIEWPOINT: 4 - Elevation (Sign)

# Viewpoint - Cont.



# Render View



Rendered View 1

## **Appendix B**

### **B.1 ANNEX 2**

#### **GADS004\_Proposed-Obtrusive**

# Viewpoint

## GADS004 - Proposed Scheme

| Luminaire Schedule |     |                               |             |  |       |                  |                 |             |
|--------------------|-----|-------------------------------|-------------|--|-------|------------------|-----------------|-------------|
| Symbol             | Qty | Label                         | Arrangement | Description  | LLF   | Luminaire Lumens | Luminaire Watts | Total Watts |
| □                  | 6   | NEOS 1 LED 5102 24 XP-G3 500m | Sign Offset | NEOS 1 LED 5102 24 XP-G3@500mA<br>NW 740 230V Back Light | 1.000 | 4124             | 37.6            | 225.6       |

| Luminaire Location Summary |                               |                 |   |   |        |      |
|----------------------------|-------------------------------|-----------------|---|---|--------|------|
| LumNo                      | Label                         | Insertion Point |   |   | Orient | Tilt |
|                            |                               | X               | Y | Z |        |      |
| 101                        | NEOS 1 LED 5102 24 XP-G3 500m | 8.983           | 0 | 9 | 270    | 5    |
| 102                        | NEOS 1 LED 5102 24 XP-G3 500m | 11.583          | 0 | 9 | 270    | 5    |
| 103                        | NEOS 1 LED 5102 24 XP-G3 500m | 14.183          | 0 | 9 | 270    | 5    |
| 104                        | NEOS 1 LED 5102 24 XP-G3 500m | 16.783          | 0 | 9 | 270    | 5    |
| 105                        | NEOS 1 LED 5102 24 XP-G3 500m | 19.383          | 0 | 9 | 270    | 5    |
| 106                        | NEOS 1 LED 5102 24 XP-G3 500m | 21.983          | 0 | 9 | 270    | 5    |

| Calculation Summary   |                 |       |        |       |       |         |         |
|-----------------------|-----------------|-------|--------|-------|-------|---------|---------|
| Label                 | CalcType        | Units | Avg    | Max   | Min   | Min/Avg | Min/Max |
| Sign 1 Side 3         | Illuminance     | Lux   | 231.71 | 328.8 | 121.1 | 0.52    | 0.37    |
| East 100m Cd Seg1     | Obtrusive - Cd  | N.A.  | 74.11  | 302   | 7     | 0.09    | 0.02    |
| East 100m Ill Seg1    | Obtrusive - Ill | Lux   | 0.00   | 0.1   | 0.0   | N.A.    | 0.00    |
| North 100m Cd Seg1    | Obtrusive - Cd  | N.A.  | 45.77  | 175   | 0     | 0.00    | 0.00    |
| North 100m Ill Seg1   | Obtrusive - Ill | Lux   | 0.07   | 0.1   | 0.0   | 0.00    | 0.00    |
| South 100m Cd Seg1    | Obtrusive - Cd  | N.A.  | 0.00   | 0     | 0     | N.A.    | N.A.    |
| South 100m Ill Seg1   | Obtrusive - Ill | Lux   | 0.00   | 0.0   | 0.0   | N.A.    | N.A.    |
| West 65m Cd Seg1      | Obtrusive - Cd  | N.A.  | 101.14 | 653   | 7     | 0.07    | 0.01    |
| West 65m Ill Seg1     | Obtrusive - Ill | Lux   | 0.01   | 0.2   | 0.0   | 0.00    | 0.00    |
| z Ground Plane Planar | Illuminance     | Lux   | 2.43   | 85.4  | 0.0   | 0.00    | 0.00    |

| Isoline Legend    |       |
|-------------------|-------|
| Illuminance (Lux) |       |
| Color             | Value |
| Black             | 10    |
| Blue              | 50    |
| Green             | 75    |
| Yellow            | 100   |
| Red               | 125   |
| Magenta           | 150   |
| Cyan              | 175   |
| Dark Blue         | 200   |
| Dark Green        | 225   |
| Dark Yellow       | 250   |
| Dark Red          | 275   |
| Dark Magenta      | 300   |

Upward Light

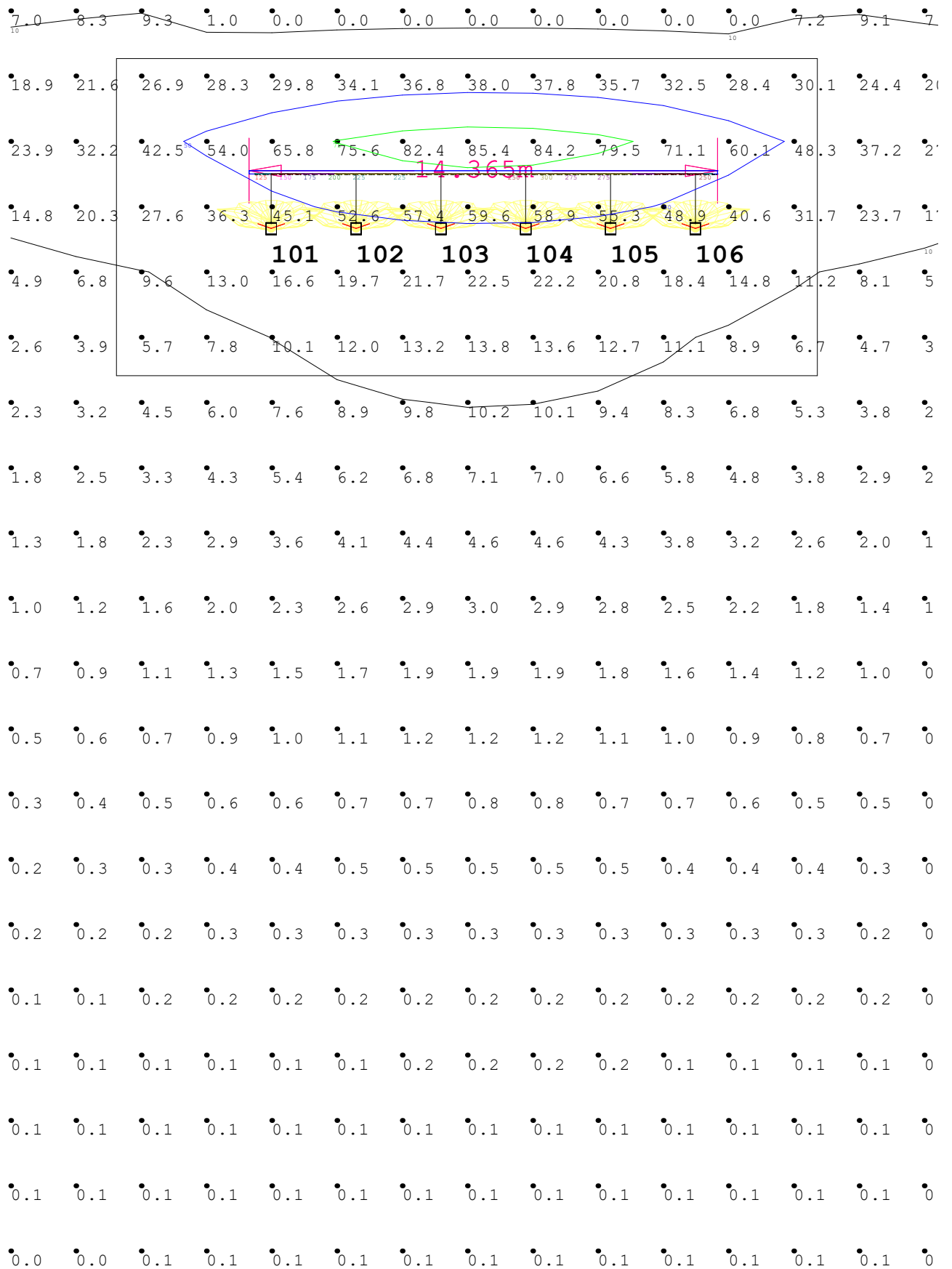
Area = 208.71 Sq.m  
UWLR = 0.002

| Object Summary |           |             |
|----------------|-----------|-------------|
| Label          | Type      | Description |
| Ground Plane   | Planar    |             |
| Sign - GADS004 | Rect-Flat |             |

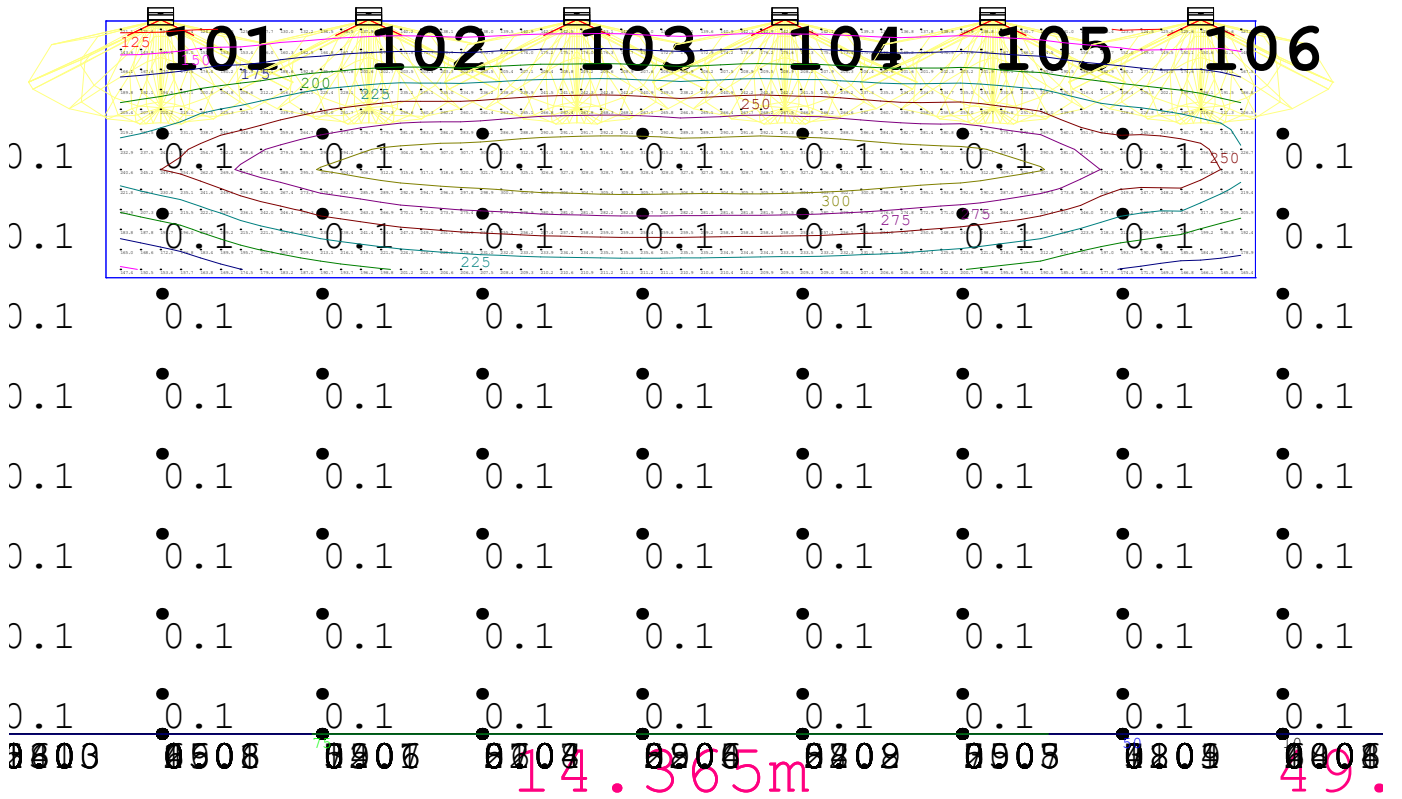




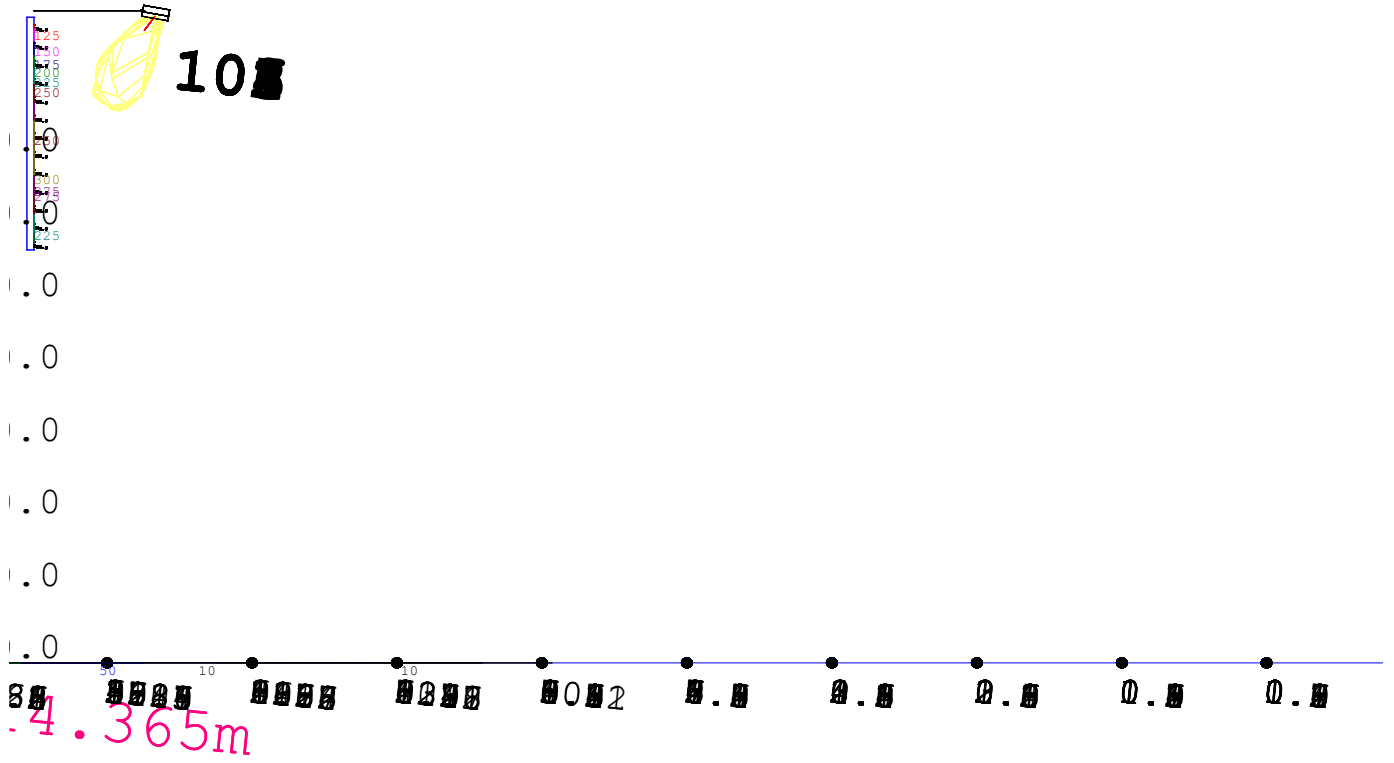
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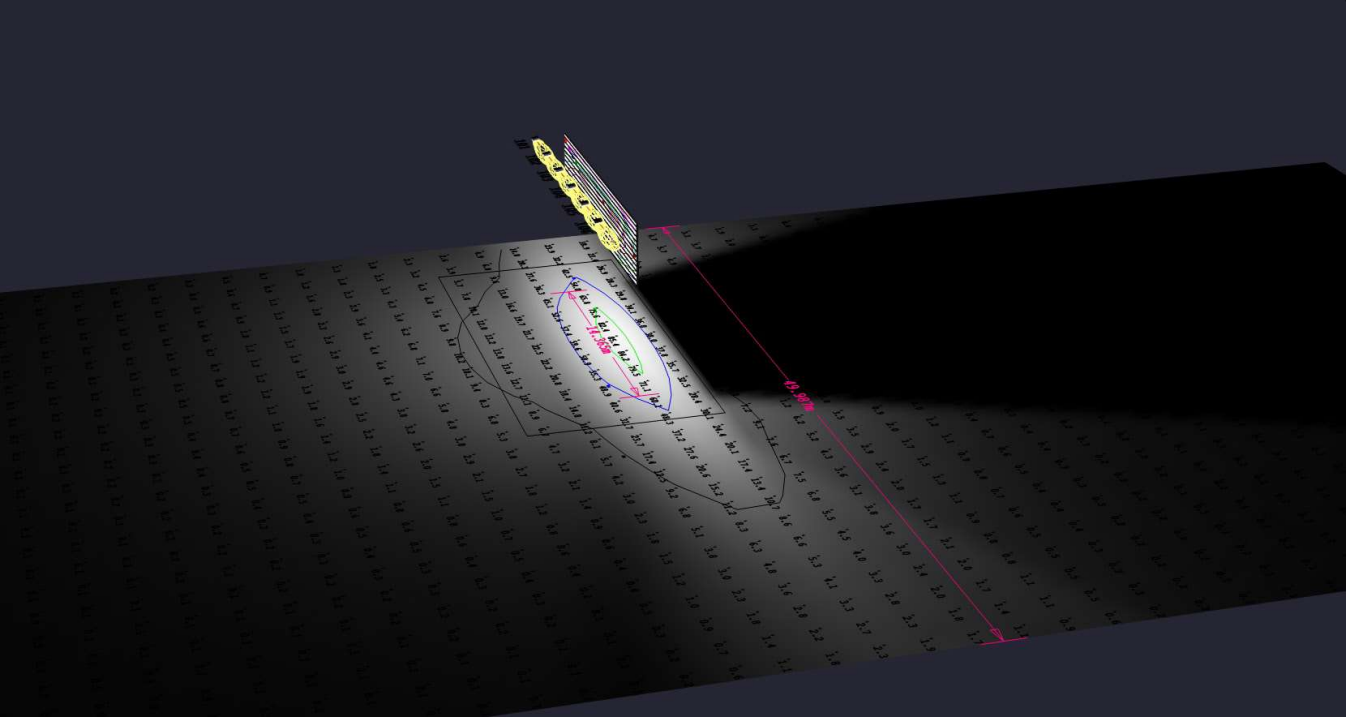
# Viewpoint - Cont.



# Viewpoint - Cont.



# Render View



Rendered View 1

M3 Junction 9

6.3 Environmental Statement Appendix 7.7 Technical Note Lighting Assessment of Gantry Signage

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## **GADS004\_Proposed-DesignValues**

# Viewpoint

## GADS004 - Proposed Scheme

| Luminaire Schedule |     |                               |             |  |       |                  |                 |             |
|--------------------|-----|-------------------------------|-------------|--|-------|------------------|-----------------|-------------|
| Symbol             | Qty | Label                         | Arrangement | Description  | LLF   | Luminaire Lumens | Luminaire Watts | Total Watts |
| □                  | 6   | NEOS 1 LED 5102 24 XP-G3 500m | Sign Offset | NEOS 1 LED 5102 24 XP-G3@500mA<br>NW 740 230V Back Light | 0.890 | 4124             | 37.6            | 225.6       |

| Luminaire Location Summary |                               |                 |   |   |        |      |
|----------------------------|-------------------------------|-----------------|---|---|--------|------|
| LumNo                      | Label                         | Insertion Point |   |   | Orient | Tilt |
|                            |                               | X               | Y | Z |        |      |
| 101                        | NEOS 1 LED 5102 24 XP-G3 500m | 8.983           | 0 | 9 | 270    | 5    |
| 102                        | NEOS 1 LED 5102 24 XP-G3 500m | 11.583          | 0 | 9 | 270    | 5    |
| 103                        | NEOS 1 LED 5102 24 XP-G3 500m | 14.183          | 0 | 9 | 270    | 5    |
| 104                        | NEOS 1 LED 5102 24 XP-G3 500m | 16.783          | 0 | 9 | 270    | 5    |
| 105                        | NEOS 1 LED 5102 24 XP-G3 500m | 19.383          | 0 | 9 | 270    | 5    |
| 106                        | NEOS 1 LED 5102 24 XP-G3 500m | 21.983          | 0 | 9 | 270    | 5    |

| Calculation Summary   |                 |       |        |       |      |         |         |
|-----------------------|-----------------|-------|--------|-------|------|---------|---------|
| Label                 | CalcType        | Units | Avg    | Max   | Min  | Min/Avg | Min/Max |
| Sign 1 Side 3         | Illuminance     | Lux   | 208.65 | 331.2 | 67.6 | 0.32    | 0.20    |
| East 100m Cd Seg1     | Obtrusive - Cd  | N.A.  | 65.97  | 268   | 6    | 0.09    | 0.02    |
| East 100m Ill Seg1    | Obtrusive - Ill | Lux   | 0.00   | 0.1   | 0.0  | N.A.    | 0.00    |
| North 100m Cd Seg1    | Obtrusive - Cd  | N.A.  | 40.72  | 156   | 0    | 0.00    | 0.00    |
| North 100m Ill Seg1   | Obtrusive - Ill | Lux   | 0.07   | 0.1   | 0.0  | 0.00    | 0.00    |
| South 100m Cd Seg1    | Obtrusive - Cd  | N.A.  | 0.00   | 0     | 0    | N.A.    | N.A.    |
| South 100m Ill Seg1   | Obtrusive - Ill | Lux   | 0.00   | 0.0   | 0.0  | N.A.    | N.A.    |
| West 65m Cd Seg1      | Obtrusive - Cd  | N.A.  | 90.01  | 581   | 6    | 0.07    | 0.01    |
| West 65m Ill Seg1     | Obtrusive - Ill | Lux   | 0.01   | 0.2   | 0.0  | 0.00    | 0.00    |
| z Ground Plane Planar | Illuminance     | Lux   | 2.16   | 76.0  | 0.0  | 0.00    | 0.00    |

| Isoline Legend    |       |
|-------------------|-------|
| Illuminance (Lux) |       |
| Color             | Value |
| Black             | 10    |
| Blue              | 50    |
| Green             | 75    |
| Yellow            | 100   |
| Red               | 125   |
| Magenta           | 150   |
| Cyan              | 175   |
| Dark Blue         | 200   |
| Dark Green        | 225   |
| Dark Yellow       | 250   |
| Dark Red          | 275   |
| Dark Magenta      | 300   |

Upward Light

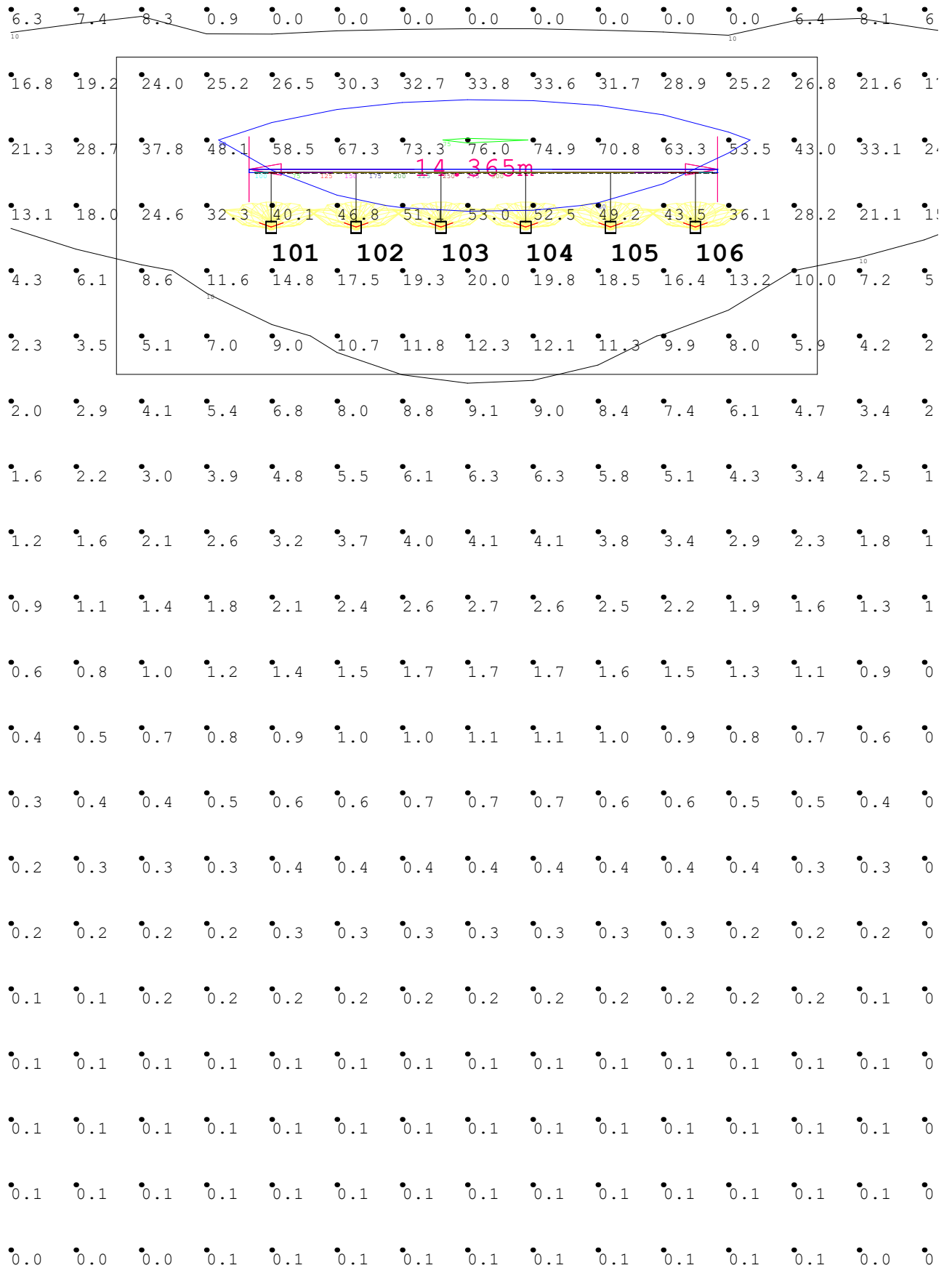
Area = 208.71 Sq.m  
UWLR = 0.002

| Object Summary |           |             |
|----------------|-----------|-------------|
| Label          | Type      | Description |
| Ground Plane   | Planar    |             |
| Sign - GADS004 | Rect-Flat |             |

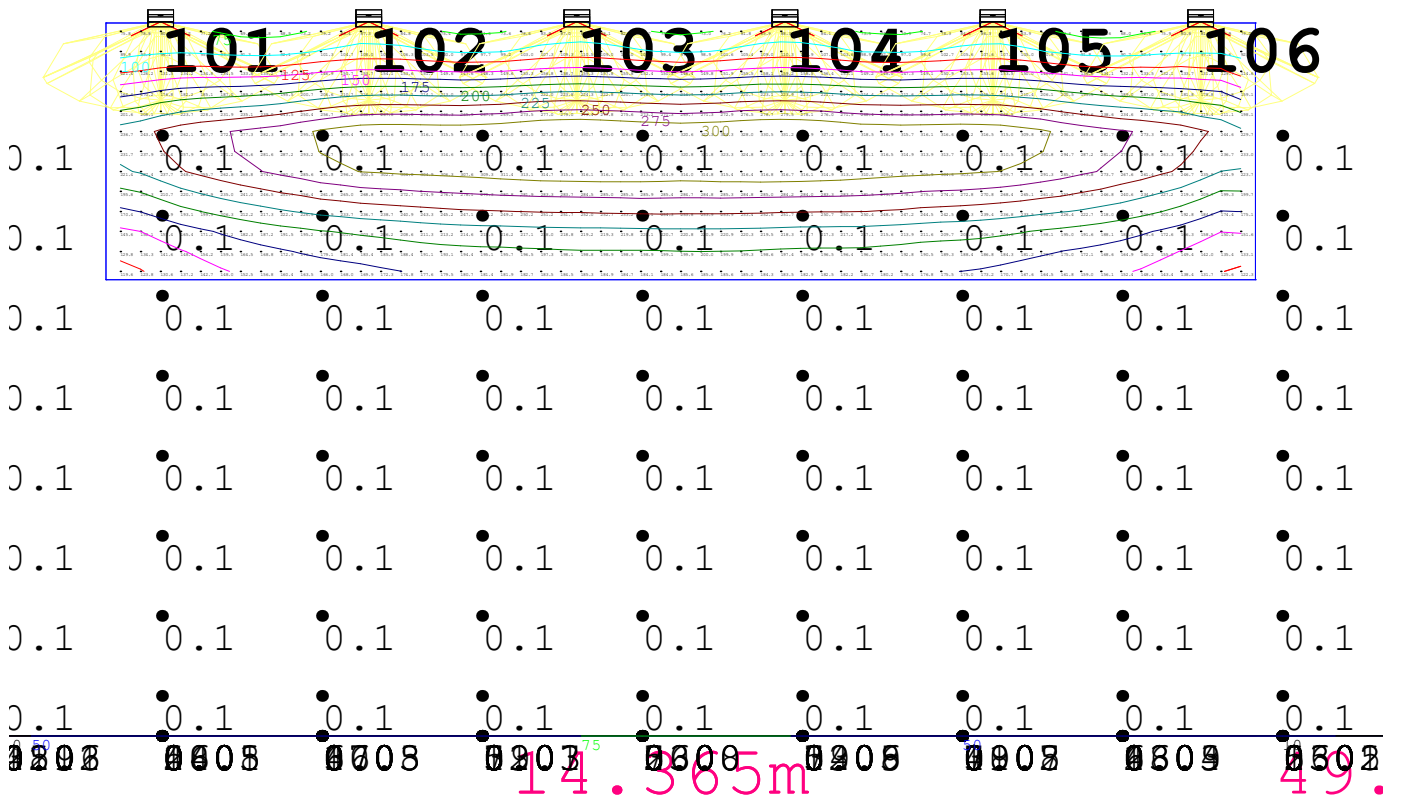




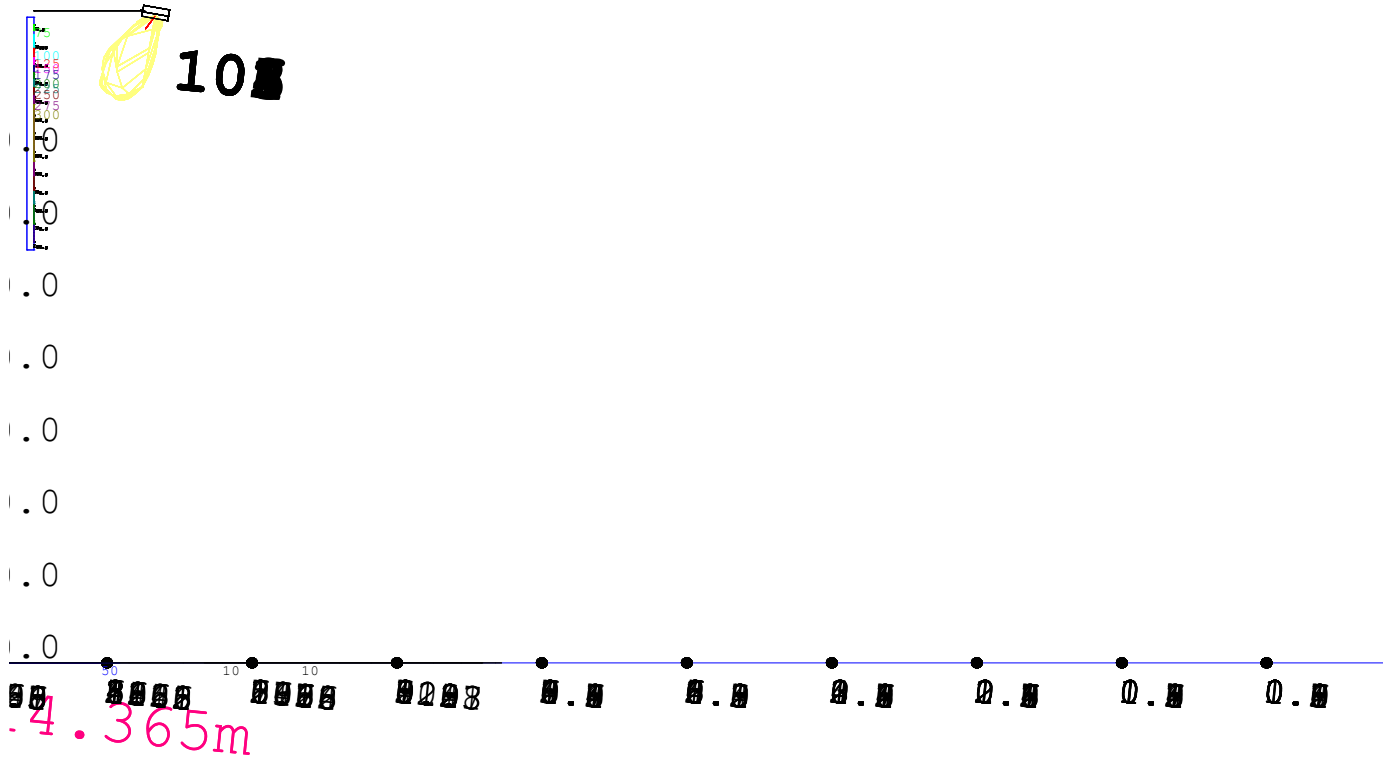
# Viewpoint - Cont.



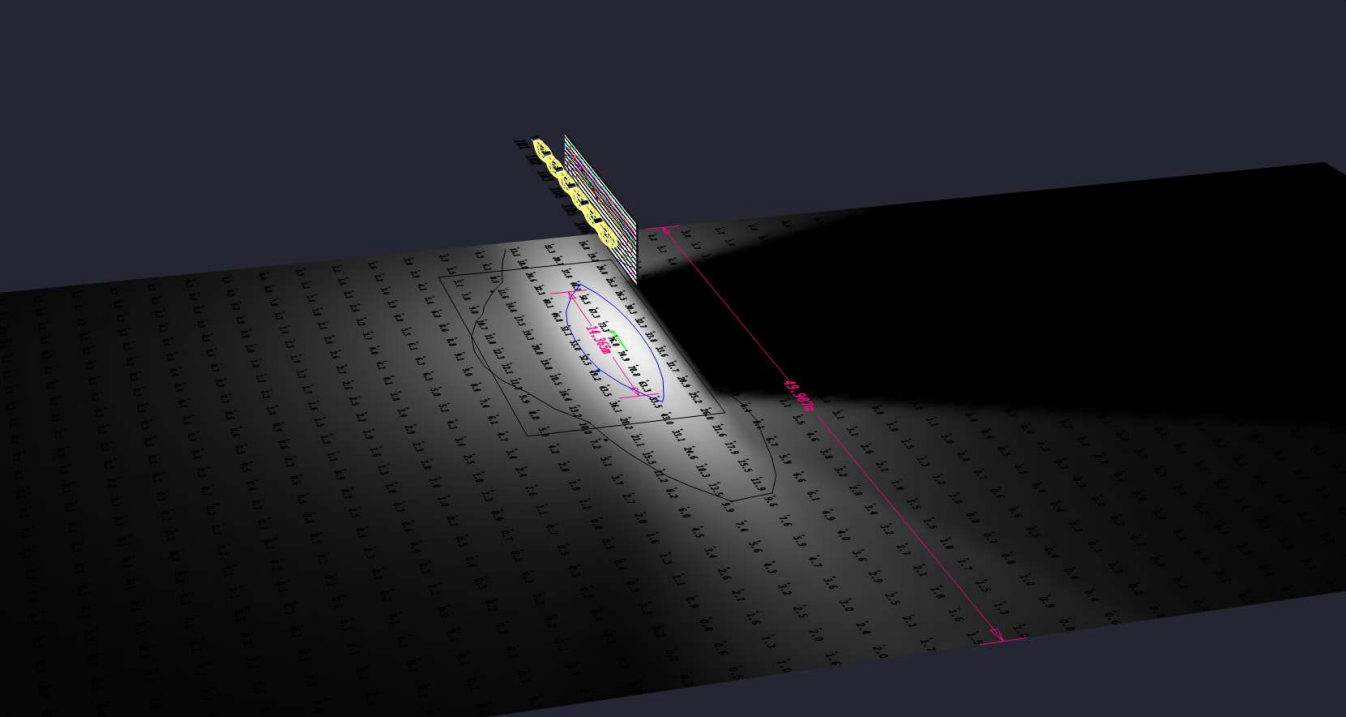
# Viewpoint - Cont.



# Viewpoint - Cont.



# Render View




Rendered View 1

## **Appendix C**













### **C.1 ANNEX 3**

#### **Reference (UrbisOriginal)-DesignValues**

# Viewpoint

| Luminaire Schedule  |     |                               |                  |  |       |                  |                 |             |
|---|-----|-------------------------------|------------------|--|-------|------------------|-----------------|-------------|
| Symbol  | Qty | Label                         | Arrangement      | Description  | LLF   | Luminaire Lumens | Luminaire Watts | Total Watts |
|  | 6   | NEOS 1 LED 5121 16 XP-G3 500m | Urbis Sign Light | NEOS 1 LED 5121 16 XP-G3@500mA<br>NW 740 230V Back Light | 0.890 | 2648             | 25.9            | 155.4       |

| Luminaire Location Summary |                               |                 |   |      |        |      |
|----------------------------|-------------------------------|-----------------|---|------|--------|------|
| LumNo                      | Label                         | Insertion Point |   |      | Orient | Tilt |
|                            |                               | X               | Y | Z    |        |      |
| 149                        | NEOS 1 LED 5121 16 XP-G3 500m | 11.925          | 0 | 10.3 | 270    | 0    |
| 150                        | NEOS 1 LED 5121 16 XP-G3 500m | 14.925          | 0 | 10.3 | 270    | 0    |
| 151                        | NEOS 1 LED 5121 16 XP-G3 500m | 17.725          | 0 | 10.3 | 270    | 0    |
| 152                        | NEOS 1 LED 5121 16 XP-G3 500m | 20.625          | 0 | 10.3 | 270    | 0    |
| 153                        | NEOS 1 LED 5121 16 XP-G3 500m | 23.525          | 0 | 10.3 | 270    | 0    |
| 154                        | NEOS 1 LED 5121 16 XP-G3 500m | 9.025           | 0 | 10.3 | 270    | 0    |

| Isoline Legend  |       |
|---|-------|
| Illuminance (Lux)   |       |
| Color   | Value |
|  | 10    |
|  | 50    |
|  | 75    |
|  | 100   |
|  | 125   |
|  | 150   |
|  | 175   |
|  | 200   |
|  | 225   |
|  | 250   |
|  | 275   |
|  | 300   |

| Calculation Summary   |                 |       |        |       |      |         |         |
|-----------------------|-----------------|-------|--------|-------|------|---------|---------|
| Label                 | CalcType        | Units | Avg    | Max   | Min  | Min/Avg | Min/Max |
| Sign 1 Side 3 1       | Illuminance     | Lux   | 105.84 | 157.5 | 49.6 | 0.47    | 0.31    |
| East 100m Cd Seg1     | Obtrusive - Cd  | N.A.  | 148.96 | 239   | 2    | 0.01    | 0.01    |
| East 100m Ill Seg1    | Obtrusive - Ill | Lux   | 0.02   | 0.1   | 0.0  | 0.00    | 0.00    |
| North 100m Cd Seg1    | Obtrusive - Cd  | N.A.  | 61.10  | 265   | 0    | 0.00    | 0.00    |
| North 100m Ill Seg1   | Obtrusive - Ill | Lux   | 0.12   | 0.2   | 0.1  | 0.83    | 0.50    |
| South 100m Cd Seg1    | Obtrusive - Cd  | N.A.  | 0.00   | 0     | 0    | N.A.    | N.A.    |
| South 100m Ill Seg1   | Obtrusive - Ill | Lux   | 0.08   | 0.1   | 0.0  | 0.00    | 0.00    |
| West 65m Cd Seg1      | Obtrusive - Cd  | N.A.  | 166.88 | 255   | 1    | 0.01    | 0.00    |
| West 65m Ill Seg1     | Obtrusive - Ill | Lux   | 0.03   | 0.1   | 0.0  | 0.00    | 0.00    |
| z Ground Plane Planar | Illuminance     | Lux   | 1.09   | 71.5  | 0.0  | 0.00    | 0.00    |

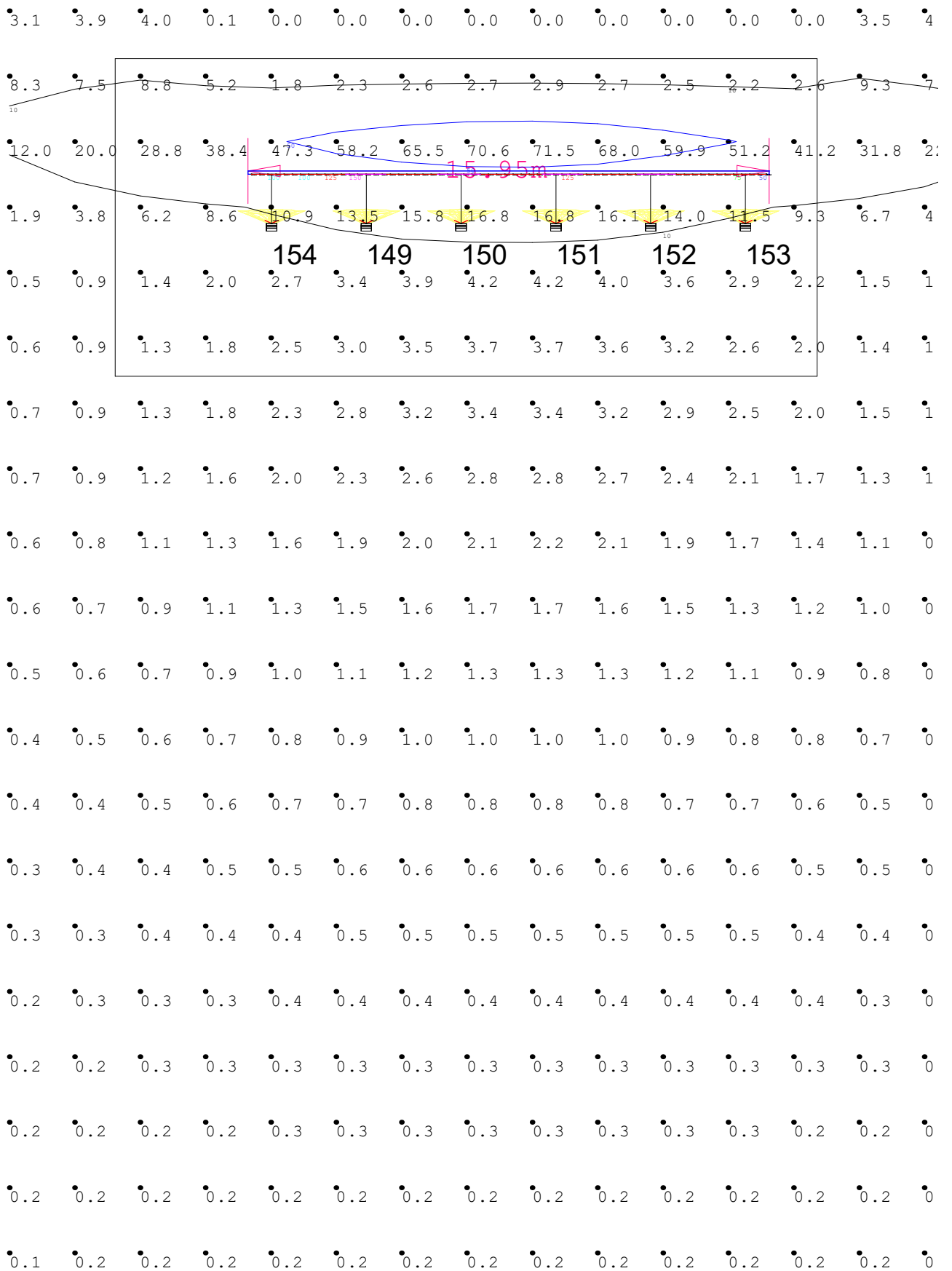
Upward Light

Area = 208.71 Sq.m  
UWLR = 0.113

| Object Summary |           |             |
|----------------|-----------|-------------|
| Label          | Type      | Description |
| Ground Plane   | Planar    |             |
| Sign 1         | Rect-Flat |             |

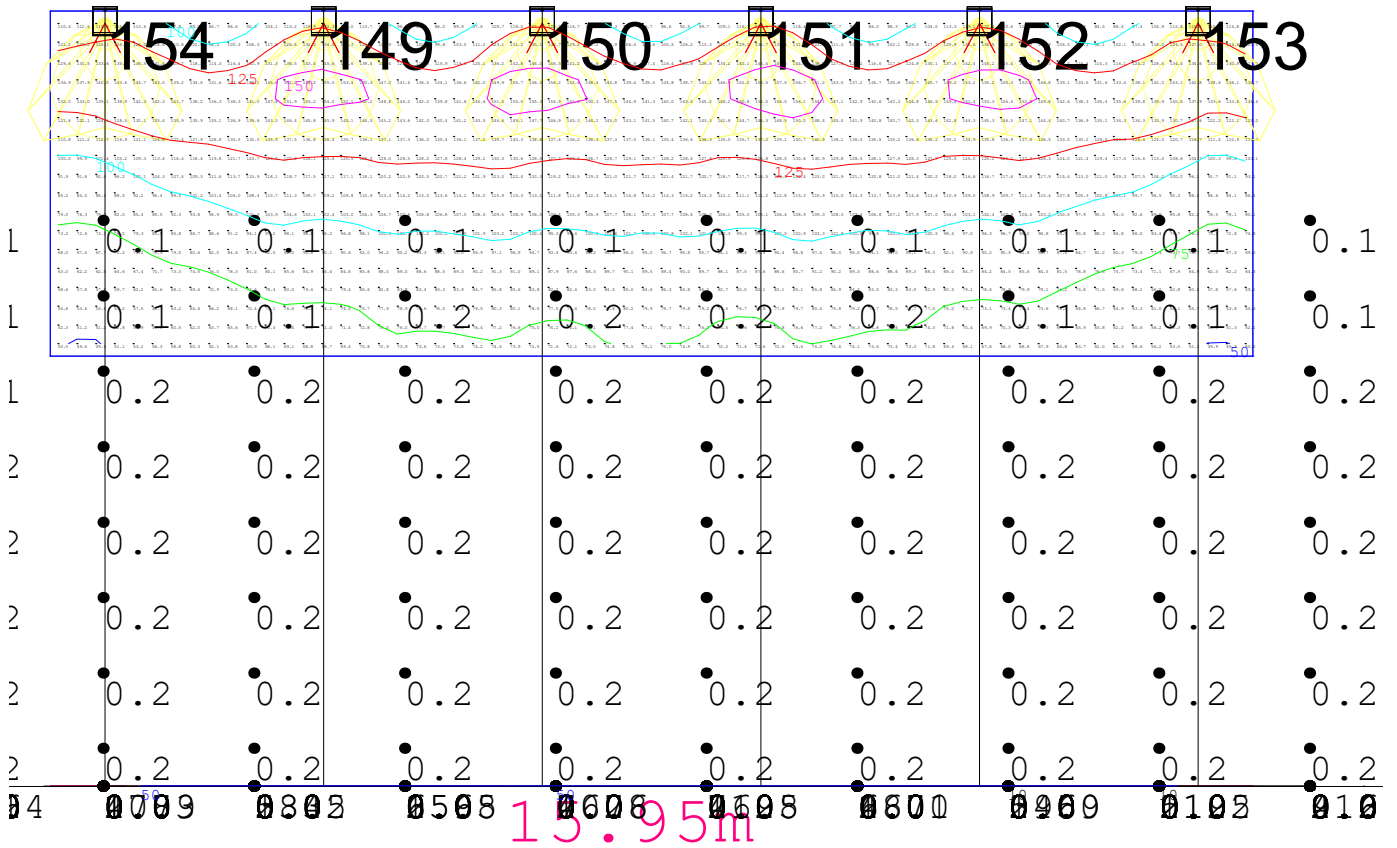


# Viewpoint - Cont.

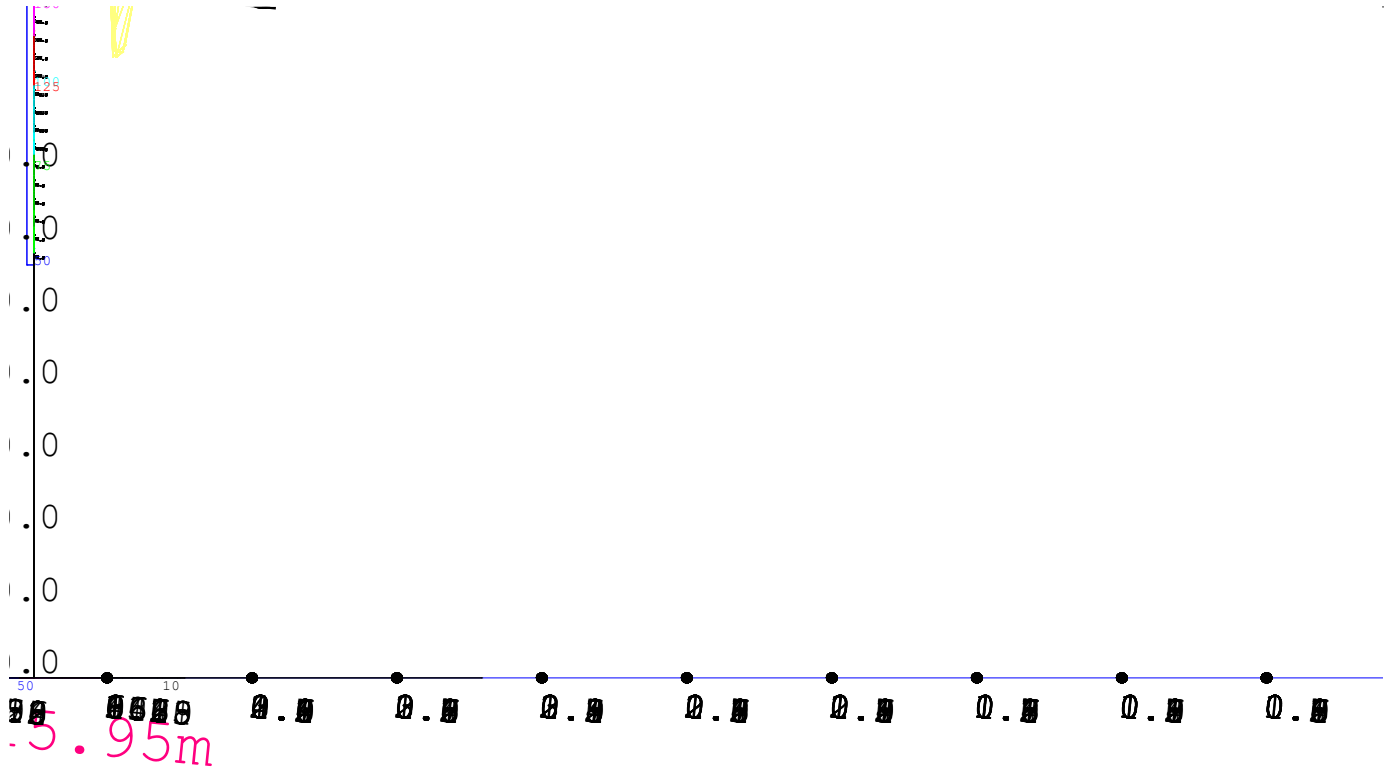




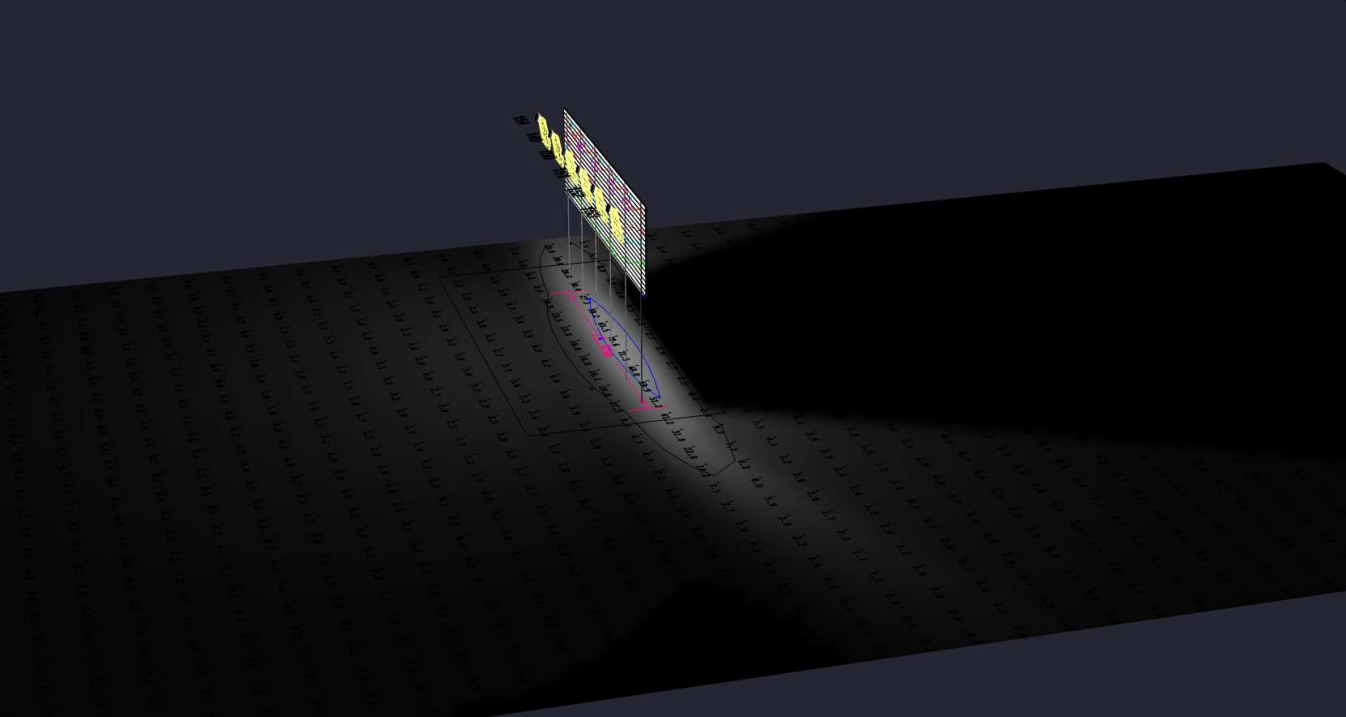
# Viewpoint - Cont.



# Viewpoint - Cont.



# Render View



Rendered View 1