



Immingham Green Energy Terminal

TR030008

Volume 6

6.4 Environmental Statement Appendices

Appendix 2.B: Lighting Strategy

Planning Act 2008

Regulation 5(2)(a)

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

September 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning
(Applications: Prescribed Forms and
Procedure) Regulations 2009 (as amended)

Immingham Green Energy Terminal

Development Consent Order 2023

6.4 Environmental Statement Appendices

Appendix 2.B: Lighting Strategy

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1 Introduction

1.1 Overview

- 1.1.1 This Lighting Assessment Report has been prepared by AECOM Ltd to support an application for development consent by Associated British Ports (“the Applicant”) (“ABP”) in respect of Immingham Green Energy Terminal and associated development (“the Project”).
- 1.1.2 The application seeks consent for the alteration of a harbour facility for the construction, operation and maintenance of a multi-user green energy terminal to facilitate the import and export of liquid bulks associated with the energy sector. The Terminal would be located on eastern side of the Port of Immingham (“the Port”). The associated development includes the construction and operation of a green hydrogen production facility for the production of green hydrogen from imported green ammonia on site by Air Products (BR) Ltd (“Air Products”). The Site is defined in **Section 2.1** below. The works which comprise the Project are identified by Works No’s (as shown on **Figure 2.3 [TR030008/APP/6.3]** and on the **Works Plans [TR030008/APP/4.2]**)
- 1.1.3 This assessment considers three separate parts of the Project: first, the ‘Marine Infrastructure’ including the jetty (the marine elements of Work No. 1); secondly, the ‘Jetty Access Works’ comprising the landside infrastructure associated with the jetty and jetty access road (between Laporte Road and the jetty), including piperack (the terrestrial elements of Work No. 1 together with all elements of Work No. 2); and thirdly, the ‘Hydrogen Production Facility’ (Work Nos. 3, 5 and 7). All have lighting needs specific to their particular uses and context.
- 1.1.4 The three parts are at different stages of development, with the ABP design of the Marine Infrastructure and Jetty Access Works being more advanced.
- 1.1.5 The preliminary design of the Marine Infrastructure and Jetty Access Works has set out the indicative design intent of new lighting required as provided in **Annexes A and B**.
- 1.1.6 The Hydrogen Production Facility to be developed by Air Products comprises ammonia storage, hydrogen processing and associated works and infrastructure across two main areas (the “East Site” (Work Nos 3 and 5) and “West Site” (Work No. 7)). As the final dimensions and configuration of buildings and structures associated with the Hydrogen Production Facility are subject to future detailed design development, an outline strategy (see **Annex C**) setting out lighting principles and requirements has been developed for this aspect of the Project.

1.2 Purpose of the Report

- 1.2.1 The purpose of the report is to identify Site lighting requirements and proposals (based on the information provided by the Applicant and Air Products), identify potential constraints, assess whether the lighting proposals would be acceptable (i.e. whether they would introduce obtrusive lighting which would not align to the environmental character of the local area, or impact sensitive receptors such as residential properties or ecology) and explain how the final operational lighting

design will be secured by a requirement of the draft Development Consent Order (“DCO”).

1.2.2 The report is comprised of the following sections:

- a. **Section 2** – provides relevant information on the Project location, site arrangements and high-level overview of existing site context lighting conditions and light sensitive receptors;
- b. **Section 3** – contains a review of relevant legislation, standards and good practice guidance;
- c. **Section 4** provides a classification of the surrounding area with regard to the Environmental Zones as set out in the Institute of Lighting Professionals (“ILP”) Guidance Notes for the Reduction of Obtrusive Light (GN01) and explains good practice technical and environmental criteria relevant to the Project;
- d. **Sections 5, 6 and 7** – provide an overview of the lighting proposals for the Marine Infrastructure, Jetty Access Works and Hydrogen Production Facility respectively;
- e. **Section 8** assesses the proposals against technical and environmental criteria; and
- f. **Section 9** – provides a summary of the assessment and the requirements for the final lighting design.

1.2.3 The lighting assessment for the Marine Infrastructure and Jetty Access Works is based on the lighting design intent and associated indicative lighting calculation prepared for the Applicant by Ramboll (provided in **Annexes A and B** to this report), which provides an overview of the expected technical and environmental performance of the proposed lighting arrangements and selected equipment.

1.2.4 The lighting assessment for the Hydrogen Production Facility is based on the lighting requirements set out in **Annex C** to this report. Operational lighting shall be designed to provide safe visibility for site operatives and haulage contractors during the hours of darkness. The design will be carried out in accordance with best practice recommendations for site activities as set out in BS EN12464 and the reduction of light pollution aligned with ILP GN01.

1.2.5 Requirement 16 set out in Schedule 2 to the **draft DCO [TR030008/APP/2.1]** requires a scheme of operational external lighting to be submitted and approved for works within Work No. 2, 3, 5 and 7. That scheme must comply with this report and, in that context, **Section 8** sets out the requirements for the final lighting design. The **Outline Construction Environmental Management Plan (“CEMP”)** [TR030008/APP/6.5] will address lighting during construction.

1.3 Scope of Assessment

1.3.1 New lighting is required for the Project to provide safe Site access and use when adequate daylight is not available during both the construction and operational phases.

- 1.3.2 This requirement for new lighting needs to be balanced against the character of the Site and surrounding environment to ensure that sensitive receptors, typically in the form of residential development and terrestrial/marine ecology, are considered.
- 1.3.3 The assessment addresses potential effects stemming from lighting that has been confirmed as part of the design proposals, or comprises typical equipment associated with industrial sites such as the Hydrogen Production Facility. The lighting typologies include the following:
- a. Column mounted lighting;
 - b. Building mounted lighting;
 - c. Handrail lighting; and
 - d. Mobile tower lighting (during construction activities).
- 1.3.4 The assessment considers the effect of the Project by reference to key obtrusive light metrics:
- a. Light spill: light reaching beyond the area that is being lit, to adjacent land, habitat or windows;
 - b. Sky glow: light shining into the night sky from direct light (expressed as an upward light ratio, ("ULR")) and from direct/indirect light (expressed as an upward flux ratio, ("UFR")); and
 - c. Glare: noticeably bright light against a dark surround or direct views of light sources.

Assumptions and Limitations

- 1.3.5 While the effects of a lighting installation are considered in terms of technical performance, visual impact does not form part of the lighting analysis. This is considered in **Chapter 13: Landscape and Visual Impact [TR030008/APP/6.3]**.
- 1.3.6 The lighting assessment is based on a desktop exercise. Project design information and mapping was obtained via the design team with proposed lighting information provided by the Applicant (listed in **Annexes A and B** of this report).
- 1.3.7 A worst-case scenario is used for the assessment that assumes lighting at full output will be needed to cover all areas of the Site rather than be zoned to accommodate Site use patterns throughout the year.
- 1.3.8 The intention is that the Terminal and the hydrogen production facility will operate 24 hours a day, seven days a week and 365 days a year. As a result, outside daylight hours it is lighting will be required for safety and operational reasons throughout the Site under normal conditions.
- 1.3.9 Lighting will be coordinated with CCTV operation.

2 Project Overview & Site Context

2.1 Project Location

- 2.1.1 The Site is located in North East Lincolnshire on the south bank of the Humber Estuary to the east of the Port. **Figure 1.1** of the ES [TR030008/APP/6.3] illustrates the Project's location (the "Site"), which is approximately centred on National Grid Reference ("NGR") E520783 N415271.
- 2.1.1 The landside works fall within the administrative boundary of North East Lincolnshire Council ("NELC"), as illustrated on **Figure 2.2** [TR030008/APP/6.3]. The marine-side works, that extend seaward and fall beyond the local authority's boundary, would take place in the bed of the Humber Estuary, which is owned by the Crown Estate and over which the Applicant has the benefit of a long lease. The Project in its entirety covers an area of approximately 121ha.
- 2.1.2 The Site is largely outside of the operational area of the Port. The area surrounding the Port is industrial in nature, being dominated by chemical manufacturing, oil processing and power generation facilities. Residential and commercial properties are present to the south of the Port on Queens Road and lie within, and adjacent to, the Site. Beyond the industrial facilities, the wider area is largely agricultural. The nearest residential area is on the eastern edge of the town of Immingham approximately 460m from the western edge of the Site.
- 2.1.3 The Site is low-lying, relatively flat and open with a gradual slope toward the Humber Estuary. There are areas of more mature vegetation and trees along the boundary of the Site, however these would not be considered to provide consistent screening throughout. The land is comprised largely of a combination of agricultural or former agricultural land, reclaimed land and hardstanding.

2.2 Project Summary

- 2.2.1 The works which comprise the Project are identified by Works No's (as shown on **Figure 2.3** [TR030008/APP/6.3] and on the **Works Plans** [TR030008/APP/4.2]) and are summarised as follows:
- a. The Nationally Significant Infrastructure project ("NSIP"), Work No. 1, comprising:
 - i. On the marine side, a terminal for liquid bulks: comprising:
 - A. A jetty (defined by **Work No. 1a**) including a loading platform, associated dolphins, fenders and walkways, topside infrastructure but not limited to control rooms, marine loading arms, pipe-racks, pipelines and other infrastructure.
 - B. a single berth, with a berthing pocket with a depth of up to 14.5m below chart datum.
 - ii. Related landside infrastructure including, but not limited to, a jetty access ramp, a flood defence access ramp and works to raise the seawall locally under the jetty access ramp.

- b. Associated Development on the landside, comprising:
- i. A corridor between the new jetty and Laporte Road which would support a private road (the 'jetty access road'), pipe-racks, pipelines to enable the ammonia import to the East Site, as well as security gates, a security building, a power distribution building and associated utilities – (**Work No. 2**).
 - ii. 'East Site - Ammonia Storage' (**Work No. 3**) on which an ammonia storage tank and related plant including an ammonia tank flare stack would be constructed (**Work No. 3a**) as well as additional buildings (including welfare building, power distribution building and a process instrumentation building), pipe-racks, pipelines, pipes, cable-racks, utilities and other infrastructure.
 - iii. Construction of a culvert (**Work No. 4**) under Laporte Road for pipelines, pipes and cables and other conducting media linking the two parts of the East Site.
 - iv. 'East Site – Hydrogen Production Facility' (**Work No. 5**) on which up to three hydrogen production units and associated plant including flue gas stacks and flare stacks would be constructed (**Work No. 5a**) together with additional buildings (including process control building, power distribution buildings, process instrumentation buildings, analyser shelters), pipe-racks, pipelines, pipes, utilities and other infrastructure.
 - v. Underground pipelines, pipes, cables and other conducting media (**Work No. 6**), between the East and West Sites, for the transfer of ammonia, hydrogen, nitrogen and utilities, with cathodic protection against saline corrosion.
 - vi. 'West Site' (**Work No. 7**) involving the construction of up to three hydrogen production units with associated flue gas stacks and flare stacks and up to four liquefier units (**Work No. 7a** and **Work No. 7b** combined); hydrogen storage tanks, hydrogen trailer filling stations, a hydrogen vent stack and associated process equipment (**Work No. 7c**); and hydrogen vehicle and trailer filling stations, hydrogen compressors and associated process equipment (**Work No. 7d**). Also additional buildings (including but not limited to control room and workshop building, security and visitor building, contractor building, warehouse, driver administration building, safe haven building, electrical substation and metering station, power distribution buildings, process instrumentation buildings, analyser buildings and additional temporary buildings during construction), process and utility plant including cooling towers and pumps, fire water tank, instrument air equipment, pipe-racks, pipelines, pipes, cable-racks, utilities and other infrastructure.
 - vii. Formation of temporary construction and laydown areas on Queens Road (**Work No. 8**) and off Laporte Road (**Work No. 9**).
 - viii. Temporary removal of street furniture and modification of overhead cables on Kings Road (**Work No. 10**) associated with the transport of large construction components from the Port to the Site.

2.2.2 A detailed description of the Project is outlined in **Chapter 2: The Project [TR030008/APP/6.2]**. Illustrative layouts, sections and elevations are provided as **Illustrative Layouts [TR030008/APP/4.3]** and **Illustrative Sections and Elevations [TR030008/APP/4.4]** and an illustrative Project layout is also presented in **Figure 2.5 [TR030008/APP/6.3]**.

2.3 Receptors

Residential Receptors

2.1.2 The closest residential receptors to the Site include:

- a. A total of ten residential properties located on the west side of Queens Road as follows:
 - i. Houses at Numbers 1-5 and 31 Queens Road (six houses in total).;
 - ii. Number 6 Queens Road (two flats in total); and
 - iii. Numbers 7-8 (one flat) and 18 Queens Road (one flat), with these flats on the upper floors above commercial interests on the ground floors (two flats in total).
- b. Residential properties on the eastern edge of Immingham, including Somerton Road, Worsley Road, Dunster Walk, Ings Lane, Oakham Walk, Kendal Road, Chestnut Avenue, Waterworks Street and Spring Street, which at the closest point are located between approximately 460m and 480m west of the West Site.
- c. Mauxhall Farm off Stallingborough Road, located approximately 1km south-west of the West Site.

2.1.3 Other settlements nearby include: Grimsby (approximately 5km) to the south-east; Healing (approximately 3.5km) and Great Coates (approximately 5.5km) to the south-east; Stallingborough (approximately 2.5km) to the south; Keelby (approximately 5km) to the south-west; and Habrough (approximately 4.5km) to the west.

Ecological Receptors

Marine Ecology

2.3.1 Shoaling fish are the only identified species that have the potential to be impacted by new lighting associated with the Project, primarily from the jetty. There is the potential for a minor increase in the risk of predation. This consideration is balanced by potential increased efficiency in feeding.

2.3.2 Given the area where new lighting is planned for use, it is not expected to disrupt or block migratory routes.

Terrestrial Ecology

2.3.3 The main terrestrial species identified in association with the Site include bats, otter and water vole, this is detailed in **Chapter 8: Nature Conservation (Terrestrial Ecology) [TR030008/APP/6.2]**.

- 2.3.4 At present, low levels of bat activity have been recorded with respect to foraging habitat and the Site is not considered to have a high value for bats overall. To minimise impacts to bat populations, new lighting will need to be appropriately controlled. Bats are most likely to utilise the Site along the treeline of the Long Strip woodland between Laporte Road and the Humber. High levels of activity associated with the operation of the Project are not anticipated to take place in this area. Therefore, the Project is not anticipated to create an impact on the conservation status of bats.
- 2.3.5 Otters are determined to have a more longstanding association with watercourses and areas of industrial activity and be less likely to be disturbed by the operation of this type of development than other species such as bats. No significant effects are anticipated from the construction or operation of the Project on otters.
- 2.3.6 Water vole are also less likely to be disturbed by the operation of this type of development than bats. Disturbance of water vole is possible at the east end of the drainage ditch at the base of the flood embankment. However, no significant effects from the construction or operation of the Project are anticipated on water vole.

2.4 Existing Lighting Context

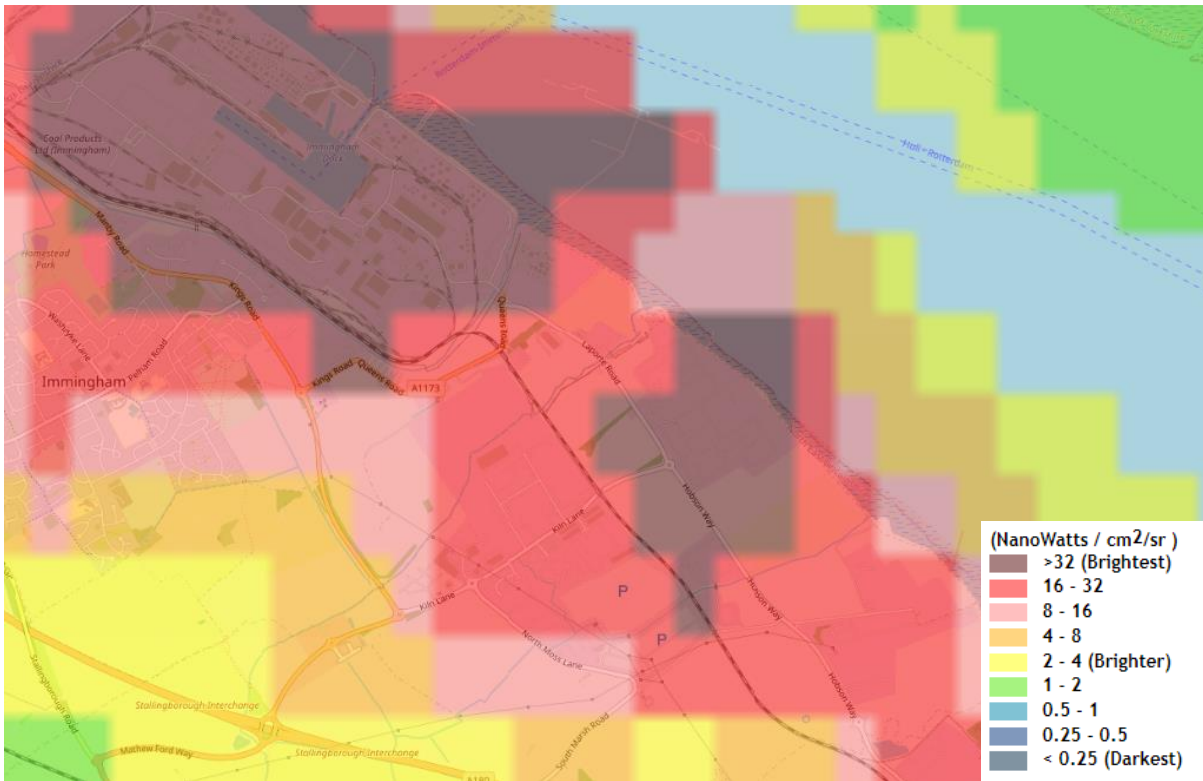
- 2.4.1 There are a mix of lighting typologies installed in the local area around the Site; lighting to Kings Road, portions of Queens Road, and in car parks consist of streetlight style luminaires on 10-12m height columns with post top and bracket-arm mounting; while lighting within the larger industrial sites consists of predominantly building-mounted bulkheads or floodlights, and column mounted floodlights.
- 2.4.2 Lamp types observed are predominantly light-emitting diode (“LED”), but also include the more traditional discharge lamps such as metal halide and high pressure sodium.
- 2.4.3 The Site is unlit but is subject to effects from lighting conditions associated with adjacent developed areas.

Associated Brightness Conditions

- 2.4.4 Light mapping from the Campaign for the Protection of Rural England (“CPRE”) (Ref 1-1) shows that the area around the Site has a moderate to high characteristic brightness, in keeping with the industrial nature along the local coast of the Humber Estuary. These developments tend to require increased lighting for the safe undertaking of exterior tasks and supporting appropriate security measures. These areas therefore tend to be at the higher end of environmental zone classifications as defined by the Institution of Lighting Professionals (“ILP”), which are further discussed in **Section 4** of this report.
- 2.4.5 Existing light mapping shows that the intensity of light reduces toward the Humber Estuary to the east and the agricultural land to the west.

2.4.6 **Plate 1** provides an overview of the intensity of light local to the Site where the colour blocks shown depict the level of spectral radiance that shines up into the night sky. This is a combined result of light shining directly upward and light reflecting upward from the ground or other surfaces.

Plate 1: England light pollution and dark skies mapping (CPRE)



Source: 10Ref 1-1

2.5 Working Hours

2.5.1 Construction lighting is typically required to support site safety while undertaking specific construction activities and for security purposes. While the majority of activities are planned to occur during daytime hours, it is expected that lighting will be used during inclement weather or in winter months when daylight is limited during working hours.

2.5.2 Construction lighting would be managed as necessary by a Light Management Plan developed as part of the CEMP(s).

Construction

Marine Construction

2.5.3 In months where percussive piling is permitted within the water body spatial, diurnal and duration restrictions apply for certain periods as set out in the Deemed Marine Licence. For example, it is anticipated that night time restrictions will apply to percussive piling works within the water body for Work No. 1, seaward of the mean highwater mark outside the hours of sunrise and sunset in certain summer months (June and August) and 19:00 and 07:00 in certain winter months (March, September and October), seven days a week. Other marine

construction activities for Work No. 1 including dredging, are assumed to be undertaken on a 24-hour basis and continue until completion for safety or quality reasons.

- 2.5.4 Some landside construction activities to support marine working may be required during the marine construction working hours. This landside working would be restricted to the work areas defined for Work No 1, 2 and 9. The landside activities are expected to include material supply, plant maintenance and vehicle movements to support the construction of Work No. 1.

Landside Construction

- 2.5.5 Core construction working hours for the landside works are between 07:00 and 19:00 Monday to Saturday. Works comprising the terrestrial part of Work No. 1 and activities in Work No. 2 and 9 for the delivery of the marine construction works may need to be undertaken outside of these core working hours. Other exceptions may apply to all works, for example because certain construction activities cannot be stopped, such as concrete pouring or tank welding. Any such works would be carefully managed to reduce effects on local people.

Operation

- 2.5.6 The Project would operate 24 hours a day, seven days a week and 365 days a year.

3 Legislation, Policy, Standards and Guidance

3.1.1 The following documents identify the current legislation, policy, standards and guidance that are relevant to the design and implementation of a lighting design for lighting associated with the Project.

3.2 Legislation

Environmental Protection Act, 1990

3.2.1 Section 79 of the Environmental Protection Act 1990 (Ref 1-2) (as amended by the Clean Neighbourhoods and Environment Act 2005 (Ref 1-3)) identifies statutory nuisances including in section 79(1)(fb) '*artificial light emitted from premises so as to be prejudicial to health or a nuisance*'.

3.3 Ref 1-3 Policy

National Policy Statement for Ports (“NPSfP”) 2012

3.3.1 The National Policy Statement for Ports (Ref 1-4) is part of the policy framework established under the Planning Act 2008 (Ref 1-5) to deal with nationally significant infrastructure proposals. It provides a framework for decisions on new port development and associated developments including roads, rail links and non-port development, where relevant. This document provides high level recommendations relating to light and biodiversity and impact on amenity, landscape and views. Particular considerations within the NPSfP relating to the technical assessment of lighting are set out below.

3.3.2 Section 5.1 Biodiversity and geological conservation:

(Section 5.1.3) *“Construction and operation of port infrastructure can have an adverse impact on biodiversity and / or geodiversity including through: .. light, which can alter or hinder the migration of fish through estuaries.”*

3.3.3 Section 5.8 – Dust, odour, artificial light, smoke, steam and insect infestation:

(Section 5.8.1) *“During the construction, operation and decommissioning of port infrastructure there is potential for the release of a range of emissions such as odour, dust, steam, smoke, artificial light and infestation of insects. All have the potential to have a detrimental impact on amenity or cause a common law nuisance or statutory nuisance under Part III, Environmental Protection Act 1990.”*

(Section 5.8.3) *“..The aim should be to keep impacts to a minimum and at a level that is acceptable.”*

(Section 5.8.7) *“The decision-maker should satisfy itself that all reasonable steps have been taken, and will be taken, to minimise any detrimental impact on amenity from insect infestation and emissions of odour, dust, steam, smoke and artificial light.”*

National Planning Policy Framework (“NPPF”) 2021

- 3.3.4 The NPPF (Ref 1-6) details the Government’s planning policies for England and how these are expected to be applied. Set out in the section on ‘Ground conditions and pollution’, paragraph 185 (c) 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 and wider area 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.”

Planning Practice Guidance

- 3.3.5 The Light Pollution section of the Planning Practice Guidance (“PPG”) (Ref 1-7), which was last updated in November 2019, provides practical guidance on light pollution and advice for local authorities on when and how to consider light within the planning system. It also outlines what factors are relevant when considering possible ecological impacts of a new or changed lighting system. The PPG states:

“Artificial light provides valuable benefits to society... However, for maximum benefit, it is important to get the right the right light, in the right place and providing light at the right time.”

3.4 Standards

British Standards

- 3.4.1 British Standards (“BS”) are standards produced by the British Standards Institute (“BSI”) which provide a standard set of tools describing consistent requirements for design, installations, and use of different aspects of design. The following standards are relevant when developing and evaluating a new lighting installation:
- a. BS 5489-1:2020 Code of Practice for the Design of Road Lighting Part 1: Lighting of Roads and Public Amenity Areas (Ref 1-8);
 - b. BS EN 13201-2:2015 – Code of Practice for the Design of Road Lighting – Part 2: Performance Requirements (Ref 1-9); and
 - c. BS 12464-2: 2014 Lighting of Work Places – Outdoor Work (Ref 1-10).

3.5 Good Practice Guidance

The Chartered Institution of Building Services Engineers (“CIBSE”) Society of Light and Lighting (“SLL”) guidance

- 3.5.1 The SLL has produced a series of lighting guides that address various approaches and requirements for lighting. The following guidance is relevant when developing new exterior lighting installations:
- a. Lighting Guide 6 (“LG6”) – The Exterior Environment (Ref 1-11);

- b. Lighting Guide 21 (“LG21”) – Protecting the Night-Time Environment (Ref 1-12).

Institute of Lighting Professionals (“ILP”) guidance

3.5.2 The ILP is the current body of the former Institute of Lighting Engineers (“ILE”). They have produced the following guidance documents which are relevant when developing new lighting installations:

- a. Guidance Note 1 (“GN01”): The Reduction of Obtrusive Light (Ref 1-13);
- b. Guidance Note 8 (“GN08”): Bats and Artificial Lighting in the UK (Ref 1-14).

Other Guidance

3.5.3 The following guidance documents have also been considered and used to inform this lighting strategy:

- a. CIE 126 Guidelines for Minimising Sky Glow (Ref 1-15);
- b. CIE 150 Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (Ref 1-16);
- c. Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government (2019). Guidance: Light Pollution (Ref 1-17);
- d. ILP PLG04 Planning Guidance 4 Guidance on undertaking Environmental Lighting Impact Assessments (Ref 1-18);
- e. SLL Code for Lighting (Ref 1-19); and
- f. SLL Lighting Handbook (Ref 1-20).

4 General Design Parameters

4.1.1 This section provides a classification of the surrounding area with regard to Environmental Zones defined in the ILP Guidance Notes for the Reduction of Obtrusive Light (GN01) and explains good practice technical and environmental criteria applicable to the Project.

4.2 Environmental Design Parameters

4.2.1 The ILP document GN01 Guidance Notes for the Reduction of Obtrusive Light (Ref 1-13) is an industry standard guidance document used in assessing lighting performance. It advises that lighting which has the same characteristics as the overall area lighting is less likely to cause disturbance, as well as minimise instances of light pollution. recommends limiting criteria to that end. **Table 1** is an extract from the guidance document and describes the typical lighting environment for certain “Environmental Zones”.

Table 1: Lighting Environmental Zones

Zone	Surrounding	Lighting environment	Examples
E0	Protected	Dark (SQM 20.5+)	Astronomical Observable dark skies, UNESCO starlight reserves, IDA dark sky places
E1	Natural	Dark (SQM 20 to 20.5)	Relatively uninhabited rural areas, National Parks, Areas of Outstanding Natural Beauty, IDA buffer zones etc.
E2	Rural	Low district brightness (SQM ~15 to 20)	Sparsely inhabited rural areas, village or relatively dark outer suburban locations
E3	Suburban	Medium district brightness	Well inhabited rural and urban settlements, small town centres of suburban locations
E4	Urban	High district brightness	Town / City centres with high levels of night-time activity

Source: Ref 1-13

4.2.2 The lighting characteristics for the area in which the Site is located reflect an industrial type of development which is most similar to the zone identified as zone E3. However, the existing Port and adjacent industrial development present brightness levels consistent with or greater than those identified for zone E3 (**Plate 1**) resulting in brighter overall characteristics. There is a rapid drop to a brightness character more associated with zone E2 or below when moving away from Immingham and the Humber.

4.2.3 While overall brightness is high, zone E3 is used to set the maximum limiting criteria which lighting performance should be assessed against. Where possible to do so, without compromising safety or security requirements, the final lighting designs should consider whether zone E2 requirements can be met, to minimise obtrusive effects beyond the Site boundary.

4.3 Environmental Target Criteria

4.3.1 Obtrusive light limits for exterior lighting installations based on zonal characteristics as set out from ILP guidance are shown below in **Table 2**, which are intended to support decision makers in establishing whether artificial lighting is detrimental to local amenity or could create a potential statutory nuisance.

4.3.2 Values are provided for light spill and glare in pre- and post-curfew conditions. Pre-curfew conditions apply when lighting is required before 23:00. Post-curfew conditions typically apply from 23:00 to morning (typically 05:00 – 06:00) where generally it may be desirable to reduce lighting impacts.

Table 2: Lighting threshold criteria – Maximum vertical illuminance on properties (light spill)

Light technical parameter	Application conditions	Environmental zone				
		E0	E1	E2	E3	E4
Illuminance in the vertical plane (E _v)	Pre-curfew	n/a	2 lx	5 lx	10 lx	25 lx
	Post-curfew	n/a	<0.1 lx*	1 lx	2 lx	5 lx

* If the installation is for public (road) lighting then this may be up to 1 lx.

Source: Ref 1-13

Table 3: Lighting t threshold criteria – Limits for luminous intensity (glare)

Light technical parameter	Application conditions	Luminaire group (projected area A _p in m ²)					
		0 < A _p ≤ 0.002	0.002 < A _p ≤ 0.01	0.01 < A _p ≤ 0.03	0.03 < A _p ≤ 0.13	0.13 < A _p ≤ 0.50	A _p > 0.5
Maximum luminous intensity emitted by luminaire (I in cd) ⁵	E0 Pre-curfew	0	0	0	0	0	0
	E0 Post-curfew	0	0	0	0	0	0
	E1 Pre-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	2,500
	E1 Post-curfew	0	0	0	0	0	0
	E2 Pre-curfew	0.57 d	1.3 d	2.5 d	5.0 d	10 d	7,500
	E2 Post-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	500
	E3 Pre-curfew	0.86 d	1.9 d	3.8 d	7.5 d	15 d	10,000
	E3 Post-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	1,000
	E4 Pre-curfew	1.4 d	3.1 d	6.3 d	13 d	26 d	25,000
	E4 Post-curfew	0.29 d	0.63 d	1.3 d	2.5 d	5.1 d	2,500

Source: Ref 1-13

Table 4: Lighting threshold criteria – Limits for upward light (sky glow)

Light technical parameter	Environmental zones				
	E0	E1	E2	E3	E4
Upward light ratio (ULR) / %	0	0	2.5	5	15

Source: Ref 1-13

Table 5: Lighting threshold criteria – Limits for upward flux (sky glow)

Light technical parameter	Type of installation	Environmental zones				
		E0	E1	E2	E3	E4
Upward flux ratio (UFR) / %	Road	n/a	2	5	8	12
	Amenity	n/a	n/a	6	12	35
	Sports	n/a	n/a	2	6	15

Source: Ref 1-13

Table 6: Lighting threshold criteria – Limits for building and signage luminance

Light technical parameter	Application conditions	Environmental zones				
		E0	E1	E2	E3	E4
Building façade luminance (L_b)	Taken as the product of the design average illuminance and reflectance divided by n	< 0.1 cd/m ²	< 0.1 cd/m ²	5 cd/m ²	10 cd/m ²	25 cd/m ²
Sign luminance (L_s)	Taken as the product of the design average illuminance and reflectance divided by n (pi), or for self-luminous signs, its average luminance	< 0.1 cd/m ²	50 cd/m ²	400 cd/m ²	800 cd/m ²	1,000 cd/m ²

Source: Ref 1-13

4.4 Lighting Design Environmental Parameters

4.4.1 **Table 7** sets out the environmental performance criteria established by ILP as good practice guidance for Zone E3. Zone E2 criteria is also included in the table for reference.

Table 7: Environmental design criteria

Metric	Zone E2	Zone E3
Light spill (pre-curfew)	5 lux	10 lux
Light spill (post-curfew)	1 lux	2 lux
Sky glow (ULR)	2.5%	5%
Upward Flux (road, UFR)	5%	8%
Glare (pre-curfew)	7,500 cd	10,000 cd
Glare (post-curfew)	500 cd	1,000 cd

4.5 Technical Design Parameters

4.5.1 The Project requires lighting to support safe site use and access. Typical requirements for schemes such as the Project are contained in British Standards. **Table 8, Table 9, Table 10** and **Table 11** are extracted from BS EN 12464-2 (Ref 1-10) and are consistent with BS 5489-1 (Ref 1-8). Technical requirements set for the lighting proposals provided by ABP (**Annexes A and B**) and Air Products (**Annex C**) are consistent with these typical requirements.

Table 8: General Lighting Requirements for Areas and for Cleaning at Outdoor Workplaces

Ref. no.	Type of area, task or activity	\bar{E}_m lx	U_o	R_{GL}	R_a	Specific requirements
5.1.1	Walkways exclusively for pedestrians	5	0,25	50	20	
5.1.2	Traffic areas for slowly moving vehicles (max. 10 km/h), e.g. bicycles, trucks and excavators	10	0,40	50	20	
5.1.3	Regular vehicle traffic (max. 40 km/h)	20	0,40	45	20	At shipyards and in docks, R_{GL} may be 50
5.1.4	Pedestrian passages, vehicle turning, loading and unloading points	50	0,40	50	20	
5.1.5	Cleaning and servicing	50	0,25	50	20	All relevant surfaces

Source: Ref 1-10

Table 9: Industrial Site and Storage areas

Ref. no.	Type of area, task or activity	\bar{E}_m lx	U_o	R_{GL}	R_a	Specific requirements
5.7.1	Short-term handling of large units and raw materials, loading and unloading of solid bulk goods	20	0,25	55	20	
5.7.2	Continuous handling of large units and raw materials, loading and unloading of freight, lifting and descending location for cranes, open loading platforms	50	0,40	50	20	
5.7.3	Reading of addresses, covered loading platforms, use of tools, ordinary reinforcement and casting tasks in concrete plants	100	0,50	45	20	
5.7.4	Demanding electrical, machine and piping installations, inspection	200	0,50	45	60	Use local lighting

Source: Ref 1-10

Table 10: Parking Areas

Ref. no.	Type of area, task or activity	\bar{E}_m lx	U_o	R_{GL}	R_a	Specific requirements
5.9.1	Light traffic, e.g. parking areas of shops, terraced and apartment houses; cycle parks	5	0,25	55	20	
5.9.2	Medium traffic, e.g. parking areas of department stores, office buildings, plants, sports and multipurpose building complexes	10	0,25	50	20	
5.9.3	Heavy traffic, e.g. parking areas of major shopping centres, major sports and multipurpose building complexes	20	0,25	50	20	

Source: Ref 1-10

Table 11: Oil and other chemical industries

Ref. no.	Type of area, task or activity	\bar{E}_m lx	U_o -	R_{GL} -	R_a -	Specific requirements
5.10.1	Handling of servicing tools, utilization of manually regulated valves, starting and stopping motors, lighting of burners	20	0,25	55	20	
5.10.2	Filling and emptying of container trucks and wagons with risk free substances, inspection of leakage, piping and packing	50	0,40	50	20	
5.10.3	Filling and emptying of container trucks and wagons with dangerous substances, replacements of pump packing, general service work, reading of instruments	100	0,40	45	40	
5.10.4	Fuel loading and unloading sites	100	0,40	45	20	
5.10.5	Repair of machines and electric devices	200	0,50	45	60	Use local lighting

Source: Ref 1-10

5 Marine Infrastructure – Indicative Lighting Proposal

5.1 Design Overview

5.1.1 An indicative lighting proposal, as presented in **Annex A** of this report, has been developed by the Applicant to address Marine Infrastructure exterior lighting requirements. This reflects the different spatial requirements for the marine areas of the Terminal (Work No. 1).

5.1.2 The lighting assessment within this document reviews the proposals against stated requirements in Section 4 and the design intent contained within **Annex A** and provides an analysis of their likely performance in relation to technical and environmental criteria, particularly in relation to light spill, sky glow and glare, based on identified constraints and the local area lighting character.

5.2 Lighting Design Parameters

5.2.1 The following lighting design targets (**Table 12**) set out the minimum criteria used to develop the lighting proposals to support the operation of the Terminal based on industry standard design performance criteria established by British Standards (Ref 1-8, Ref 1-9, Ref 1-10) requirements and CIBSE good practice guidance (Ref 1-11).

Table 12: Lighting design criteria for the Terminal

Site area	Avg. Light level (lux)	Uniformity	Colour rendering (min)	Glare ratio	Comments
General Circulation (vehicular)	20	0.4	20	50	Requirement at grade
High risk operational areas	50	0.4	20	50	Requirement at grade
Loading area for hazardous products	100	0.4	20	45	Requirement at product point

Lighting Design

5.2.2 The Terminal includes circulation (vehicular and walkway) as well as loading and operational areas comprising of the jetty head and berthing and mooring dolphins, which are built out into the Humber Estuary. Spatial uses are fixed and task areas reflect the general requirements as set out in **Table 1** and so the technical parameters are established as the minimum required for safe access and operation.

5.2.3 Figure 2205097-RAM-03-MG-DR-E-1001_P02 included in **Annex A** of this report presents a full marine area overview and zoomed in layouts of the lighting proposals for the Terminal.

5.2.4 The lighting proposals that have been developed are tasked to balance achieving suitable light levels for the exterior areas and to control obtrusive lighting effects. To ensure that the installed design meets the technical and environmental criteria, the final lighting design will need to continue to be cognisant of where the light shines, when the light shines, how much light shines, and the possible ecological impact of lighting used based on an open Site configuration.

5.2.5 Lighting is not required for the piperack.

Lighting Arrangements

5.2.6 The proposed lighting design intent for the Terminal is set out within the following figures in **Annex A**:



- a. 2205097-RAM-ZZ-ZZ-DE-MA-0023 Rev P03
- b. 2205097-RAM-ZZ-ZZ-DE-MA-0024 Rev P03
- c. 2205097-RAM-ZZ-ZZ-DE-MA-0025 Rev P03
- d. 2205097-RAM-ZZ-ZZ-DE-MA-0026 Rev P03
- e. 2205097-RAM-ZZ-ZZ-DE-MA-0027 Rev P03
- f. 2205097-RAM-ZZ-ZZ-DE-MA-0028 Rev P03
- g. 2205097-RAM-ZZ-ZZ-DE-MA-0029 Rev P03




Lighting Details

5.2.7 The lighting proposals for the Terminal utilise a combination of column mounted street light style luminaires and column-mounted floodlighting to meet the established design criteria.

5.2.8 All lighting is LED which provides an efficacy of/above 100 lm/W. **Table 13** provides an overview of the luminaire typologies that have been used within the provided proposals.

Table 13: Luminaire typologies – Jetty luminaires equipment selection

Symbol	Image	Product (or equivalent)	Lamp Details	Installation
A, B1, B2		FAEL Domino Street AP	39 W 5049-5560 lm 3000 K CRI 70+	Pole mounted at height 6 m Tilt angle 0° above the horizontal B2: Bracket outreach 1 m
B3		FAEL Domino Street AP	39 W 5049 lm 3000 K CRI 70+	Building mounted at height 3 m Tilt angle 0° above the horizontal

Symbol	Image	Product (or equivalent)	Lamp Details	Installation
C		CHAMLIT Evolution X	188 W 19197 lm 3000 K CRI 70+	Pole mounted at height 12 m Tilt angle – maximum 7° above the horizontal
D, E, F		ABACUS Vago AL61101	D: 50W / 6509 lm E: 32W / 3306 lm F: 19 W / 2104 lm 3000 K CRI 70+	Pole mounted at height 8 m D: Tilt angle 5° above the horizontal E, F: Tilt angle 0° above the horizontal
H, I		GHIDINI Corrimano 420 GH1108 Handrail	H: (50% flux) 4.4W / 163 lm I: (25% flux) 4.4W / 82 lm 4300 K CRI 70+	Integrated into handrail

5.3 Lighting Controls

- 5.3.1 The lighting system will be operational at all times. A photocell will be used to control when the relevant lighting is switched on during daylight hours, to ensure lighting does not operate when sufficient daylight is available.
- 5.3.2 Presence detection/PIR systems (where lighting is normally off and is then turned on for a set period of time when physical activity is detected) will not be used as lighting is not intended to be shut off during operation. This could introduce a health and safety risk to operatives should a light turn off during loading or unloading of hazardous substances.
- 5.3.3 Lighting will generally be on during the night, to provide required light levels.
- 5.3.4 It is expected that there may be some facility for manual override to allow for a reduction or dimming of light output on the jetty if there is a planned decrease in occupancy.

6 Jetty Access Works – Indicative Lighting Proposal

6.1 Design Overview

- 6.1.1 An indicative lighting proposal has been developed by the Applicant to address exterior lighting requirements for the Jetty Access Works.
- 6.1.2 This reflects the different spatial requirements for these works and is presented in **Annex B** of this report.
- 6.1.3 The lighting assessment in **Section 8** assesses these proposals against the requirements set out in **Section 4** particularly in relation to light spill, sky glow and glare.

6.2 Lighting Design Parameters

- 6.2.1 The following lighting targets summarise the minimum criteria used to develop the lighting proposals to support the operation of the Project. **Table 14** sets out the design performance criteria established by British Standards (Ref 1-8, Ref 1-9, Ref 1-10) requirements and CIBSE good practice guidance (Ref 1-11) in coordination with special client requirements.

Table 14: Lighting design criteria for the Landside Access

Site area	Avg. Light level (lux)	Uniformity	Colour rendering (min)	Glare ratio	Comments
Access road	20	0.4	20	50	Requirement at grade
Pedestrian emergency access route	10	0.5	20	50	Requirement at grade
Pedestrian only walking and car parking	10	0.5	20	45	Requirement at grade
Ramp and steps	20 (10 min)	0.5	20	50	Requirement at grade
Search bay area	50	0.4	20	50	Requirement at grade

Lighting Design

- 6.2.2 The jetty access road connects the Terminal to the hydrogen production facility and the same requirements as set out for the landside jetty access ramp apply. A similar lighting approach is proposed so that a consistent lighting environment is provided between the jetty head and the hydrogen production facility.

Lighting Arrangements



6.2.3 The proposed lighting design for the jetty access road and landside access ramp is provided in the following drawings in **Annex B**. Please note that lighting is not required for the piperack:

- a. 2205097-RAM-02-LS-DR-E-1201 Rev P01
- b. 2205097-RAM-02-LS-DR-E-1202 Rev P01
- c. 2205097-RAM-02-LS-DR-E-1203 Rev P01
- d. 2205097-RAM-02-LS-DR-E-1204 Rev P01

Lighting Details

6.2.4 **Table 15** provides corresponding details of the luminaires that are expected to be used in this area.

Table 15: Luminaire typologies – landside access luminaires proposed equipment selection

Symbol	Image	Product (or equivalent)	Lamp Details	Installation
B		FAEL Domino Street AP	51 W 6109 lm 3000 K CRI 70+	Pole mounted at height 6 m Tilt angle 0° above the horizontal
C		ABACUS Revati AL60601	5.1 W 642 lm 3000 K CRI 70+	Wall / fence mounted at height 2.3 m Tilt angle 0° above the horizontal
D		ABACUS Revati AL60601	13.6 W 1712 lm 3000 K CRI 70+	Hinge-pole mounted at height 4 m Tilt angle 0° above the horizontal
E		GHIDINI Corrimano 420 GH1108 Handrail	(25% flux) 4.4 W 82 lm 3000 K CRI 70+	Integrated into handrail

6.3 Lighting Controls

6.3.1 The lighting system will be operational at all times. A photocell will be used to control when the relevant lighting is switched on during daylight hours, to ensure lighting does not operate when sufficient daylight is available.

- 6.3.2 Presence detection/PIR systems (where lighting is normally off and is then turned on for a set period of time when physical activity is detected) will not be used as lighting is not intended to be shut off during operation. This could introduce a health and safety risk to operatives should a light turn off during loading or unloading of hazardous substances.
- 6.3.3 Lighting will generally be on during the night, to provide required light levels.
- 6.3.4 It is expected that there may be some facility for manual override to allow for a reduction or dimming of light output on the jetty if there is a planned decrease in occupancy.

7 Hydrogen Production Facility – Outline Lighting Strategy

7.1 Design Overview

7.1.1 The exterior lighting strategy for the Hydrogen Production Facility set out in this section is based on the operational requirements of the facility.

7.1.2 **Section 8** assesses the lighting strategy against the criteria contained in **Section 4** in terms of obtrusive light, in particular light spill, sky glow and glare, based on any identified constraints and the local area lighting character.

7.2 Lighting Design Parameters

7.2.1 **Table 16** sets out the lighting design criteria for the Hydrogen Production Facility, which align with British Standards (Ref 1-8, Ref 1-9, Ref 1-10) requirements and CIBSE good practice guidance (Ref 1-11).

Table 16: Lighting design criteria for the Hydrogen Production Facility

Site area	Avg. Light level (lux)	Uniformity	Colour rendering (min)	Glare ratio	Comments
Car Park / Parking Areas	10	0.25	20	50	Requirement for medium traffic volume, at grade
Maintenance Track	10	0.25	20	50	Typical requirement. May accommodate emergency access
Entrance Gate	150	0.4	50	50	Requirement at grade, for electrical sub-station (typical)
Tanker filling (general area)	50	0.4	20	45	Requirement at grade
Stairways and Ladders	50 (typical) 100 (high activity)	0.4 (typical) 0.5 (high activity)	40	45	Requirement on stair/ladder treads
Outdoor operating platforms	50	0.4	20	50	Requirement at floor level
Outdoor pump & valve areas	100	0.4	20	50	Requirement at grade
Electrical sub-stations outdoor switchyard	50	0.4	20	50	Requirement at grade

Site area	Avg. Light level (lux)	Uniformity	Colour rendering (min)	Glare ratio	Comments
Electrical sub-stations outdoor transformer area	50	0.4	20	50	Requirement at grade
Electrical sub-stations Street lighting	5	0.4	20	50	Requirement at grade
Electrical sub-stations Generator fuelling area	50	0.4	20	45	Requirement at grade
Outdoor Walkway	50	0.25	20	50	Requirement at grade
Pedestrian Walkway	5	0.25	20	50	Requirement at grade

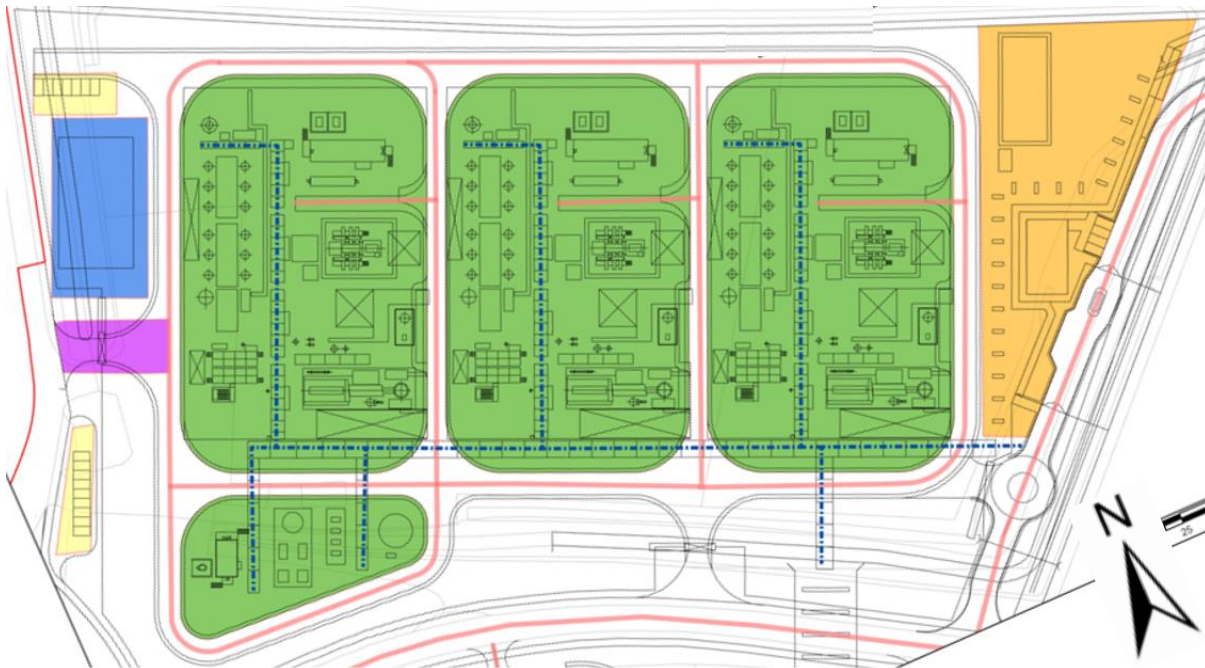
Lighting Design Strategy

- 7.2.2 The hydrogen production facility would include a wide variety of space types, broadly characterised as circulation, utilities, control/security, processing, staff welfare and storage. Lighting requirements may be subject to some flexibility but there will be minimum requirements for safe access and operation.
- 7.2.3 The strategy must be committed to minimising light spill to retained habitats, particularly in relation to bat corridors to avoid impact on the conservation status of bats due to new lighting. This is secured by way of a DCO Requirement.
- 7.2.4 The lighting strategy will also need to consider impacts to the rail lines that runs through the Site in order to avoid creating discomfort or disability glare and associated distraction to train drivers.
- 7.2.5 Indicative lighting zoning typologies are provided below for the three main terrestrial areas: the East Site – Hydrogen Production area (Work No 5 including 5a), East Site – Ammonia Storage area (Work No 3 including 3a) and the West Site (Work No. 7 including 7a-d). These typologies will be refined as the final design and layout develops.

East Site – Hydrogen Production

- 7.2.6 **Plate 2** provides an overview of the indicative lighting zoning and levels for the East Site – Hydrogen Production area based on illustrative layouts.

Plate 2: Indicative lighting zoning and levels – East Site – Hydrogen Production Area



Source: Extract of drawing EN-222517-PIP-PP503-001 rev P01

- | | | | |
|--|--|---|---|
|  Circulation road |  Work/equipment areas |  Piperack location |  Vehicle loading |
|  Carpark |  Security / Control Bldgs |  Site entrance | |








West Site

7.2.7 **Plate 3** provides an overview of the indicative lighting zoning and levels for the West Site based on illustrative layouts.

Plate 3: Indicative Lighting Zones and Levels – West Site



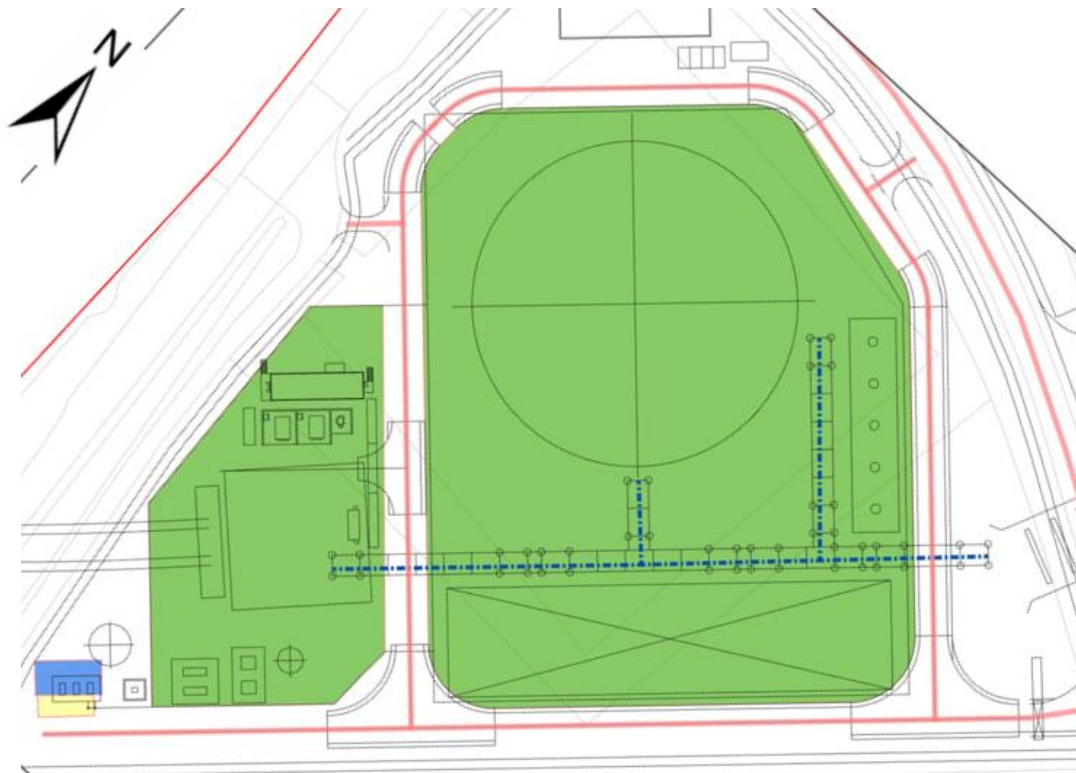
Source: Extract of drawing EN-222517-PIP-PP502-001 rev 01

- | | | | |
|--|--|---|---|
|  Circulation road |  Work/equipment areas |  Piperack location |  Vehicle loading |
|  Carpark |  Site entrance | |  Buildings |

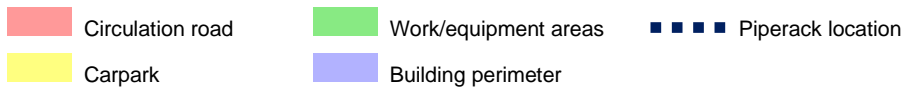
East Site – Ammonia Storage area

7.2.8 **Plate 4** provides an overview of the indicative lighting zoning and levels for the East Site – Ammonia Storage area based on illustrative layouts.

Plate 4: Indicative Lighting Zones and Levels – East Site – Ammonia Storage Area



Source: Extract of drawing EN-222517-PIP-PP504-001 rev 01



Lighting Arrangements

7.2.9 The indicative approach to lighting arrangements is summarised below. The final design will be informed by lighting calculations, to ensure the required lighting levels set out in **Table 16** above are achieved:

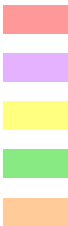



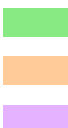





- a. The main road and access roads around the perimeter of the East Site will be lit mainly with streetlight style luminaires mounted on poles with a minimum height of 8m.
- b. Security gates and entrance areas may have additional lighting with pole mounted floodlights or streetlight luminaires mounted on 8m high poles.
- c. Dedicated car parking areas to feature 6m height lighting poles with streetlight luminaire heads to best achieve a uniformly lit effect.
- d. Vehicle loading/turning areas will be lit from 6-10m height floodlights or streetlight style luminaires around the perimeter with additional floodlights for trailer loading, all ideally mounted onto pipe racks so as to minimise dedicated poles and thereby reduce clutter.
- e. Working/equipment areas will be lit by floodlights on 8-12m height poles.
- f. Where additional lighting is needed near Site buildings, bulkhead luminaires will be mounted onto the building perimeter wall.

- g. The bridge over the pipes may be lit by linear or point lighting integrated into handrails which will provide a neatly concealed and safe solution.

Lighting Details

7.2.10 **Table 17** sets out the luminaire typologies that are likely to be used in these areas. The luminaire type, lumen output and any installation requirements will be finalised as part of design development.

Table 17: Indicative luminaire typologies – Ammonia Terminal equipment selection

Indicative Area	Image	Product (or equivalent)	Lamp Details	Installation
		FAEL Domino Street AP	51 W 6109 lm 4000 K CRI 70+	Pole mounted at height 6 – 8 m Tilt angle 0° above the horizontal
		CHAMLIT Evolution X	188 W 19197 lm 4000 K CRI 70+	Pole mounted at height 8-12 m Tilt angle maximum 7° above the horizontal
		ABACUS Vago AL61101	D: 50 W 6509 lm 4000 K CRI 70+	Pole mounted at height 6-8 m Tilt angle 5° above the horizontal
		ABACUS Revati AL60601	5.1 W 642 lm 4000 K CRI 70+	Building mounted at height 2.3 – 3.0 m Tilt angle 0° above the horizontal
		GHIDINI Corrimano 420 GH1108 Handrail	(50% flux) 4.4W 163 lm 4000 K CRI 70+	Integrated into handrail

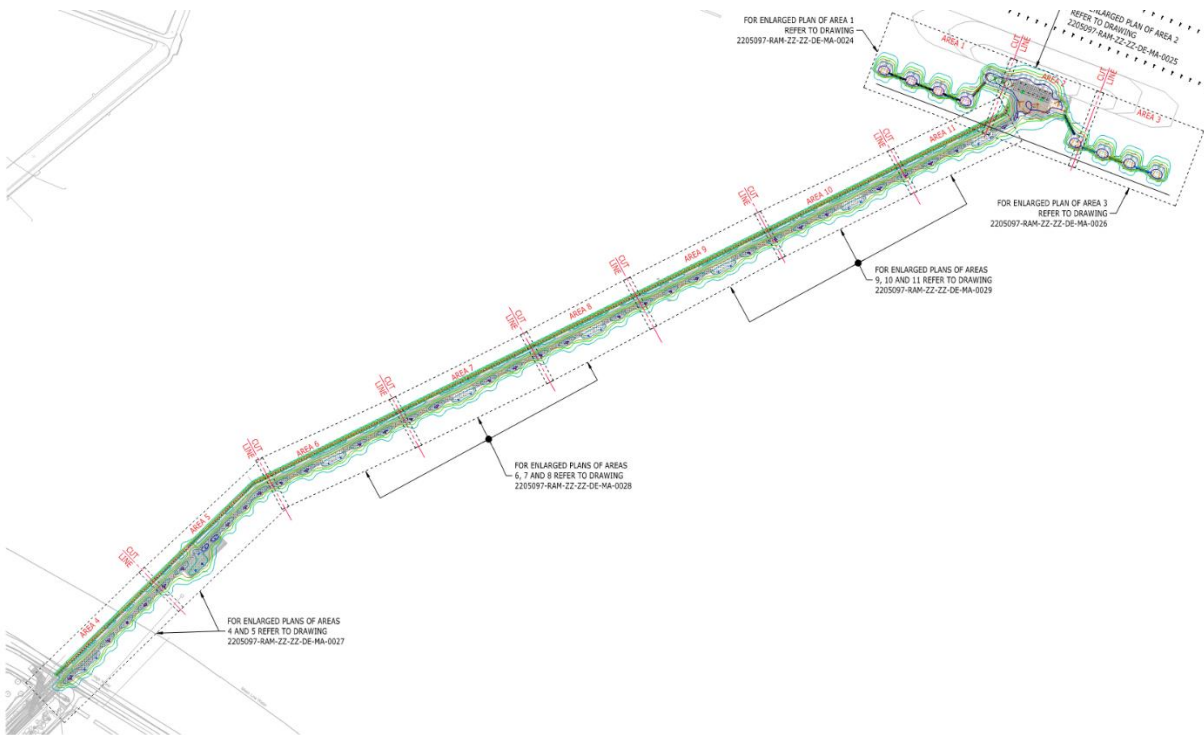
7.3 Lighting Controls

- 7.3.1 There will be three main service categories: Normal, Essential and Emergency.
- a. Normal lighting will support day to day site activities and applies to the process plant, storage area and pipe rack. This state is considered to utilise 100% of illuminance capacity, although this will be considered further once the final design and equipment selection has been made to prevent over-lighting in exterior areas;
 - b. Essential lighting service is required to carry out critical activities in the event of a systems failure, using a back-up generation system or other power source as specified. It is anticipated this would normally apply to interior areas but could also be required externally where hazardous conditions exist to ensure a consistent lighting condition for safe working; and
 - c. Emergency lighting conditions are considered for internal areas only and are outside the scope of this assessment.
- 7.3.2 Photocells are to be used as a primary control on all exterior lighting so that no luminaires will remain switched on when adequate daylight is available to support operations.
- 7.3.3 A manual override switch integral to the distribution board shall also be incorporated to control the exterior lighting in the event of an emergency.
- 7.3.4 In the event a distribution board is regulated by a photocell, the photocell is to be located outside the building housing the board.
- 7.3.5 High-level platform lighting will have the capability of being manually switched off when not required.

8 Technical Assessment

- 8.1.1 Lighting performance has been assessed by reference to the calculations set out in the reports provided in **Annexes A** and **B** of this report, and the outline strategy for the Hydrogen Production Facility set out in **Annex C** of this report.
- 8.1.2 The assessments consider only a bare-earth scenario, screening and obstruction by buildings or other structures was not considered in the lighting calculations to present a worse-case scenario, but is considered in the context of mitigation for any effects identified.
- 8.1.3 Additionally, in accordance with standard practice and in line with the bare-earth approach, variable screening that might be provided by mature trees, shrubbery or other vegetation is not considered within the assessment. There may be landscape elements like trees along certain areas of the Site boundary which create some degree of screening throughout the year and further reduce reported effects (where effects are noted from off-Site locations).
- ### 8.2 Maintenance and Maintenance Factor
- 8.2.1 Maintenance Factors are determined based on the operational life of a luminaire, environment and maintenance regime which would affect the light output over a period of time. Maintenance Factors consider guidance provided by BS 5489-1:2020 (Ref 1-8). A Maintenance Factor of 0.9 was used in the calculations for ABP site areas in the calculations provided in **Annexes A** and **B**.
- 8.2.2 The performance output in supplied drawings reflects the maintained light output. Day 1 conditions are usually brighter, but this initial brightness can be controlled by using a constant current system that adjusts to provide a consistent light output over time.
- ### 8.3 Marine Infrastructure and Jetty Access Works Lighting Proposal Performance
- 8.3.1 **Plate 5:** provides a high-level overview of the information used in the lighting calculation undertaken for the jetty and shows light distribution in plan using point readings for design areas and iso-contour lines from centre to the perimeter using a range of 2-50 lux, where 2 lux is the post-curfew criteria for zone E3. The full calculation and zoom-ins of each area are provided in **Annexes A** and **B**.

Plate 5: Proposed Site lighting performance – Terminal light distribution



Source: Extract of drawing 2205097-RAM-ZZ-ZZ-DE-MA-0023 rev P03

8.4 Marine Infrastructure - Results Overview

8.4.1 Areas identified were found to meet or exceed the design criteria set out in **Section 4** for light levels and uniformity. The jetty walkway has a higher illumination level than required as an outcome of lighting provided to vehicle circulation and dimming is recommended for periods when the road area is not in use.

8.4.2 **Table 18** provides a summary of the simulation results.

Table 18: Lighting design results

Site area	Avg. Light level (lux) target	Uniformity target	Avg. Light level (lux) result	Avg. Uniformity result	Comments
Loading Areas, Hazardous Products	100	0.4	111	0.45	Meets design criteria
Higher Risk Operational Areas (jetty)	50	0.4	49	0.40	Sufficiently close to target, considered to meet criteria
General Circulation (vehicle)	20	0.4	22	0.40	Meets design criteria

Site area	Avg. Light level (lux) target	Uniformity target	Avg. Light level (lux) result	Avg. Uniformity result	Comments
Walkways (unmapped)	10	0.5	28	0.41	Meets design criteria

Light Spill

- 8.4.3 Light spill will not reach existing built receptors and the relevant criteria are considered to be met for pre- and post-curfew conditions for zone E3 and the stricter criteria for zone E2.
- 8.4.4 Light distribution is expected to extend beyond the built elements of the jetty (designated task areas) and into the Humber River, up to 2 lux is likely within 7.5 m of the jetty heads and platform and up to 4.0 m from the access ramp road.
- 8.4.5 Light spill is contained to within the Site, however additional luminaire angling / orientation and/or switching may be desirable to further minimise potential spill to potential habitat and keep light directed toward task areas.

Sky Glow

- 8.4.6 The introduction of direct upward light shining into the sky appears to be suitably controlled by the proposals and a maximum of 0.4% has been calculated. This is well within the recommended threshold for Zone E3 and the stricter criteria of Zone E2 and so good practice sky glow criteria are met.
- 8.4.7 The lighting proposals incorporate design measures which inherently limit upward light. This includes:
- Selection of full cut-off lighting which does not shine light directly above the horizontal;
 - Directing light down by installing new lighting with minimal to no tilt; and
 - Selection of dimmable lighting equipment which does not contribute to over lighting.
- 8.4.8 Site material selections and avoidance of excess light can also help to control sky glow by managing the potential for indirect contribution of upward light. This is possible in areas which have structures or surfaces that are lightly coloured or contain large areas comprised of specular materials. Non-diffuse surface materials can lead to an increase in reflected light which is exacerbated in scenarios where there is over-lighting. Therefore, it is important that the proposed lighting provides the required light without significant excess.

Glare

- 8.4.9 As no sensitive residential receptors have a direct line of sight to the Terminal, offsite glare was not addressed in the calculations; however the following context elements are considered:
- Column heights which are predominantly 6 – 8m are similar to heights used in typical street lighting installations. Lower mounting height combined with tilts

that on average do not exceed 5°, would not contribute to significant instances of light source visibility;

- b. 12m columns with street light style heads mounted at a maximum of 15° increase the potential for visibility but would not be highly visible by receptors on land which are much closer to the existing Port of Immingham and the future Ammonia Storage Site;
- c. Additionally, should there be any potential for direct views of lamps from jetty or access ramp lighting, it will be generally obstructed by new buildings or existing landscape.

8.4.10 On this basis, glare to receptors at or beyond the Site at this part of the Site is assessed to be within the recommended threshold for Zone E3 and the stricter criteria of Zone E2 and so good practice glare criteria are met.

8.5 Jetty Access Works - Results Overview

8.5.1 Overall, the lighting proposals were found to meet the design criteria set out in **Section 4** for light levels and uniformity. Vehicle passing/parking bays are expected to have a higher illumination level than required as an outcome of lighting provided to vehicle circulation and dimming is recommended for periods when the road area is not in use.

8.5.2 **Table 19** provides a summary of the simulation results.

Table 19: Lighting design results

Site area	Avg. Light level (lux) target	Uniformity target	Avg. Light level (lux) result	Avg. Uniformity result	Comments
Access road	20	0.4	21	0.42	Meets design criteria
Pedestrian emergency access route	10	0.5	12	0.52	Meets design criteria
Pedestrian only walking	10	0.5	10	0.59	Meets design criteria
Car parking	10	0.5	23	0.57	Meets design criteria, though over-lighting may be further minimised.
Ramp	20 (10 min)	0.5	25 (13 min)	0.52	Meets design criteria
Steps	20 (10 min)	0.5	23 (12 min)	0.57	Meets design criteria

Search bay area	50	0.4	50	0.71	Meets design criteria
-----------------	----	-----	----	------	-----------------------

Light Spill

- 8.5.3 Light spill will not reach existing built receptors and criteria is considered to be met for pre- and post-curfew conditions for zone E3 and the stricter criteria for zone E2.
- 8.5.4 Light spill is contained within the Site boundary. Additional luminaire angling / orientation and/or switching may be desirable to further minimise potential spill to habitat and keep light directed toward task areas.
- 8.5.5 It should be noted that light spill outside of task areas and onto the water is likely to occur due to the scale of the Project and necessity of supporting safe operation and access of the jetty heads and platform.

Sky Glow

- 8.5.6 The introduction of direct upward light shining into the sky appears to be suitably controlled by the proposals and a maximum of 0.2 % has been calculated. This is well within the recommended threshold for zone E3 and the stricter criteria of zone E2 and so good practice sky glow criteria are met.
- 8.5.7 The lighting proposals incorporate design measures which inherently limit upward light. This includes:
- Selection of full cut-off lighting which does not shine light directly above the horizontal;
 - Directing light down by installing new lighting with minimal to no tilt; and
 - Selection of dimmable lighting equipment which does not contribute to over lighting.
- 8.5.8 Site material selections and avoidance of excess light can also help to control sky glow by managing the potential for indirect contribution of upward light. This is possible in areas which have structures or surfaces that are lightly coloured or contain large areas comprised of specular materials. Non-diffuse surface materials can lead to an increase in reflected light. This should be taken into account in the final lighting design.

Glare

- 8.5.9 As no sensitive residential receptors would have a direct line of sight to the relevant infrastructure, offsite glare is not required to be assessed. However the design approach summarised in **Section 9.4** and in **Section 6** would also be applied to provide robust light management throughout the Site.
- 8.5.10 On this basis, glare to receptors at or beyond the Site Boundary at this part of the Site is assessed to be within the recommended threshold for Zone E3 and the stricter criteria of Zone E2 and so good practice glare criteria are met.

8.6 Hydrogen Production Facility - Lighting Strategy Assessment

8.6.1 The final lighting proposals can incorporate good optical control including through:

- a. Selection of light sources that do not shine light above the horizontal; and
- b. Light management in the form of baffles, louvres, hoods, or other shielding to aid in shaping light distribution and limiting views of light sources where appropriate.

8.6.2 An acceptable lighting performance can be achieved which minimises obtrusive lighting effects. The detailed operational lighting scheme submitted for approval should therefore meet the requirements of **Table 16** and consider the measures identified below.

Light Spill

8.6.3 Light spill will be managed through the specification of lighting equipment with good optical control and a detailed design which focuses illumination on defined task areas. Additional shielding will be incorporated, where necessary, to aid in managing light distribution above the horizontal or to areas not intended to be lit. It is expected that light spill criteria for a zone E3 can be achieved.

Sky Glow

8.6.4 Sky glow is expected to be moderately well contained by lighting proposals. Dimming controls should be considered where appropriate to minimise sky glow from indirect light through large areas of over-lighting.

8.6.5 Sky glow can be managed through the specification of lighting equipment with good optical control and a detailed design which focus illumination on defined task areas. It is expected that sky glow criteria for a zone E3 can be achieved.

Glare

8.6.6 Glare is best managed by specification of lighting with good optical control and a detailed design that incorporates zero or minimal uplift from the horizontal. Alternatively, the introduction of a shield or baffle to luminaires will minimise / obscure source intensity in affected viewing directions. It is expected that glare criteria for a zone E3 can be achieved.

9 Summary

9.1.1 An indicative lighting proposal setting out lighting design intent has been developed for the Marine Infrastructure and Jetty Access Works. An outline lighting strategy has been produced for the Hydrogen Production Facility. Each reflects the requirements for safe Site use and access along with consideration of identified technical and environmental constraints.

9.1.2 The following sections summarise the assessment findings regarding lighting performance and detailed design requirements.

9.2 Construction

9.2.1 Most activities associated with construction would be primarily kept to daylight hours. There would be limited use of high-power floodlighting to allow for an extension of the working period during winter months or when there is insufficient daylight available due to inclement weather.

9.2.2 A Light Management Plan will be developed by the contractor and be incorporated into the final CEMP(s) to be submitted and approved pursuant to a requirement of the draft DCO in accordance with the **Outline CEMP [TR030008/APP/6.5]** which addresses use and monitoring of lighting, particularly around sensitive areas. Therefore, it is expected that effects from construction lighting can be adequately managed and comply with policy and ILP good practice.

9.3 Operation

9.3.1 Light modelling of the proposed lighting arrangements for the Marine Infrastructure and Jetty Access Works has been undertaken to ensure the correct light levels and uniformities are provided to task areas and evaluate the design against good practice guidance for limiting obtrusive light.

9.3.2 An outline design strategy has been provided for the Hydrogen Production Facility including lighting design criteria for specific task areas and anticipated types of exterior lighting that would be provided to ensure the safe operation of the facility.

Marine Infrastructure

9.3.3 The lighting design proposals based on the details provided in **Annex A** are found to largely contain light within the confines of the Terminal. Pole lighting provides illumination to the designated areas predominantly without over-lighting, and the light is expected to drop below 2 lux at around 7.5m from pole locations.

9.3.4 Sky glow and glare effects to receptors are adequately managed.

9.3.5 Lighting criteria for a zone E3 can be met based on the lighting proposals received.

Jetty Access Works

- 9.3.6 The lighting design proposals based on the details provided in **Annex B** are found to largely contain light within the confines of the jetty access road and landside access ramp. Pole lighting provides illumination to the designated areas predominantly without over-lighting, and the light is expected to drop below 2 lux within 7.5m from pole locations.
- 9.3.7 Sky glow and glare effects to receptors are adequately managed.
- 9.3.8 Lighting criteria for a zone E3 can be met based on the lighting proposals received.

Hydrogen Production Facility

- 9.3.9 Provided the final lighting proposals address the technical requirement of **Table 16** and the considerations set out in **Paragraphs 8.6.3- 8.6.6**, an acceptable lighting performance can be achieved which minimises obtrusive lighting effects to identified sensitive receptors.

10 References

- Ref 1-1 Natural England (2016). England's Light Pollution and Dark Skies.
- Ref 1-2 UK Government (1990) The Environmental Protection Act 1990 (c. 43).
- Ref 1-3 The Stationery Office (2005). Clean Neighbourhoods and Environment Act.
- Ref 1-4 Department for Transport (2012). National Policy Statement for Ports.
- Ref 1-5 The Stationary Office (2008) The Planning Act
- Ref 1-6 Ministry of Housing, Communities and Local Government (2021). National Planning Policy Framework.
- Ref 1-7 Ministry of Housing, Communities and Local Government (2021). Planning Practice Guidance.
- Ref 1-8 British Standards Institute (2020). BS 5489-1 Code of practice for the design of road lighting - Lighting of roads and public amenity areas.
- Ref 1-9 British Standards Institute (2015). BS EN 13201-2 Road Lighting - Performance Requirements.
- Ref 1-10 British Standard Institute (2014). BS EN 12464-2 Lighting of work places - Outdoor work places.
- Ref 1-11 Chartered Institute of Building Services Engineers and Society of Light and Lighting (2016). SLL LG6 Lighting Guide 6 The Exterior Environment.
- Ref 1-12 Chartered Institute of Building Services Engineers and Society of Light and Lighting (2021). SLL LG21 Lighting Guide 21 Protecting the Night-Time Environment.
- Ref 1-13 Institute of Lighting Professionals (2021). ILP GN01 Guidance Note 1 for the Reduction of Obtrusive Light.
- Ref 1-14 Institute of Lighting Professionals (2018). ILP GN08 Guidance Note 8 Bats and Artificial Lighting in the UK.
- Ref 1-15 Commission Internationale de l'Eclairage (1997). CIE 126 Guidelines for Minimising Sky Glow.
- Ref 1-16 Commission Internationale de l'Eclairage (2017). CIE 150 Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations.
- Ref 1-17 Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities and Local Government (2019). Guidance: Light Pollution.

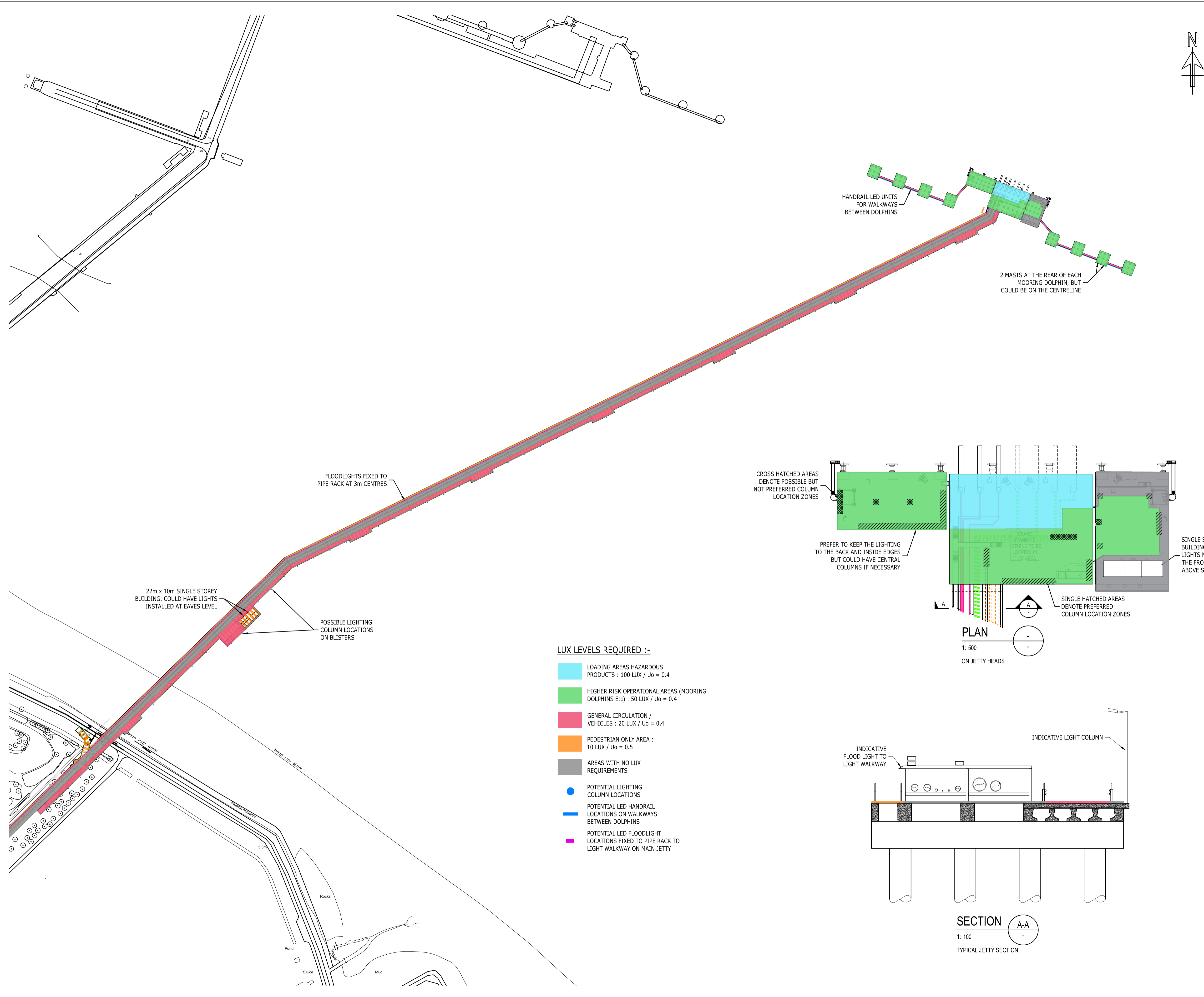
- Ref 1-18 Institute of Lighting Professionals (2013). ILP PLG04 Planning Guidance 4 Guidance on undertaking Environmental Lighting Impact Assessments.
- Ref 1-19 Chartered Institute of Building Services Engineers and Society of Light and Lighting (2022). SLL Code for Lighting.
- Ref 1-20 Chartered Institute of Building Services Engineers and Society of Light and Lighting (2018). SLL Lighting Handbook.

Annex A: Marine Infrastructure Indicative Lighting Proposals

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 - ALL COORDINATES ARE IN METRES U.N.O.
 - ALL LEVELS ARE IN METRES ABOVE CHART DATUM U.N.O.
 - FOR THE RELATIONSHIP BETWEEN THE CHART DATUM AND ORDNANCE DATUM REFER TO THE DIAGRAM BELOW:

TIDAL LEVELS - EXTRACTED FROM TOTALTIDE 20/06/23		
TIDAL LEVEL DESCRIPTION	ABBREVIATION	LEVEL
HIGHEST ASTRONOMICAL TIDE	HAT	+8.0m C.D.
MEAN HIGH WATER SPRINGS	MHWS	+7.3m C.D.
MEAN HIGH WATER NEAPS	MHWN	+5.8m C.D.
MEAN SEA LEVEL	MSL	+4.18m C.D.
MEAN LOW WATER NEAPS	MLWN	+2.6m C.D.
MEAN LOW WATER SPRINGS	MLWS	+0.9m C.D.
LOWEST ASTRONOMICAL TIDE	LAT	+0.1m C.D.



Rev	Description	Date	By	App
P02	SECOND ISSUE	24/07/2023	SD/DH	JC
P01	FIRST ISSUE	13/06/2023	SPF/DH	JC

PRELIMINARY

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R.I.B.A. STAGE 2 LIGHTING - JETTY HEAD AND APPROACH STRUCTURE

Project No:	Scale (@A1):	Drawn:	Date:
1620015674	1:2000	SD	JULY 2023
Drawing No:		Rev:	
2205097-RAM-03-MG-DR-E-1001		P02	

Lighting Schedule Project Total (for mast arrangements see table/s below)						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
A	33	1 x 69116_V	Domino Street AP Single Post Top Mounted Luminaire Elevation 0°	6	39	5560
B1	14	1 x 69111_S	Domino Street AP Single Post Top Mounted Luminaire Elevation 0°	6	39	5049
B2	3	1 x 69111_S	Domino Street AP Single Bracket Outreach 1m Luminaire Elevation 0°	6	39	5049
B3	2	1 x 69111_S	Domino Street AP Building Mounted Luminaire Elevation 0°	3	39	5049
C	6	EVXB_20L_LE_AS	Evolution X_Zone 1_5K Luminaire Elevation -7°	12	188	19197
D	16	AL61101_10_1_AW_50_4K	Vago - Luminaire Elevation 5°	8	50	6509
E	15	AL61101_4_0_AW_32_4K	Vago - Luminaire Elevation 0°	8	32	3306
F	8	AL61101_2_0_AW_19_4K	Vago - Luminaire Elevation 0°	8	19	2104
G	387	AL61101_1_0_AW_13_4K	Wall mounted Vago - 8% Flux Luminaire Elevation 0°	2	13	1503
H	15	GH1108_BGXO400EL	Corrimano Handrail - 50% Flux	1	4.64	163
I	81	GH1108_BGXO400EL	Corrimano Handrail - 25% Flux	1	4.64	82

Mast Arrangement						
M1, M2						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
C	3	EVXB_20L_LE_AS	Evolution X_Zone 1_5K Luminaire Elevation -7°	12	188	19197

Mast Arrangement						
M3, M4, M5, M6, M7, M8, M9, M10, M11, M12, M13, M14, M15, M16, M17, M18						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
D	1	AL61101_10_1_AW_50_4K	Vago - Luminaire Elevation 5°	8	50	6509

Mast Arrangement						
M19, M22, M23, M24, M25, M26, M27						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
E	2	AL61101_4_0_AW_32_4K	Vago - Luminaire Elevation 0°	8	32	3306

Mast Arrangement						
M20, M21						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
F	4	AL61101_2_0_AW_19_4K	Vago - Luminaire Elevation 0°	8	19	2104

Mast Arrangement						
M28						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
E	1	AL61101_4_0_AW_32_4K	Vago - Luminaire Elevation 0°	8	32	3306

Glare Summary	
Label	GRmax
Observer 01	38
Observer 02	37
Observer 03	37
Observer 04	39
Observer 05	37
Observer 06	10
Observer 07	11
Observer 08	22
Observer 09	29
Observer 10	21
Observer 11	10
Observer 12	10

Area Summary	
Label	Total Watts
Total Area	10064.41

Isoline Legend	
illuminance (Lux)	Value
2	2
5	5
10	10
20	20
50	50

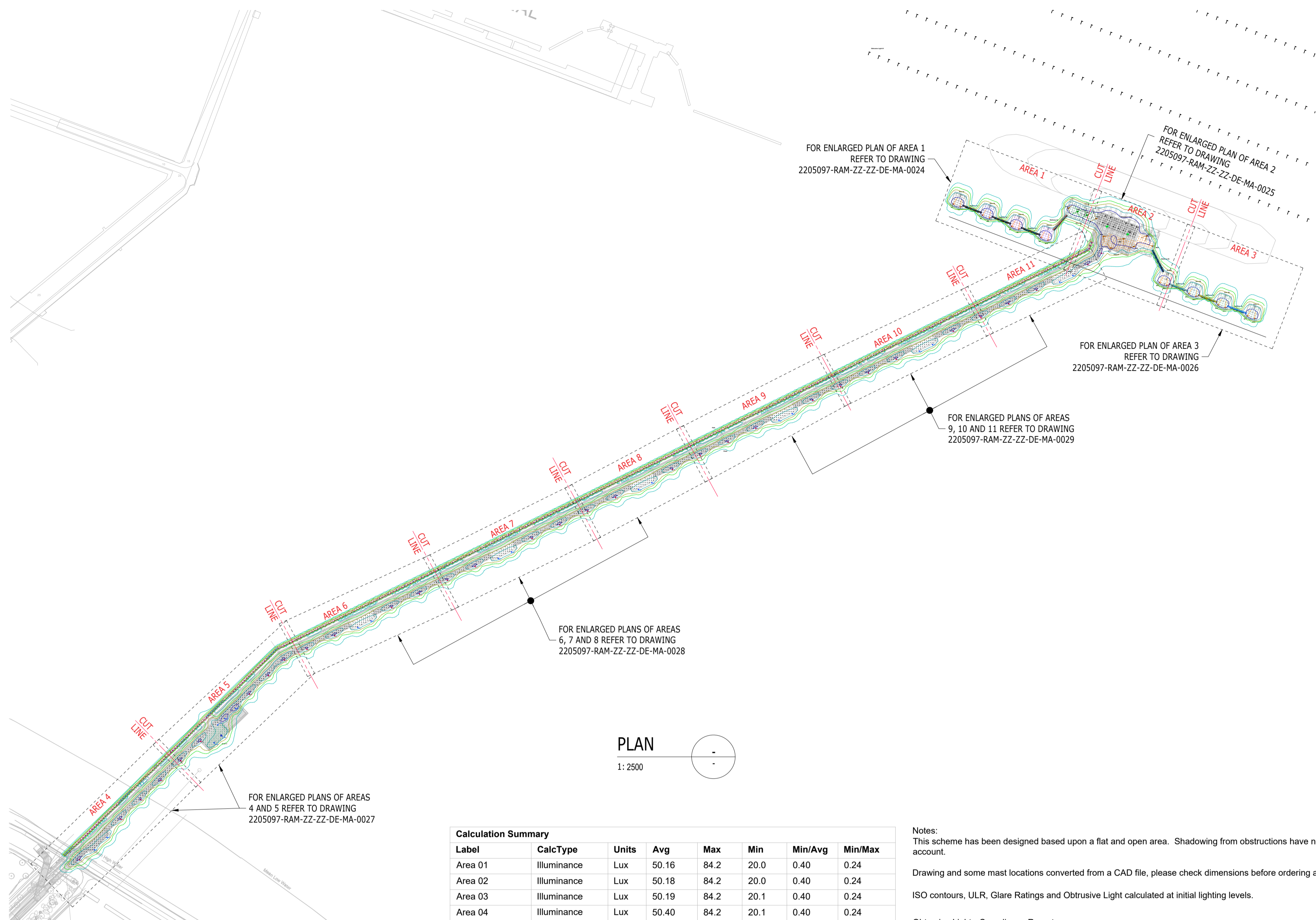
Maintenance Factor 0.9	
LED lifetime	Value
L80B10: > 60,000 hours	
Dirt depreciation factor:	BS5489-1:2020 Table C.1
	12 month cleaning intervals

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All illuminance values are the result of computer calculations, based upon precisely positioned luminaires in a fixed relationship to each other and to the area under examination. In practice the values may vary due to tolerances on luminaires, luminaire positioning, reflection properties and electrical supply.

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PLAN
1:2500

Horizontal Illuminance Levels				
Customer Specification				
Label	CalcType	Units	Avg	Min/Avg
Loading Areas Hazardous Products	Illuminance	Lux	100	0.40
Higher Risk Operational Areas	Illuminance	Lux	50	0.40
General Circulation / Vehicles	Illuminance	Lux	20	0.40
Pathway	Illuminance	Lux	10	0.50

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Min/Avg	Min/Max
Area 01	Illuminance	Lux	50.16	84.2	20.0	0.40	0.24
Area 02	Illuminance	Lux	50.18	84.2	20.0	0.40	0.24
Area 03	Illuminance	Lux	50.19	84.2	20.1	0.40	0.24
Area 04	Illuminance	Lux	50.40	84.2	20.1	0.40	0.24
Area 05	Illuminance	Lux	52.42	87	24	0.46	0.28
Area 06	Illuminance	Lux	55.66	139	22	0.40	0.16
Area 07	Illuminance	Lux	50.67	84.3	20.2	0.40	0.24
Area 08	Illuminance	Lux	50.19	84.2	20.1	0.40	0.24
Area 09	Illuminance	Lux	50.18	84.2	20.0	0.40	0.24
Area 10	Illuminance	Lux	50.15	84.2	20.0	0.40	0.24
Area 11	Illuminance	Lux	24.80	49	10	0.40	0.20
Hazardous Area	Illuminance	Lux	111.03	161	50	0.45	0.31
Path	Illuminance	Lux	14.72	22	10	0.68	0.45
Road	Illuminance	Lux	22.36	95	9	0.40	0.09
Walkway 01	Illuminance	Lux	28.91	56	12	0.42	0.21
Walkway 02	Illuminance	Lux	28.93	56	12	0.41	0.21
Walkway 03	Illuminance	Lux	28.81	56	12	0.42	0.21
Walkway 04	Illuminance	Lux	23.47	40	13	0.55	0.33
Walkway 05	Illuminance	Lux	31.69	58	14	0.44	0.24
Walkway 06	Illuminance	Lux	28.93	56	12	0.41	0.21
Walkway 07	Illuminance	Lux	28.92	56	12	0.41	0.21
Walkway 08	Illuminance	Lux	28.93	56	12	0.41	0.21

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Min/Avg	Min/Max
ObtrusiveLight_01_Cd_Seg1	Obtrusive - Cd	N.A.	31.59	133	3	0.09	0.02
ObtrusiveLight_01_III_Seg1	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_02_Cd_Seg1	Obtrusive - Cd	N.A.	15.57	35	5	0.32	0.14
ObtrusiveLight_02_III_Seg1	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_03_Cd_Seg1	Obtrusive - Cd	N.A.	11.89	22	5	0.42	0.23
ObtrusiveLight_03_III_Seg1	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.
ObtrusiveLight_04_Cd_Seg1	Obtrusive - Cd	N.A.	10.45	17	4	0.38	0.24
ObtrusiveLight_04_III_Seg1	Obtrusive - III	Lux	0.00	0	0	N.A.	N.A.

Notes:
 This scheme has been designed based upon a flat and open area. Shadowing from obstructions have not been taken account.
 Drawing and some mast locations converted from a CAD file, please check dimensions before ordering and installing.

ISO contours, ULR, Glare Ratings and Obtrusive Light calculated at initial lighting levels.

Obtrusive Light - Compliance Report
 CIE 150:2017, E2-Low District Brightness, Pre-Curfew
 Filename: LS4061095_4_Immingham Green Energy GET ABP
 19/07/2023 13:42:57

Illuminance
 Maximum Allowable Value: 5 Lux

Calculations Tested (4):	Test Results	Max. Illum.
ObtrusiveLight_01_III_Seg1	PASS	0
ObtrusiveLight_02_III_Seg1	PASS	0
ObtrusiveLight_03_III_Seg1	PASS	0
ObtrusiveLight_04_III_Seg1	PASS	0

Luminous Intensity (Cd) At Vertical Planes
 Maximum Allowable Value calculated from CIE 150:2017 (varies by Projected Area sq.m. and Distance Factor)
 For E2-Low District Brightness, Projected Area and Distance Factors:
 (0.002, 0.57) (0.01, 1.3) (0.03, 2.5) (0.13, 5) (0.5, 10)

Calculations Tested (4):	Test Results
ObtrusiveLight_01_Cd_Seg1	PASS
ObtrusiveLight_02_Cd_Seg1	PASS
ObtrusiveLight_03_Cd_Seg1	PASS
ObtrusiveLight_04_Cd_Seg1	PASS

Upward Light Ratio (ULR)
 Maximum Allowable Value: 2.5 %

Calculated ULR: 0.4 %
 Test Results: PASS

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 2205097-RAM-ZZ-ZZ-DE-MA-0025 - AREA 2
 2205097-RAM-ZZ-ZZ-DE-MA-0026 - AREA 3
 2205097-RAM-ZZ-ZZ-DE-MA-0027 - AREAS 4 & 5
 2205097-RAM-ZZ-ZZ-DE-MA-0028 - AREAS 6, 7 & 8
 2205097-RAM-ZZ-ZZ-DE-MA-0029 - AREAS 9, 10 & 11

Rev	Description	Date	By	App
P03	UPDATED TO LATEST SCHEME	21/07/2023	NNP/DH	JC
P02	UPDATED TO LATEST SCHEME	23/06/2023	SPF/DH	JC
P01	FIRST ISSUE	28/04/2023	SPF/DH	JC

PRELIMINARY

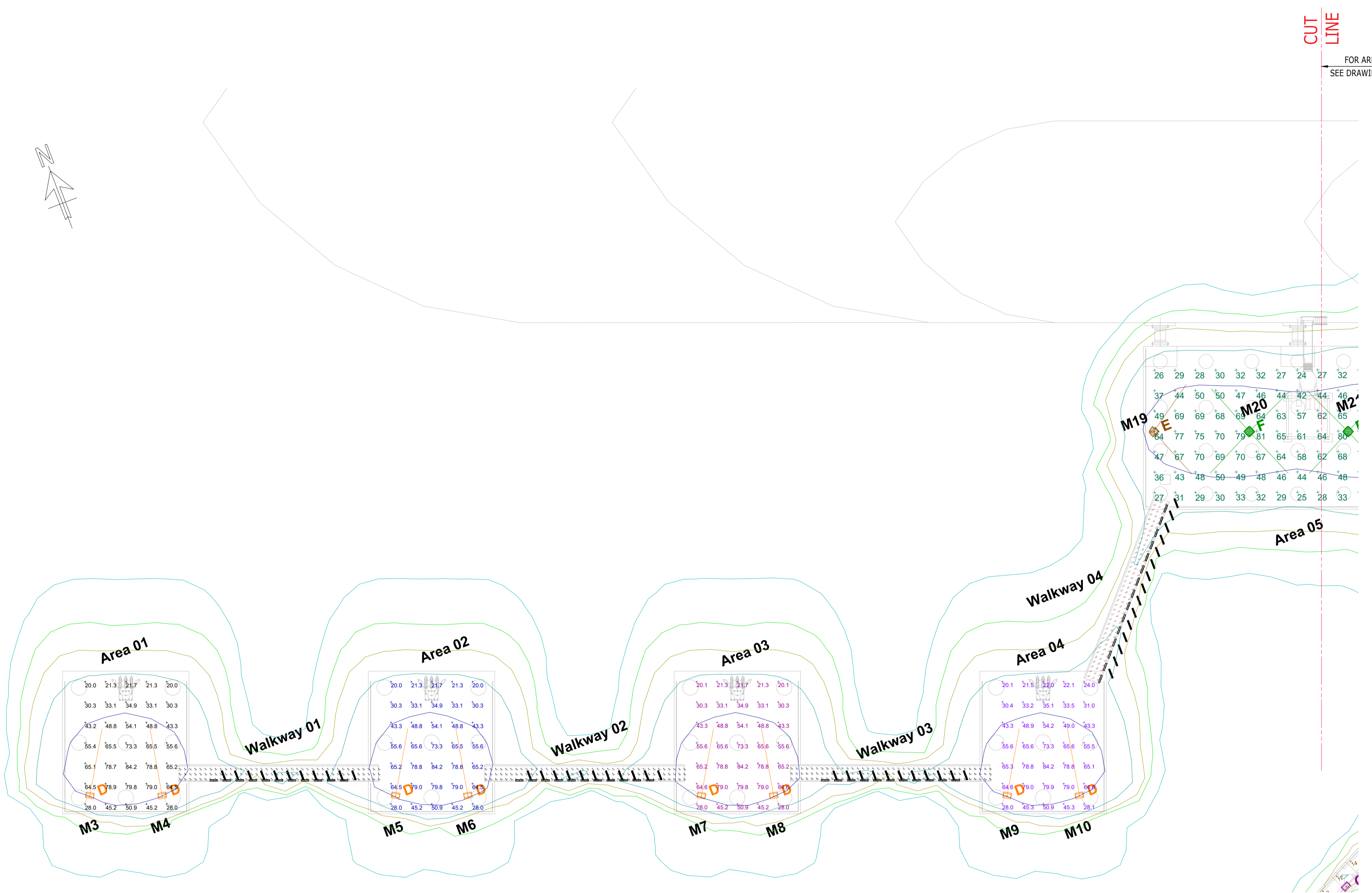
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EXTERNAL LIGHTING PLAN

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1620015674	1:2500	SPF	APR 2023
Drawing No:	Rev:		
2205097-RAM-ZZ-ZZ-DE-MA-0023	P03		



PLAN ON AREA 1

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P01	FIRST ISSUE	28/04 2023	SPF DH	JC
Rev	Description	Date	By	App
			CHK	

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AREA 1 JETTY HEAD
LIGHTING PLAN

Project No:	Scale (@A1):	Drawn:	Date:
1620015674	1:250	SPF	APR 2023
Drawing No:	Rev:		
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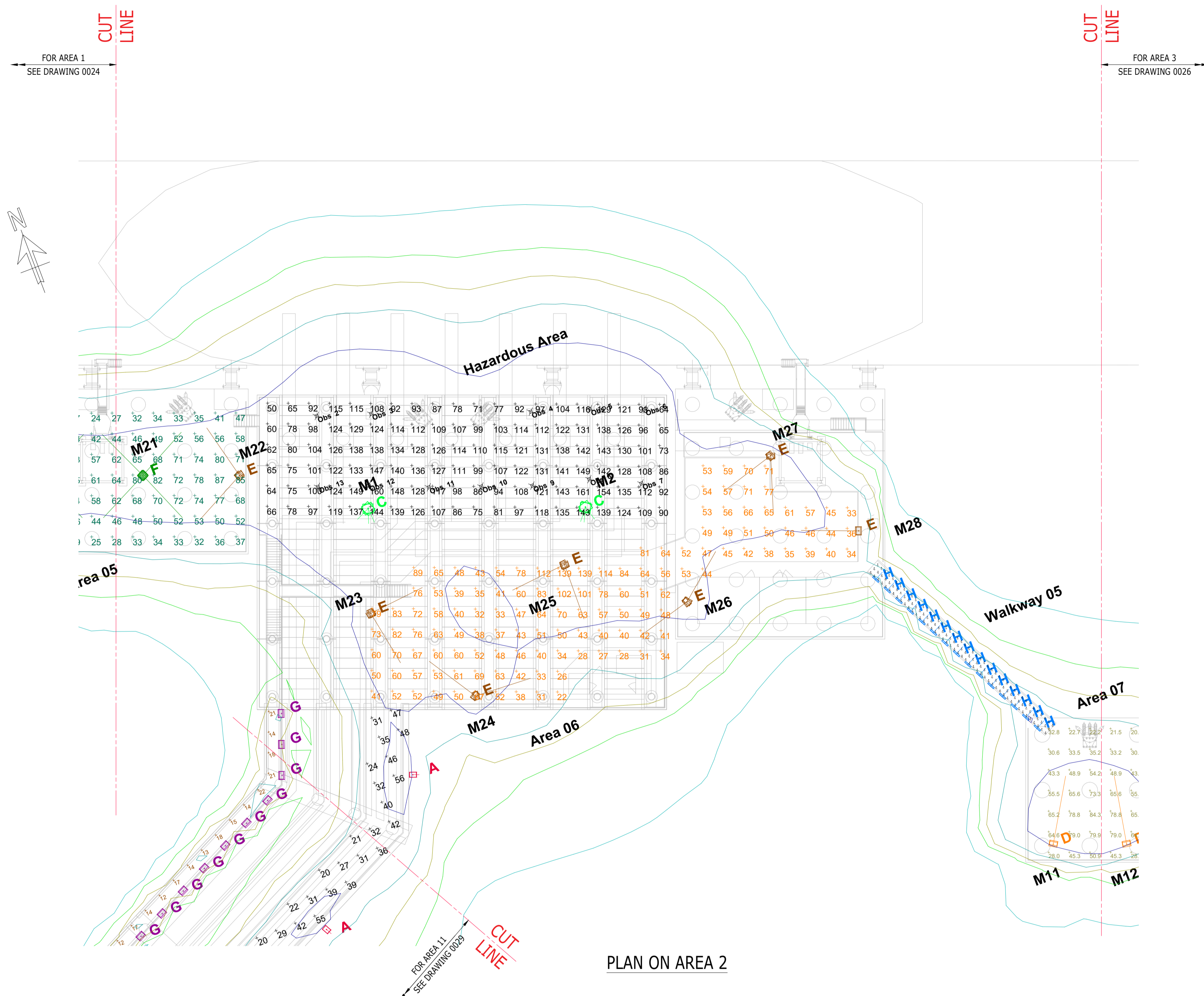
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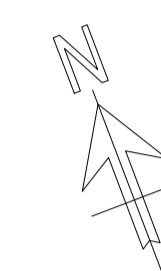
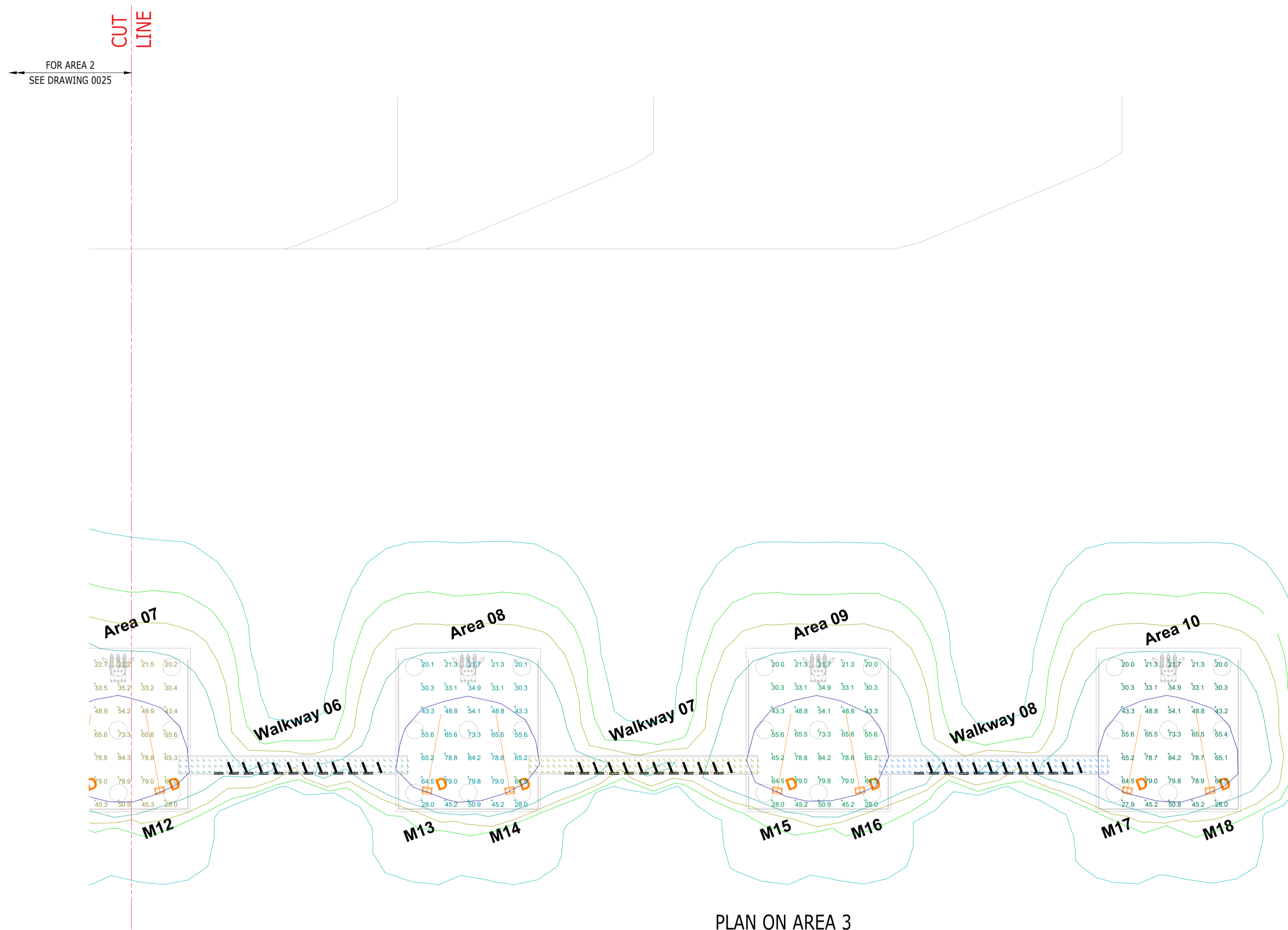
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LIGHTING PLAN

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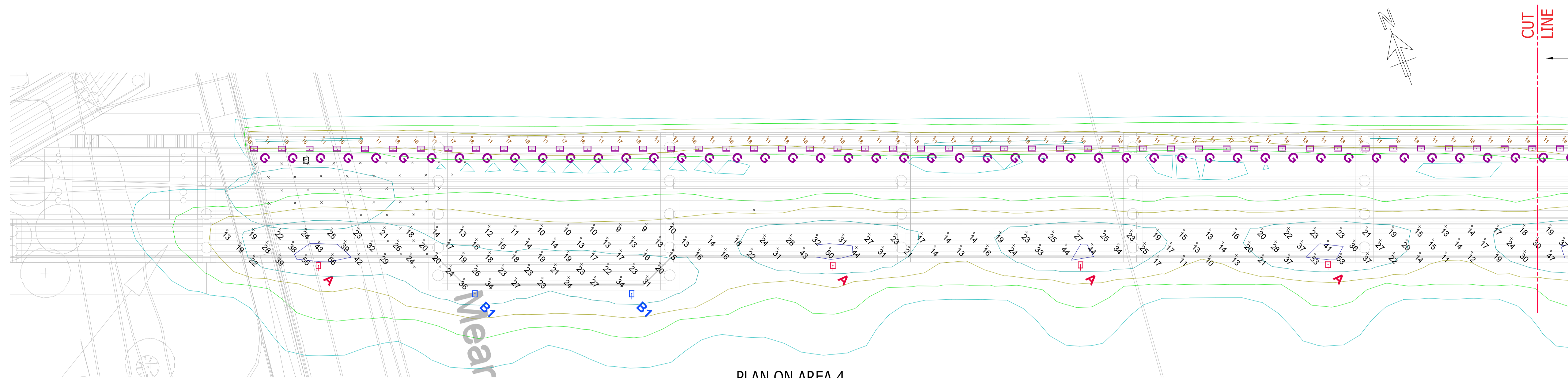
AREA 3 JETTY HEAD
LIGHTING PLAN

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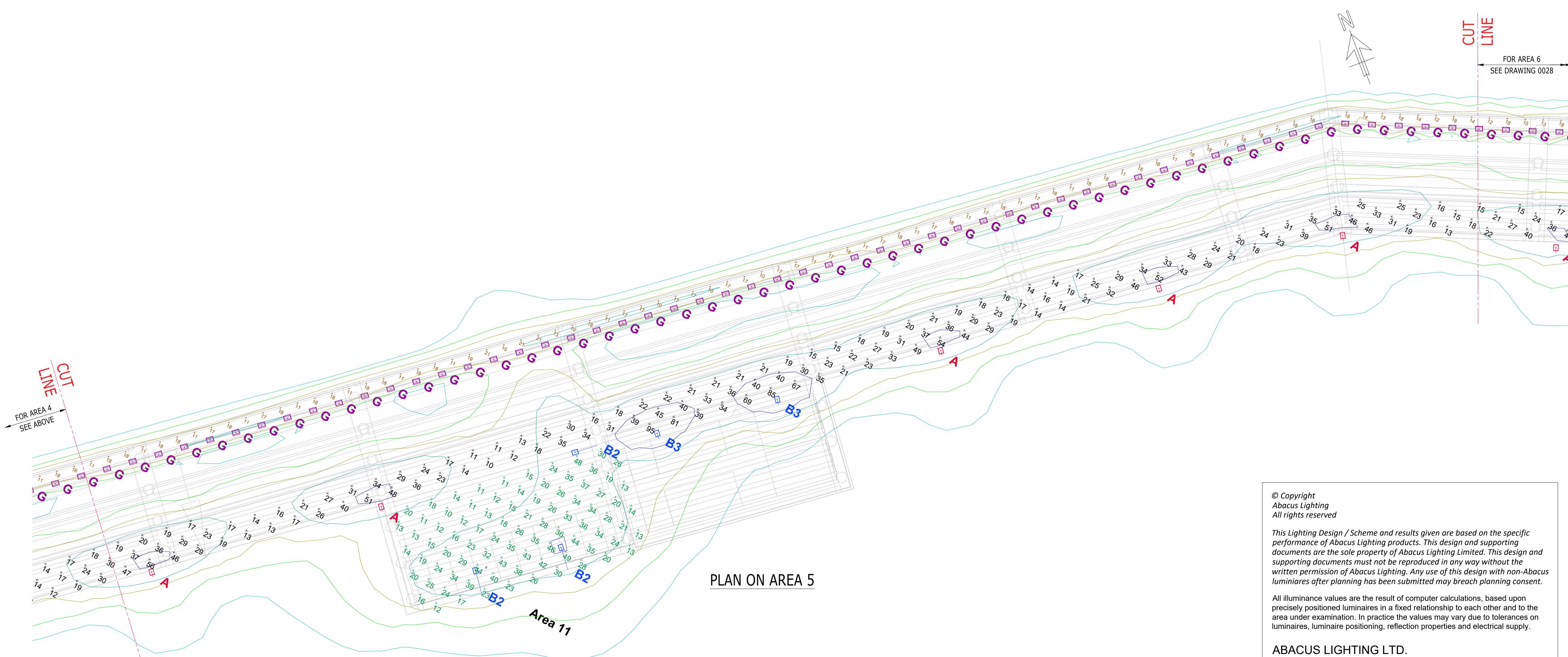
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PLAN ON AREA 4



PLAN ON AREA 5

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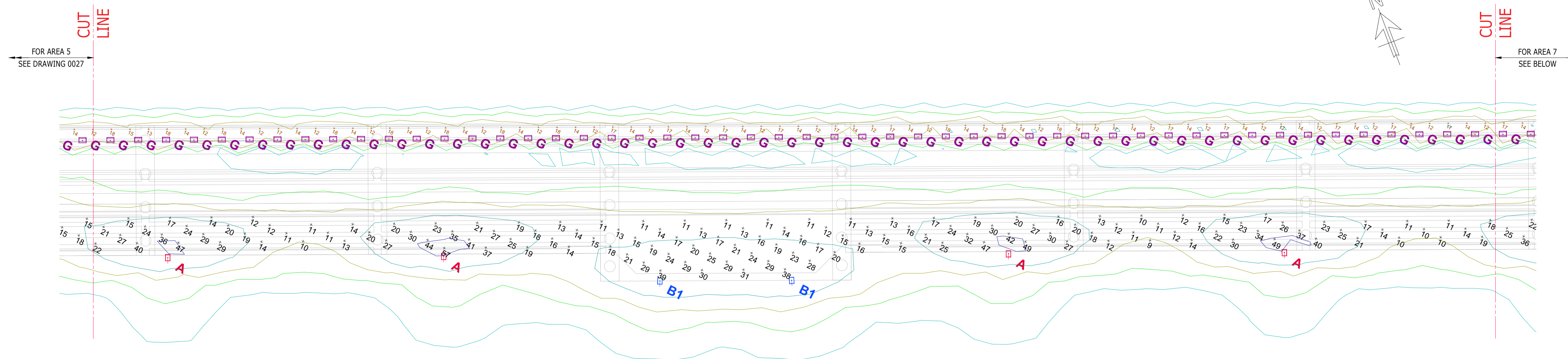
AREAS 4 AND 5
APPROACH JETTY
LIGHTING PLANS

Project No:	Scale (@A1):	Drawn:	Date:
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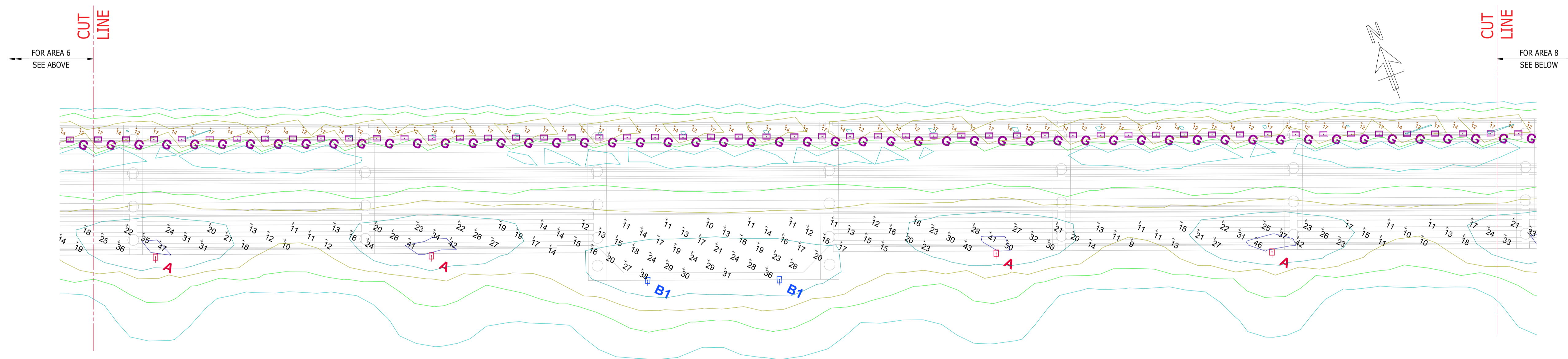
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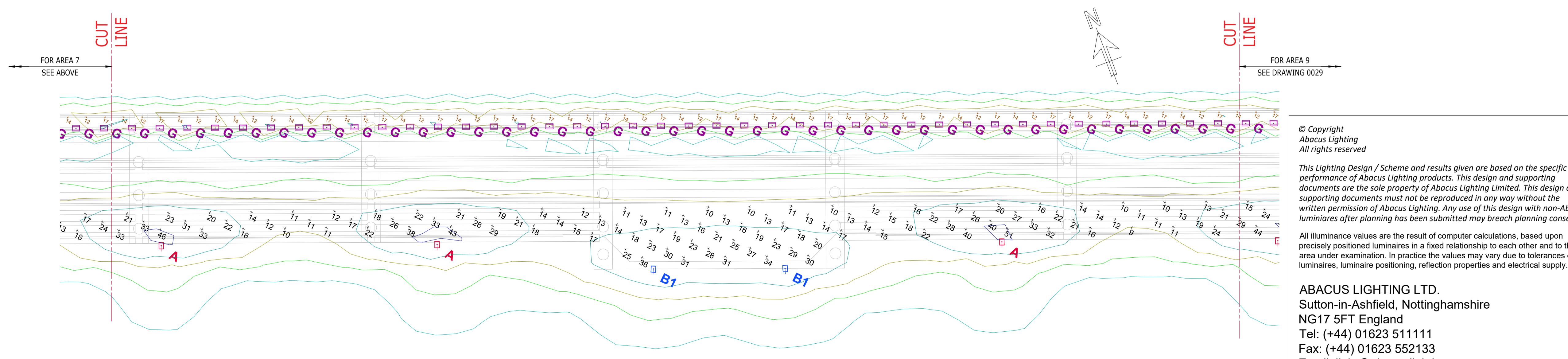
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PLAN ON AREA 6



PLAN ON AREA 7



PLAN ON AREA 8

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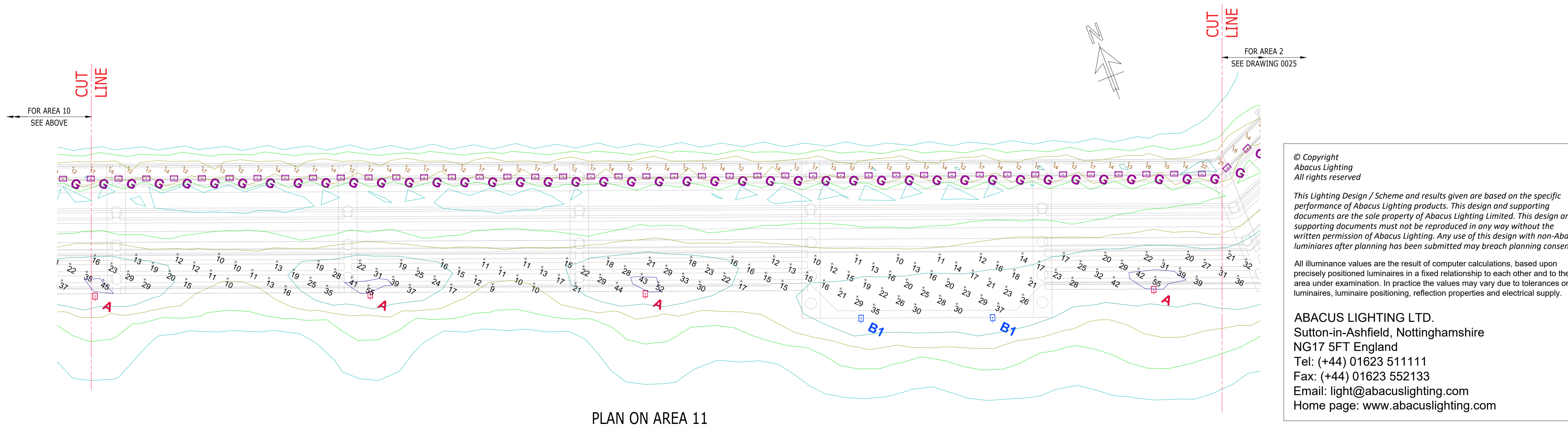
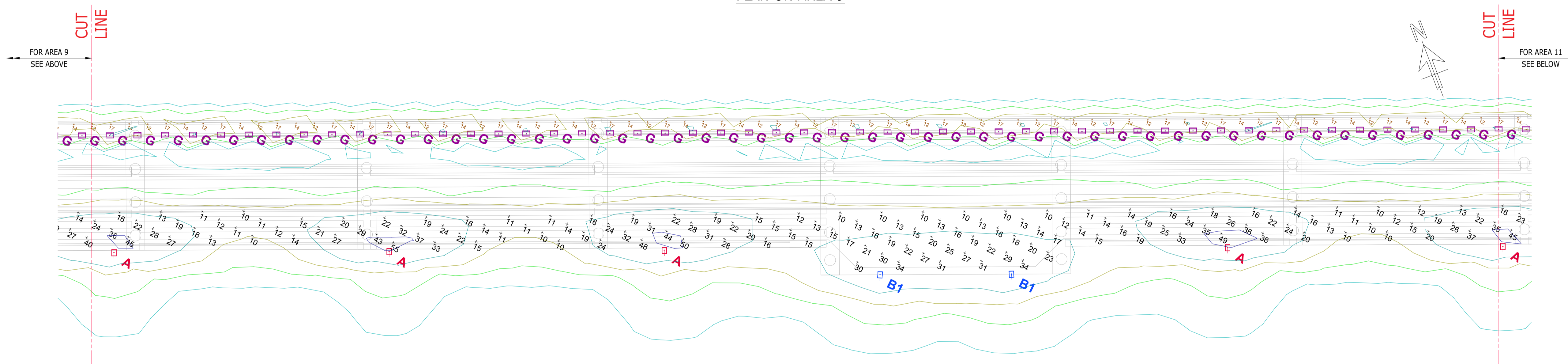
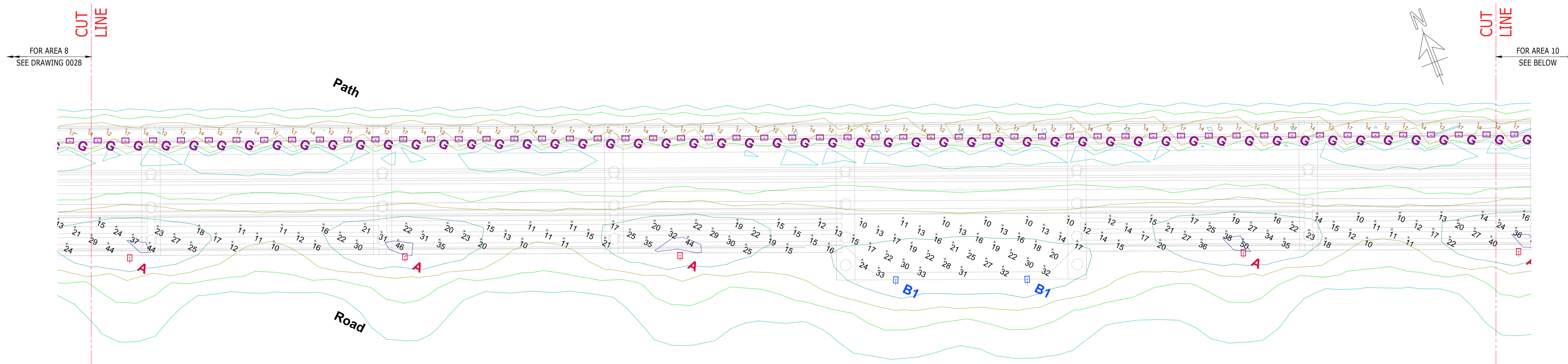
AREAS 6, 7 AND 8
APPROACH JETTY
LIGHTING PLANS

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AREAS 9, 10 and 11
APPROACH JETTY
LIGHTING PLANS

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Annex B: Jetty Access Indicative Lighting Proposals

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 2205097-RAM-02-LS-DR-E-1203 - AREA 2
 2205097-RAM-02-LS-DR-E-1204 - AREA 3

Lighting Schedule Project Total						
Symbol	Tag	Qty	Description	Mounting Height (m)	Luminaire Watts	Luminaire Lumens
	B	33	1 x 69113_S Domino Street AP Single One Way Accessory Arm Luminaire Elevation 0°	6	51	6109
	C	59	AL60601_17W_4K + EM - 30% Flux Revati - Wall/Fence Mounted Luminaire Elevation 0°	2.3	5.1	642
	D	25	AL60601_17W_4K + EM - 80% Flux Revati - York Hinge Column - Custom Mounted Luminaire Elevation 0°	4	13.6	1712
	E	16	GH1108_BGXO400EL + EM - 25% Flux Corrimano Handrail	1	4.64	82

Horizontal Illuminance Levels				
Customer Specification				
Label	CalcType	Units	Avg	Min/Avg
Access Road	Illuminance	Lux	20	0.40
Pedestrian Emergency Access Route	Illuminance	Lux	10	0.50
Pedestrian Only Walkway And Car Parking	Illuminance	Lux	10	0.50
Ramp And Steps	Illuminance	Lux	20 (10 min)	0.50
Search Bay Area	Illuminance	Lux	50	0.40
Spill lighting for security outside of perimeter	Illuminance	Lux	N/A	N/A

Calculation Summary							
Label	CalcType	Units	Avg	Max	Min	Min/Avg	Min/Max
Spill Security Lighting	Illuminance	Lux	6.33	22	1	0.16	0.05
Steps	Illuminance	Lux	22.95	29	12	0.52	0.41
Car Parking	Illuminance	Lux	22.81	48	13	0.57	0.27
Main Access Road	Illuminance	Lux	21.31	52	9	0.42	0.17
Pedestrian Emergency Access Route	Illuminance	Lux	11.58	20	6	0.52	0.30
Pedestrian Only Walkway	Illuminance	Lux	10.23	17	6	0.59	0.35
Ramp	Illuminance	Lux	25.23	45	13	0.52	0.29
Search Bay	Illuminance	Lux	50.36	63	36	0.71	0.57

Area Summary	
Label	Total Watts
Total Area	2398.138

Calculation Grid Intervals	
Label	Grid
All Areas	2m x 2m
Steps	0.5m x 0.5m

Glare Summary	
Label	GRmax
Observer 01	48
Observer 02	44

Notes:
 This scheme has been designed based upon a flat and open area. Shadowing from obstructions have not been taken into account.
 Drawing converted from a CAD file, please check dimensions before ordering and installing.

Isoline Legend	
Illuminance (Lux)	
Colour	Value
	2
	5
	10
	20
	50



Access Road, Pedestrian Emergency Access Route, Pedestrian Only Walkway, Ramp and Steps have been calculated separately.
 Maintenance Factor 0.77
 ISO contours, ULR, Observer Glare Ratings and Threshold Increment calculated at initial lighting levels with all fittings on. (Maintenance Factor 1.0)



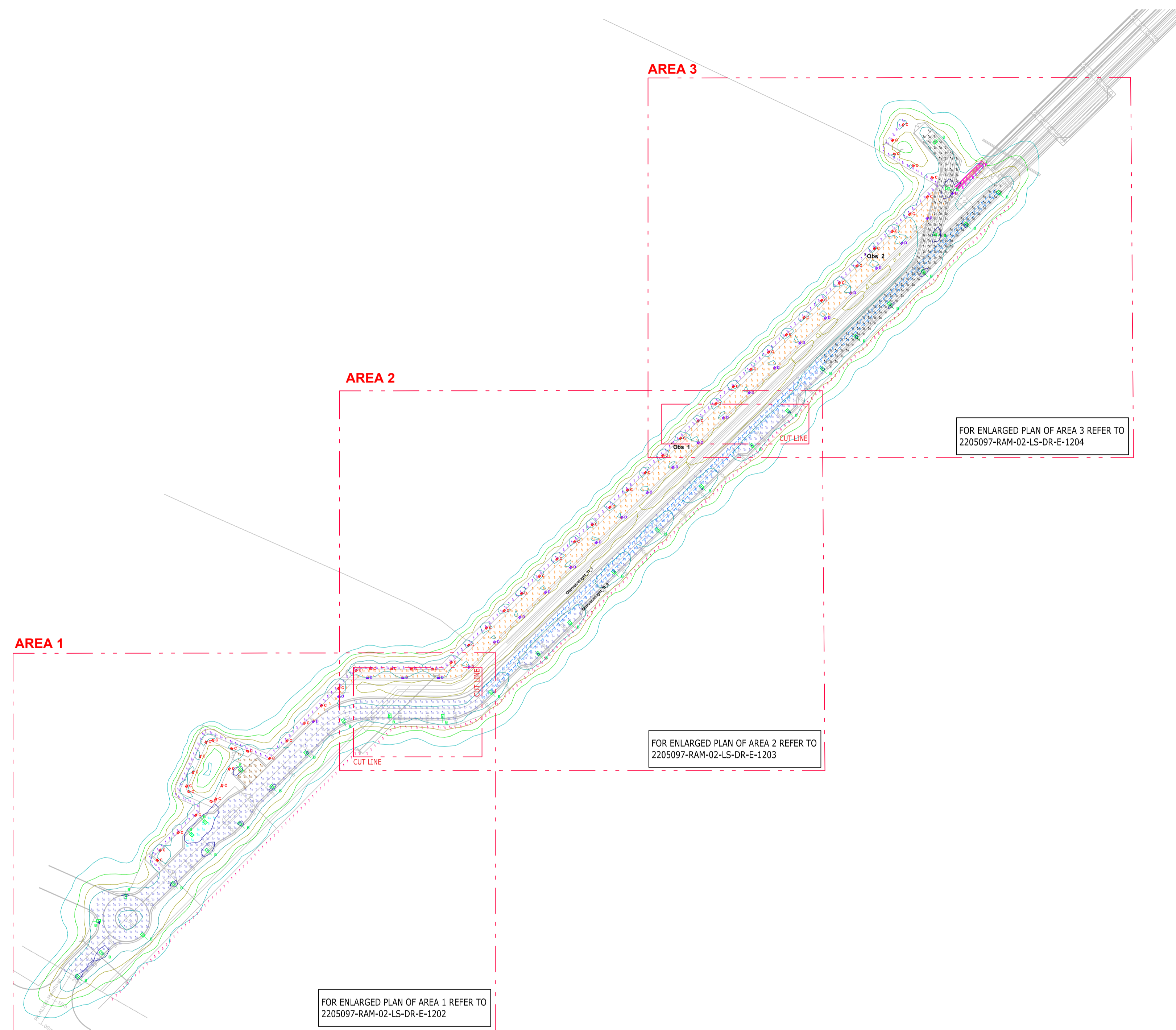
Obtrusive Light - Compliance Report
 CIE 150:2017, E3-Medium District Brightness, Pre-Curfew
 Filename: LS4062207_1_GET Landside Immingham
 04/08/2023 09:06:19

Threshold Increment (TI)
 Maximum Allowable Value: 15 %

Calculation Label	Adaptation Test	
	Luminaire	Results
ObtrusiveLight_TI_1	10	PASS
ObtrusiveLight_TI_2	10	PASS

Upward Light Ratio (ULR)
 Maximum Allowable Value: 5.0 %

Calculated ULR: 0.2 %
 Test Results: PASS



PLAN
 1: 1000

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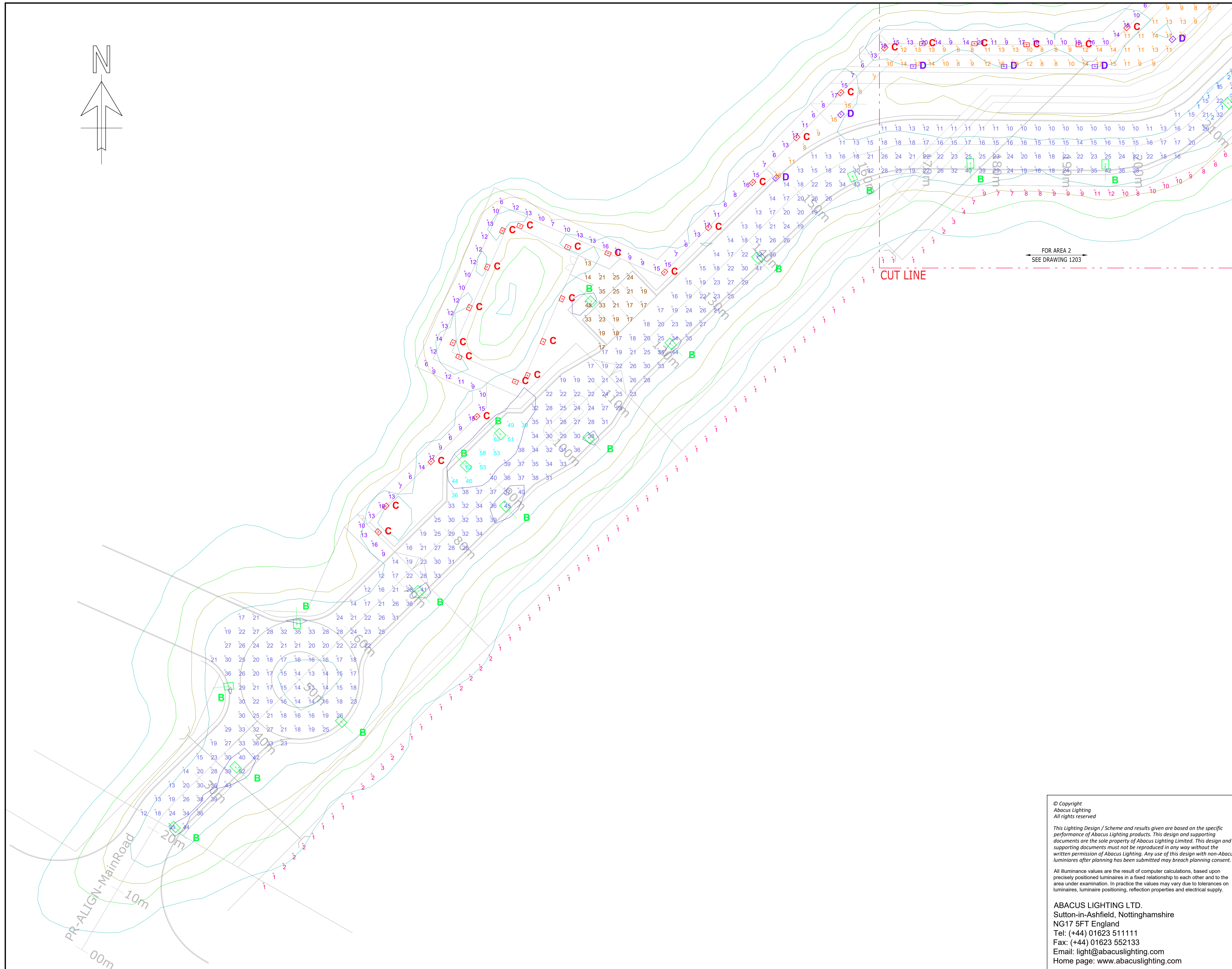
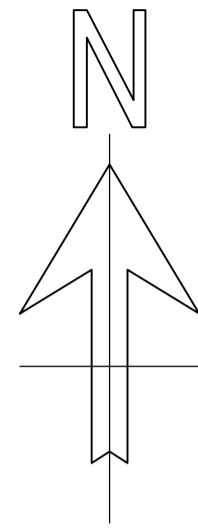
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LANDSIDE LIGHTING PLAN

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FOR AREA 2
SEE DRAWING 1203

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AREA 1
LANDSIDE LIGHTING PLAN

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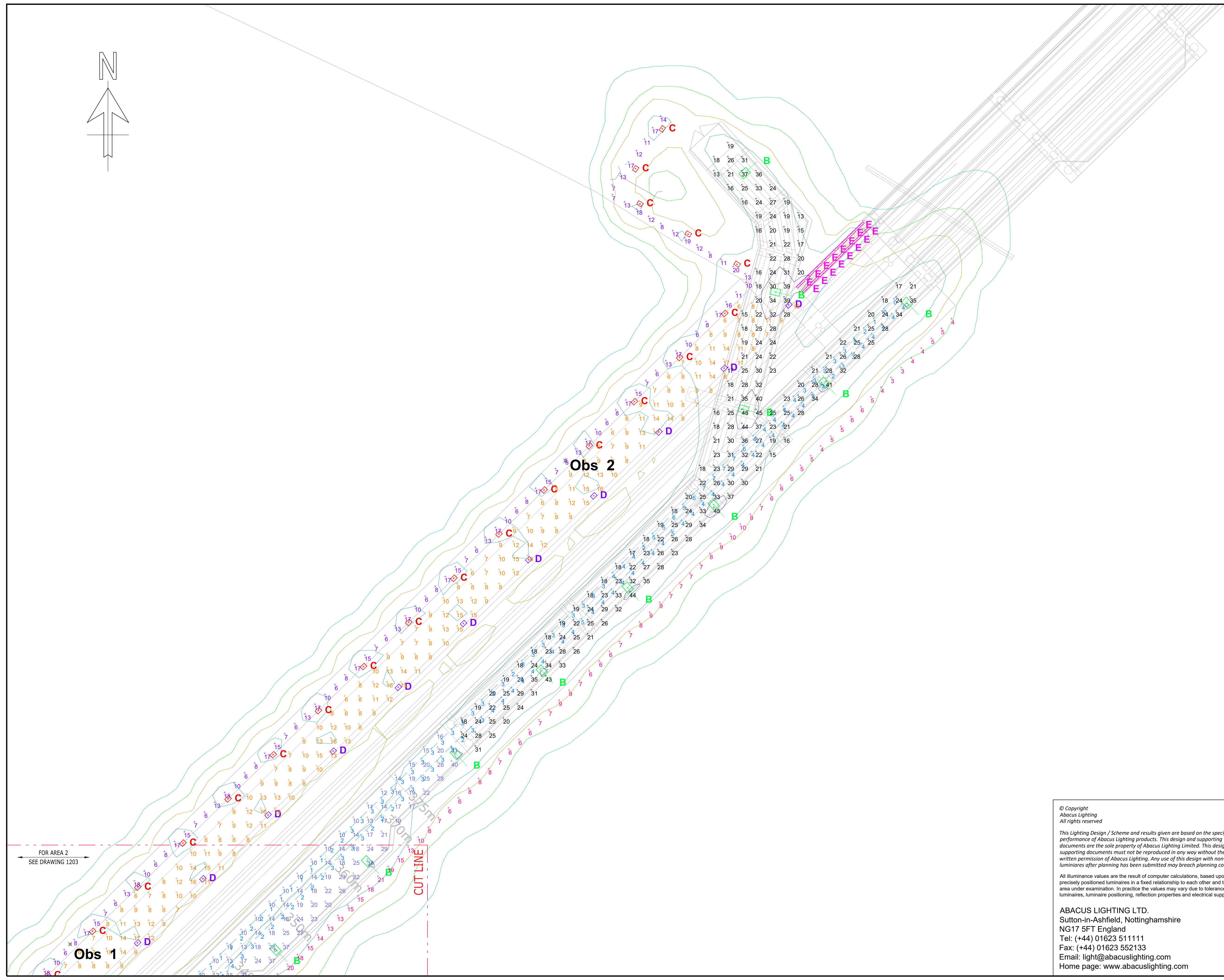
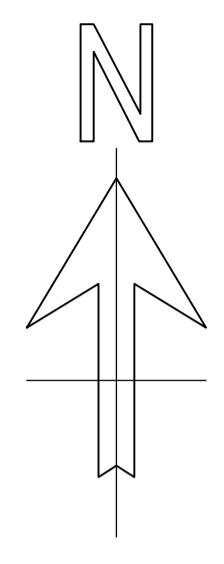
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AREA 3
LANDSIDE LIGHTING PLAN

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Annex C: Hydrogen Production Facility Lighting Philosophy

Lighting Philosophy

For

Immingham NH3 Terminal

At

Immingham, UK

Air Products Project No: EN-222517

REVISION HISTORY						
Rev	Pages	Date	Description	Originator	Checked	Approved
00	6	13-Sep-23	Issued For Information	TALBOTM	GONDANR	SODEINA

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1.2	Detailed lighting design	3
1.3	Minimum required levels of illumination	4
1.4	Emergency lighting - escape and standby	5
1.5	External lighting	6

1.1 INTRODUCTION

Immingham NH3 Terminal plant Lighting shall be designed to provide safe visibility for site operatives and haulage contractors during the hours of darkness. The design will be carried out in accordance with best practice recommendations for the reduction of light pollution set out in BS EN12464.

The lighting scheme shall be set out in three key zones: the west process site, east process and storage area site. Each area will utilise a combination of building and pole mounted fixtures. The peripheral circulation routes in each process area and pipe rack up to the jetty, will be lit by pole mounted fixtures. The extent of the light spill beyond the site boundaries shall be defined by the lighting calculations and layouts. Platforms shall utilise handrail mounted light fittings.

External plant lighting distribution boards shall be controlled via photo-electric cell, so lighting is on continuously during the hours of darkness. High level platform lighting can be manually switched off when required.

With regards to the effects of lighting, it is considered that the additional lighting associated with the new plant will be seen as part of the overall night-time glow of the existing industrial area but would not worsen the existing situation.

The lighting design will be designed to avoid or minimise Lighting overspill.

1.2 DETAILED LIGHTING DESIGN

The detailed lighting design shall fall into three main service categories.

Normal	The lighting levels required to conduct day to day site activities safely within the process plant, storage area, pipe rack and jetty. The system consists of both of emergency and standard light fittings. This is the state in which the entire system is energised and emitting 100% of illuminance capacity.
Essential	The lighting levels to carry out critical activities in the event of a systems failure. Where a back-up generation system or alternative source has intervened. In this state, only emergency fitting circuits shall be energised to emit at 100% of the fitting's illuminance capacity.
Emergency	The lighting levels to evacuate the plant safely in the event of a total systems failure. Only emergency fittings shall be energised typically emitting at 50% of the fitting's total illuminance capacity. The fittings shall be operating off the internal battery back-up supply.

Lighting calculations shall be made, using the design office computer programs (Chalmlite, DIALux, Calculux, etc.) for each area of the project.

The locations and mounting arrangements of lighting fittings shall be planned to comply with the results of the calculations, but other factors shall also be considered and may affect the final design, as follows:

- a) Accessibility for re-lamping.
- b) The use of structures to provide suitable mounting supports.
- c) Glare problems.
- d) Key emergency routes, changes in direction.
- e) Location of emergency equipment, muster points, firefighting etc.

Plant areas shall have their lighting controlled by motion sensors where practical.

On platforms, pole mounted fittings shall be avoided, where possible fittings shall be mounted between the handrails.

1.3 MINIMUM REQUIRED LEVELS OF ILLUMINATION

Lighting shall be provided to obtain the following minimum average illumination level in service at the elevations shown. All illumination levels shall be taken to refer to the horizontal plane unless otherwise stated.

	In-Service (lux)	Illumination Elevation (Metres)
Outdoor pump & valve areas	100	Grade
Outdoor operating platforms	50	Floor
Outdoor access platforms	50	Floor
Stairways and ladders (typically)	50	Floor
(high activity)	100	Floor
Outdoor walkways	50	Grade
Tanker filling areas:		
General area	50	Grade
Filling point	100	At point
Electrical sub-stations:		
Outdoor switchyard	50	Grade
Outdoor transformer area	50	Grade
Street lighting	5	Grade
Generator fuel filling area	50	At point
Entrance gate area	150	Grade

	In-Service (lux)	Illumination Elevation (Metres)
Parking Areas	10	Grade
Pedestrian Walkways	5	Grade

In addition to the above table, the design must be in accordance with minimum recommended levels as per: BS EN 12464_2 – Lighting of work places – Outdoor work places

1.4 EMERGENCY LIGHTING - ESCAPE AND STANDBY

Escape lighting is provided to ensure the safe and effective evacuation from a building and must:

- a) Reach 50% of the required illuminance level 5 seconds after 'mains' failure and take no longer than 60 seconds to reach 100% illuminance level. (As per BS EN 1838)
- b) Indicate clearly and unambiguously the escape routes.
- c) Illuminate the escape routes to allow safe movement towards and out of exits.

Fittings shall be located near each exit and emergency exit doors and shall not be mounted too high or they may become obscured by smoke. The minimum illuminance along escape routes up to 2m in width shall not be less than 1 LUX in accordance with standard BS EN 1838.

Where necessary, standby and escape lighting will be provided by means of self-contained non-maintained fittings unless stated otherwise by the scope of the project.

Escape fittings and emergency fittings shall be of a self-contained type incorporating inverter and battery pack system rated for a minimum of 1-hour escape time as defined in BS EN 1838. These fittings shall be fitted with 'healthy' battery monitoring and visible display.

Maintained emergency plant lighting fittings shall be supplied from the emergency distribution boards.

In areas of high risk, the maintained illuminance on the task area plane shall not be less than 10% of the required illuminance for that task, however, it shall not be less than 15 lux.

Electrical equipment buildings shall be provided with emergency lighting as the areas are deemed critical in the event of failure of the electrical power system.

In some facilities the lighting of critical areas of the plant may require the supply from a back-up power system to provide normal illumination levels in the event of partial systems failure. The lighting areas shall permit continued product distribution and tanker loading and should be assessed on a project-by-project basis.

If there are any requirements for essential lighting systems, it shall be defined in the project design philosophy.

1.5 EXTERNAL LIGHTING

External lighting shall be provided by means of LED fittings with integral controllers. Where possible, building structures/ existing steel work shall be used to fix the fittings. Where existing structures cannot be utilised pole mounted floodlighting should be detailed.

Lighting columns 6m high and above shall be positioned to enable access of mobile raised platforms (e.g. "Cherry picker") or be hinged to permit re-lamping.

All external lighting will be controlled by photo-electric cell with a manual override switch integral to the distribution board.

Where a distribution board is regulated by a photocell, the photocell shall be located external to the building in which the distribution board is located.

Outdoor Plant floodlighting and pendant lighting shall be directional and fittings supplied with cut-offs to reduce upward and spill lighting.

Plant lighting shall be controlled using Passive Infrared sensors (PIR) or microwave sensors switching lighting on when personnel are present, and to support safe operation of the Plant.

Note: Road and area lighting shall be photocell controlled.