WIAL SOUTHERN SEAWALL

CONSTRUCTION LIGHTING

ASSESSMENT OF ENVIRONMENTAL EFFECTS

Prepared for

Wellington International Airport Limited

I N D E P E N D E N T E L E C T R I C A L & I L L U M I N A T I O N E N G I N E E R S

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DOCUMENT VERSION HISTORY

Revision	Prepared By	Description	Date
0	John Mckensey	Original	28-08-2025

DOCUMENT QUALITY ASSURANCE

Action	Name	Signed	Date
Prepared by	John Mckensey		28-08-2025
Reviewed by	Murray Grindley		28-08-2025
Approved by	John Mckensey		28-08-2025
on behalf of	Dean Coleman – Managing Director		

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EXECUTIVE SUMMARY

LDP Limited ("**LDP**") has been engaged by Wellington International Airport Limited ("**WIAL**") to provide an assessment of lighting effects associated with the proposed Wellington International Airport Limited Southern Seawall Renewal Project ("the **Project**").

This report provides that assessment and will support WIAL's application for approvals for the Project under the Fast-Track Approvals Act 2024.

The construction process will extend over 6-8 years and the primary construction activity (i.e. construction of the seawall) must be undertaken at night, outside Wellington International Airport's ("**the Airport**") core operational hours (generally between midnight and 6am). For this reason, construction lighting will be required to illuminate the Southern Seawall construction site ("**SSC**"), and the three construction yards that will support the nighttime activities at the SSC.

Hence, it is important to ensure that any adverse effects from the construction lighting are adequately mitigated. Potential adverse effects include light spill, glare and skyglow to sensitive receivers, including residents, motorists and nocturnal biota.

This report seeks to define the proposed construction lighting for the Project, quantify potential adverse effects, and to propose conditions to adequately mitigate any adverse effects.

The following work sites ("**Work Sites**") are relevant to this report (as shown in Figure 1 and described in detail in the Assessment of Environmental Effects ("**AEE**")):

- the SSC (including the Rear Slope, Wave Trap, Seawall face, Eastern Area and Eastern Bank), and the part of the Moa Point Construction Yard ("**Moa Point Yard**") located on the seaward side of Moa Point Road;
- the Moa Point Yard office area (located on the corner of Moa Point Road and Stewart Duff Drive);
- the Miramar Golf Course Construction Yard ("**MGC Yard**"); and
- the George Bolt Street Construction Yard ("**George Bolt Yard**").

The SSC and the portion of the Moa Point Yard on the seaward side of Moa Point Road have been combined for the purposes of the lighting assessment as they will effectively be operating as one site during the period of Southern Seawall reconstruction works, with shared lighting requirements and effects.

Construction lighting has the greatest potential for adverse effects at the SSC as it is close to residential use (Moa Point Road), beside public or publicly accessible roads (Moa Point Road and Stewart Duff Drive[1]) and adjacent to the ocean and any nocturnal biota therein. With the proposed works program extending up to 8 years, any obtrusive light will have a greater potential adverse effect than it would if experienced for a short period, such as a few days.

[1] Note that Stewart Duff Drive is privately owned road.

While nighttime activities will occur throughout the works program, the primary construction activity is proposed to take between 24 – 30 months. Potential adverse lighting effects are expected to be greatest during that period, with lighting for the cranes occurring throughout the night, along with other mobile plant, mobile lighting towers and vehicles.

The MGC Yard, while close to residential areas to the east and Stewart Duff Drive, is much less likely to cause adverse effects, primarily due to the high levels of lighting already present throughout the night at the Airport.

The Moa Point Yard office area will have minimal lighting and is screened from residential locations, other than those owned by WIAL, by the buildings owned by WIAL.

The George Bolt Yard is remote from residential areas and public roads. It is also shielded by surrounding buildings and topography, particularly when viewed from locations further away.

My key findings in respect of lighting effects at the Work Sites are set out below.

Lighting effects

To manage the potential effects of the Project, I have proposed conditions at section 7 of this report as summarised below;

1. Screening: 2m high beside work areas
2. Colour and colour temperature: White LED and 3000K
3. Intensity: Minimum required
4. Adaptive controls:
    a. Security lighting: Daylight & motion sensor control
    b. Fixed area lighting: Daylight & time control
5. Building security lighting: Aimed down (i.e. no upward tilt)
6. Fixed area lighting: Aimed down (i.e. no upward tilt), aimed away from public roads and residences within 500m and overall height no more than 10m
7. Mobile plant and work lights, other than crane boom lights: Upward tilt limited to 45 degrees up to 3m high and 30 degrees if higher
8. Vehicle egress points from SSC: Not within 30m of residences on Moa Point Rd
9. Vehicle headlights: Dipped while on any work site and travelling between work sites

These measures will serve to;

1. Minimise obtrusive light effects as far as practical while enabling the work to proceed safely and effectively
2. Satisfy the permitted activity limits in the Operative District Plan
3. Control effects to a level I consider low, or less than minor

Residential views - amenity

The George Bolt Yard and any lighting therein will not be visible from residential locations.

The Moa Point Works (including the Moa Point Yard and the SSC) and the MGC Yard, along with any lighting therein, will be visible to residents to the west of the Airport, up to the ridge line of the surrounding hills. However, any such views are seen against the brightly lit airport and lessened by distance as the closest residence is more than 1.2km from any potentially visible lighting. The downward tilt proposed will ensure that any such visibility will be minimal in effect.

The SSC lighting will potentially be visible from the residences between 33-48 Moa Point Road. However, any such lighting will be aimed away from the residences.

Residents to the east of the MGC Yard, up to the ridge line of the hills, may have some visibility of lighting within the MGC Yard. However, such views are minimal due to the topography and vegetation and would be seen against the brightly lit airport. The relative height of the lights along with downward tilt will ensure that the residents are unlikely to see any light source directly, just the lighting effect on the ground at the MGC Yard.

Overall position

In my opinion, the construction lighting effects of the Project overall will be low to moderate (i.e. no more than minor), provided that the conditions I propose in this report are adopted.

1.0 INTRODUCTION

LDP has been engaged by WIAL to provide an assessment of lighting effects associated with the Project.

The construction process will extend over 6-8 years. The primary construction activity (i.e. construction of the seawall) must be undertaken outside the Airport's core operational hours (generally between midnight and 6am).

The reason for this restriction on construction timing, is that the height of the plant – especially cranes and large excavators – will significantly breach the Obstacle Limitation Surface ("**OLS**") at the end of the runway and would present a safety hazard if construction was to occur during daylight hours when aircraft are operating.

Construction lighting is also required at each of the other Work Sites for nighttime activities at those sites, needed to support the nighttime activities at the Southern Seawall Construction site ("**SSC**").

Since there are activities which can only occur at night, construction lighting will be necessary to safely and effectively undertake the work. Hence, it is important to ensure that any adverse effects from the construction lighting are adequately mitigated. Effects could include light spill, glare and skyglow to sensitive receivers, including residents, motorists and nocturnal biota.

The purpose of this report is to quantify the nature of the construction lighting, identify adverse effects that could potentially occur and to propose conditions to adequately mitigate any such effects.

Report Author

John Mckensey is the author of this report, acting on behalf of LDP. LDP is an independent Electrical and Illumination Engineering Consultancy, established in 1994. I hold the position of Executive Engineer and have over 40 years' experience in relation to lighting design and the assessment of effects of lighting.

I have the following qualifications and expertise:

- I hold a Bachelor of Engineering (Electrical), am a Member of the Illuminating Engineering Society of Australia and New Zealand Inc. (MIES) and hold a number of relevant affiliations including CMEngNZ, MIEAust, CPEng(Aust), NER, APEC Engineer, IntPE(Aust). I am a member of both the Resource Management Law Society of NZ Inc. and the International Dark-Sky Association.
- I have received 19 awards for lighting design from the Illuminating Engineering Society and other learned bodies, including 3 International awards and 3 lighting design awards from the Royal Astronomical Society of New Zealand (for "efficient, effective and sustainable lighting design – protecting the night environment").
- In addition to advising local government in relation Plan Changes (Auckland – AUP, Christchurch – DP updates, Hamilton – DP plan changes PC5 and PC9), I have provided evidence in the Environment Court for a number of resource consent applications.
- I have provided advice regarding construction lighting effects for a range of resource consent applications including;
    - AC36 Americas Cup, Auckland
    - Hydroelectric Drainage Canal, Tekapo
    - Junction Road Power Plant, Taranaki

I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023 and this report has been prepared in compliance with that Code, as if it was expert evidence presented in proceedings before the Environment Court. Unless I state otherwise, this report is within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this report.

2.0 SUMMARY DESCRIPTION OF THE PROPOSED WORKS

2.1 Project Summary

The Southern Seawall at Wellington International Airport ("**the Airport**") has reached the end of its functional life. The proposed Southern Seawall Renewal Project ("**the Project**") will help safeguard the long-term operation of the Airport against natural hazards, increase the Airport's resilience to climate change, and reduce the (otherwise increasing) maintenance demands of the existing seawall.

The Project includes the following key elements:

> Establishing two construction yards (Miramar Golf Course Construction Yard ("**MGC Yard**"), and Moa Point Construction Yard ("**Moa Point Yard**")), and using them, along with the existing

George Bolt Street Construction Yard ("**George Bolt Yard**") for storage and construction activities;

- Reconstructing the Southern Seawall with rock and Cubipods;
- Remediating the eroding Eastern Bank with rock protection; and
- Establishing two new Kororā colonies to support Kororā habitation and breeding.

Overall, the Project is expected to take 6 to 8 years, with the seawall construction itself taking 24 to 30 months. Construction will be managed to maintain airport operations, minimise nighttime noise, and work around adverse weather and sea conditions. The Project must also appropriately manage constraints arising from sourcing, transporting and stockpiling the significant volumes of rock and Cubipods required to complete the seawall works.

2.2 MGC Yard

The MGC Yard will serve as the primary storage and secondary maintenance area for the Project. It will be used to stockpile rock, Cubipods and other materials and store plant and equipment. The MGC Yard is needed in advance of the seawall works to facilitate the gradual stockpiling of rock and small numbers of Cubipods over multiple years. The yard will also house a site office and staff welfare facilities. Site establishment will begin in 2026 and will require extensive earthworks and associated activities to level the site to an appropriate grade and provide services, drainage, erosion and sediment control, and to form unbound access roads and construct concrete entry / exit crossings.

Whilst access to the MGC Yard will be required 24 hours a day, 7 days per week, operating hours will vary between 6am and 8pm. No heavy machinery or heavy vehicles will access or operate at the MGC Yard outside these hours. Once the Project is complete, the site will be demobilised and disestablished by removing all construction facilities, including yard buildings on site.

2.3 George Bolt Yard

The George Bolt Yard includes a storage yard which is currently used by WIAL for various storage activities, and a hangar which will be demolished and made contiguous with the existing storage yard. During the Project, the combined yard will be used to store construction materials, plant, and equipment, and as the site of a workshop and staff facilities. The yard will operate 24 hours a day, 7 days a week. Upon Project completion, temporary facilities will be removed, and the yard may continue to be used for armour unit storage or other airport-related activities.

2.4 Moa Point Works

2.4.1 Moa Point Yard

The Moa Point Yard will serve as the main operational hub during the seawall construction, operating 24 hours a day, 7 days per week. The site will be recontoured and all-weather unbound access roads will be formed to facilitate yard activities. Once operational, the yard will store construction materials and support general plant setup and maintenance. Most Cubipods will be delivered directly to the Moa Point Yard, but rock, other construction materials (including small numbers of Cubipods) and equipment to support the seawall works will be transported from the MGC Yard to the Moa Point Yard during the day to ensure ready access to necessary materials overnight, thereby improving construction efficiency and minimising overnight truck movements. Upon Project completion, the yard will be rehabilitated.

The Moa Point Yard offices will be located on the corner of Moa Point Road and Stewart Duff Drive. As mentioned above, for the purposes of this assessment, the Moa Point Yard offices are considered separately to the portion of the Moa Point Yard that is located on the seaward side of the road.

2.4.2 Southern Seawall Construction

Prior to seawall construction commencing, the site will need to be cleared, and ground improvements, such as cement-stabilized hardstanding or micro piling and / or piling, may be required to support construction equipment. Once the site is established, the construction process includes: removing existing reno mattresses, gabion baskets, Akmons and rock from the seawall crest area; excavating the seawall toe trench; smoothing rock pinnacles and / or placing toe rock; and placing underlayer rock and reused Akmons. Cubipods will be installed over the underlayer. Additional tasks include placing a gabion and crest wall if required, constructing rock protection on the crest, and replacing rear slope geotextile, underlayer and rock armour.

The upgraded Southern Seawall will extend approximately 400 m (measured along the crest) from Lyall Bay Breakwater to the end of the existing informal Eastern Area rubble seawall. The majority of the work will be done using shore-based equipment, with marine equipment potentially used as needed. The construction is expected to take approximately 24-30 months, operating up to 24 hours a day, 7 days a week, with activities that will penetrate the Airport's designated OLS scheduled to occur overnight, outside the Airport's core operating hours.

2.4.3 Eastern Bank Remediation

The Eastern Bank Remediation involves protecting approximately 80 m of bank with rock to reduce erosion. The plant and equipment required for works on the Eastern Bank Remediation will be able to operate under the OLS, therefore, construction in this area will occur within daylight hours. It will take approximately three months to construct the Eastern Bank Remediation.

2.4.4 Kororā Colonies

The Stage 1 Kororā Colony – located on the landward side of Moa Point Road, south of the Airport – will be constructed early in the Project, in advance of the main seawall construction. This will allow for the relocation of Kororā before habitat within the construction footprint is lost. The Stage 2 Kororā Colony will be constructed on the south-eastern part of the Moa Point Yard (following site demobilisation), on completion of the Southern Seawall.

Construction of the Stage 1 Kororā Colony will involve the installation of a precast concrete underpass beneath the road, and construction of a rock revetment to enhance the Kororā passage entrance and to help protect the existing landside infrastructure against erosion. Minor earthworks will be required to recontour both the Stage 1 and Stage 2 sites to a suitable level to improve Kororā access, shelter and nesting opportunities, based on ecological advice.

The plant and equipment required for works on the Kororā colonies will be able to operate under the OLS, therefore, construction in this area will occur within daylight hours except for the underpass installation which may be undertaken at night for traffic management reasons. It will take approximately three months to construct each stage of the Kororā colonies.

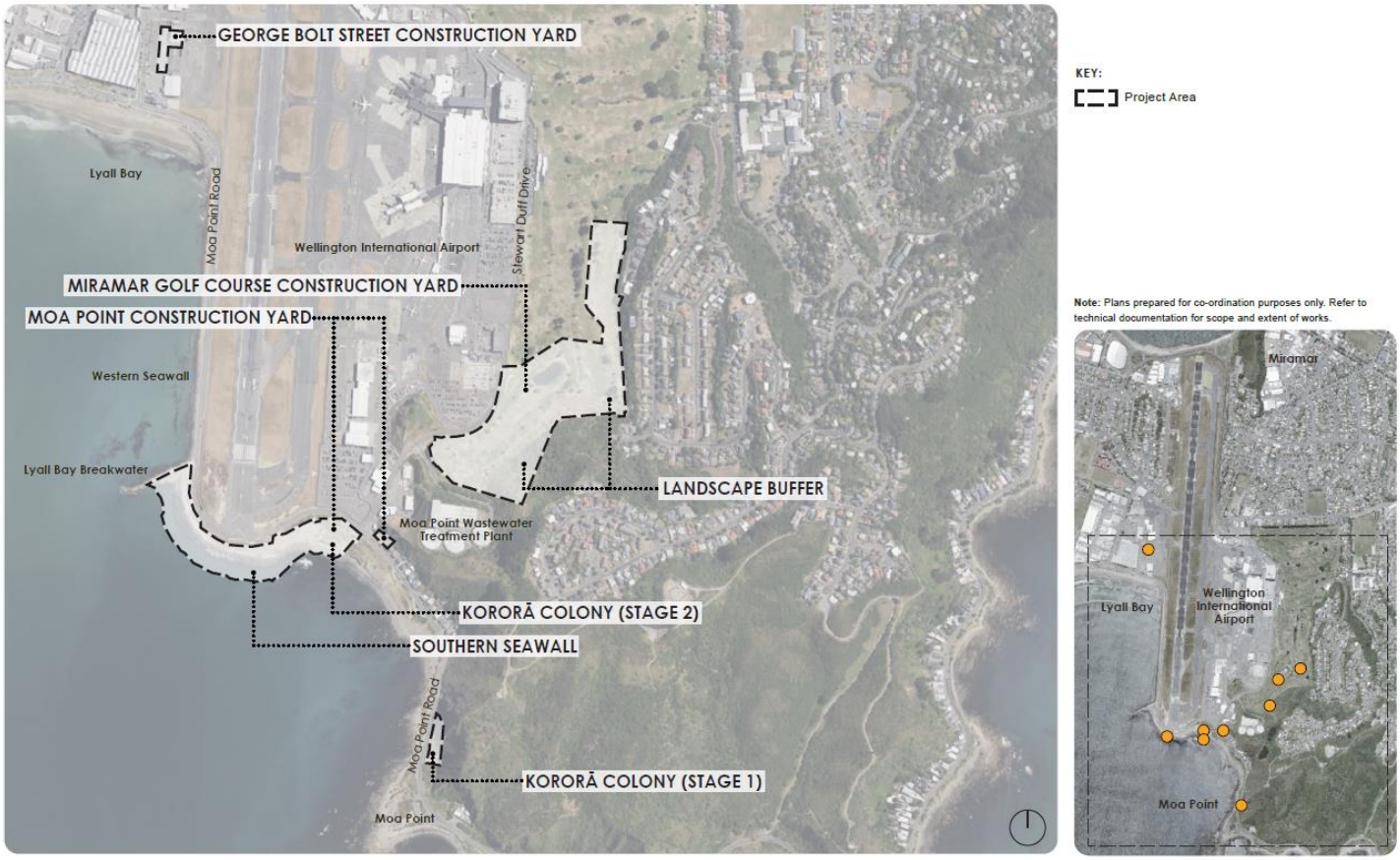


Figure 1. Work Sites

3.0 EXISTING ENVIRONMENT

The existing environment comprising and surrounding the Work Sites (shown in Figure 1) is described in detail in the AEE.

Those Work Sites are:

- the Southern Seawall (including the Rear Slope, Wave Trap, Seawall face, Eastern Area and Eastern Bank), and the part of the Moa Point Yard on the seaward side of Moa Point Road;
- Moa Point Yard office area (located on the corner of Moa Point Road and Stewart Duff Drive);
- the MGC Yard; and
- the George Bolt Yard.

Under the Operative Wellington City Council District Plan 2000 ("**Operative District Plan**"), the Work Sites are on land zoned as;

- Southern Seawall and Moa Point Yard: Open Space B Zone; and
- Moa Point Yard office area, MGC Yard and George Bolt Yard: Airport and Golf Course Recreation Precinct.

Under the Proposed Wellington City District Plan 2024 (**"the Proposed Plan"**), the Work Sites are on land zoned as:

- Southern Seawall and Moa Point Yard: Natural Open Space Zone;
- Moa Point Yard Office, MGC Yard and George Bolt Yard: Airport Zone.

Observations relating to the relative location of nearby land and its residential use are described in Table 1.

Table 1. Nearby Residential Use

ITEM	WORK SITE	CLOSEST RESIDENTIAL USE	OBSERVATIONS
1.1	**SSC (including the Rear Slope, Wave Trap, Seawall face, Eastern Area and Eastern Bank), and the Moa Point Yard**	***Residential Area 1*** (33-48 Moa Pt Rd) (see Figures 4a, 4b, 4c and 4d below)	The actual work areas of the Southern Seawall will generally be screened from view by the local topography. Construction lighting may be visible, although floodlights on mobile lighting towers will be aimed away from the residences. There will be limited visibility of the Moa Point Yard offices from some residences. The separation distances from the nearest residence are approximately 15m from the yard, 50m from the offices and 100m from the seawall.
1.2	**MGC Yard**	***Residential Area 2*** (Bunker Way, 50-76 Raukawa St & 18-36 Kekerenga St) (see Figures 5a, 5b, 5c and 5d below)	The MGC Yard and associated lighting is generally well screened from view by dense foliage. Views are typically over the top of the MGC Yard due to the relative height of the roads to the yard. The condition to face lighting away from residences will mitigate effects to these areas, including the lowest height properties in Bunker Way. Views are seen in the

			context of the brightly lit airport adjacent to it. The separation distances from the nearest residence are approximately 50m from the yard.
1.3	**George Bolt Yard**	No residential areas nearby	The George Bolt Yard is screened from residential views by surrounding buildings.

Using the guidelines provided in AS/NZS 4282:2023 (Control of the obtrusive effects of outdoor lighting) ("**AS/NZS 4282**"), which are identical to those provided in AS/NZS 4282:2019 (superseded), the ambient light conditions at the Work Sites could best be described as shown in Table 2.

Table 2. Ambient light conditions

ITEM	LOCATION	ENVIRONMENTAL ZONE (per AS/NZS 4282:2023)	AMBIENT LIGHT CONDITIONS
	Work Sites		
2.1	• SSC, Moa Point Yard and the Moa Point Yard office area	A3	Medium district brightness (Nearby road lighting, car park lighting and more distant airport lighting)
2.2	• MGC Yard	A4	High district brightness (Nearby road and airport lighting)
2.3	• George Bolt Yard	A4	High district brightness (Commercial area lighting)
	Surrounds		
2.4	• ***Sea***	A1	Dark

	– beside Southern Seawall face and Eastern Bank Remediation		
2.5	• ***Residential Area 1*** – beside Eastern Bank Remediation, Moa Point Yard, and near the Southern Seawall (33-48 Moa Pt Rd)	A3	Medium district brightness (Road lighting & views of lit suburban areas)
2.6	• ***Residential Area 2*** - East through South of the MGC Yard (Bunker Way, 50-76 Raukawa St & 18-36 Kekerenga St)	A4	High district brightness (Direct views of nearby airport lighting)
2.7	• ***Commercial Area*** - Surrounding the George Bolt Yard	A4	High district brightness (Commercial area lighting)
	Distant Views		
2.8	• ***Residential Area 3*** - All residential locations west of the Southern Seawall with views of the site – i.e. southern parts of Lyall Bay and eastern parts of Houghton Bay	A3	Medium district brightness (Road lighting & views of lit suburban areas)

The definition of the environmental zones is described in table 3.1 of AS/NZS4282:2023, repeated below as Table 3 for ease of reference.

Table 3. Environmental zones (per AS/NZS4282 Table 3.1)

Environmental Zones	Ambient Light Conditions	Descriptions/Examples
A0	Intrinsically Dark	UNESCO Starlight Reserve IDA: Dark Sky Parks, Reserves or Sanctuaries Major optical observatories Other accreditations of dark sky places for example astro-tourism, heritage value, astronomical importance, wildlife/ecosystem protection Lighting for safe access may be required
A1	Dark	Relatively uninhabited rural areas (including terrestrial, marine, aquatic and coastal areas)
A2	Low district brightness	Sparsely inhabited rural and semi-rural areas Generally roadways without streetlighting through suburban, rural or semi-rural areas other than intersections
A3	Medium district brightness	Suburban areas in towns and cities Generally roadways with street lighting through suburban, rural or semi-rural areas
A4	High district brightness	Town and city centres and other commercial areas Residential areas abutting commercial areas Industrial and port areas Transport Interchanges
TV	High district brightness	Vicinity of major sport and event stadiums during TV broadcasts
NOTE: Zones A0 and A1 would normally have a minimum area of 50 ha (0.5 km^2). There may be smaller environmentally sensitive areas.		

4.0 PROPOSED CONSTRUCTION LIGHTING

No permanent lighting has been proposed for the Project.

This assessment is based on the project description contained in the Mitchell Daysh Limited Assessment of Environmental Effects and the Beca design plans for the Project.

This section summarises when each construction lighting element will be present AND when lighting associated with that element could be used. The element itself could be present at all other times (24/7) without being in use.

- All Work Sites;
    - Vehicles travelling within and between sites: Vehicle headlights and safety lighting
    - Vehicles and mobile plant working within sites where applicable (see below): Vehicle headlights and safety lighting, as well as additional working lights added to vehicles
    - Note:
        - "Vehicles" referred to in the report are light vehicles (e.g. utility, sedan, van, etc)
        - "Mobile lighting towers" will be up to 10m high. They are on wheels and will be moved as needed to provided lighting to current work areas. They have a telescopic mast enabling the lights to be located at any height up to 10m, but typically fully extended. They typically include 4 floodlights each independently tilt adjustable
        - "Aircraft curfew hours" are typically 1am – 6am.
- MGC Yard;
    - Vehicles: Dusk to dawn
    - Mobile plant (Table 4 – item nos 4.4, 4.7, 4.8, 4.9 & 4.11): 6am – 10pm
    - Temporary site offices and construction related buildings (up to 3 no. total): Security lighting fixed to buildings: Dusk – dawn
    - Mobile lighting towers (up to 3 no.): 6am – 8pm
- George Bolt Yard;
    - Vehicles: Dusk to dawn
    - Mobile plant (Table 4 – item nos 4.4, 4.9 to 4.11): Dusk to dawn
    - Temporary site offices and construction related buildings (up to 7 no. total): Security lighting fixed to buildings: Dusk to dawn
    - Mobile lighting towers: Not used
    - Fixed column mounted lighting (up to 12 no. mounted at up to 6m): Dusk to dawn
- Moa Point Yard offices (corner of Moa Point Road and Stewart Duff Drive;
    - Vehicles: Dusk to dawn

- Mobile plant: Not used
- Temporary site offices and construction related buildings (up to 4 no. total): Security lighting fixed to buildings: Dusk to dawn
- Mobile lighting towers: Not used
- Working area floodlights (up to 8 no.) mounted on buildings: Dusk to dawn

- The SSC (including the Moa Point Yard on the seaward side of Moa Point Road but excluding the Eastern Bank Remediation works);
  - Vehicles: Dusk to dawn
  - Mobile plant (Table 4 – item nos 4.1 to 4.11): Aircraft curfew times
  - Buildings: None present
  - Mobile lighting towers (up to 10 no.): Aircraft curfew times
- The Eastern Bank Remediation works;
  - All work has been proposed between 6am – 10pm. Hence, depending on the time of year, lighting will be required – 6am-dawn and dusk-10pm
  - Vehicles: 6am-dawn or dusk-10pm
  - Mobile plant (Table 4 – item nos 4.3 to 4.5 and 4.8 to 4.11): 6am-dawn or dusk-10pm
  - Buildings: None present
  - Mobile lighting towers (up to 13 no.). Stockpiles of rock and Cubipods will be stored at the Moa Point Yard behind the Eastern Remediation, these materials will be accessed 24/7, and are assessed as part of the SSC, described above.

Proposed plant and equipment

MDCL has supplied a list and details of the general type of machinery they expect to use to construct the Project. MDCL has advised that the actual equipment will be subject to future confirmation. However, I understand that the indicated equipment as summarised in Table 4 is sufficiently accurate to inform the nature of the construction lighting effects that can be expected for the Project.

The table includes a range of vehicles. The proposed locations and nature of use for each item are summarised in the last column.

Examples of mobile plant and mobile lighting towers are shown at item 4.7 in Table 4, and also in Figure 3. I note that each item of plant in Table 4 typically is expected to have approximately 4 lights shining forward as per the image in Table 4 at Item 4.2, for the 150t long reach excavator. MDCL plans to add further lights to improve visibility of the workspace on all sides of the plant – nominally a total of 3 times the number of lights that come supplied as standard on the plant.

I refer to my comments below Table 4 regarding the proposed mobile construction lighting.

Proposed timing of construction

The equipment and plant included in Table 4 will be used throughout the activity period associated with the locations shown, as further explained in section 2 of this report.

By way of summary, the proposed operational hours at each Work Site are:

- MGC Yard – operating hours between 6am and 8pm. No heavy machinery or vehicles will access or operate at the MGC Yard outside these hours.
- George Bolt Yard – the yard will be used to store construction materials, plant, and equipment, maintain plant and equipment, and will operate 24 hours a day, 7 days a week.
- Moa Point Yard – will serve as the main operational hub during the seawall construction, operating 24 hours a day, 7 days per week. As noted above, this report considers the Moa Point Yard offices on the landward side of Moa Point Road and Stewart Duff Drive separately to the construction works adjacent to the seawall due to their differing lighting requirements.
- SSC – construction is expected to take approximately 24-30 months, operating up to 24 hours a day, 7 days a week, with activities that will penetrate the Airport's OLS scheduled to occur overnight, outside the Airport's core operating hours.

Construction is proposed to be undertaken during the day and at nighttime at the times and locations summarised at the beginning of section 4. There will be nighttime activities at all work sites, but as per the summary, the extent and nature of those activities will vary between sites. The most significant nighttime activities will occur at the SSC.

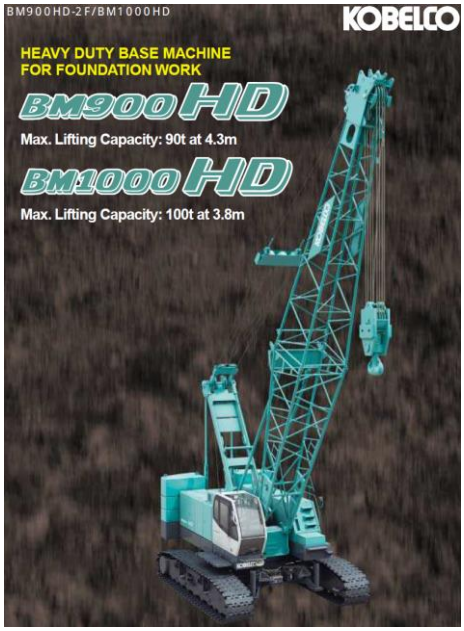
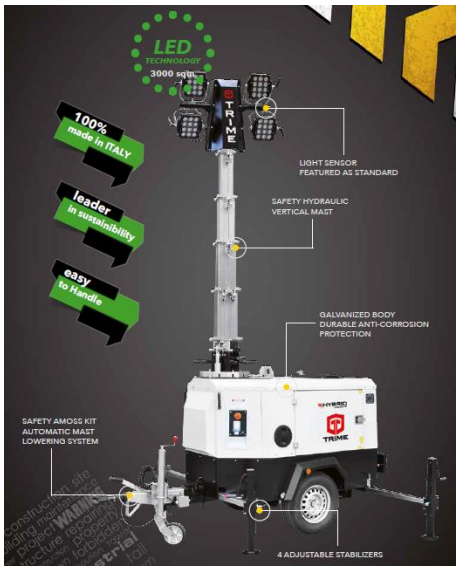
Table 4 sets out the proposed use of indicative plant and machinery at nighttime to manage any potential lighting effects.

Table 4. Proposed use of indicative plant and equipment

ITEM	EQUIPMENT AND PLANT	TYPICAL IMAGES	USAGE DURING HOURS OF DARKNESS
4.1	1 no. 400t long reach excavator (expect 3 x light output shown)		SSC: • Placement of rock and Cubipods

4.3	2 no. 150t long reach excavator (expect 3 x light output shown)	  	SSC: General earth moving, placement of rock and Cubipods. George Bolt Yard: Storage, maintenance & manoeuvring for relocation to/from the SSC
4.4	1 no. 90t long reach excavator (expect 3 x light output shown)		SSC: General earth moving, placement of rock and Cubipods.

4.5	2 no. 25t fork lifts		MGC Yard & Moa Point Yard: General construction materials movement (Cubipods, etc) George Bolt Yard: Storage, maintenance & manoeuvring for relocation to/from the MGC Yard and & Moa Point Yard
4.6	1 no. 30t articulated dump truck	 	MGC Yard and SSC: Used to carry material at the MGC Yard and SSC George Bolt Yard: Storage, maintenance & manoeuvring for relocation to/from the SSC & Moa Point Yard

4.7	1 no. 100t crawler crane		SSC: Placement of seawall construction elements
4.8	13 no. lighting towers		Typical details: 4 x 150W LED floodlights Lights: Can tilt and aim Height: up to 10m SSC & MGC Yard: Primarily for SSC and placed to suit current activities Aimed down (and seaward for SSC) to light work face George Bolt Yard: Storage, maintenance & manoeuvring for relocation to/from the SSC & MGC Yard

4.9	1 no. 45t excavator		MGC Yard: Predominantly daytime only use George Bolt Yard: Storage, maintenance & manoeuvring for relocation to/from the MGC Yard
4.10	1 no. watercart		SSC: Used at end of night shift at SSC (and elsewhere during daytime only) George Bolt Yard: Storage, maintenance & manoeuvring for relocation
4.11	1 no. road sweeper		Moa Pt Rd & Stewart Duff Dr Used as required, day and night George Bolt Yard: Storage, maintenance & manoeuvring for relocation
4.12	2 no. tractors		MGC Yard & SSC: Used to tow trailers to transport rock & Cubipods from MGC Yard to SSC George Bolt Yard: Storage, maintenance & manoeuvring for relocation

Mobile construction lighting

Based on the information supplied, I envisage that the mobile construction lighting at the SSC will appear similar to the image in Figure 2. The 2 lights on the left are on mobile light towers. The remaining lights are vehicle headlights and working lights fixed to mobile plant and vehicles.

Mobile lighting tower floodlights will have zero upward tilt.

Floodlights attached to mobile plant will have no more than 45 degrees tilt if mounted up to 3m above ground or no more than 30 degrees if higher. Zero tilt may not be practical for mobile plant floodlights to ensure safe and effective operation. However, since any such lighting will be regularly changing direction with the orientation of the mobile plant, effects will be less than they would be for a similar light mounted in a permanent static orientation on a building or structure.

Figure 2. Typical mobile construction site lighting

In addition to lighting attached to mobile plant and vehicles, mobile light towers are proposed to safely illuminate the Work Sites. These will be moved around as necessary to focus light where it is required to suit current construction activities and locations. An example of a mobile

light tower is shown in Figure 3 (Note: The floodlights differ from those in the proposed model, but the lighting effect demonstrated will be similar).

I have recommended, at section 7 below, that in order to manage potential adverse effects, any mobile lighting towers used for the Project be aimed away from public roads or residences within 500m, that the upward tilt of any floodlight shall not exceed 0 degrees, and the total height shall not exceed 10m.

Figure 3. Typical mobile light tower

Fixed lighting

Fixed lighting will include column-mounted area lighting at the George Bolt Yard and building-mounted area and security lighting in the MGC Yard, George Bolt Yard and the Moa Point Yard offices. Further details are provided at the start of section 4.1.

Lighting effects mitigation

In order to minimise the potential effects of construction lighting for the Project and ensure that lighting is suitable for safe use, the following requirements are proposed, as reflected in my proposed conditions in section 7;

- **Colour Temperature**

  All fixed lighting will have a colour temperature (CCT) of 3000K to help minimise the blue light content. Thereby any related light scattering effects, which could otherwise reduce night sky visibility, will be reduced, albeit to a minor extent in this situation.

- **Colour**

  The lighting colour will be white to ensure safe conditions for construction.

- **Intensity**

  All construction lighting will have fixed intensity. It will be the practical minimum required to ensure safe conditions for construction.

- **Adaptive Lighting Controls**

  While the fixed lighting proposed will have set intensity, colour and colour temperature as described above, controls will be provided to minimise the time of use to ensure that they only operate at night (i.e. dusk to dawn) and only during permitted construction activity times.

  Security lighting on buildings will be fitted with daylight and motion sensor control to limit usage.

  Controls will be included on all other fixed lighting to ensure that they do not operate outside of permitted construction times.

5.0 ASSESSMENT OF ENVIRONMENTAL EFFECTS

I have considered the potential effects of the construction lighting required as part of the Project with respect to potential sensitive receivers (**Observers**).

Observers could include:

- Occupants of residential dwellings with direct visibility of the Work Sites (**Residents**)
- Motorists on public roads (**Motorists**)
- Nocturnal biota (**Biota**)

This section of my report addresses the potential effects of construction lighting on Observers, including:

- relevant site observations;
- categories of potential effects; and
- an assessment of the effects.

The Quality Planning website proposes a scale[2] as below for the determination of adverse effects. I have added an abbreviated expression in square brackets to simplify the reference to each category for brevity;

[2] Quality Planning – Determining the extent of adverse effects (https://www.qualityplanning.org.nz/node/837)

- **Nil Effects [Nil]**
  No effects at all.
- **Less than Minor Adverse Effects [Less than minor]**
  Adverse effects that are discernible day-to-day effects, but too small to adversely affect other persons.
- **Minor Adverse Effects [Minor]**
  Adverse effects that are noticeable but will not cause any significant adverse impacts.
- **More than Minor Adverse Effects [More than minor]**
  Adverse effects that are noticeable that may cause an adverse impact but could be potentially mitigated or remedied.
- **Significant Adverse Effects that could be remedied or mitigated [Significant]**
  An effect that is noticeable and will have a serious adverse impact on the environment but could potentially be mitigated or remedied.
- **Unacceptable Adverse Effects [Unacceptable]**
  Extensive adverse effects that cannot be avoided, remedied or mitigated.

Working within the context of the above definitions, I have correlated these terms with my view of technical effects, to provide a technical effect rating as shown in Table 5.

Table 5. Technical vs planning effects terminology

EFFECT RATING	PLANNING DETERMINATION
Very high	Significant
High	Significant
Moderate-high	More than minor
Moderate	More than minor
Low-moderate	Minor
Low	Less than minor
Very low	Less than minor

5.1 Residents

5.1.1 Site observations

I undertook day and night site visits to view the proposed Work Sites and the surrounding receiving environment on 23 October 2024.

I undertook a daytime visit, commencing at 1pm, sequentially to;

- The boundary of the MGC Yard to consider the relative location of nearby residences to the east
- The Moa Point Yard site and the SSC site, as well as the adjacent residential area in Moa Point Rd to consider potential views
- The George Bolt Yard site and immediate surrounds
- Lyall Bay, Melrose & Houghton Bay near sea level, and then progressing uphill to consider potential views, particularly back towards the SSC and MGC Yard
- The residential areas in Strathmore Park adjacent the MGC Yard

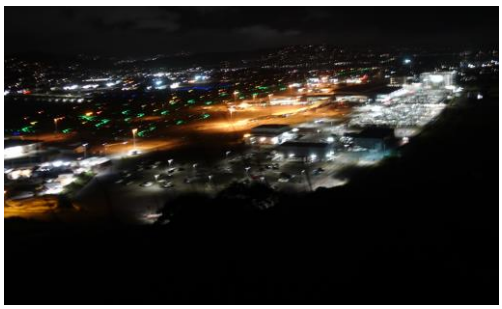
I then repeated the visit at night, commencing at 9pm, to each of those locations in turn, to appreciate the existing nighttime lighting environment.

I went to each of the proposed Work Sites to determine the extent of existing lighting in the vicinity, and to determine residential areas that could be seen from those Work Sites. Then I visited each of the residential areas to view the Work Sites and surrounds. I did so in daylight and again at night.

In particular, the nighttime visit enabled me to observe the Work Sites from the residential areas to provide context in terms of the visibility and nature of the existing lighting in the vicinity of the Work Sites.

Examples of the views observed are shown in Figures 4-7. I understand that the existing mounds shown in Figures 4a, 4b, 4c and 4d are proposed to be modified/reduced in height by the proposed works and will therefore not offer screening of the site from the residences. However, their removal may help reduce effects by keeping vehicle lights lower and less likely to angle up on uneven ground during manoeuvring.

Residential Area 1 – Moa Point Road:	
	
Figure 4a. Residential Area 1 (33-48 Moa Pt Rd) – View towards houses from SSC - Day	**Figure 4b. Residential Area 1 (33-48 Moa Pt Rd) – View towards SSC from houses - Day**

	
Figure 4c. Residential Area 1 (33-48 Moa Pt Rd) – View towards houses from SSC – Night	**Figure 4d. Residential Area 1 (33-48 Moa Pt Rd) – View towards SSC from houses - Night**
Residential Area 2 – Strathmore Park:	
	
Figure 5a. Residential Area 2 (50-76 Raukawa St & 18-36 Kekerenga St) – View towards houses from MGC Yard - Day	**Figure 5b. Residential Area 2 (50-76 Raukawa St & 18-36 Kekerenga St) – View towards MGC Yard from houses - Day**
	
Figure 5c. Residential Area 2 (50-76 Raukawa St & 18-36 Kekerenga St) – View towards houses from MGC Yard - Night	**Figure 5d. Residential Area 2 (50-76 Raukawa St & 18-36 Kekerenga St) – View towards MGC Yard from houses - Night**

Residential Area 3 – Near sea level (Lyall Bay):	
	
Figure 6a. Residential Area 3 (Lyall Bay South) – View towards houses from SSC - Day	**Figure 6b. Residential Area 3 (Lyall Bay South) – View towards SSC from houses - Day**

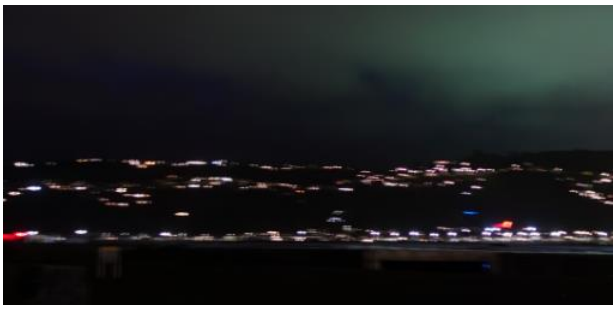
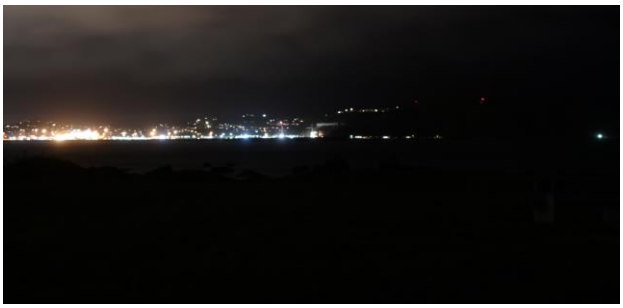
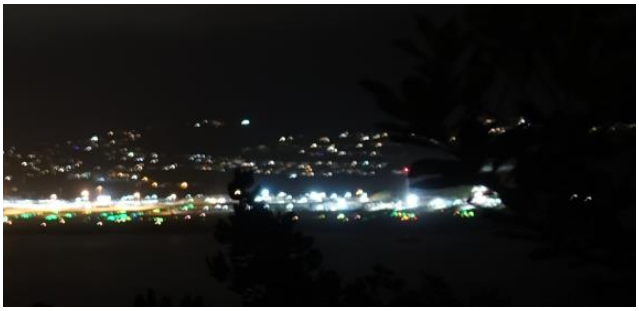

	

Figure 6c. Residential Area 3 (Lyall Bay South) – View towards houses from SSC - Night	**Figure 6d. Residential Area 3 (Lyall Bay South) – View towards SSC from houses - Night**
Residential Area 3 – Higher elevations (Houghton Bay):	
	
Figure 7a. Residential Area 3 (Houghton Bay East) – View towards houses from SSC - Day	**Figure 7b. Residential Area 3 (Houghton Bay East) – View towards from SSC from houses - Day**

	
Figure 7c. Residential Area 3 (Houghton Bay East) – View towards houses from SSC - Night	**Figure 7d. Residential Area 3 (Houghton Bay East) – View towards SSC from houses - Night**

Figures 4-7. Existing Views

5.1.2 Effects on Residents

While not all types of obtrusive light effects will necessarily affect Residents, the following potential effects have been considered;

1. ***Sky glow***: Light scattered in the atmosphere reducing visibility of the night sky;
2. ***Light spill***: Direct light trespass, as measured in lux, typically at the window of a dwelling;
3. ***Glare***: Brightness of a light source when viewed in contrast to the immediate surrounds;
4. ***Amenity***: Views of the night sky; and
5. ***Health:*** Sleep disturbance & seizures.

Light spill is a governed by statute. Glare and sky glow are recommended by a standard (AS/NZS 4282:2023). Amenity and health effects are good practice elements assessed by expert opinion.

Sky Glow

Sky glow is typically noticed as the glow visible above a town or city at night when viewed from a distance, as a result of direct and reflected upward light from artificial lighting, striking particles in the atmosphere and scattering the light.

The Work Sites are located in a major city where there is already a significant sky glow present. In my opinion, the additional sky glow effects from the proposed construction lighting will be indistinguishable from the existing sky glow.

Hence, the quantity and intensity of the proposed construction lighting are such that, in my opinion, sky glow effects on Residents will be very low.

Light Spill

The nominal illuminance (spill light) at the window of a dwelling from a point source can be calculated by the formula;

$E = I/d^2$ (E=Illuminance, I=Luminous Intensity, d=distance)

In other words, spill light reduces geometrically with distance from the light source.

For the range of separation distance anticipated, based on my experience, I am of the opinion that spill light at any residence will be extremely low – likely similar to starlight.

So long as construction lights are aimed down and away from residences (in accordance with my recommended conditions, set out in section 7 below), the additional light spill at residences generated by the construction lighting will be effectively nil for practical purposes.

In my opinion, if my recommendations are adopted, spill light effects to Residents will be very low.

Glare

Glare (luminous intensity) will vary with viewing angle but not distance.

Provided my proposed conditions are adopted, any potential glare effects can be satisfactorily managed;

- Building security lighting: No light above horizontal. Therefore, there would be no glare effects to locations at the same height or higher. In addition, such lighting is typically modest in nature and not excessively glary
- Mobile light towers: Limited to a maximum upward tilt of 0 degrees and aimed away from nearby residents wherever practical
- Vehicle and mobile plant lighting: Since this type of lighting is not typically fixed in a given direction, any glare effects would typically be fleeting and therefore not obtrusive

While it is true that the numerical value of luminous intensity does not vary with distance, the actual effect of the apparent brightness does lessen as distance increases, since the light source occupies a progressively smaller part of the view.

A comparison could be made with our Sun. It is a star, with a similar size and order of brightness as many others we see in the night sky. However, our Sun is much closer than the other stars and thereby too bright to look at directly. Whereas other more distant stars are comfortable to view.

In my opinion, if my proposed conditions are adopted, glare effects to Residents will be very low to low, other than Residential Area 1 (Moa Point Road), where effects will be low-moderate. Hence, overall, glare effects will be very low to moderate.

Amenity

When considering the enjoyment of views of the night sky, the existing lighting environment is typically the limiting factor.

In this instance, the Work Sites are located within a brightly lit major city. Hence, from a lighting perspective, additional effects on amenity will be negligible. The effects of construction

lighting on amenity are considered in greater detail in the Landscape and Natural Character Effects Assessment prepared for the Project by Boffa Miskell (Boffa Miskell, 2025).

Health

Excess light at night can negatively affect sleep. In this instance, the Work Sites are located in a brightly lit city and any additional effects will be negligible.

Properties between 33-48 Moa Point Road, may see some of the SSC construction lighting. These properties will also experience (existing) road lighting and spill light from other residences.

To mitigate the potential effects of construction lighting from the Work Site on sleep disturbance, I have recommended a series of conditions. This includes, for example, a requirement for any fixed lighting to be aimed away from the residences. With these measures in place, in my opinion, any additional effects in terms of sleep disturbance arising from the Work Site will be very low.

I understand that WIAL are willing to offer black out blinds to any residents adjacent the SSC. This could potentially be helpful if adopted. However, my assessment does not assume the adoption of this measure.

In addition, flashing lights can trigger seizures in a small percentage of people. The only flashing lights expected are safety warning lights on mobile plant. However, the flashing frequency of such lights is understood to be typically 1-2 cycles per second, whereas the range of frequency that could typically trigger a seizure is typically in the range of 5-30 cycles per second[3]. Hence, this is not expected to be a concern.

Overall, in my opinion, provided that my proposed conditions are adopted, the effects of construction lighting on the health to Residents will be very low.

Summary of effects of Residents

I have summarised my site observations and opinion regarding anticipated construction lighting effects in Table 6 below.

[3] Shedding Light on Photosensitivity, One of Epilepsy's Most Common Conditions – Epilepsy Foundation.

Table 6. Residential Areas – Anticipated Lighting Effects

RESIDENTIAL AREA	WORK SITE VISIBILITY	OBSERVATIONS
Close Views		
Residential Area 1 (33-48 Moa Pt Rd)	• Southern Seawall (excluding Eastern Bank Remediation): No visibility of the seawall, but taller plant may be partially visible • Eastern Bank Remediation: Work mostly done in daylight, but hours are 6am-8pm, so in winter months there will be lighting as described in Section 4 • Moa Point Yard: The actual work areas of the Southern Seawall will generally be screened from view by the local topography. However, construction lighting may be visible. There will be limited visibility of the Moa Point Yard offices from some residences	• Southern Seawall (excluding Eastern Bank Remediation): The SSC is not directly in front of the residences. Provided the conditions I propose are adopted, construction lighting effects should be satisfactorily mitigated. The proposed site vehicle access point is well away from the residences which will mitigate headlight sweep effects. • Eastern Bank Remediation: Mobile lighting towers will be aimed away from residences. Mobile plant and vehicle lights may be seen. Work lights added to mobile plant will be tilted down to minimise glare effects. The limited nighttime operating hours and limited construction period will assist to minimise effects. Provided the conditions I propose are adopted, construction lighting effects should be satisfactorily mitigated.

		• Moa Point Yard: Provided the conditions I propose are adopted, construction lighting effects should be satisfactorily mitigated. • The effects in this area will likely be greater than elsewhere in the project due to intermittent visibility of the crane boom lights and mobile plant and vehicle lights when manoeuvring. Overall, in my opinion, effects will be low - moderate.
Residential Area 2 (Bunker Way, 50-76 Raukawa St & 18-36 Kekerenga St)	• MGC Yard: The yard will be lower in elevation than the residences and existing foliage will screen most of the yard and associated lighting. Residences further uphill may have some visibility of the yard, but effects will reduce with distance	• MGC Yard: The brightly lit airport and suburban area lighting beyond dominate the existing view. In my opinion, provided that the conditions I propose are adopted, the added effects of construction lighting in the MGC Yard will be low.
Distant Views		
Residential Area 3 - All residential locations west of the SSC with views of the site – i.e. southern parts of Lyall Bay and eastern parts of Houghton Bay	• Southern Seawall and Moa Point Yard: The sites become progressively more visible moving south from the centre of Lyall Bay • MGC Yard: Screened from views at similar elevation by	• All Work Sites: Based on my nighttime observations, it was apparent that the views from Residential Area 3 will not be materially affected by construction lighting as the predominant view at night from

	intervening buildings. Heading towards the higher elevations in Lyall Bay / Houghton Bay, and surrounds, the yard will become visible	this area currently comprises a well-lit vista including the brightly lit airport and well-lit suburban areas (road lighting, house lighting, etc). In my opinion, construction lighting effects will be very low.

In summary, in my opinion, construction lighting effects on residential locations will be low to moderate, provided the conditions I propose are adopted.

5.2 Motorists

Site Observations

I undertook day and night site visits to view the proposed Work Sites and the surrounding environment on 23 October 2024.

This was undertaken as part of the same visit sequence mentioned earlier in this report.

During my site visit I observed construction lighting and security at a site on Stuart Duff Drive, just below the Moa Point Wastewater Treatment Plant, as shown in Figure 8 (**SDD Construction & Security Lighting**). The lighting on structures and buildings was aimed downwards and the temporary work lighting appeared to be aimed toward the work area (rather than being tilted up excessively). The SDD Construction site is immediately next to Stewart Duff Drive and while driving past it is noticeably bright, but it is not obtrusive, and in my opinion is satisfactory in terms of any construction lighting effects on motorists.

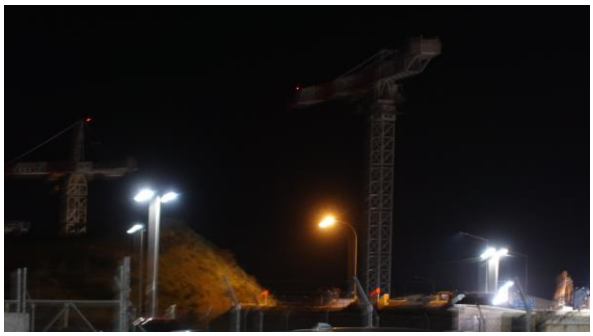


Figure 8a. Mobile Light Towers	**Figure 8b. Security Lighting**

Figure 8. SDD Construction & Security Lighting

Effects on Motorists could potentially include;

1. ***Glare***: The relative brightness of a light source in the driver's field of view and the potential of this to affect vision; and

2. ***Distraction***: The potential for a flashing light to distract the driver's attention.

Glare

An analysis of glare effects to Motorists is similar to that for Residents. Any glare effects will lessen with distance due to the reduction in the size of the light source size in the Motorist's view.

Provided the conditions I propose are adopted, construction lighting effects to Motorists will be satisfactorily mitigated.

The roads that are of relevance are;

- Stewart Duff Drive (next to the MGC Yard, Moa Point Yard & SSC)
- Moa Point Road (next to the Moa Point Yard & SSC)
- The intersection of those roads

In particular, the conditions I propose that will mitigate effects to Motorists are;

- Mobile light towers:
    - Floodlight upward tilt restricted to 0 degrees
    - Aimed away from roads
- Vehicles and mobile plant:
    - Screened by site hoarding
- Building security & area lighting:
    - Selected and mounted such that no light is emitted above the luminaire

Glare to motorists is evaluated by the term Threshold Increment (**TI**). AS/NZS 4282 recommends a maximum TI of 15%. TI is primarily related to the visibility of the main beam of each luminaire, but in this instance, all such luminaires will be aimed away from the road. Hence, the TI will be approximately 0%.

In my opinion, provided that my proposed conditions are adopted, glare effects to Motorists will be very low to low.

Distraction

Flashing lights can be distracting to a motorist. This would be particularly so in an otherwise dark environment but in this instance, the Work Sites are located in areas with moderate to high existing ambient lighting brightness. The presence of flashing safety warning lights on mobile plant is also relatively commonplace in a major city such as Wellington and thus less distracting than it might otherwise be if it were novel.

Hence, in my opinion, distraction effects to Motorists will be low.

Summary of effects on Motorists

Provided that the conditions I proposed in Section 7 of this report are adopted, I expect effects to be similar or less than those indicated in Figure 8 (SDD Construction & Security Lighting) which I assessed as being satisfactory.

Hence, in my opinion, effects to Motorists will be low.

5.3 Biota

When considering Biota, particular regard is typically afforded to the national critical endangered NZ long-tailed bat (**Bats**), nocturnal sea birds (**Birds**) and nocturnal insects (**Insects**).

The effects of the Project on biota is considered in three reports:

- The Southern Seawall Ecological Impact Assessment (Bioresearches, 2025) – which considers terrestrial ecology including bats, insects and birds on shore;
- The Southern Seawall Marine Ecological Impact Assessment (Bioresearches, 2025) – which considers seabirds (excluding Kororā – little penguin) while at sea, and marine mammals; and
- The Southern Seawall Kororā Assessment (Kororā Ornithology, 2025).

The three reports above consider the effects of artificial light at night on terrestrial and marine ecology and Kororā, so I do not assess effects on biota in this report.

However, it should be noted that from a lighting perspective, the SSC is adjacent a brightly lit city and in particular, a brightly lit international airport. There is existing roadway and carpark lighting nearby as well as light from the adjacent residences on Moa Point Road.

While the temporary construction lighting will add to these effects, in my opinion, additional effects will be minimal. Thereby, I am of the opinion that the added effects of the construction lighting are unlikely to add significantly to current lighting effects in the vicinity of the SSC.

In my view, the conditions that I recommend to manage sky glow effects on Residents will also manage effects on biota (refer to **Table 7** below). However, I note that the relevant ecological experts may recommend additional conditions relating to lighting to manage potential effects on biota.

5.4 Potential effects vs proposed conditions

In order to minimise potential effects, I have proposed a set of conditions at section 7. The reasons for these conditions are described in Table 7.

Table 7. Potential effects vs proposed conditions

POTENTIAL EFFECT	MANAGED BY IMPOSING RESTRICTIONS SECURED THROUGH CONSENT APPLYING PROPOSED CONDITIONS	RESULTING OVERALL EFFECTS IN MY OPINION
Residents:		
Sky glow	2, 3, 4, 5, 6, 7, 8	Very low
Light spill	1, 3, 5, 6, 7	Low to very low
Glare	1, 3, 5, 6, 7	Low to moderate
Amenity	All	N/A – addressed in Landscape and Natural Character Assessment
Health	All	Very low
Motorists:		
Glare	1, 3, 6, 7	Low to very low
Distraction	8, 9	Low to very low
Biota	2, 3, 4, 7, 8	N/A – addressed in terrestrial ecology, marine ecology and Kororā assessments

5.5 Overall Summary of effects

In my opinion, provided that my proposed conditions are adopted, effects from the construction lighting for the Project will be low to moderate, or no more than minor.

6.0 ASSESSMENT AGAINST RELEVANT STATUTORY AND NON-STATUTORY PROVISIONS

The relevant statutory and non-statutory provisions relating to lighting that are relevant to my assessment of the Project include;

- Lighting provisions in the Operative District Plan and Proposed Wellington City Council District Plan 2024 ("**Proposed District Plan**");
- Lighting provisions in designations;
- WIAL lighting requirements;
- Civil Aviation Authority (**CAA**) lighting requirements; and
- AS/NZS 4282:2023.

I have considered AS/NZS 4282 for completeness. However, the relevant parts of that standard (i.e. spill light and glare) are already addressed by the statutory provisions. Hence, there are no additional matters raised in the standard that need to be considered.

Given An assessment of the relevant statutory and non-statutory provisions referred to above are summarised and assessed in Table 8.

Table 8. Assessment against relevant statutory and non-statutory provisions

PROVISION	ASSESSMENT
Operative District Plan	
MGC Yard **(Airport and Golf Course Recreation Precinct Area)**	
Permitted Standards:	
11.1.1.6.1 Any non-aviation activity which requires the lighting of outdoor areas must ensure that direct or indirect illumination does not exceed 8 lux at the windows of residential buildings in any nearby Residential Area.	The MGC Yard is a significant distance from the closest residential boundary and the height differential will ensure that any additional light spill from construction lighting at the windows will be effectively nil and certainly less than 8 lux specified in this rule. The Project will therefore comply with this permitted activity standard.
Other Work Sites:	
{No lighting provisions apply}	
Proposed District Plan	
Southern Seawall and Moa Point Yard	

(Natural Open Space Zone)	
Permitted Standards: *NOS-S1: ...Poles for lighting and surveillance...must not exceed a maximum height of 18m above ground level*	The indicative mobile light towers have a maximum nominal height of 10m so the Project would be consistent with this permitted activity standard.
MGC Yard and George Bolt Yard (Airport Zone)	
{No lighting provisions apply}	
All Sites (Light Chapter)	
LIGHT-S1 Measurement Methods *1. Lighting limits must be measured and assessed in accordance with AS/NZS 4282:2023 Control of the Obtrusive Effects of Outdoor Lighting. In the event of any conflict between AS/NZS 4282:2023 and the District Plan, the District Plan shall prevail; and* *2. Where an activity is located on a site which adjoins or is separated by a road from adifferent zone, the activity on the site must meet the relevant zone standards for lightfor the adjoining zone at the zone boundary.*	S1 – 1. Acknowledged and has been taken into consideration S1 – 2. Acknowledged and has been taken into consideration **Complies**
LIGHT-S2 Light Spill ***Residential Zones and Open Space Recreation Zones*** *1. Outdoor artificial lighting must not exceed the following vertical illuminance levels:* *a. 7.00am – 10.00pm: 10 Lux; and* *b. 10.00pm – 7.00am: 2 Lux.* *The vertical illuminance shall be measured at:* *c. Any window of a habitable room of a building used for a sensitive activity on any adjacent site; or* *d. The minimum setback distance for buildings and structures used for residential purposes for the relevant zone of an adjacent site if that site does not contain a building used for a sensitive activity. The vertical extent of the calculation points for vertical illuminance shall be between:* *i. 1.5m above ground level; and*	• Residential Zones: The proposed conditions will ensure that; ○ Light spill from fixed lighting and mobile lighting towers at any residential window will be nil ○ Light spill from mobile plant and vehicles will be minimised and in my opinion it will be well below the 2 lux limit and transitory in nature. District Plan provisions typically, and appropriately, address fixed rather than mobile lighting, since mobile lighting is typically transitory and thereby not significantly obtrusive, and acknowledging that it is also not possible to calculate by its nature. • Airport Zone: As above

ii. The maximum building height permitted by the relevant zone. ***Airport Zone*** *Outdoor artificial lighting must not exceed the following vertical illuminance levels:* *a. 7.00am – 10.00pm: 25 Lux; and* *b. 10.00pm – 7.00am: 5 Lux.* *The vertical illuminance shall be measured* *at:* *c. Any window of a habitable room of a building used for a sensitive activity on any adjacent site; or* *d. The minimum setback distance for buildings and structures used for residential purposes for the relevant zone of an adjacent site if that site does not contain a building used for a sensitive activity. The vertical extent of the calculation points for vertical illuminance shall be between:* *i. 1.5m above ground level; and* *ii. The maximum building height permitted by the relevant zone.*	• Open space zone: Not applicable (no residences present within the open space zone) **Complies**
LIGHT-S3 Glare ***Residential Zones and Open Space Zones*** *1. Outdoor artificial lighting on any site adjacent to a road, or adjacent to a site which contains a building used for a sensitive activity, must be selected, located, aimed, adjusted and/or screened so that the luminous intensity does not exceed the following:* *a. 7.00am – 10.00pm: 12,500 cd; and* *b. 10.00pm – 7.00am: 2,500 cd.* ***Airport Zone*** *3. Outdoor artificial lighting on any site adjacent to a road, or adjacent to a site which contains a building used for a sensitive activity, must be selected, located, aimed, adjusted and/or screened so that the luminous intensity does not* *exceed the following:* *a. 7.00am – 10.00pm: 25,000 cd; and* *b. 10.00pm – 7.00am: 2,500 cd.*	• Residential Zones: The proposed conditions will ensure that; ○ Glare from fixed lighting and mobile lighting towers at any residential window will be nil or at least very close to nil, and certainly less than 2,500cd ○ Glare from mobile plant and vehicles will be minimised by conditions limiting upward tilt, roadside screening and practical orientation requirements[*]. District Plan provisions typically, and rightly, address fixed rather than mobile lighting, since mobile lighting is typically transitory and thereby not significantly obtrusive, and acknowledging that it is also not possible to calculate by its nature. [*] Orientation: The only floodlight proposed to be exempt from the maximum tilt condition are the crane boom floodlights. These are intended

	to light the load area and as such are aimed downwards, but are fixed to the boom which can change in tilt angle as needed. In the majority of situations, the floodlight tilt angle is anticipated to be no more than 45 degrees and the maximum beam (nor close to it) should not be experienced at any residential location. • Airport Zone: As above • Open space zone: Not applicable (no residences present within the open space zone) **Complies**
LIGHT-S4 Effects on road users Residential Zone and Open Space Zone *2. Outdoor artificial lighting must not exceed a 15% threshold increment limit (based on adaption luminance of 2 cd/m 2) when calculated in the direction of travel within each traffic lane of any public road.* ***Airport Zone*** *3. Outdoor artificial lighting must not exceed a* *15% threshold increment limit (based on adaption luminance of 10 cd/m 2) when calculated in the direction of travel within each traffic lane of any public road.*	• Residential Zones: The proposed conditions will ensure that Threshold Increment will be less than 15% at an adaption luminance of 2 cd/m^2. It is not possible to calculate TI for mobile plant & vehicle lighting, but the transitory nature will ensure that any effects are negligible. It is also not possible to calculate TI for mobile lighting towers, since the location and aiming changes regularly to suit operations. However, the condition to limit these to zero tilt and aim away from public roads will ensure that TI will be 0%, or close thereto. The only column-mounted fixed lighting proposed will be remote from, and/or aimed away from, any public roads such that TI will be well controlled. While not possible to calculate at this point in the project, it will be well within the 15% limit. Building security lighting is low height, low intensity and directed downwards. It will produce TI at, or close to, 0%. • Airport Zone: As above • Open space zone: Not applicable (no residences present within the open space zone) **Complies**

LIGHT – S5 Sky Glow *Residential Zone and Open Space Zone* *2. Outdoor artificial lighting must not exceed an upward light ratio of 2%.* *Airport Zone* *3. Outdoor artificial lighting must not exceed* *an upward light ratio of 3%.*	District Plan provisions typically, and appropriately, address fixed rather than mobile lighting, since mobile lighting is typically transitory and thereby not significantly obtrusive, and acknowledging that it is also not possible to calculate by its nature. All fixed lighting will be flat faced (LED) and installed with zero upward tilt. Hence, the upward light ratio will be 0%. **Complies**
WIAL LIGHTING REQUIREMENTS	
1. *Lighting must not provide direct glare or create confusion (through colour) to aircraft on approach or in the manoeuvring area, nor to controllers in the Tower (in the past, some streetlights have required adjustment to prevent glare in the control tower).* 2. *The colour confusion relates to aircraft on approach where there is a background of red, green or white that might be confused when seen from the air with threshold, runway end lighting, etc.* 3. *This can be further exacerbated by environmental conditions such as low cloud (e.g. WIAL has had issues with tankers at Burnham Wharf – when pilots broke clear of the low cloud the bright lights and reflection created an immediate confusion as to where they were, and their alignment with the airport).* 4. *There must be no lasers or spotlights pointing skywards around airports and in the control zone unless an independent aeronautical study is completed (and covered by CAA Rule Part 77).*	1. The proposed conditions will ensure that the construction lighting will not cause confusion. 2. Other than flashing orange safety warning lights on mobile vehicles and plant and red taillights in vehicles, all lighting will be white in colour. Colour confusion will not occur. 3. Atmospheric conditions will not introduce confusion in relation to the foregoing item. 4. Upward aiming lasers and spotlights are not proposed.

CAA LIGHTING REQUIREMENTS – Aviation Rules Part 77 b	
(b) A person proposing to operate a light or a laser must notify the Director in accordance with rule 77.13 if— *(1) because of its glare or affect on a pilot's vision, the light or laser is liable to endanger aircraft; or* *(2) for a laser, it would produce exposures in navigable air space exceeding the maximum permissible exposure defined for that laser in NZS/AS 2211; or* *(3) it is likely to endanger aircraft by being mistaken for—* *(i) a light or part of a system of lights established or approved for display at or near an aerodrome; or* *(ii) a light marking a hazard in navigable airspace.*	(1) Not applicable (no lasers proposed) (2) Not applicable (no lasers proposed) (3) No lasers are proposed. The proposed construction lighting is not of a nature that would be likely to be confused for aircraft navigation.
NON-STATUTORY STANDARDS	
AS/NZS 4243 (Control of the Obtrusive Effects of Outdoor Lighting)	I have reviewed the standard. The most relevant portions of the recommendations in this standard have been addressed in the relevant Proposed District Plan provisions as discussed above. Hence, there are no further aspects in the standard that I would consider necessary to address.

7.0 PROPOSED CONDITIONS

In order to satisfactorily manage the construction lighting effects of the Project, I recommend the following conditions be included if consent is granted;

CONSTRUCTION LIGHTING

1. Management: All construction related exterior lighting must be managed to avoid the spill of light or glare that is:

a. hazard to traffic safety; or

b. hazard to navigation in the coastal marine area.

2. Colour and colour temperature: Luminaires used for all fixed area lighting (mounted on buildings and columns) and luminaires used for mobile lighting towers, shall be white LED with a colour temperature of 3000K

3. Intensity: The intensity of each luminaire shall be the practical minimum required to ensure safe conditions for construction

4. Adaptive controls:

a. Security lighting shall be fitted with daylight and motion sensor control

b. All other fixed area lighting (mounted on buildings and columns) shall be fitted with daylight and time control to ensure that they only operate at night (i.e. dusk to dawn) and only during permitted construction activity times

5. Temporary Building Security Lighting: Shall be mounted on buildings and shall be located and selected such that no light is emitted above the luminaire.

6. Fixed area lighting: Shall be aimed away from any public road or residence located within 500m and the upward tilt of any floodlight shall not exceed 0 degrees. The total tower height shall not exceed 10m.

7. Mobile lighting towers: Shall be aimed away from any public road or residence within 500m and the upward tilt of any floodlight shall not exceed 0 degrees. The total tower height shall not exceed 10m.

8. Mobile plant and vehicle work lights (other than a crane boom light): Any work lights attached to vehicles or mobile plant (e.g. aimable lights attached to the plant or vehicle, other than vehicle headlights, tail lights, hazard warning lights and the like) shall be tilted up to no greater than 45 degrees if up to 3m above ground, or 30 degrees if higher.

9. Headlight Sweep:

a. Vehicle egress locations from the SSC shall not be established within 30m of 33-48 Moa Point Road

b. Vehicles operating within any Work Site shall not use un-dipped headlights.

8.0 CONCLUSION

Overall, provided the conditions I propose are implemented, it is my opinion that lighting effects from the construction lighting for the Project will be low to moderate, or no more than minor.