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Step 1. Keep light off the beach and the sea surface	
a) Adopt as an objective the joint achievement of the minimum light level required for human safety <u>and</u> avoidance of turtle disruption.	The minimum lighting for human safety has been proposed. Onshore lighting will be required to: • safely receive, unload and turn around road haul trucks • manage product stockpiles • load product onto the shiploading load out system, • collect product samples • allow for general safe personnel movement. Lighting at the ship loader will operate at night during transhipment vessel loading. A typical loading operation is estimated to take up to 4 hours during which lighting on the ship and around the ship loader will be energised to ensure a safe work area.
b) Start with darkness and add light only as absolutely necessary for safety and operational requirements.	The minimum lighting for human safety has been proposed
c) Design facilities to avoid light spill onto the beach and sea surface.	Facilities in proximity to the beach will be designed to minimise light spill. Examples include: • Workshops and office areas will have wall mounted fixtures at low level to light access routes • Stockyard and road high level lighting will be restricted to a maximum 12 m pole height and directed away from the beach and sea surface • Access (doorway) lighting will be fitted with glare control shielding to minimise upward light spill • Trucks and other mobile plant will not be parked with lights directed out into the ocean
d) Do not use decorative lighting; confine lighting to essential purposes only.	No decorative lighting is proposed
e) Maintain a darkness zone within at least 1.5 km of significant rookeries[1].	No significant rookeries are within 1.5 km of the Proposal
f) Avoid over the horizon glow in line of sight of significant rookeries[2].	No significant rookeries are within 1.5 km of the Proposal
g) Use natural topography and vegetation or structures to shield the beach from light at turtle eye level.	The Stockyard is set back from the beach as far as practicable to maximise the use of natural topography and vegetation as shields
h) Design in light screens using topography, vegetation or structures.	Stockyard and road lighting will be directed away from the coastline and provided with glare shields
i) Design activities to avoid turtle nesting season[3] with a suitable buffer since nesting can vary between years.	The Proposal will be required to operate continuously throughout the year
j) Avoid night-time activity in turtle nesting season, including turning off non-essential lights completely during the season.	The Proposal will be required to operate continuously throughout the year, however IOH will develop operating procedures to limit lighting to essential areas and de-energising any non-essential lighting that can be turned off during this period
k) Locate light sources such as gas flares at or below ground level, well inland and behind screening buildings, topography or vegetation.	No light sources such as gas flares are proposed as part of the Proposal
l) Design for the minimum number and intensity of lights necessary.	IOH has designed for the minimum number and intensity of lights necessary.
m) Consider redesigning activities that require lighting so that they can be done elsewhere (e.g. fabrication, maintenance), in daylight, automated, out of turtle nesting season or with task lighting only (e.g. head-torches).	IOH has located its accommodation camp and workshop areas further inland, which greatly reduces any non-essential lighting in proximity to the beaches. Work areas requiring night time access for regular tasks have been designed to limit light emissions
n) Design light fixtures that are mounted low down, shielded and aligned to direct light onto the target area only – e.g. embedded LED stud lights or recessed lighting can be used to illuminate roads	• Workshops and office areas will have wall mounted fixtures at low levels to light access routes • Stockyard and road high level lighting will be restricted to a maximum 12 m pole height with targeted shielded lighting

[1] A darkness zone means a zone where artificial lighting is not visible to nesting or hatchling turtles.
[2] The terms 'nesting beaches' and 'rookeries' are used interchangeably here.
[3] Turtle nesting season refers to both the period of nesting and the period when hatchlings emerge from nests.

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and paths.	• Sample station work areas will be enclosed where lighting is required at night work stations • Conveyors will have lighting that is reduced to low anti-collision levels for unoccupied times and switched to safe access levels if personnel access them at night • Access (doorway) lighting will be fitted with glare control shielding to direct light spill
o) Direct lights downward and shield them to avoid overhead glow on cloudy nights.	Lights will be directed downwards and shielded above to minimise overhead glow Dust control sprays will be used to control air born particles, minimising light diffraction and consequential glow
p) Direct shielded jetty and vessel deck lighting onto work surfaces and ensure it does not spill over the vessel deck onto the water.	Lighting at the ship loader will operate at night during transhipment vessel loading. A typical loading operation is estimated to take up to 4 hours during which lighting on the ship and around the ship loader will be energised to ensure a safe work area. During this time, lighting will be directed only over the working areas to minimise light spill into the water
q) Reduce the light footprint by using light distribution types that illuminate along rather than across roadways.	Road light fittings have been selected which are similar to those used around airports. These have glare control lens limiting backward and upward light spill. Roads and stockpiles have been combined to limit the total number of lights.
r) Turn lights on only when they are needed (use motion sensors).	• Office lighting will be switched off when not in use • Conveyors will have lighting that is reduced to low anti-collision levels for unoccupied times and switched to safe access levels if personnel access them at night • Long operation life LED flood lights at the jetty will be remotely controlled by the vessel captains or energised from local switches if the area is to be occupied at night.
s) Turn lights off after 2100 hours or when not needed (use timers) including search lights and deck lights at sea.	See above
t) Use long period flashing lights for navigation beacons or safety marking.	Navigation aids will be selected with a preference for long period flashing lights while complying with Department of Transport requirements.
u) Design in ground level path lighting for use when task lighting is not required on jetties and ships.	The jetty will not be accessible by foot or vehicle and does not have permanent lighting along its length. The launching ramp will not be permanently lit at night, but will have manually switched lighting for use on demand.
v) Design surfaces of structures and ground coverings to avoid reflection so light is not reflected towards beaches or upwards (to reduce glow).	Reflective materials are not generally required for the Proposal. The major piece of infrastructure in proximity to the beaches is the stockyard, which will only have minor areas which may reflect light. Given the nature of the proposed works, dust levels on most surfaces will be high, which will reduce their reflective capacity. Marine structures will generally be painted with non-reflective finishes
w) Screen interior lights with blinds, window tinting or light traps at doorways.	• Offices and administration buildings in proximity to the beaches will have blinds installed to screen interior lights. • Access (doorway) lighting will be fitted with glare control shielding to minimise upward light spill
x) Design buildings with windows and doors facing away from the beach.	Building access paths, doors and outdoor work areas will be situated on the land side of structures where possible.
y) Plan construction and maintenance activities for daylight hours only or avoid the turtle nesting season wherever possible if 24 hour operations are required.	Construction is planned to operate a day shift only, unless specialised work is approved to be undertaken at night. Operation of the Proposal is required to occur continuously
Step 2. Reduce light intensity	
a) Use the minimum number of lights required.	The lighting design philosophy is to provide minimum number of lights and light level for safe movement with task lighting only at defined work points.
b) Reduce the wattage and brightness of individual lights as low as possible; security lighting need only	As per a) above. Minimum safe movement lighting provided, and only on when movement is occurring.

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be a fraction of the light needed for detailed work.	
c) Use light emitting diodes (LEDs) for lighting wherever possible.	• LED lamps with longer wavelengths in the yellow end of the visual spectrum, have been selected • Proposed solution is long operation life LED flood lights remotely controlled by the vessel captains or energised from local switches if the area is occupied at night. • The sample station area will be illuminated using LED and fluorescent source lights.
d) Reduce directivity by avoiding intense lights or clusters of lights.	Design philosophy has eliminated intense clusters of lights.
Step 3. Select Wavelengths with appropriate spectral qualities	
a) Use long wavelength (550-700 nm, orange to red) lights wherever possible. While light responses in turtles are likely to be species specific, low pressure sodium (LPS) lights are considered more desirable than HPS sources. HPS lights are, however, a better choice than short wavelength (blue) and broad spectrum sources such as metal halide, mercury vapour, fluorescent or halogen lights.	LED lamps with longer wavelengths in the yellow end of the visual spectrum have been selected
b) Use amber filters on HPS lights if their use cannot be avoided, but remember that filtering is not as effective as avoiding light spill.	HPS lighting will not be used
c) Do not use white lights that emit ultraviolet light.	White lights that emit ultraviolet light will not be used in proximity to the beaches
d) Limit strong blue or green spectral elements (e.g. mercury vapour lights) as far as possible.	Strong blue or green spectral elements will not be used in proximity to the beaches
e) Remember that even long wavelength lights can be disruptive if there is no moon or the light source is very intense.	Noted, lighting will be limited.