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Gorgon Operations

Lighting Guideline - LNG Ships and Condensate Vessels

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1 purpose

The purpose of this document is to provide guidance to LNG ships and Condensate vessels (collectively "Vessels") on methods to minimise artificial lighting while visiting the Port of Barrow Island, Gorgon Marine Terminal (GMT) to reduce the impact to the marine environment.

The Barrow Island Port Information Manual (Barrow Island Port — Australia.chevron.com) require all Vessels entering the Port of Barrow Island to reduce lighting to the minimum required for safe operations whilst meeting their own and regulatory safety and security requirements at all times. This requirement has been mirrored in the Gorgon Project Long Term Marine Turtle Management Plan (LTMTMP) (G1-NT-PLNX0000296), approved by State and Commonwealth environmental regulators.

1.1 scope

This document applies to all Vessels, visiting the Port of Barrow Island, Gorgon Marine Terminal. Additional focus will be placed on the reduction of light spill, horizon glow and overboard lighting during peak turtle nesting and hatching season [November to February (inclusive)], where the risks associated with artificial light spill are greatest.

1.2 ecological background

Light is an important element of the marine environment. The alteration of natural light levels (duration, intensity, or wavelength) around Vessels or infrastructure commonly results in the attraction and concentration of marine fauna such as plankton, squid, fish and seabirds. This increased food availability may alter foraging behavior of seabirds and fish. This local change to the marine environment caused by artificial lights may result in a nuisance for the Vessel (increased fouling from birds) but may also have a negative impact on other species. For example, fledgling shearwaters are nocturnal and can be attracted to Vessel lighting which can result in disorientation and increased mortality.

Marine turtles are particularly sensitive to the presence of artificial light and there is potential for adult females to be deterred from nesting on these beaches. Of particular concern regarding lighting is misorientation of turtle hatchlings as they are strongly attracted to artificial light and may aggregate or become trapped in areas of light spill, exposing them to increased levels of predation.

2 lighting guidance

Specific guidance is provided within the following sections of this document on options for lighting modification and reduction. Through the implementation of the controls provided, Vessels will ensure that light spill, horizon glow, direct overboard lighting and impacts to fauna are minimised.

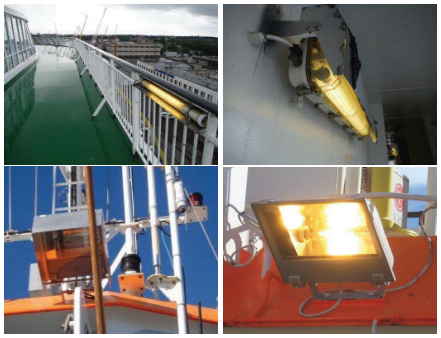
2.1 safety

Vessels shall ensure that changes made to reduce light spill and direct overboard lighting to minimum levels will not impede the ability to meet regulatory safety and security requirements.

2.2 modify lights and light fittings

Lights that are least disruptive to marine turtles should be installed, in order to minimise the impacts. These include yellow / orange lights which are long-wavelength (reduced spectrum) and low- wattage lights (i.e. colour spectrum greater than 560 nm wavelength with a Colour Rendition Index (CRI) greater than 20 Ra), or can be achieved by installing yellow / orange filters on white lights. Table 2-1 outlines recommended lighting controls.

Table 2-1: Light and light fitting controls

#	Lighting Control	Examples	Photos
1.	Replace external white lights	• External / visible lighting should appear yellow/amber/orange, this may be achieved by: ○ Replacing white or metal halide lights with: ▪ Yellow / orange Light Emitting Diodes (LED) ▪ High pressure sodium vapour lamps instead of floodlights ▪ Yellow or yellow sleeved fluorescents ○ Installing yellow / orange covers or light filters over white lights	

2.3 modify light location and direction

Light location and direction should be modified on Vessels to reduce horizon glow and overboard light spill onto surrounding waters. A number of controls are described in Table 2-2:

Table 2-2: light location and direction control

#	Lighting Control	Examples	Photos
1.	Change the direction of lights to focus onto work areas and away from the water to avoid direct artificial light spill onto water where practicable	• This may be achieved by: ○ Modifying the angle and direction of existing lights to direct lighting downward onto Vessel or work area	

2.	Shielding light fittings	• This may be achieved by: ○ Fabricating and installing light shields on those lights that cause direct overboard light spill ○ Use of gaffer tape along the edges of the light fitting to reduce spill and horizon glow (this is most relevant to fluorescent light fittings)	 

2.4 lighting reduction

Lighting reduction measures are included within Table 2-3. If lighting modifications (as presented in Tables 2-1 and 2-2) are not practicable for the Vessel, the controls listed below are likely become the primary measures to reduce horizon glow and overboard light spill.

Table 2-3: light reduction controls

#	Lighting Control	Examples	Photos
1.	Implement lighting reduction measures to keep external lighting to a minimum	• Light reduction controls include: ○ Switching off lights when not in use ○ Removing bulb/s or fuses from non-essential lights	Not Applicable
2.	Prevent light spill from portholes and windows	• This may be achieved by: ○ Installing curtains, blinds, deadlights, blanks or storm covers over portholes and windows and ensuring windows are covered between sunset and sunrise while in Port ○ Covering windows and portholes with cardboard/fabric/window film (or other suitable material) ○ Tinting windows is adequate if vision between outside and inside is required ○ Bridge lighting should be maintained as low as possible between sunset and sunrise if no modifications are made to windows	

2.5 routine night-shift vessel inspection

lighting inspection should be undertaken by Vessel crew, whilst in the Port of Barrow Island, Gorgon Marine Terminal to ensure that vessel lighting modifications and controls are implemented and are effectively minimising overboard light spill and glow. These inspections should include the verification that portholes and windows are covered each evening.

3 roles and responsibilities

The following table outlines the roles and responsibilities associated with this document.

Table 3-1: Roles Responsibilities and Competencies

Role	Responsibilities
Vessel Pilot, Marine Team, Port Superintendent,	• Ensure Vessel Master is made aware of this guideline and the requirement to minimise overboard light spill whilst in the Port of Barrow Island
Vessel Master	• Implement the controls outlined in this document to minimise overboard light spill, horizon glow and direct overboard lighting.
Vessel Crew	• Notify the Vessel Master of any identified overboard light spill. • Conduct lighting modifications, inspections, or other management measures to minimise light spill as directed by the Vessel Master
Chevron ABU HSE Specialist - Environment	• Update guideline as required to ensure alignment with the Gorgon Long Term Marine Turtle Management Plan and Barrow Island Terminal Regulations • Provide technical support to assist with the implementation of this document, as requested