

Cumulative Impact Assessment Report

APA Crib Point Pakenham Pipeline Project and AGL Gas Import
Jetty Project

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Table of Contents

Executive Summary	i
1. Introduction	1
1.1 Purpose	1
2. Project descriptions	1
2.1 Crib Point Pakenham Pipeline (Pipeline Project)	1
2.2 AGL Gas Import Jetty Project (Jetty Project)	4
2.2.1 Landside component of the Jetty Project	4
2.2.2 Floating Storage and Regasification Unit (FSRU)	4
2.2.3 Jetty Infrastructure	5
3. Assessment methodology	6
3.1 Overview	6
3.2 Stage 1 – Scoping	6
3.3 Stage 2: Assessment of potential cumulative impacts	6
4. Cumulative impact assessment exclusions	7
5. Stage 1 – Scoping	8
6. Stage 2 – Detailed assessment of potential cumulative impacts	13
6.1 Introduction	13
6.2 General overview of Crib Point	13
6.3 Operational noise	16
6.3.1 Existing noise environment	16
6.3.2 Methodology for assessing cumulative operational noise impacts	17
6.3.3 Operational noise criteria	17
6.3.4 Operational noise cumulative impact assessment	18
6.3.5 Environmental management measures	19
6.4 Landscape and visual impacts	19
6.4.1 Existing landscape and visual setting	19
6.4.2 Methodology for assessing cumulative landscape and visual impacts	20
6.4.3 Landscape cumulative impact assessment	20
6.5 Greenhouse gas	21
6.5.1 Existing greenhouse gas emissions	21
6.5.2 Methodology for assessing greenhouse gas emissions	21
6.5.3 Greenhouse gas cumulative impact assessment	22
6.5.4 Environmental management measures	22
6.6 Ecology (including potential impacts on the Western Port Ramsar site)	23
6.6.1 Existing ecological environment	23
6.6.2 Assessment methodology	23
6.6.3 Cumulative impact assessment – native vegetation	24
6.6.4 Cumulative impact assessment - Ramsar site	25
6.6.5 Environmental management measures	30
7. Conclusion	31
8. References	32

Executive Summary

This report provides an assessment of potential cumulative impacts of the proposed APA Transmission Pty Ltd (APA) Crib Point Pakenham Pipeline Project (Pipeline Project) and AGL Wholesale Gas Limited (AGL) Gas Import Jetty Project (Jetty Project). This includes an evaluation of the potential impacts of the Pipeline Project as an indirect impact of the Jetty Project and vice versa, and the potential cumulative impacts of both the Jetty Project and the Pipeline Project collectively. Potential impacts of each of the projects were assessed independently in a range of studies and reports undertaken for each project.

Cumulative impacts were defined as those where the impacts of both projects when considered together may result in increased environmental impacts when compared with the level of impact associated with each project in isolation.

Two other activities are occurring within, or in proximity to, the footprint of the Pipeline Project and the Jetty Project at Crib Point:

- Jetty Upgrade works to be undertaken by Port of Hastings Development Authority (PoHDA) to refurbish the existing Crib Point Jetty
- Flattening of high spots on the seabed to be undertaken by Victorian Regional Channels Authority (VRCA) for the operation of the Crib Point Jetty.

These two activities have not been considered within this cumulative impact assessment as they are not dependent on the Pipeline Project or the Jetty Project, are point in time activities that will not substantially overlap with the Jetty Project or the Pipeline Project and the effects from these activities have been addressed by other, separate statutory mechanisms (specifically consents under the *Coastal Management Act 1995* which have already been issued).

An initial screening assessment was undertaken to assess where the two projects, when combined, had the potential for cumulative impacts to occur. This screening included determining the spatial and temporal boundaries of the potential effects and a recommendation on whether a more detailed assessment was required to identify potential cumulative impacts.

As a result of the screening assessment, it was found that further assessment was required for the following potential cumulative impacts:

- Residential amenity, which may be impacted by project related infrastructure at Crib Point (specifically, operational noise emissions).
- Significant landscapes and natural features and key viewpoints at and around Crib Point.
- Operational greenhouse gas emissions.
- Ecological considerations, including native vegetation and the Western Port Ramsar site.

A more detailed summary of these potential impacts is set out below.

Construction related cumulative impacts are considered, in terms of space, time and intensity, to be minor. The works at the connection of the two projects at Crib Point will be largely progressive and staged independently. The overlap of construction related activities at Crib Point will be for a short time frame. Construction associated with the pipeline aspects of the Pipeline Project is linear in nature, and being remote from the Crib Point infrastructure, is not expected to result in significant cumulative construction impacts.

Operational noise

The operational noise impact assessment (AECOM 2018a) modelled the indirect and cumulative effect of proposed noise emissions from a range of operating scenarios for both projects.

The cumulative assessment found that for all combinations of scenarios, the predicted cumulative levels were compliant with the NIRV Recommended Maximum Levels. The assessment found that the cumulative levels were

slightly higher at some receivers than the levels for the Jetty Project only. However, residents surrounding the connection point of the two projects at Crib Point are unlikely to perceive the change in noise levels when the two projects start operation. As a result, the cumulative noise impacts are not likely to have a significant effect on amenity or the local community and further noise mitigation measures are not required.

Landscape and visual

The Landscape and Visual Impact Assessment (LVIA) (Ethos Urban 2018b) considered the potential impacts of the Jetty Project (including the Floating Storage and Regasification Unit (FSRU) ship, liquid natural gas (LNG) carrier and its movements and the Jetty Infrastructure), in addition to the Receiving Facility (which forms part of the Pipeline Project). The Crib Point Pakenham pipeline is predominantly located underground, and as such, no assessment of its operational landscape character or visual impact is required.

The LVIA found that there was no substantial change to the overall landscape character as a result of the cumulative landscape effects. On this basis, the cumulative impact on landscape values and at sensitive receptors overall remains of Low to Moderate significance (depending on the selected viewpoint).

Minor changes to the visual impact at key viewpoints were identified in the LVIA. However, many of the existing viewpoints have had views of the existing industrial and maritime land uses on the Crib Point headland for many years. While there is some visual impact from several viewpoints as a result of the Jetty Project and the Pipeline Project, the cumulative visual impact is considered overall to be of Low to Moderate significance of visual effects due to the longstanding presence of maritime industry at this location and its part in the existing landscape.

Greenhouse gas emissions

Greenhouse gas (GHG) emissions were assessed separately for the Jetty Project and the Pipeline Project. In combination, the two projects are expected to emit 123,348 tonnes CO₂ equivalent per annum (t CO₂-e per annum), of which 3,029 t CO₂-e per annum will be attributable to the Pipeline Project and 120,319 t CO₂-e per annum will be attributable to the Jetty Project. This is under the 200,000 t CO₂-e per annum threshold specified in the '*Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978*' (seventh edition, Department of Sustainability and Environment 2006) (the Guidelines). As such, the cumulative impacts of the projects on GHG emissions are not considered significant.

Ecology

The cumulative impact assessment considered potential impacts on two key ecological components:

- Total combined area of native vegetation to be cleared
- Cumulative impact on the character of the Western Port Ramsar site.

Monarc Environmental (2018a) and Jacobs (2018b) have assessed the respective impacts of the Pipeline Project and the Jetty Project on native vegetation including impacts on flora, fauna and ecological communities. These impacts are summarised in the respective project referrals (AGL 2018, APA 2018). The total combined extent of native vegetation clearance resulting from the Jetty Project and Pipeline Project is 8.691 ha.

The majority of native vegetation clearance will result from the Pipeline Project, comprising:

- 3.291 ha of Endangered EVCs (Swamp Scrub, Swampy Riparian Woodland and Grassy Woodland)
- 2.444 ha of Vulnerable EVCs (Damp Heathy Woodland)
- 1.098 ha of Least Concern EVCs (Heathy Woodland).
- 37 scattered trees within the construction footprint equating to an additional 1.418 ha of vegetation clearance

There is a cumulative vegetation clearance impact when the Pipeline Project is added to the Jetty Project with the Jetty Project contributing 0.44 ha of Heathy Woodland proposed to be cleared. This area of Heathy Woodland associated with the landside component of the Jetty Project has been identified as an area of regeneration less than 10 years old and its removal is considered exempt from the need for a permit under the Mornington Peninsula Planning Scheme (Jacobs 2018a).

As an indication, the overall amount of vegetation clearance from the Jetty Project and the Pipeline Project is below the Guidelines level deemed sufficiently significant for an EES referral to be required. The criteria for referral require potential clearing of 10 ha or more of native vegetation that is identified as endangered or of very high conservation significance. It is also below the combination referral criteria of potential clearing of 10 ha or more of native vegetation.

The potential cumulative impacts of the Jetty Project and the Pipeline Project on the Western Port Ramsar wetland values have been assessed against the Ecological Character Description (ECD) described in the Western Port Ramsar Wetland Ecological Character Description (KBR 2010). This ECD provides an account of the benefits and services that Ramsar wetlands provide and the critical components, processes and services that contribute to those benefits and services.

The assessment concluded that the Pipeline Project will not result in significant additive effects to the Jetty Project due to its predominantly onshore location. Most of the potential impacts on wetland values are associated with the Jetty Project and a number of specific studies have been undertaken to assess the potential impacts of this project. The Pipeline Project will not directly impinge on the waters or shoreline of Western Port, and as such, will not have an additive effect on the main potential impacts on wetland values associated with the Jetty Project.

There is minor potential for cumulative sedimentation impacts from the Pipeline Project resulting from construction activities proximal to watercourses draining into Western Port. However, these impacts would be readily manageable due to the temporary nature of the works associated with construction of the Pipeline Project, timing of the activities (i.e. during summer) and the implementation of suitable environmental controls such as horizontal directional drilling (HDD) and the establishment of sediment controls. The potential for substantial fluid loss during HDD is unlikely to occur given the depth of the HDD and the geological conditions; however suitable monitoring procedures and contingency planning will be implemented in the event of a loss of drilling mud.

Overall, based on this assessment, the Pipeline Project will not result in significant additive effects to the Jetty Project due to its predominantly onshore location.

1. Introduction

APA Transmission Pty Limited (APA) and AGL Wholesale Gas Ltd (AGL) have engaged AECOM to assess the potential cumulative and relevant indirect impacts of the proposed APA Crib Point Pakenham Pipeline Project (the Pipeline Project) and AGL Gas Import Jetty Project (the Jetty Project). A more detailed description of each of these projects is provided in **Chapter 2** and the respective project overviews are shown in **Figure 2-1** and **Figure 6-1**. The respective impacts of these projects on the environment have been assessed by technical specialists engaged by APA and AGL to support separate referrals to the Victorian Minister for Planning in accordance with the *Environment Effects Act 1978* (EE Act). This report has also been prepared in support of these separate referrals.

AGL and APA recognise the importance of ensuring that the analysis and decision-making under the EE Act for the Minister's assessments of the proposed Jetty Project and Pipeline Project is able to consider the relevant direct, indirect and cumulative impacts of the projects.

Accordingly, AGL and APA are submitting their respective referral documentation together to enable comprehensive consideration of the direct and indirect impacts of the respective projects to determine the cumulative impacts of the two projects together. This will enable a comprehensive, integrated and transparent assessment of the projects to be undertaken under the EE Act.

1.1 Purpose

The purpose of this cumulative impact assessment is to evaluate the impacts of the Pipeline Project as an indirect impact of the Jetty Project and vice versa, and the potential cumulative impacts of both the Jetty Project and the Pipeline Project collectively. The assessment of potential cumulative impacts has been prepared to assist the Victorian Minister for Planning when assessing the projects to determine whether the Pipeline Project and the Jetty Project will have an overall significant effect on the same environmental asset.

2. Project descriptions

2.1 Crib Point Pakenham Pipeline (Pipeline Project)

APA is proposing to construct and operate a high pressure gas pipeline from Crib Point to the Victorian Transmission System (VTS) east of Pakenham. The purpose of the Pipeline Project is to enable the connection to the VTS.

Once construction of the Pipeline Project is complete, the natural gas from the FSRU and AGL's Jetty Infrastructure will then be transferred to APA's Crib Point Receiving Facility. The high pressure gas pipeline will transfer the natural gas to the APA Pakenham Delivery Facility where it will be conditioned to maintain the operating parameters of the VTS before injection at a location on the Longford Dandenong Pipeline, east of Pakenham.

Construction is currently planned to commence at the Receiving and Delivering Facilities in mid-2019. The pipeline construction is planned to commence in October 2019 with the pipeline system planned to be operational by March 2020. The exact timing is dependent on a number of factors including timing of the required approvals, access agreements with relevant stakeholders and weather conditions.

The Pipeline Project consists of the following components:

- Approximately 56 km of high pressure gas transmission pipeline with a nominal diameter of 600mm, within a construction right-of-way of 30m in width and an operational easement of generally 15m in width;
- Two mainline valves (MLVs), which will be situated along the route of the pipeline and either remotely or manually operated. MLVs are provided as a means to isolate the pipeline in segments for emergency management, maintenance, repair and/or operation;

- A cathodic protection system is to be provided via a combination of cross-bonds to existing cathodic protection system and the installation of an impressed current system, on current design and subject to obtaining necessary tenure, at either of the MLVs which will be determined during detailed design. The system will be designed to use both impressed current and sacrificial anodes;
- Crib Point Receiving Facility situated at landside of the Crib Point Jetty and including metering, pigging facility, nitrogen storage and injection, odourant plant, gas analysers and a vent stack;
- Pakenham Delivery Facility situated adjacent to the Pakenham East Rail Depot, which is within land owned by Public Transport Victoria and which includes a scraper station, filtration, metering, heating, pigging facility and a vent stack; and
- An underground scraper/delivery station on the Longford Dandenong Pipeline and the Bunyip to Pakenham Pipeline (collectively referred to as the Longford Dandenong Pipeline) where the proposed pipeline connects to them. This station, which will be within the area of the permanent easement, will consist of a number of fittings that will allow for the future connection of temporary pig traps to inspect the internal lining of the pipeline during operations.

The design life of the pipeline and pipeline valves and assemblies (excluding scraper traps) is 60 years. Other station equipment, piping fixtures and instrumentation have a design life of between 10 and 40 years and will require maintenance and replacement during the pipeline design life. With ongoing integrity management, and subject to appropriate commercial drivers, the operational life of the pipeline is expected to be longer.

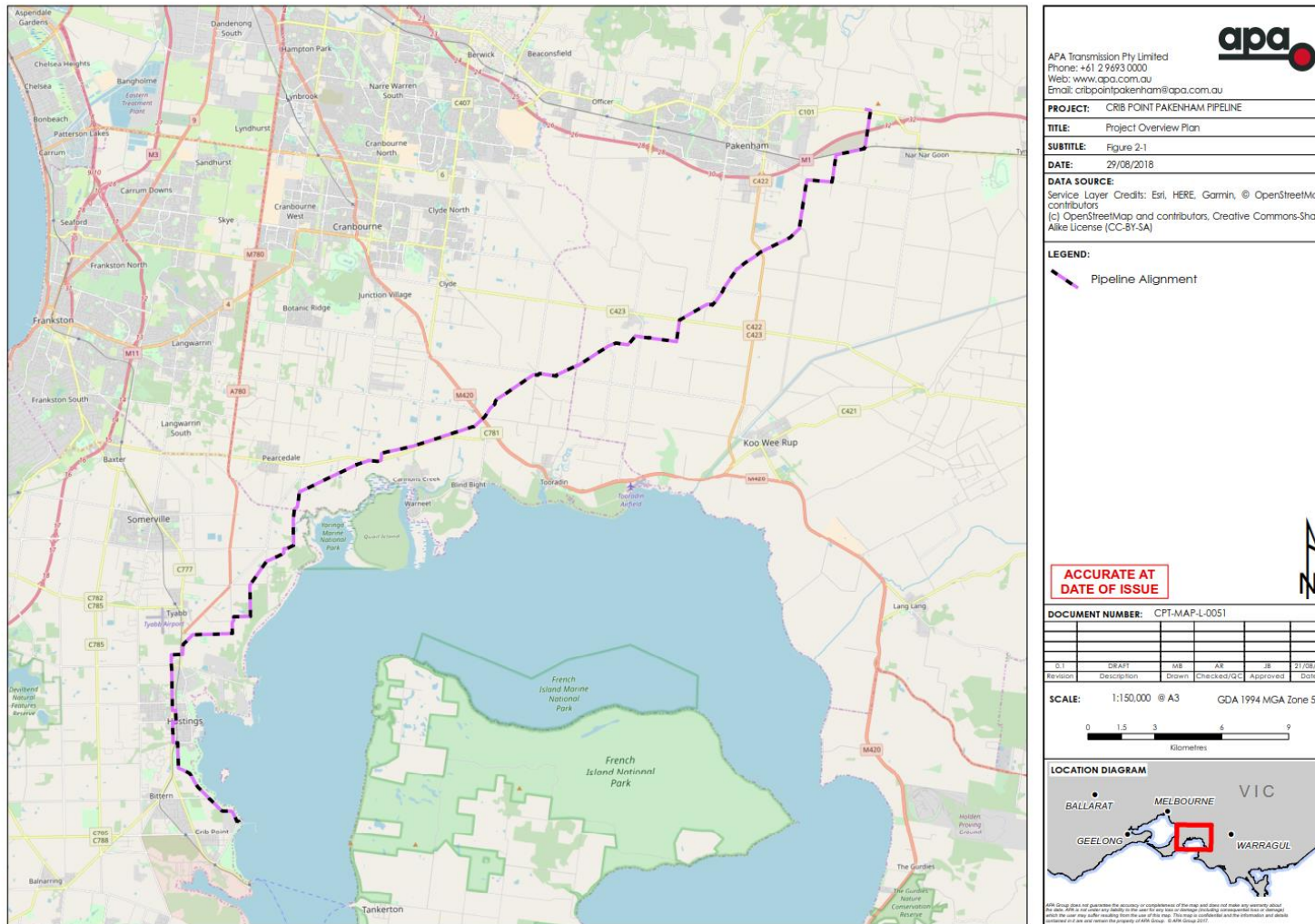


Figure 2-1 Crib Point Pakenham Pipeline (Pipeline Project) Project Overview Plan

2.2 AGL Gas Import Jetty Project (Jetty Project)

AGL is proposing to develop an LNG import facility, using a FSRU, to be located at Crib Point. The Jetty Project is shown in **Figure 6-1** and comprises:

- The continuous mooring of an FSRU at the existing Crib Point Jetty, which will receive LNG carriers of approximately 300 m in length
- The construction of ancillary topside jetty infrastructure (Jetty Infrastructure) including high pressure gas unloading arms and a high pressure gas flowline mounted to the jetty and connecting to a flange on the landside component to allow connection to the Pipeline Project

The FSRU will receive LNG from visiting LNG carriers (that will moor directly adjacent to the FSRU), store the LNG and re-gasify it as required to meet demand within the eastern Australian gas market. The project life is anticipated to be approximately 20 years. However, it may be extended pending security and stability of gas supply to south-eastern Australia (AGL 2018). Further details on the FSRU and the jetty infrastructure are provided below.

2.2.1 Landside component of the Jetty Project

The landside component of the Jetty Project ('landside component') is located within Crown Allotment 2040, Parish of Bittern (SPI: 2040\PP2159) and situated at The Esplanade, Crib Point, which is Crown land vested to the PoHDA. During construction, temporary construction laydown and vehicle parking areas will be established on the areas already cleared of vegetation within the landside component.

The permanent landside infrastructure of the Jetty Project will consist of the flange and gas flowline as part of the Jetty Infrastructure, connecting to the Pipeline Project.

2.2.2 Floating Storage and Regasification Unit (FSRU)

The Jetty Project will use a FSRU vessel continuously moored at Berth 2 of the Crib Point Jetty. LNG will be delivered to the facility by a LNG carrier double berthed directly adjacent to the FSRU.

The FSRU will store the LNG at approximately -162°C in cryogenic storage tanks. The cold temperature keeps the LNG cargo in its liquid state until it is required for the gas network. Heat is required to return the LNG to a gaseous state. The preliminary design of the FSRU includes the supply of heat from seawater, which will be drawn into the FSRU through the vessel sea chest or dedicated ports in the hull and circulated through heat exchangers. If operating at maximum capacity, a daily volume of up to $450,000\text{ m}^3$ (450 ML/day) of seawater from Western Port will be pumped at a rate of $5.2\text{ m}^3/\text{s}$ through heat exchangers in the FSRU. A daily volume of up to $450,000\text{ m}^3$ (450 ML/day) will also be returned to Western Port. However, the typical operation will require a daily volume of $300,000\text{ m}^3$ (300ML) pumped at a rate of $5.2\text{ m}^3/\text{s}$ through the heat exchangers and then returned to Western Port. The temperature drop from the seawater intake to the point of exit is estimated to be 7°C cooler than the ambient seawater temperature before mixing back to ambient temperature.

To prevent the growth of marine organisms in the heat exchange system on the FSRU, the seawater intake will be subject to an electrolysis process (electric current through seawater) to produce chlorine and hypochlorite. The seawater discharged from the FSRU heat exchange process will contain short-lived residual chlorine at a concentration of 100 parts per billion or 0.1 mg/L at the point of exit and prior to any blending or decay.

The regasification system will be capable of delivering 500 million standard cubic feet per day (mmscf/d) (a unit of measurement for gases) of "firm" gas at high reliability and up to 750mmscf/d on an "as available" basis with lower reliability. This is the equivalent to more than the current Victorian natural gas market. The daily volume of seawater up to $450,000\text{ m}^3$ (450 ML/day) is based upon regasification rates of 750mmscf/d.

Although the FSRU is subject to an ongoing procurement process, sources and amount of FSRU emissions will be similar across candidate vessels driven by the need to consume boil-off gas and supply fuel to the ship's power generation systems.

The FSRU will be leased from a third party under a time charger arrangement.

2.2.3 Jetty Infrastructure

Following consultation with the PoHDA, the pilots, the harbourmaster and the VRCA, AGL has selected Berth 2 at Crib Point as the berthing location for the FSRU (see Photo 2). Arriving LNG carriers will berth into the ebb tide facing north, with the cargo transfer occurring via the port side of the LNG carrier. LNG carriers will depart via the existing deep-water swing basin.

The infrastructure mounted on the jetty (Jetty Infrastructure) includes high pressure gas unloading arms and a high pressure gas flowline. Gas will be discharged from the FSRU and then transmitted through the gas flowline, which will connect to a flange on the landside component to allow connection to the Pipeline Project. A firefighting system will also be installed to provide cooling and safe coverage for the wharf and wharf personnel.



Photo 1: View of Crib Point Jetty from the west Photo 2: View of Crib Point Jetty from the south-east

3. Assessment methodology

3.1 Overview

This cumulative impact assessment is based on the broad requirements set out in the Guidelines for the assessment of potential cumulative impacts and recognised international literature on the carrying out of cumulative environmental impact assessments, including guidance from the International Finance Corporation¹ and the European Commission².

For the purposes of this assessment, potential cumulative impacts are assessed having regard to the definition of cumulative impacts as set out in the Guidelines:

‘... where a project, in combination with one or more other proposed projects, or existing activities in an area, may have an overall significant effect on the same environmental asset.’

Cumulative impacts can be additive (i.e. equal to the sum of the individual effects), amplified (i.e. where the total effect is more than the sum of the individual effects) or neutralising (i.e. individual effects counteract or neutralise each other).

The assessment of potential cumulative impacts has considered the potential for the Pipeline Project and the Jetty Project to have an overall significant effect on the same environmental asset. The cumulative effects of these projects are considered important to assess because in isolation, a particular impact from one project may be considered minor, but when the impact of both projects are considered, the impacts may be more substantial.

A staged assessment methodology has been used to assess potential cumulative effects from the Jetty Project and the Pipeline Project, comprising a scoping stage (Stage 1) and an assessment stage (Stage 2). The steps carried out as part of each stage are discussed in more detail in the following sections.

3.2 Stage 1 – Scoping

Stage 1 establishes the scope of the cumulative impact assessment, including identification of the potential environmental assets that may be impacted.

A screening assessment has been carried out having regard to the environmental effects identified in the project referrals for the Pipeline Project and the Jetty Project. The screening assessment consisted of the following steps, to determine whether further assessment was required:

1. Determination of the spatial and temporal boundaries of the potential environmental effects.
2. Identification of the environmental assets that may be impacted, and the potential cause(s) of these impacts.
3. Consideration of the present conditions of the environmental assets at the specified locations.
4. An assessment of the potential for cumulative environmental impacts to occur, including a determination as to whether the projects, together, may have an overall significant effect on the same environmental asset.
5. Recommendation on whether detailed assessment is required.

The screening assessment is set out in **Chapter 5** of this report.

3.3 Stage 2: Assessment of potential cumulative impacts

Following the scoping phase, an assessment of the environmental assets which may be affected by potential cumulative impacts from the Jetty Project and the Pipeline Project has been carried out. The assessment includes consideration of the potential change in the condition of the environmental asset, whether the cumulative impact is

¹ Good Practice Handbook – Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets, International Finance Corporation 2013

² Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions, European Commission 1999

likely to be additive, amplified or neutral, and a determination as to whether there is a risk of significant adverse cumulative effects, having regard to the Guidelines.

The assessment of potential cumulative impacts is informed by the separate project referrals and associated technical studies carried out for the Pipeline Project and the Jetty Project. Stage 2 also includes the identification of any relevant environmental management or mitigation measures.

4. Cumulative impact assessment exclusions

The cumulative impact assessment has focussed on the Pipeline Project and the Jetty Project. Two other activities are occurring within, or in proximity to, the footprint of the Pipeline Project and the Jetty Project at Crib Point. These activities comprise:

- *Upgrade works to the Crib Point Jetty:* These works include the refurbishment of the existing Crib Point Jetty and construction of new mooring and berthing dolphins to provide an upgraded berth for shipping. The works will be undertaken by PoHDA. The jetty upgrade will proceed irrespective of the Jetty Project and the Pipeline Project. Consent pursuant to the *Coastal Management Act 1995* has been issued to PoHDA for this work.
- *Flattening of high spot on the seabed:* The movement of vessels of various sizes through Western Port has resulted in the creation of a high spot on the seabed in the vicinity of the southern end of the existing Berth 2 wharf infrastructure. VRCA, as part of its routine maintenance activities for maintaining operation of the jetty, will be flattening the high spot. Consent pursuant to the *Coastal Management Act 1995* has been issued to VRCA for this work.

These two activities have not been considered within the cumulative impact assessment for the following reasons:

- They are not dependent on the Pipeline Project or the Jetty Project.
- They are 'point in time' activities and in being implemented will occur prior to the commencement of the Jetty Project or the Pipeline Project. Impacts will primarily be confined to the period during which the works are being carried out and will be short-term and separated in time from impacts associated with the Jetty Project and the Pipeline Project. Activity specific management measures will manage potential impacts.
- The effects of the jetty upgrade and flattening of the high spot on the seabed have been addressed by other, separate statutory mechanisms (specifically consents under the *Coastal Management Act 1995* which have already been issued).
- Residual cumulative effects are unlikely to be significant enough to affect the acceptability of the Pipeline Project or the Jetty Project.

5. Stage 1 – Scoping

The following table summarises the screening process undertaken as part of scoping to identify the environmental assets that could be subject to a potential cumulative impact as a result of the Pipeline Project and the Jetty Project. The screening assessment has been carried out in accordance with the Guidelines, and inputs from the Pipeline Project and the Jetty Project technical assessments were used as the source documents. Where a possible cumulative impact was identified, further detailed assessment has been carried out (see **Chapter 6**).

The screening assessment identified that the following environmental assets required further assessment to determine whether an overall significant cumulative effect on that environmental asset will occur as a result of the two projects under consideration:

- Residential amenity, which may be impacted by infrastructure related to both projects at Crib Point (specifically, operational noise emissions).
- Landscapes and natural features and key viewpoints at and around Crib Point.
- Operational GHG emissions.
- Ecological considerations, including native vegetation and the Western Port Ramsar site.

The screening assessment identified geographic areas where potential cumulative impacts will be most likely to occur. Cumulative impacts on the environmental assets listed above were identified as being likely to occur predominantly at the connection point of the Pipeline Project and the Jetty Project at Crib Point. This is primarily due to the two projects being immediately adjacent to each other at this location and operating concurrently, and therefore having the potential to impact on the same environmental assets.

Table 5-1 Cumulative impact screening assessment

Environmental asset	Key assessment results		Project phase of key impact(s)	Location of impact(s)	Likely to result in a significant cumulative impact?	Reference to detailed cumulative impact assessment (where required)
	Pipeline Project	Jetty Project				
Aboriginal heritage	Areas of Aboriginal cultural heritage sensitivity are present within the Pipeline Project footprint and two Cultural Heritage Management Plans are being prepared. Impacts will be avoided and / or acceptably managed through this process.	Project partially located within an area of cultural heritage sensitivity (the defined boundary of the Western Port Ramsar Wetland, defined in the Aboriginal Heritage Regulations 2007), however the works do not constitute a high impact activity and will occur on land which has been subject to significant ground disturbance. There is low potential for unknown Aboriginal cultural heritage to be impacted by the Jetty Project within the landside component.	Construction	Pipeline route	No – Impacts on areas of Aboriginal heritage sensitivity along the pipeline route will be managed via two CHMPs.	Not applicable
Air quality (note: emissions relating to GHG considered in separate section of this screening assessment)	Main source of air emissions from the Pipeline Project will be during construction and impacts can be readily managed through implementation of a Construction Environmental Management Plan (CEMP).	Low risk of air quality impacts during construction as the existing surrounds are an operational port (i.e. not sensitive) and impacts can be managed through a CEMP. Air quality modelling was completed for operation and found a low risk of air quality impact on on-shore sensitive receptors. The Environment Protection Authority Victoria (EPA) has confirmed an EPA Works Approval and EPA Licence are required and operational air quality for the Jetty Project will be regulated through these processes.	Construction and operation	Crib Point, pipeline route	No – neither project is expected to generate significant air emissions and those generated during construction can be managed through measures identified in a CEMP	Not applicable
Contaminated land	Acid sulfate soils were identified in two locations near Crib Point, however this is considered manageable through the implementation of a CEMP. The Pipeline project does not involve activities or infrastructure that could result in land contamination. However, a desktop study and targeted intrusive soil contamination investigations suggest the potential for some localised contamination based on past uses and use of fill material. Any such contamination will be pre-existing and require management such as disposal to licenced landfills.	Some contaminated soil, sediment and groundwater within landside project footprint, however minimal disturbance of soils is anticipated and can be managed through a CEMP. No effect on acid sulfate soils. Groundwater unlikely to be encountered.	Construction	Crib Point, pipeline route	No – no cumulative impacts are generated. Management of pre-existing contaminated soils may be required. Interactions with acid sulfate soil and/or contaminated soil are not expected to be significant and can be managed through measures identified in a CEMP	Not applicable
Noise	Noise modelling predicted that the operations will comply with the recommended noise levels for all time periods (day, evening and night).	Noise modelling predicted that the operations will comply with the recommended noise levels for all time periods (day, evening and night).	Operation	Crib Point	Possible – further assessment of the cumulative impact required.	Undertake a cumulative noise impact assessment to understand the impact when both projects are operating. See section 6.3 .
Flora, fauna and ecological communities (terrestrial and marine)	Potential impacts on Western Port Ramsar site. Potential presence of EPBC listed	Potential impacts on Western Port Ramsar site. Potential presence of EPBC listed	Construction and operation	Crib Point, Western Port, pipeline route	Possible – further assessment of the cumulative impact may be required, specifically:	Cumulative assessment of total area of native vegetation to be removed. Cumulative assessment of potential

Environmental asset	Key assessment results		Project phase of key impact(s)	Location of impact(s)	Likely to result in a significant cumulative impact?	Reference to detailed cumulative impact assessment (where required)
	species and communities. Will require removal of 8.2 ha of native vegetation (endangered, vulnerable and least concern) and 37 scattered trees. Potential impact on at least six FFG listed species and communities.	species and communities. Will require removal of 0.44 ha of native vegetation (least concern) within landside footprint. Potential impact on three FFG listed species.			<p>The combined total of native vegetation removal may exceed the Guidelines' referral criteria of 10 ha</p> <p>Potential combined impacts on the ecological character of the Western Port Ramsar site.</p> <p>The assessment of potential ecological cumulative impacts includes consideration of potential cumulative impacts on matters of National Environmental Significance. Referrals to the Commonwealth Department of Environment in accordance with the EPBC Act have / will be made for the Jetty Project and Pipeline Project by AGL and APA respectively.</p> <p>One FFG listed species – Australian Grayling – was identified as being potentially affected by both projects (specifically, the Pipeline Project and the landside component of the Jetty Project). However use of horizontal drilling will mean that impacts on Australian Grayling habitat will be avoided by the Pipeline Project and therefore no potential cumulative impacts on FFG species, communities or habitats have been identified as requiring further assessment.</p>	impacts on the Western Port Ramsar site. See section 6.6 .
Historic heritage	There are a number of historic heritage sites within or adjacent to the Pipeline Project footprint, however most were assessed as not likely to be impacted by the proposed works, including the Former BP Refinery Administration Building (VHR H1016).	Historic heritage site located opposite project site (Former BP Refinery Administration Building, VHR H1016) with potential for indirect impact identified (e. g vibration, dust) but considered manageable through a CEMP.	Construction	Crib Point, pipeline route	No – no direct impacts on historic heritage are anticipated by either project. Potential indirect impacts around the nearby BP Refinery Administration Building site may occur during construction (primarily associated with potential vibration and/or dust impacts) however these will be relatively short-lived and able to be adequately managed through the implementation of the project specific CEMPs.	Not applicable
Hydrology	The pipeline route crosses eight main watercourses and 58 unnamed channels / drains / waterways. The construction methodology for the crossing of the waterways will be designed to minimise impacts to each waterway.	Regional groundwater resources will not be affected. No waterways in the vicinity of the project site.	Construction	Crib Point, pipeline route	No – significant cumulative impacts on waterways or groundwater are not expected for either project. No impact on hydrology at the connection point of the Pipeline Project and the Jetty Project at Crib Point is expected from either project.	Not applicable
Social impact	Construction of the Pipeline Project likely to generate some temporary impacts on amenity of residents including dust, noise and visual	Construction of the Jetty Project likely to generate some temporary impacts on amenity of residents including dust, noise and visual changes. These	Construction and operation	Crib Point, pipeline route	No – significant cumulative amenity impacts are not expected. Also refer to air quality, noise and landscape and visual sections of this screening table.	Not applicable

Environmental asset	Key assessment results	Project phase of key impact(s)	Location of impact(s)	Likely to result in a significant cumulative impact?	Reference to detailed cumulative impact assessment (where required)	
	<p>changes. These impacts are addressed in separate sections of this screening table and will be relatively short-lived and localised to where construction is occurring.</p> <p>No additional potential significant effects considered likely on amenity of residents during construction or operation.</p>				No additional potential significant effects considered likely on amenity of residents during construction or operation.	
Landscape and visual impact	<p>There will be temporary visual changes along the pipeline route during construction, but these are not expected to be major and during operation of the pipeline there are not expected to be visual impacts. The significance of the impact of the operation of the receiving facility on sensitive landscape receptors was assessed as Low to Moderate. The significance of the impact of the operation of the receiving facility on sensitive visual impact receptors was assessed at Moderate.</p>	<p>Impact on landscape receptors is considered to be of Low to Moderate significance.</p> <p>Impact on majority of visual receptors is considered to be of Low significance. The maritime infrastructure already installed at Crib Point provides an existing context for the further development of appropriate and consistent maritime uses.</p>	Operation	Crib Point, Western Port, pipeline route	<p>Possible – further assessment required</p> <p>In combination the two projects may increase the impacts on sensitive landscape and / or visual impact receptors in Crib Point and surrounding location.</p>	See section 6.4 .
Greenhouse gas	Operational activities will emit between 2,500 and 3,030 tonnes of CO ₂ equivalent per annum.	Operational worst case will emit 120,319 tonnes of CO ₂ equivalent per annum will be generated	Operation	Crib Point (for Scope 1 emissions) Offsite (for Scope 2 and 3 emissions)	Possible – further assessment required Combined GHG emissions from both projects will not exceed the Guidelines referral criteria of 200,000 tonnes of CO ₂ equivalent per annum.	Assess combined GHG emissions from the Jetty Project and the Pipeline Project. See section 6.5 .
Water quality and ecological characteristics of Western Port	<p>The Pipeline project does not generate any direct water quality impacts on Western Port as there are no abstractions or discharges to the waters of Western Port. As such, the project does not create any cumulative impact on those assessed for the Jetty Project.</p> <p>Shore based construction activities at Crib Point could create sediment flows into Western Port if not adequately managed. Pipeline works at some stream crossings could result in sediments entering Western Port, though the risk will be adequately managed by implementation of CEMP requirements.</p>	<p>Construction works will not cause physical disturbance to Western Port as Project activities will occur on the FSRU, topside of the existing jetty and within the landside component (which is outside the boundary of the Ramsar site). Potential for indirect impact but considered manageable through a CEMP.</p> <p>Operationally, there will be no substantial and measurable change to the water quality of Western Port. The determined water quality effects associated with the water discharge from the FSRU (i.e. residual chlorine levels and reduced water temperature) are predicted to occur only within a small area (restricted to an area approximately 200 m north and south and 60 m east and west), with background levels achieved outside of this area of initial mixing. Entrainment may affect planktonic populations within North Arm to an area of approximately 1 km north and south and approximately 250 m either side (east</p>	Construction and operation	Western Port, North Arm	Possible - potential for sedimentation from construction activities associated with the Jetty Project and Pipeline Project to enter Western Port and impact on Ramsar values.	Assess potential cumulative effects of sedimentation from construction activities impacting on Western Port Ramsar values. See section 6.6 .

Environmental asset	Key assessment results	Project phase of key impact(s)	Location of impact(s)	Likely to result in a significant cumulative impact?	Reference to detailed cumulative impact assessment (where required)
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and west) of the FSRU, however entrainment was predicted to be less than 1 percent over the whole of North Arm

6. Stage 2 – Detailed assessment of potential cumulative impacts

6.1 Introduction

This section sets out the detailed assessment of potential cumulative impacts on the environmental assets identified in the screening assessment in **Chapter 5**, comprising:

- Residential amenity, which may be impacted by infrastructure related to both projects at Crib Point (specifically, operational noise emissions)
- Landscapes and natural features and key viewpoints at and around Crib Point
- Operational GHG emissions
- Ecological considerations, including native vegetation and the Western Port Ramsar site.

With the exception of ecological considerations, these potential cumulative impacts will be focused on the geographic connection of the two projects at Crib Point. A general description of the existing environment at Crib Point is therefore provided in the following section. A concept plan showing the Jetty Project and the Crib Point Receiving Facility component of the Pipeline Project is shown in **Figure 6-1**. Environmental management measures (where required) are also identified to manage potential cumulative impacts on the aforementioned environmental assets.

6.2 General overview of Crib Point

The Crib Point Jetty is located at Crib Point within the Port of Hastings on the Mornington Peninsula. The land is Crown land and is leased to the PoHDA. The area around the landside component of the Jetty Project was originally cleared for the BP Refinery and associated jetty from 1964-1965. Pipelines and a number of associated support buildings are present on and adjacent to the Crib Point Jetty. The site is a working industrial site, reflected in the Port Zone that has been applied to the land under the Mornington Peninsula Planning Scheme.

Key urban centres on the coastline of Western Port and in the vicinity of the projects include the township of Crib Point (approximately 1.5 km east from the landside component), the township of Bittern (approximately 3.7 km north-east from the landside component) and the township of Hastings (approximately 4 km north from the landside component). Industrial activities have occurred in the vicinity of the landside component and the Crib Point Jetty for more than 50 years, including petroleum refining and storage as well as gas and steel processing facilities.

The Crib Point Jetty currently has two mooring berths. Berth 1 is owned by PoHDA and is used by United Petroleum to transfer liquid fuel via a flexible hose and pipeline along the jetty that is connected by a buried pipeline to its onshore storage facility located near Hastings. Berth 2 is currently vacant.

The public land to the north is used as a park which runs along the coastline to the north and is heavily vegetated. There are walking tracks leading to the coast from The Esplanade in this area, including to a maritime viewing deck overlooking a submarine moored nearby. There are five houses approximately 600 m north of the landside component. The next nearest residential development is located approximately 1 km to the south-west of the landside component

Land to the west of the jetty is occupied by the Victorian Maritime Centre which is housed in the former BP Refinery Administration Building. Land further west contains the decommissioned BP oil refinery. Some tanks remain on the site. Woolleys Beach Reserve is located to the south of the jetty and contains BBQ and picnic facilities and a boardwalk (AGL 2018).

The Jetty Project and Pipeline Project referral documents (AGL 2018 and APA 2018) identify the key environmental assets/sensitivities around the landside component as including:

- The existing jetty is situated within the defined boundary of the Western Port Ramsar site of international significance.

- The landside component contains areas of native vegetation covering approximately 2 hectares (in total) and comprises native Heathy Woodland and scattered native trees.
- The five houses located approximately 600 m north of the northern extent of the landside component.
- Adjacent land immediately north of the landside component, which is heavily vegetated.
- Woolleys Beach Reserve to the south of the landside component which is vegetated in part.

The presence and proximity of these assets has informed the assessment of potential cumulative impacts.

Within the vicinity of the landside component, the Former BP Refinery Administration Building is listed on the Victorian Heritage Register (VHR), the Schedule to the Heritage Overlay of the Mornington Peninsula Planning Scheme, and the Register of the National Estate (RNE).

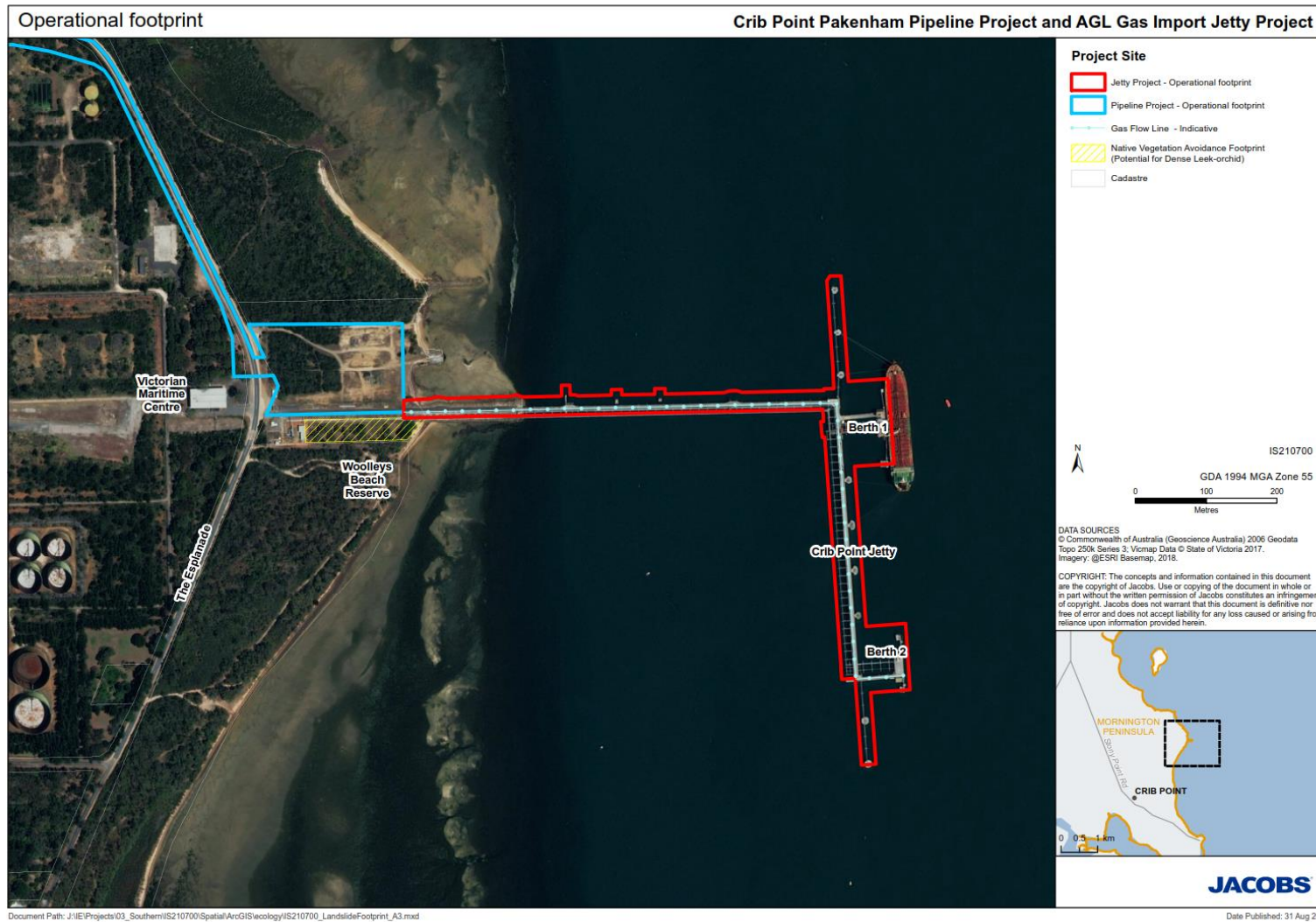


Figure 6-1 Operational footprint of the Jetty Project and the Pipeline Project at Crib Point, Victoria

6.3 Operational noise

AECOM (2018a) completed an acoustic assessment of the Pipeline Project to consider the operational noise emissions from surface infrastructure at the Crib Point Receiving Facility and the Pakenham Delivery Facility. Jacobs (2018c) completed an acoustic assessment of the Jetty Project to consider operational noise emissions from mooring and regasification activities during operation.

In accordance with the findings set out in **Table 5-1** of this assessment, there is potential for cumulative operational noise impacts on residential amenity from the concurrent operation of the Crib Point Receiving Facility component of the Pipeline Project and the Jetty Project.

The AECOM acoustic assessment (2018a) therefore included a cumulative operational noise assessment at Crib Point, where the predicted noise levels for Crib Point Receiving Facility scenarios (part of the Pipeline Project) were added to the predicted noise levels for the Jetty Project. The Jetty Project noise levels were obtained from Jacobs (2018c).

6.3.1 Existing noise environment

Environmental noise monitoring around Crib Point was undertaken by Jacobs (2018c) in September and November 2017 and was adopted by AECOM (2018a) as the background noise levels for the two projects. Jacobs undertook noise monitoring at four locations in Crib Point and at three locations at French Island. **Table 6-1** provides a summary of the noise monitoring results at Crib Point. Maps showing the noise monitoring locations are included in Appendix A of the AECOM acoustic assessment (AECOM 2018a).

Table 6-1 Crib Point - Background noise monitoring results

Monitoring location	Day	Evening	Night
32 Lorimer Street, Crib Point (Note 1)	39 dB(A) L ₉₀	32 dB(A) L ₉₀	31 dB(A) L ₉₀
43 Disney Street, Crib Point	43 dB(A) L ₉₀	36 dB(A) L ₉₀	35 dB(A) L ₉₀
103 The Esplanade, Crib Point (Note 2)	42 dB(A) L ₉₀	33 dB(A) L ₉₀	40 dB(A) L ₉₀
123 The Esplanade, Crib Point (Note 3)	37 dB(A) L ₉₀	36 dB(A) L ₉₀	32 dB(A) L ₉₀
French Island Logger Location 1 (Note 4, 5)	34 dB(A) L ₉₀	33 dB(A) L ₉₀	30 dB(A) L ₉₀
French Island Logger Location 2 (Note 4, 5)	34 dB(A) L ₉₀	32 dB(A) L ₉₀	29 dB(A) L ₉₀
French Island Logger Location 3 (Note 4, 5)	34 dB(A) L ₉₀	32 dB(A) L ₉₀	29 dB(A) L ₉₀

Source: AECOM, 2018a

Notes:

- 2.5 dB was removed from the measured data as the logger was within 2 m of a façade.
- At 103 The Esplanade, there was a significant noise source occurring every Evening from approximately 6.15pm which then decayed until approximately 2am. The nature of the noise leads us to believe that it is due to fauna, (e.g. bats), which could be seasonal. For this reason, data between 6.15pm and 2am has been removed from the assessment.
- At 123 The Esplanade, noise data was removed from the assessment due to wind, rain and industrial noise sources.
- There are no residential addresses on French Island; therefore these locations are in reference to the locations shown in Figure 2.2 (Jacobs, 2018c).
- At the French Island locations, noise data was removed from the assessment due to wildlife, outboard motors and weather (rain and thunder).

6.3.2 Methodology for assessing cumulative operational noise impacts

AECOM's methodology for assessment of the Crib Point Receiving Facility operational noise impacts was developed to maintain consistency with the assumptions applied by Jacobs (2018c) for the adjoining Jetty Project (where applicable) to allow for a cumulative assessment to be carried out. This included implementation of the same calculation method and noise model inputs for both projects.

Noise emissions were predicted using SoundPLAN version 7.4 environmental noise modelling software and the implementation of ISO 9613-2: 1996 '*Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*'. ISO 9613-2 describes a method for calculating the attenuation of sound from industrial sources and is used to predict noise levels at noise-sensitive receptors. ISO 9613-2 assumes downwind propagation from the sound source to the receiver.

The noise level at each noise sensitive receiver was predicted near the building façade or in an area immediately adjacent to the most affected side of a sensitive building at a height of 1.5 metres above the ground.

A detailed description of the assessment methodology for the Crib Point Receiving Facility, including the noise model inputs, is provided in Chapter 5 of the AECOM acoustic assessment (AECOM 2018a).

(1) Noise modelling scenarios

Crib Point Receiving Facility (part of the Pipeline Project)

For the purposes of the cumulative noise impact assessment, it was assumed that the Crib Point Receiving Facility will alternate between the following modes of operation:

- *Nitrogen offloading*: Offloading of nitrogen trucks to replenish the onsite nitrogen storage tanks
- *Nitrogen injection*: Injection of nitrogen into the gas pipeline

The Crib Point Receiving Facility has proposed times of operation spanning 24 hours per day, 7 days per week. However, some site operations will only occur during the Day time period. Therefore, the following scenarios have been modelled:

1A Nitrogen offloading – Night time operation

1B Nitrogen offloading – Day time operation

2A Nitrogen Injection – Night time operation

2B Nitrogen Injection – Day time operation

An assessment of the Evening operation has not been undertaken as the equipment operating during the Evening and Night are assumed to be the same. The Night time noise criteria are more stringent than the Evening noise criteria. Therefore, any mitigation required to achieve compliance with the Night time operation criteria will also be able to achieve compliance during the Evening.

Jetty Project

The scenarios modelled by Jacobs (2018c) for the Jetty Project are:

- Scenario 1: Mooring activities
- Scenario 2: Regasification

The Jetty Project modelled scenarios were assumed not to change between Day, Evening and Night time periods.

The noise impact assessment prepared for the Jetty Project and the Pipeline Project (AECOM 2018a) determined the noise requirements for operation of the both projects were in accordance with *Noise from Industry in Regional Victoria* (EPA Publication 1411) (NIRV).

6.3.3 Operational noise criteria

The following environmental noise policies and guidelines have been considered in the assessment of operational noise from Crib Point Receiving Facility:

- EPA Publication 1411: *Guideline Noise from Industry in Regional Victoria* (NIRV) which is a guideline that applies to noise from commerce, industry and trade premises in regional Victoria.
- EPA Publication S31: *State Environmental Noise Policy (Noise from Industry, Commerce and Trade) No. N-1* (SEPP N-1) which is a statutory policy that applies to noise from commerce, industry and trade premises in the Melbourne Metropolitan area.

A detailed description of the application of the aforementioned noise policies and guidelines is provided in section 4.1 of the AECOM acoustic assessment (AECOM 2018a).

The proposed Crib Point Receiving Facility is outside the boundary defined by the EPA for which SEPP N-1 applies but is within a Major Urban Boundary. Therefore, NIRV is the governing guideline but SEPP N-1 procedures have been applied to derive the recommended noise levels.

Recommended Noise Levels have been derived by Jacobs (2018c) for the Jetty Project. The same criteria have been adopted for both projects. Recommended Noise Levels are presented in **Table 6-2**.

Table 6-2 Crib Point – Recommended Noise Levels

Noise-Sensitive Receiver	SEPP N-1 Recommended Maximum Levels (LAeq,30min)		
	Day	Evening	Night
32 Lorimer Street, Crib Point	51 dB(A)	43 dB(A)	40 dB(A)
43 Disney Street, Crib Point	58 dB(A)	49 dB(A)	46 dB(A)
103 The Esplanade, Crib Point	52 dB(A)	43 dB(A) ^(Note 1)	43 dB(A)
123 The Esplanade, Crib Point	52 dB(A)	47 dB(A)	43 dB(A)
132 The Esplanade, Crib Point	54 dB(A)	45 dB(A)	42 dB(A)
French Island Residential Locations ^(Note 2)	45 dB(A)	37 dB(A)	34 dB(A)

Notes:

1. The Recommended Noise Level at this location is based on a limited amount of data due to “noise events” polluting the measurements. Consequently, this value may be overly conservative as usually the Evening Recommended Noise Level will be higher than the Night Recommended Noise Level.
2. The Recommended Noise Levels for French Island are based on the minimum background noise levels measured.

6.3.4 Operational noise cumulative impact assessment

As set out in section 5.1 and section 5.2 of the AECOM acoustic assessment (AECOM 2018a), the predicted noise levels for the Crib Point Receiving Facility and the Jetty Project all complied with the NIRV Recommended Maximum Levels when assessed separately. The purpose of the cumulative assessment is therefore to determine whether the projects will still comply when assessed cumulatively, where the predicted noise levels for all Crib Point Receiving Facility scenarios are added with the predicted noise levels for all Jetty Project scenarios.

Table A-1 to **Table A-4** in Appendix A present the predicted levels for each Crib Point Receiving Facility and Jetty Project scenario separately as well as the cumulative levels when the scenarios are combined. Grey shading in the tables indicates no change in predicted noise level compared to the Jetty Project scenarios; yellow shading indicates a small change in predicted level (up to 3 dB) in comparison to the Jetty Project scenarios.

The cumulative assessment found that the cumulative levels were slightly higher at some receivers than the levels for the Jetty Project only. However, for all combinations of scenarios, the predicted cumulative levels were compliant with the NIRV Recommended Maximum Levels and no noise mitigation measures are required.

(1) United Petroleum fuel facility

The Receiving Facility (part of the Pipeline Project) and Jetty Project are located near the existing United Petroleum fuel facility on Berth 1 of Crib Point Jetty (see **Figure 6-1**). The operational noise emissions from the United Petroleum facility are not known. However, the United Petroleum facility is required to comply with EPA Guidelines for operational noise emissions and for the purpose of this assessment it was assumed United are operating at the threshold limits. As the predicted cumulative levels from the Crib Point Receiving Facility and Gas Import Jetty demonstrate a considerable compliance margin with the NIRV Recommended Maximum Levels, it is expected that the combined noise from all three projects will also comply.

6.3.5 Environmental management measures

The predicted cumulative noise levels are compliant with the NIRV Recommended Maximum Levels and therefore no noise mitigation measures are required. To manage the risk of an unacceptable outcome at nearby residents as a result of the concurrent operation of the Crib Point Receiving Facility, the Jetty Project and the United Petroleum fuel facility, it is recommended that more information about the operation at the United Petroleum facility is obtained during detailed design to confirm the assumptions set out in the acoustic assessment (AECOM 2018a).

6.4 Landscape and visual impacts

6.4.1 Existing landscape and visual setting

The Crib Point Jetty is not identified as having regional or State significance landscape values (AGL 2018). The Landscape and Visual Impact Assessment (LVIA) prepared for the Jetty Project (Ethos Urban 2018a) reports on the Coastal Spaces Landscape Assessment Study (Planisphere, 2006) which assesses the landscape character and significance of Victorian coastal areas. The Jetty Project referral (AGL 2018) states that while the Coastal Spaces Landscape Assessment Study excludes the Crib Point area, the eastern coastline of Western Port is defined as the 'Western Port Lowlands Character Area' and is 'likely to extend around Western Port outside the Jetty Project site for some distance north and west'.

A LVIA was completed for the Crib Point Receiving Facility component of the Pipeline Project by Ethos Urban in August 2018 (Ethos Urban, 2018b). According to Ethos Urban, the Western Port Lowlands Character Area is valued for visual qualities including:

- Perceived naturalistic quality of the varied coastal edge, in particular the mangroves, salt marshes and beach.
- Waterbody of Western Port (key landscape feature).
- Remnant stands of woodland vegetation.
- Native fauna, in particular birdlife.
- Maritime association of limited development along the coast.
- Passive recreation uses at locations with access to wetlands and wider Western Port.

The Ethos Urban (2018b) study identifies the overall Western Port Lowlands Character Area as being of High landscape sensitivity but notes that this sensitivity rating reduces to Low in the vicinity of the Crib Point site due to the former industrial use and existing presence of Maritime Industry in the area.

In the immediate context of the landside component, the landscape character is represented by a juxtaposition of the undeveloped and naturalistic qualities of the wetland and foreshore reserves and the maritime industrial development located on points and headlands. North-south views along these headland points contribute to a greater sense of development along the coastline than is actually present. In contrast, the embayments and inlets of the interstitial foreshore reserves focus views within and across Western Port beyond, creating a sense of an undeveloped coastline.

Development that will cause likely changes to the landscape include coastal development beyond existing settlements, new structures along undeveloped stretches of foreshore, and development that is not visually integrated with the landscape and responsive to the landscape character. While the landscape is relatively flat, the

stands of remnant vegetation in areas along the coast provide an opportunity to screen development. In addition, the landscape that will be potentially impacted by the proposed development at Crib Point has a Moderate susceptibility to change.

6.4.2 Methodology for assessing cumulative landscape and visual impacts

The LVIAs prepared to support the referrals for the respective projects have been used to determine potential cumulative impacts on significant landscapes and natural features and key viewpoints around Crib Point (Ethos Urban 2018a, Ethos Urban 2018b). Five key viewpoints were selected from the wider number of viewpoints evaluated in order to assess the impact on the most sensitive receptors and to be representative of the overall potential visual impacts. Cumulative visual impacts were assessed at the five key viewpoints which included residential uses, a lookout, the Maritime Museum and recreational / tourist land uses.

The qualitative assessment also included consideration of potential landscape and visual impacts on nearby sensitive land uses such as residences (receptors) and uses of public open space, where views to the project elements at Crib Point associated with each project will be visible.

The LVIA prepared by Ethos Urban in August 2018 identifies sensitive landscape receptors and visually sensitive receptors in the context of the Crib Point Jetty, onshore land adjacent to the jetty and a broader area. The cumulative landscape effects were identified from expected changes to significant elements or features of the landscape (Ethos Urban, 2018b).

6.4.3 Landscape cumulative impact assessment

The LVIA prepared by Ethos Urban (2018b) considered the potential impacts of the Jetty Project (including the FSRU ship, LNG carrier and its movements) and the Receiving Facility (which forms part of the Pipeline Project). The remainder of the Pipeline Project is predominantly located underground, and as such, no assessment of its operational visual impact is required.

The LVIA (Ethos Urban 2018b) found that there was no substantial change to the overall landscape character expected to be produced as a result of the cumulative landscape effects. On this basis, the cumulative impact on landscape values and at sensitive receptors overall remains of Low to Moderate significance (depending on the selected viewpoint).

The LVIA (Ethos Urban 2018b) concluded that the Jetty Project and Pipeline Project will also contribute to the presence of maritime industry in the area and positively impact this landscape receptor. The cumulative effects of the Jetty Project and the Pipeline Project continue to represent an ongoing change, but one that is able to be reversed and of moderate scale to a restricted area. As such, potential visual impacts are considered Low for the marine industrial area.

At three of the five key viewpoints, cumulative visual effects were considered to be similar to those resulting from the standalone Receiving Facility. Two viewpoints possess key vistas of the ocean which will be disrupted as a result of the proposed FSRU boat and LNG carriers (part of the Jetty Project). These views represent the most substantial scale of change and the cumulative effect increases the visual impacts at these viewpoints to some degree. **Table 6-3** below summarises the findings of the cumulative impact assessment on the key viewpoints.

Table 6-3 Summary of cumulative visual impact assessment on key viewpoints

Viewpoint	Visual Sensitivity	Significance of Visual Effect (Receiving Facility)	Cumulative Significance of Visual Effect
5 Jacks Beach			
5(b) Residential Uses	Medium	Low	Low
6 Victorian Maritime Museum			
6(a) Submarine Lookout	Medium	Low	Moderate
6(b) Maritime Museum	Medium	Moderate	Moderate
7 Woolley's Beach			
7(a) Foreshore North	Medium – High	Low – Moderate	Moderate – High
9 French Island			
9(b) The Pinnacles	Medium – High	Moderate	Moderate

Source: Ethos Urban 2018b

Many of the existing viewpoints have had views of the existing industrial and maritime land uses on the Crib Point headland for many years. While there is some visual impact from several viewpoints as a result of the two proposed projects, the cumulative visual impact is considered overall to be of Low to Moderate significance due to the longstanding presence of maritime industry at this location and its part in the existing landscape.

6.5 Greenhouse gas

6.5.1 Existing greenhouse gas emissions

GHG emissions from the current operations of the existing jetty infrastructure have not been assessed as part of this assessment because the GHG emissions will be minimal based on the type of activities being conducted.

6.5.2 Methodology for assessing greenhouse gas emissions

The findings of the GHG emissions assessments (AECOM 2018b and Jacobs 2018a) prepared to support the referrals for the respective projects have been used to determine a cumulative GHG emissions scenario for the projects.

AECOM (2018b) prepared a GHG assessment for the Pipeline Project and defined three potential scenarios for assessment:

Scenario 1

- 40 cargos of LNG per annum will be processed by AGL's FSRU
- Up to 6 out of the 40 cargos will be composed of rich LNG
- Nitrogen will be supplied via a 3rd party and delivered to site via road-freight from Dandenong and stored in an onsite tank facility
- Odorant plant operational.

Scenario 2

- 40 cargos of LNG per annum will be processed by AGL's FSRU
- Up to 4 out of the 40 cargos will be composed of rich LNG
- Nitrogen will be supplied via a 3rd party and delivered to site via road-freight from Dandenong and stored in an onsite tank facility
- Odorant plant operational.

Scenario 3

- 40 cargos of LNG per annum will be processed by AGL's FSRU
- All 40 cargos will be composed of lean LNG
- Nitrogen will not be required
- Odorant plant operational.

Jacobs (2018a) prepared a GHG assessment for the Jetty Project and defined three potential scenarios for assessment:

- **Scenario A:** no gas send-out during the year with all boil-off gas used as fuel for the power generation units, and the excess gas burnt at the combustor
- **Scenario B:** continuous year-round operation of the FSRU in Open Loop mode at an average of 382mmscf high pressure gas send-out requiring 40 LNG carrier deliveries. Under this scenario two regasification units will be utilised
- **Scenario C:** Operation of the FSRU in Open Loop mode for 50.6% of the year at an average of 750mmscf high pressure gas send-out requiring 40 LNG carrier deliveries. For the balance of the year the FSRU will remain idle. Under this scenario, three regasification units will be utilised.

The 'worst case' scenario for each project was selected to assess potential cumulative impacts. The calculated emissions were added together to provide the total potential 'worst case' GHG emissions for the Pipeline Project and the Jetty Project.

6.5.3 Greenhouse gas cumulative impact assessment

The Pipeline Project GHG assessment (AECOM, 2018b) assessed each of the three potential scenarios for operational GHG emissions. For the purpose of the cumulative assessment, the scenario with the highest quantity of GHG emissions (Scenario 1) was selected.

The Jetty Project GHG assessment (Jacobs, 2018a) also assessed three potential scenarios, and the scenario with the highest GHG emissions was selected (Scenario A) for the purpose of the cumulative assessment. **Table 6-4** combines the calculated annual operational GHG emissions for the two projects under the 'worst case' scenarios.

Table 6-4 Combined annual operational GHG emissions (t CO₂-e)

Project	Scope 1	Scope 2	Scope 3	Total
Pipeline Project (Scenario 1)	1,112	1,720	197	3,029
Jetty Project (Scenario A)	106,986	-	13,333	120,319
Combined Projects	108,098	1,720	13,530	123,348

Source: AECOM, 2018b and Jacobs, 2018a

The combined total GHG emissions are 123,348 t CO₂-e per annum. This is under the 200,000 t CO₂-e per annum threshold specified in the Guidelines and therefore, as a combined project, impacts on GHG emissions are not considered significant.

6.5.4 Environmental management measures

As potential cumulative impacts on GHG emissions are not considered significant, no specific environment management measures have been identified.

6.6 Ecology (including potential impacts on the Western Port Ramsar site)

6.6.1 Existing ecological environment

Native vegetation

Monarc Environmental (2018a) identified the following existing conditions with respect to native vegetation present within the Pipeline Project footprint:

- The region has been heavily modified by agricultural practices with only a quarter of the original extent of native vegetation remaining. Approximately half of the remaining native vegetation is located within public land, with a substantial proportion of this being within conservation reserves.

The field assessments between December 2017 and August 2018 identified predominantly fragmented and largely degraded patches of native vegetation remaining within the construction footprint. These patches often contained a mixture of native and introduced weeds. The construction footprint was found to intersect 91 patches of remnant vegetation.

According to Jacobs (2018b), the landside component of the Jetty Project has been previously cleared but contains areas of native vegetation regrowth. This native vegetation covers approximately 2 ha (in total) and comprises Heathy Woodland, Swamp Scrub (derived) and Coastal Dune Scrub.

Western Port Ramsar site

Western Port includes a Ramsar site, designated as a wetland of international significance under the Ramsar Convention in 1982. Western Port meets seven of the nine criteria for designation as a Ramsar site. The Ramsar site covers 59,950 hectares of Western Port and is the third most important area of wading birds in Victoria (CEE 2018c). Western Port is also recognised as a site of high environmental, social and economic worth through its declaration as a UNESCO Biosphere Reserve and contains several Marine National Parks (CEE 2018c).

The Jetty Project is located within the Western Port Ramsar site and the Pipeline Project enters the Ramsar site boundary at Warrangine Park and Watsons Creek for short sections. In addition, the project area crosses five waterways which drain to the Western Port Ramsar site.

6.6.2 Assessment methodology

The EE Act referrals and associated ecological assessment reports for the Pipeline Project and Jetty Project have been used to determine potential cumulative impacts on ecological values. These documents are:

- Flora and Fauna Assessment - Crib Point to Pakenham Pipeline. September 2018. Report prepared for APA Group by Monarc Environmental (Monarc Environmental 2018a).
- Aquatic Survey Report – Crib Point Pakenham Pipeline Project. September 2018. Report prepared by Monarc Environmental (in association with Aquatic Environmental) for APA Transmission Pty Ltd. (Monarc Environmental 2018b).
- Jetty Project EE Act referral (AGL 2018).
- Pipeline Project EE Act referral (APA 2018)
- AGL Gas Import Jetty Project Crib Point, Western Port - Marine Ecosystem Protected Matters Assessment. Report to Jacobs Pty Ltd by CEE Pty Ltd (CEE 2018c).
- AGL Gas Import Jetty Project, Flora and fauna assessment. Report prepared by Jacobs Pty Ltd for AGL Wholesale Gas Limited (Jacobs 2018b)

This assessment of potential cumulative impacts has also referred to the Project Summary – Crib Point Pakenham Pipeline Project (APA 2018). The assessment has not sought to verify the findings of the technical reports or referrals.

6.6.3 Cumulative impact assessment – native vegetation

Monarc Environmental (2018a) and Jacobs (2018b) have assessed the respective impacts of the Pipeline Project and the Jetty Project on native vegetation including impacts on flora, fauna and ecological communities. These impacts are summarised in the respective project referrals (AGL 2018, APA 2018).

Jacobs (2018b) estimates that 0.44 hectares of Heathy Woodland, EVC 48 will be impacted by the Jetty Project as a result of the landside component. The conservation status of this EVC is 'least concern'. This area of Heathy Woodland associated with the landside component of the Jetty Project has been identified as an area of regeneration less than 10 years old and its removal is considered exempt from the need for a permit under the Mornington Peninsula Planning Scheme (Jacobs 2018b).

Monarc Environmental (2018a) identified that vegetation clearance for the Pipeline Project has been estimated based on applying the mitigation measures (outlined in **section 6.6.5**) to minimise the clearance required. After application of these measures a total of 6.833 ha of native vegetation will require removal. This comprises the following EVCs:

- 3.291 ha of Endangered EVCs (Swamp Scrub, Swampy Riparian Woodland and Grassy Woodland)
- 2.444 ha of Vulnerable EVCs (Damp Heathy Woodland)
- 1.098 ha of Least Concern EVCs (Heathy Woodland).

In addition, 37 scattered trees require removal within the construction footprint. This equates to an additional 1.418 ha of vegetation clearing under the Victorian Guidelines for the removal destruction or lopping of native vegetation (DELWP, 2017), bringing the total native vegetation clearance for the Pipeline Project to 8.251 ha.

The total native vegetation clearance required for both projects is 8.691 ha (Jacobs 2018b, Monarc Environmental 2018a), including 3.291 ha of endangered EVCs (Swamp Scrub, Swampy Riparian Woodland and Grassy Woodland). As an indication, the overall amount of vegetation clearance from the Jetty Project and the Pipeline Project is below the Guidelines level deemed sufficiently significant for an EES referral to be required. The criteria for referral require potential clearing of 10 ha or more of native vegetation that is identified as endangered or of very high conservation significance. It is also below the combination referral criteria of potential clearing of 10 ha or more of native vegetation.

6.6.4 Cumulative impact assessment - Ramsar site

(1) Ecological character and limits of acceptable change

(a) Ecological character description/critical components, processes and services

As a signatory to the Ramsar convention, Australia is expected to conserve and maintain the ecological character of all Ramsar wetlands in its territory. To achieve this, ecological character descriptions have either been prepared, or are in the process of being prepared for all Australian Ramsar sites (Department of Sustainability, Environment, Water, Population and Communities [DSEWPaC] undated).

Ecological character descriptions provide a benchmark against which to assess any future change in ecological character. They identify and describe the components, processes and services that are critical to the ecological character of the Ramsar site.

The ecological character of Western Port has been described in *Western Port Ramsar Wetland Ecological Character Description* (KBR 2010). This ECD provides an account of the benefit and services that Western Port provides and the critical components, processes and services (CPS) which contribute to those benefits and services.

These critical CPS are the primary concern in relation to the Ramsar site as change in the ecological character of the wetland will also affect those values which underpin the Ramsar listing criteria.

The benefits and services and contributing critical components and processes as described by KBR (2010) are outlined in **Table 6-5** with an assessment of individual and cumulative project impacts. Note that Hale (2016) has undertaken a review of the critical CPS since the preparation of the ECD and the critical CPS are addressed in **Table 6-5** below.

Table 6-5 Assessment of potential cumulative impacts on Western Port Ramsar site – benefits and services and contributing critical components and processes

Benefit and service	Summary (from KBR 2010)	Contributing critical components and processes (from KBR 2010)	Potential impacts: Pipeline Project	Potential impacts: Jetty Project	Potential impacts: Cumulative
Provisional services					
Commercial port	Western Port is considered to be of national economic significance as a commercial port.	Bathymetry: naturally deep channels which allow ship passage	The Pipeline Project will not adversely affect the bathymetry of the Western Port environment- all works for the Pipeline Project are on-shore, and whilst open trenching presents a small sedimentation risk, there will be no impact on Western Port bathymetry.	The Jetty Project does not involve any construction works that will cause physical disturbance to Western Port as activities will occur on the FSRU, topside of the existing jetty and within the landside component (which is outside the boundary of the Ramsar site). Operationally, the water discharge will descend to the seabed with sufficient momentum to form a local depression in the seabed within the shipping berth. This should have negligible effect outside the shipping basin and will not impact on Ramsar values (AGL 2018)	There will be no cumulative or additive impact on the port and natural bathymetry of Western Port as a result of considering the Pipeline Project in addition to the Jetty Project. The Pipeline Project will have no construction or operational elements on or in the waters of the Western Port which could impact bathymetry or port-related activities.
Wetland products – commercial fishing	Western Port is an important source of commercial fishing.	Seagrass beds provide important nursery habitat for commercially significant fish. Seagrass beds provide important food sources for commercial fish (invertebrates, plants). Bathymetry contributes to diverse marine habitats.	The Pipeline Project will not adversely affect the bathymetry of the Western Port environment. All works for the Pipeline Project are on-shore, and whilst open trenching presents a small sedimentation risk, there will be no impact to Western Port bathymetry. Whilst increased sedimentation is known to be a threat to seagrass beds, the pipeline will be bored beneath all major watercourses that interact with the Ramsar site. Those that are not bored are considered highly likely to be dry during the construction period, limiting the risk of increased sediment loads into the Ramsar site during construction. APA will implement suitable erosion and sediment controls as part of the pipeline construction processes.	The Project does not involve any construction works that will cause physical disturbance to Western Port as activities will occur on the FSRU, topside of the existing jetty and within the landside component (which is outside the boundary of the Ramsar site). Operationally, the water discharge will descend to the seabed with sufficient momentum to form a local depression in the seabed within the shipping berth. This should have negligible effect outside the shipping basin and will not impact on Ramsar values (AGL 2018) CEE (2018a, page 19) states that 'small differences in temperature variation may affect the migration of demersal fish species and biological processes such as spawning, growth and larval settlement of invertebrate species in the channel seabed community.' CEE (2018a) further states that 'the biota that will have variable contact with the cold-water will be the invertebrates living on or in the soft sediments of the channel, the fish that may swim along the seabed and the animals that are found under the Crib Point Jetty. Mobile species in the area may be exposed over a shorter period and may avoid the cooler water by moving higher in the water column or around the water body if affected.' (CEE 2018a). Saltmarsh, mangrove, mudflat, intertidal seagrass, subtidal seagrass and channel slope communities and sensitive species that occupy habitats in water depth less than 12.5 m water depth will be unaffected by contact with the cooler water resulting from the heat exchange water discharge (CEE 2018a, page 20). CEE (2018a) recommended that baseline investigations to document the distributions of marine ecosystem components in the vicinity of the discharge (which were previously systematically documented more than 40 years ago) are undertaken. The FSRU project will produce Chlorine and Hypochlorite (through electrolysis) to prevent the growth of marine organisms within the heat exchange unit of the FSRU. Invertebrate exposure to the highest concentrations of Chlorine will only occur if the invertebrates are entrained in the system. CEE (2018b, page 29) states that concentration of free chlorine remaining in the seawater as it leaves the heat exchange system will be toxic to some marine organisms that are very close to the discharge point and that are exposed long enough for toxic effect to occur.	There is little or no potential for cumulative or additive impacts on the commercial fishing value of the Ramsar site as a result of considering the Pipeline Project in addition to the Jetty Project. The Pipeline Project has no construction or operational elements on or in the waters of Western Port that could impact on seagrass and habitats supporting recreational fishing. There is minor potential for sediments from onshore construction of the Pipeline Project entering Western Port via streams but this will be localised and short term and can be readily mitigated through construction sediment control measures.
Cultural services					
Recreational fishing	Western Port has been an important source of recreational fishing and was declared a 'recreational fishing haven' in 2007.	Seagrass and mangrove vegetation is important nursery habitat for fish. Invertebrate populations are an important food source	The Pipeline Project will not adversely affect either the bathymetry of the Western Port environment, or the diversity of marine habitats that the Western Port supports Whilst increased sedimentation is known to be a threat to seagrass beds, the pipeline will be bored beneath all major	The Jetty Project does not involve any construction works that will cause physical disturbance to Western Port as activities will occur on the FSRU, topside of the existing jetty and within the landside component (which is outside the boundary of the Ramsar site). Operationally, the water discharge will descend to	There is little or no potential for cumulative or additive impacts on the recreational fishing value of the Ramsar site as a result of considering the Pipeline Project in addition to the Jetty Project. The Pipeline Project has no construction or operational elements on or in the waters of Western Port which could

	Bathymetry contributes to diverse marine habitats	watercourses that interact with the Ramsar site. Those that are not bored are considered highly likely to be dry during the construction period, limiting the risk of increased sediment loads into the Ramsar site during construction. APA will implement suitable erosion and sediment controls as part of the pipeline construction processes.	the seabed with sufficient momentum to form a local depression in the seabed within the shipping berth. This will have negligible effect outside the shipping basin and will not impact on Ramsar values (AGL 2018) Seawater drawn into the FSRU heat exchange system may entrain small marine organisms and, once entrained, these will not survive due to mechanical damage and exposure to short lived chlorine used to prevent -fouling of the heat exchange system (AGL 2018). The conceptual model of the marine ecosystem in the vicinity of Crib Point shows that the FSRU will be sufficiently remote from intertidal and nearshore marine ecosystem components and is located in an area of the channel characterised by plankton and pelagic marine species. Up to 450 ML/day of seawater will be drawn into the FSRU before being discharged from the FSRU heat exchanger 7°C cooler than ambient seawater temperature. The modelled behaviour of the discharge from the FSRU shows that the cold-water rapidly descended to depths greater than 12.5 m below the sea surface and demonstrated that marine ecosystem components in water depth less than approximately 12.5 m water depth will not be directly affected in the case of either a single-port or six-port discharge. Consequently, it is concluded that saltmarsh, mangrove, mudflat, intertidal seagrass, subtidal seagrass and channel slope communities and sensitive species that occupy habitats to a water depth of 12.5 m will be unaffected by the direct effects of the cold-water discharge (CEE 2018a). The FSRU project will produce Chlorine and Hypochlorite (through electrolysis) to prevent the growth of marine organisms within the heat exchange unit of the FSRU. Invertebrate exposure to the highest concentrations of Chlorine will only occur if the invertebrates are entrained in the system. CEE (2018b, page 29) states that concentration of free chlorine remaining in the seawater as it leaves the heat exchange system will be toxic to some marine organisms that are very close to the discharge point and that are exposed long enough for toxic effect to occur.	impact on seagrass and habitats supporting recreational fishing. There is minor potential for sediments from onshore construction of the Pipeline Project entering Western Port via streams but this will be very localised and short term and can be readily mitigated through construction sediment control measures. if	
Passive recreation	Recreational sailing and boating are popular activities. The site also offers opportunities for bird watching bushwalking, picnicking and visiting beaches. Surrounding areas offer tourist attractions including French Island National Park and Churchill Island.	Bathymetry and tidal regime enables recreational boating Waterbirds draw tourists and bird watchers Fish and invertebrates provide an important food source for birds and marine mammals.	The Pipeline Project will not adversely affect either the bathymetry of the Western Port environment, or the tidal regime that enables recreational boating. Boring the pipe beneath the most significant watercourses, and construction the pipeline over summer mitigates the potential for impact to waterbirds and to waterbird habitat Increased sedimentation load to Western Port could threaten both fish and important invertebrate populations, however the pipeline will be bored beneath all major watercourses that interact with the Ramsar site, and those that are not bored are considered highly likely to be dry during the construction period, limiting the risk of increased sediment loads into the Ramsar site during construction. Suitable erosion and sediment controls will be implemented as part of the pipeline construction processes.	The Jetty Project does not involve any construction works that will cause physical disturbance to Western Port as activities will occur on the FSRU, topside of the existing jetty and within the landside component (which is outside the boundary of the Ramsar site). Operationally, the water discharge will descend to the seabed with sufficient momentum to form a local depression in the seabed within the shipping berth. This will have negligible effect outside the shipping basin and will not impact on Ramsar values (AGL 2018) Fifty-eight marine birds have been identified that may use the Jetty Project area. Intertidal species are more likely to be affected than pelagic species. The current use of the Crib Point Jetty and adjacent areas, the scale of the proposed impacts associated with the Jetty Project and the known information regarding use of the area by marine birds suggests that there are unlikely to be significant impacts on threatened and migratory marine birds. However, further investigation is recommended to confirm this (Jacobs, 2018) CEE (2018b, page 29) states that concentration of free chlorine remaining in the seawater as it leaves the heat exchange system will be toxic to some marine organisms that are very close to the discharge point and that are exposed long enough for toxic effect to occur.	There is little or no potential for cumulative or additive impacts on the passive recreation value of the Ramsar site as a result of considering the Pipeline Project in addition to the Jetty Project. The Pipeline Project has no construction or operational elements on or in the waters of Western Port which could impact on activities such as boating or on seagrass and habitats supporting recreational fishing. There is minor potential for sediments from onshore construction of the Pipeline Project entering Western Port via streams but this will be localised and short term and can be readily mitigated through construction sediment control measures.
Spiritual and inspirational	The Ramsar site supports a number of cultural heritage sites listed on the Victorian Aboriginal Heritage Register and important European heritage sites, particularly Churchill Island.	Fish provide a food source. Bathymetry: deep channels facilitate boating and passage.	The Pipeline Project will pass in proximity to eight existing places of cultural heritage significance, however none of these are associated with the Western Port Ramsar site (APA, 2018). Consultation with the Registered Aboriginal Party has not identified any concern regarding the Pipeline Project with the spiritual connection to the Western Port Ramsar site. Increased sedimentation load to Western Port could affect food sources (fish, marine invertebrates and their habitat) however the pipeline will be bored beneath all major watercourses that interact with the Ramsar site. Those that are not bored are	The majority of the Jetty Project will occur over the water in an existing port so impact on cultural heritage values in this area of the project footprint is unlikely. The landside works do not constitute a high impact activity and occur on land which has been subject to significant ground disturbance (AGL 2018). CEE (2018b, page 29) states that concentration of free chlorine remaining in the seawater as it leaves the heat exchange system will be toxic to some marine organisms that are very close to the discharge point and that are exposed long enough	There will be no cumulative or additive impact on the spiritual and inspirational values of Western Port as a result of considering the Pipeline Project in addition to the Jetty Project. The Jetty Project has no construction or operational elements which impact on Aboriginal and European cultural heritage sites.

considered highly likely to be dry during the construction period, limiting the risk of increased sediment loads into the Ramsar site during construction and therefore impact on food source. The Pipeline Project will not affect the bathymetry of the Western Port environment.

Supporting services

Biodiversity -wetland type/habitat availability	Western Port supports a variety of marine habitat types e.g. intertidal mudflats, mangroves and seagrass beds.	Bathymetry, tidal regime and climate contribute to diverse habitats. Characteristic flora species define habitat types.	The Pipeline Project will not adversely affect either the bathymetry of the Western Port environment, the tidal regime or the climate that have together encouraged the diversity of marine habitat types within the Ramsar site. The pipeline route intersects areas of saltmarsh at one location within the Western Port Ramsar boundary, though the pipeline is to be directionally drilled at this location with no impact to the surface of the land or the saltmarsh community.	CEE (2018c) state that the general outcome of the reports indicates that the direct effects of the full-scale operation of the FSRU on the marine ecosystem in the Ramsar area will be confined within an area approximately 1 km north and south and approximately 250 m either side (east and west) of the FSRU, in water depth from approximately 12.5 m to 17 m. This represents an area of approximately 80 ha, which is less than 1.5% of the total Western Port Ramsar area of 59,950 ha.	There is little or no potential for cumulative or additive impacts on the biodiversity values of the Ramsar site as a result of considering the Pipeline Project in addition to the Jetty Project. The Pipeline Project has no construction or operational elements on or in the waters of Western Port that could impact on habitat types such as mangroves, mud flats and seagrass. There is minor potential for sediments from onshore construction of the Pipeline Project entering Western Port via streams but this will be very localised and short term and can be readily mitigated through construction sediment control measures.
Biodiversity – high diversity of waterbird species	115 waterbird species considered critical to the site's character have been recorded.	Bathymetry, tidal regime and climate contribute to diverse habitats. Critical flora and fauna components (e.g. seagrass, fish, invertebrates) provide primary food sources. Mangrove and saltmarsh vegetation provide important high tide roosts.	The Pipeline Project will not adversely affect either the bathymetry of the Western Port environment, the tidal regime or the climate that have together encouraged the diversity of marine habitat types within the Ramsar site. Increased sedimentation load to Western Port could affect critical flora and fauna components however the pipeline will be bored beneath all major watercourses that interact with the Ramsar site, and those that are not bored are considered highly likely to be dry during the construction period, limiting the risk of increased sediment loads into the Ramsar site during construction. Boring the pipe beneath the most significant watercourses, and the valuable mangrove and saltmarsh habitat that provides high-tide roosts for waterbird species mitigates the potential for impact to waterbirds and to waterbird habitat.	Fifty-eight marine birds have been identified that may use the Jetty Project area. Intertidal species are more likely to be affected than pelagic species. The current use of the Crib Point Jetty and adjacent areas, the scale of the proposed impacts associated with the Jetty Project and the known information regarding use of the area by marine birds suggests that there are unlikely to be significant impacts to threatened and migratory marine birds. However, further investigation is recommended to confirm this (Jacobs, 2018).	There is little or no potential for cumulative or additive impacts on the high diversity of waterbird species supported by the Ramsar site as a result of considering the Pipeline Project in addition to the Jetty Project. The Pipeline Project has no construction or operational elements on or in the waters of Western Port which could impact on habitat types such as mangroves, mud flats and seagrass supporting bird species. There is minor potential for sediments from onshore construction of the Pipeline Project entering Western Port via streams but this will be very localised and short term and can be readily mitigated through construction sediment control measures.
Distinct or unique wetland species – seagrass, mangrove and saltmarsh communities	Western Port Ramsar site supports the most developed and extensive mangrove population in Victoria. It also supports extensive seagrass communities and the most floristically diverse saltmarsh in Australia. These vegetation types provide habitat for a diverse range of flora and fauna species. They also play an important role in stabilising the coastal system and nutrient cycling in the bay.	Bathymetry, tidal regime, geomorphology and sedimentation, climate and water quality contribute to conditions suitable for growth of these vegetation communities.	The Pipeline Project intersects areas of saltmarsh at one location within the Western Port Ramsar boundary. The pipeline is to be directionally drilled at this location with no impact on the surface of the land or the saltmarsh community. Increased sedimentation load to Western Port could affect mangrove communities however the pipeline will be bored beneath all major watercourses that interact with the Ramsar site. Those that are not bored are considered highly likely to be dry during the construction period, limiting the risk of increased sediment loads into the Ramsar site during construction. Suitable erosion and sediment controls will be implemented as part of the pipeline construction processes.	The Jetty Project does not involve any clearing of mangroves or vegetation in tidal flats (AGL, 2018). Mangroves in Western Port reproduce by releasing floating propagules that disperse with surface water currents influenced by wind. Mangroves are located discontinuously around the perimeter of Western Port. The closest mangroves are located more than 1 km from the proposed intake position. Floating propagules from these mangroves should not be entrained by the seawater heat exchange system (CEE 2018d). The modelled behaviour of the discharge from the FSRU shows that the cold-water will rapidly descend to depths greater than 12.5 m below the sea surface and demonstrated that marine ecosystem components in water depth less than approximately 12.5 m water depth will not be directly affected in the case of either a single-port or six-port discharge. Consequently, it is concluded that saltmarsh, mangrove, mudflat, intertidal seagrass, subtidal seagrass and channel slope communities and sensitive species that occupy habitats to a water depth of 12.5 m will be unaffected by the direct effects of the cold-water discharge. (CEE 2018a)	There is little or no potential for cumulative or additive impacts on the distinct or unique wetland species supported by the Ramsar site as a result of considering the Pipeline Project in addition to the Jetty Project. The Pipeline Project has no construction or operational elements on or in the waters of Western Port which could impact on habitat types such as mangroves, mud flats and seagrass. There is minor potential for sediments from onshore construction of the Pipeline Project entering Western Port via streams but this will be very localised and short term and can be readily mitigated through construction sediment control measures.
Threatened wetland species, habitats and ecosystems	Western Port supports San Remo Marine Community, a marine invertebrate community of Victorian conservation significance.	As above.	The Pipeline Project does not involve any clearing of mangroves or vegetation in tidal flats. The pipeline route intersects areas of saltmarsh at one location within the Western Port Ramsar boundary, though the pipeline is to be directionally drilled at this location with no impact on the surface of the land or the saltmarsh community. Increased sedimentation load to Western Port could affect marine invertebrates however the pipeline will be bored beneath all major watercourses that interact with the Ramsar site. Those that are not bored are considered highly likely to be dry during the construction period, limiting the risk of increased sediment loads into the Ramsar site during construction. APA will implement suitable erosion and sediment controls as part of the pipeline construction processes.	The San Remo Marine Community is known from an area of approximately 600 x 300 metres off the coast of San Remo in Victoria. CEE (2018c) state that the general outcome of the reports indicates that the direct effects of the full-scale operation of the FSRU on the marine ecosystem in the Ramsar area will be confined within an area approximately 1 km north and south and approximately 250 m either side (east and west) of the FSRU, in water depth from approximately 12.5 m to 17 m. This represents an area of approximately 80 ha, which is less than 1.5% of the total Western Port Ramsar area of 59,950 ha.	There is little or no potential for cumulative or additive impacts on threatened wetland species, in particular the San Remo Marine Community, as a result of considering the Pipeline Project in addition to the Jetty Project. The Pipeline Project has no construction or operational elements on or in the waters of Western Port. There is minor potential for sediments from onshore construction of the Pipeline Project entering Western Port via streams but this will be very localised and short term and can be readily mitigated through construction sediment control measures. In the event of sediments entering Western Port, there will be no impact on the San Remo Marine Community due to its distance from the project site.

Priority wetland species and ecosystems.

Western Port provide important overwintering habitat for Orange-bellied Parrot *Neophema chrysogaster* (critically endangered under the EPBC Act)
Supports a number of migratory shorebirds protected under bilateral agreements including JAMBA, CAMBA and ROKAMBA and therefore listed under the EPBC Act.
Also supports internationally threatened species including Fairy Tern *Sterna nereis*.

As above.

Breeding sites for the Australian Pied Oystercatcher and Fairy Tern are on islands and are at least 6 km from the alignment (APA EPBC Act referral, in prep).
The alignment avoids all intertidal mudflat and shorebird roosting areas and does not result in surface disturbance to the Ramsar wetland (APA EPBC Act referral, in prep)
Increased sedimentation load to Western Port could affect food sources for shorebirds (fish, marine invertebrates and vegetation) however the pipeline will be bored beneath all major watercourses that interact with the Ramsar site, and those that are not bored are considered highly likely to be dry during the construction period, limiting the risk of increased sediment loads into the Ramsar site during construction and therefore impact on food supply for shorebirds.
Saltmarsh occurs along the riparian area of Watson Creek and extends around the coastal margins of Western Port (Monarc Environmental 2018a). Directional drilling is proposed for Watson Creek which will avoid removal of riparian vegetation and therefore saltmarsh. Saltmarsh is habitat for Orange-bellied Parrot.

No saltmarsh was recorded in the Jetty Project area, so impact on Orange-bellied parrot habitat as a result of the FSRU is unlikely (Jacobs 2018).
Fifty-eight marine birds have been identified that may use the Project area. Intertidal species are more likely to be affected than pelagic species. The current use of the Crib Point jetty and adjacent areas, the scale of the proposed impacts associated with the Jetty Project and the known information regarding use of the area by marine birds suggests that there are unlikely to be significant impacts to threatened and migratory marine birds. However, further investigation is recommended to confirm this (Jacobs, 2018).

There is little or no potential for cumulative or additive impacts on priority wetland species such as the Orange-bellied Parrot and Fairy Tern supported by the Ramsar site as a result of considering the Pipeline Project in addition to the Jetty Project. The Pipeline Project has no construction or operational elements on or in the waters of Western Port which could impact on habitat types supporting these species. There is minor potential for sediments from onshore construction of the Pipeline Project entering Western Port via streams but this will be very localised and short term and can be readily mitigated through construction sediment control measures.

Summary of potential cumulative ecological impacts

The assessment concluded that the Pipeline Project will not result in significant additive effects to the Jetty Project due to its predominantly onshore location.

Around 8.691 ha of native vegetation clearance will be required, which is below the Guidelines level deemed sufficiently significant for an EES referral to be required. The majority of this native vegetation removal is associated with the Pipeline Project.

Most of the potential impacts on wetland values are associated with the Jetty Project and a number of specific studies have been undertaken to assess the potential impacts of this project. The Pipeline Project will not directly impinge on the waters or shoreline of Western Port, and as such, will not have an additive effect on the main potential impacts on wetland values associated with the Jetty Project.

There is minor potential for cumulative sedimentation impacts from the Pipeline Project resulting from construction activities proximal to watercourses draining into Western Port. However, these impacts would be readily manageable due to the temporary nature of the works associated with construction of the Pipeline Project, timing of the activities (i.e. during summer) and the implementation of suitable environmental controls such as HDD and the establishment of sediment controls. The potential for substantial fluid loss during HDD is unlikely to occur given the depth of the HDD and the geological conditions; however suitable monitoring procedures and contingency planning will be implemented in the event of a loss of drilling mud.

6.6.5 Environmental management measures

Pipeline Project

The Pipeline Project has sought to manage potential environmental impacts through the pipeline route selection process and effective pipeline design, which is aligned with the requirements of the Australian Standard for gas and liquid petroleum pipelines, *AS2885.1-2012: Pipelines – Gas and liquid petroleum (design and construction)*. Through this process, where impacts have not been able to be avoided through route selection or application of a suitable construction methodology, the potential impacts have then been subject to design reviews and minimisation where possible (e.g. reduction in width of the pipeline right-of-way).

For any residual potential environment impacts, APA will implement an Environmental Management Plan for the construction and operation of the pipeline, which will define the control measures and performance criteria for the environmental hazards and risks specific to the pipeline. The EMP will be aligned with relevant industry standards, including the *Australian Pipelines and Gas Association Code of Environmental Practice* (APGA, 2017) and be subject to approval by the Department of Environment, Land, Water and Planning prior to construction of the pipeline.

Jetty Project

The Jetty Project has incorporated the following measures into the FSRU design to mitigate the potential for significant environmental effects:

- Positioning of the seawater intake between 5 m and 10 m from the seabed to minimise adverse effects on marine organisms arising from entrapment and entrainment (AGL 2018)
- Use of a six-port discharge for the seawater outlet design which has been demonstrated to result in minimal impact on marine ecology through:
 - Maintain a high enough water velocity to facilitate mixing of cooler water and return to ambient temperature
 - Facilitate prompt mixing of residual chlorine to encourage decay and mixing to environmentally safe concentrations within 200 m north and south and 60 m east and west of the discharge point
 - Facilitate mixing to minimise seabed area affected by the discharge. (AGL 2018).

7. Conclusion

This report provides an assessment of potential cumulative impacts of the Pipeline Project and the Jetty Project. This includes an evaluation of the potential impacts of the Pipeline Project as an indirect impact of the Jetty Project and vice versa, and the potential cumulative impacts of both the Jetty Project and the Pipeline Project collectively. Potential impacts of each of the projects were assessed independently in a range of studies and reports commissioned by APA and AGL for each of the projects. Cumulative impacts were defined as those where the impacts of both projects, when considered together, may result in increased environmental outcomes when compared with the level of impact associated with each project in isolation.

An initial screening assessment was undertaken to assess where the two projects, when combined, had the potential for cumulative impacts to occur. This screening included determining the spatial and temporal boundaries of the potential impacts and a recommendation on whether a more detailed assessment was required to identify cumulative impacts. As a result of the screening assessment, it was found that further assessment was required to assess the potential cumulative impacts of operational noise, landscape and visual impact, GHG emissions and ecological considerations including native vegetation clearance and impacts on the Western Port Ramsar wetland site.

As a result of this initial screening, additional assessment was conducted for the impacts considered as having potential for adverse cumulative impacts.

Based on the findings of these additional assessments, the Pipeline Project will not result in significant additive effects to the Jetty Project due to its predominantly onshore location.

8. References

AECOM (2018a), Crib Point Pakenham Pipeline Project, Acoustic Assessment, DRAFT, prepared by AECOM for APA Group

AECOM (2018b), APA Crib Point Pakenham Pipeline Project, Greenhouse Gas Assessment Report, prepared by AECOM for APA Group

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Appendix A – Predicted cumulative operational noise levels

Table A1 – Cumulative Impacts of Crib Point Receiving Facility (Scenario 1A: Nitrogen Offloading – Night) and AGL Gas Import Jetty

Receiver	Crib Point	Gas Import Jetty		Cumulative Levels	
	Scenario 1A: Nitrogen Offloading - Night	Scenario 1: Mooring Activities	Scenario 2: Regasification	Scenarios: 1A and 1	Scenarios: 1A and 2
103 The Esplanade, Crib Point	15	29	30	29	30
132 The Esplanade, Crib Point	5	32	32	32	32
14 Governors Road, Crib Point	2	31	31	31	31
107 The Esplanade, Crib Point	12	30	29	30	29
123 The Esplanade, Crib Point	8	27	28	27	28
French Island Properties	N/A ⁽¹⁾	26	17	26	17

Note:

- Noise levels predicted at French Island properties were negligible.
- Colour code: GREY: No change in level in comparison to Gas Import Jetty scenarios. YELLOW: Small change in level (up to 3 dB) in comparison to the Gas Import Jetty scenarios.

Table A2 – Cumulative Impacts of Crib Point Receiving Facility (Scenario 1B: Nitrogen Offloading – Day) and AGL Gas Import Jetty

Receiver	Crib Point	Gas Import Jetty		Cumulative Levels	
	Scenario 1B: Nitrogen Offloading - Day	Scenario 1: Mooring Activities	Scenario 2: Regasification	Scenarios: 1B and 1	Scenarios: 1B and 2
103 The Esplanade, Crib Point	29	29	30	32	33
132 The Esplanade, Crib Point	21	32	32	32	32
14 Governors Road, Crib Point	18	31	31	32	31
107 The Esplanade, Crib Point	25	30	29	31	30
123 The Esplanade, Crib Point	23	27	28	28	29
French Island Properties	N/A ⁽¹⁾	26	17	26	17

Note:

- Noise levels predicted at French Island properties were negligible.
- Colour code: GREY: No change in level in comparison to Gas Import Jetty scenarios. YELLOW: Small change in level (up to 3 dB) in comparison to the Gas Import Jetty scenarios.

Table A3 – Cumulative Impacts of Crib Point Receiving Facility (Scenario 2A: Nitrogen Injection – Night) and AGL Gas Import Jetty

Receiver	Crib Point	Gas Import Jetty		Cumulative Levels	
	Scenario 2A: Nitrogen Injection - Night	Scenario 1: Mooring Activities	Scenario 2: Regasification	Scenarios: 2A and 1	Scenarios: 2A and 2
103 The Esplanade, Crib Point	16	29	30	29	31
132 The Esplanade, Crib Point	8	32	32	32	32
14 Governors Road, Crib Point	5	31	31	31	31
107 The Esplanade, Crib Point	12	30	29	30	29
123 The Esplanade, Crib Point	10	27	28	27	28
French Island Properties	N/A ⁽¹⁾	26	17	26	17

Note:

- Noise levels predicted at French Island properties were negligible.
- Colour code: GREY: No change in level in comparison to Gas Import Jetty scenarios. YELLOW: Small change in level (up to 3 dB) in comparison to the Gas Import Jetty scenarios.

Table A4 – Cumulative Impacts of Crib Point Receiving Facility (Scenario 2B: Nitrogen Injection – Day) and AGL Gas Import Jetty

Receiver	Crib Point	Gas Import Jetty		Cumulative Levels	
	Scenario 2B: Nitrogen Injection - Day	Scenario 1: Mooring Activities	Scenario 2: Regasification	Scenarios: 2B and 1	Scenarios: 2B and 2
103 The Esplanade, Crib Point	22	29	30	30	31
132 The Esplanade, Crib Point	16	32	32	32	32
14 Governors Road, Crib Point	13	31	31	31	31
107 The Esplanade, Crib Point	20	30	29	30	30
123 The Esplanade, Crib Point	17	27	28	27	28
French Island Properties	N/A ⁽¹⁾	26	17	26	17

Note:

- Noise levels predicted at French Island properties were negligible.
- Colour code: GREY: No change in level in comparison to Gas Import Jetty scenarios. YELLOW: Small change in level (up to 3 dB) in comparison to the Gas Import Jetty scenarios.