Executive Summary

1.0 Introduction

Viva Energy Gas Australia Pty Ltd (Viva Energy) is planning to develop a floating gas terminal using a ship known as a floating storage and regasification unit (FSRU) at Refinery Pier in Corio Bay, adjacent to, and on, Viva Energy's Geelong Refinery.

The Viva Energy Gas Terminal Project (the project) would bring natural gas from other parts of the country and overseas to meet an anticipated gas shortage in south-eastern Australia in coming years. An FSRU provides a cost-effective and flexible option for short and long-term energy supply. The project is anticipated to operate for approximately 20 years.

The project comprises the following components:

- Extension of the existing Refinery Pier – a new pier arm, new berth and ancillary pier infrastructure
- The FSRU continuously moored at the new Refinery Pier berth, which would receive liquefied natural gas (LNG) from visiting LNG carriers, store and convert the LNG into natural gas when needed
- A treatment facility located within the Geelong Refinery site to check that the gas meets transmission network standards
- A pipeline to transfer the gas from the FSRU to the South West Pipeline (SWP) connection point at Lara, comprising a 3-kilometre aboveground section and a 4-kilometre underground section.

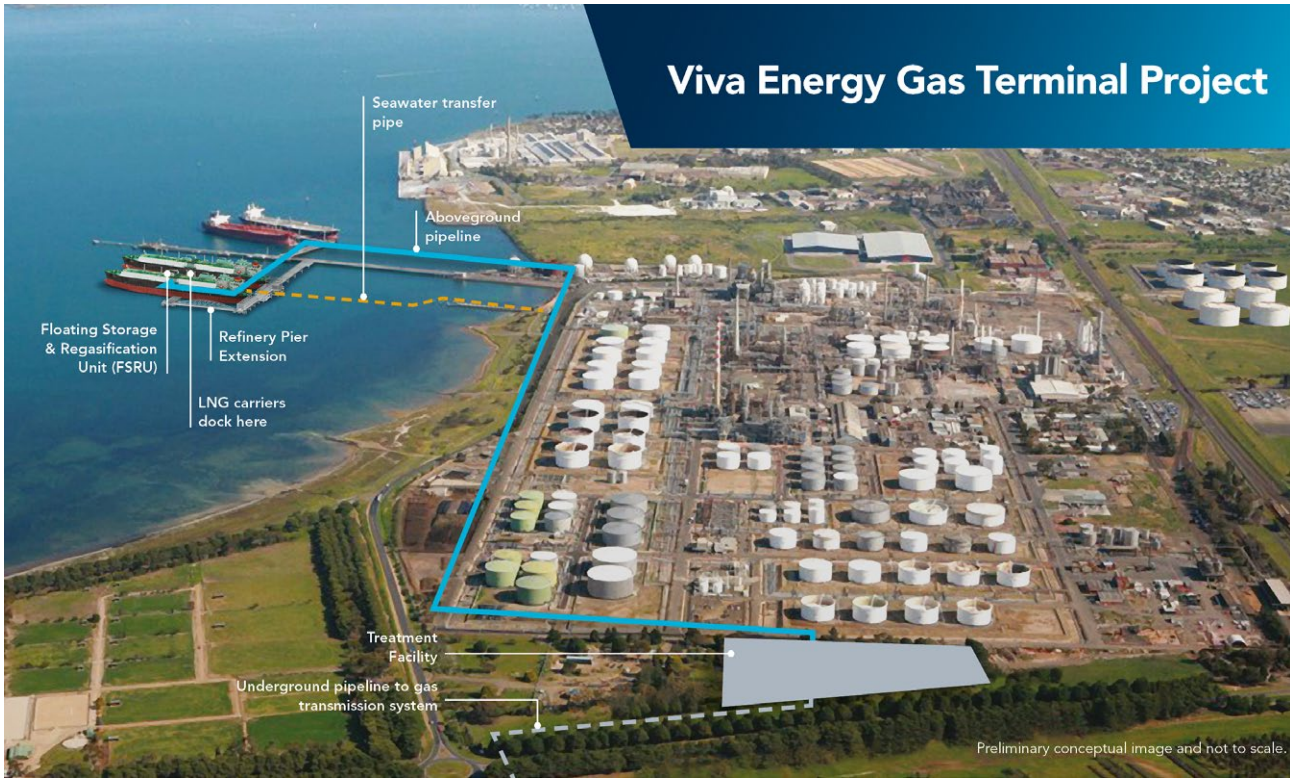

Figure 1 Viva Energy Gas Terminal Project

1.1 Proponent

The proponent for the project is Viva Energy Gas Australia Pty Ltd, a wholly owned subsidiary of Viva Energy Group Limited (Viva Energy).

Viva Energy is one of Australia's leading energy companies with more than 110 years of operations in Australia and supplies approximately a quarter of the country's liquid fuel requirements. Viva Energy is the exclusive supplier of Shell fuels and lubricants in Australia through an extensive network of more than 1,300 service stations across the country. Viva Energy owns and operates the strategically located Geelong Refinery and operates bulk fuels, aviation, bitumen, marine, chemicals and lubricants businesses supported by 24 fuel import terminals, 22 depots and 55 airports and airfields.

The Geelong Refinery is Viva Energy's largest operation, employing more than 700 people. The refinery and associated operations have been part of the local Geelong community since 1954 and supply more than half of Victoria's fuel needs and injects more than $200 million each year into the local economy through wages and services.

1.2 Project background

In June 2020, Viva Energy announced its vision to transform its Geelong Refinery into an Energy Hub. The Geelong Energy Hub would support the company's energy transition currently underway while helping to underpin the future viability of the refinery.

Having been part of the Geelong community since 1954, the refinery already supplies approximately half of Victoria's liquid fuel energy needs. The Geelong Energy Hub vision is to deliver long-term energy security by taking a leading role in supplying liquid fuels and gas as well as supporting the development of other alternative energy solutions.

Importantly, diversification of the Geelong Refinery site would protect local jobs, generate new jobs and skills and support economic development for the region. Over the 18-month construction period, the project would provide 150 to 200 jobs and 50 to 70 ongoing jobs once the terminal is in full operation.

The Gas Terminal Project (the project) is the first project related to the Geelong Energy Hub to be developed.

1.2.1 Project setting and benefits

The project would be located in the City of Greater Geelong, 75 kilometres south-west of Melbourne. The project area is situated adjacent to, and on, Viva Energy's Geelong Refinery, within a heavily developed port and industrial area on the western shores of Corio Bay between the Geelong suburbs of Corio and North Shore. The Geelong central business district is located approximately 7 kilometres to the south of the project. Geelong Grammar School is located approximately 1.7 kilometres to the north-west of Refinery Pier. The area to the north-east of the refinery and project area is characterised by rural-residential properties.

Corio Bay is the largest bay in the south-western corner of Port Phillip and is a sheltered, shallow basin at the western end of the Geelong Arm with an area of 43 square kilometres. The project is located approximately one kilometre to the west of the Point Wilson /Limeburners Bay area of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site. The Ramsar site covers 22,650 hectares and is comprised of 6 distinct areas, including Limeburners Bay and Avalon Coastal Reserve.

The Geelong Refinery and Port of Geelong provide an ideal setting for the project, with close access to Victoria's gas transmission network and major gas demand centres. This location also offers significant opportunity to make use of potential synergies between the refinery and the project and minimise potential environmental effects as well as utilise the attributes of the industrialised port and refinery setting.

The Geelong Refinery facilitates the import and export of bulk liquid fuels with over 200 shipping movements per year through the Port of Geelong shipping channel. The LNG carriers carrying LNG to the floating gas terminal would similarly access the same shipping channel and core Refinery Pier infrastructure.

A key environmental benefit of co-location of the project with the refinery is the proposed reuse of seawater used for the FSRU regasification process in the refinery's cooling water system. This reuse would result in no change to the total seawater volume extracted from Corio Bay, no change to the volume of water discharged from the refinery, no change in residual chlorine levels discharged and an improvement in the temperature of the discharge compared to the existing refinery discharge.

The refinery has been using seawater for cooling purposes and discharging this seawater back into Corio Bay through licensed discharge outlets for more than 60 years. As the project discharge after reuse in the refinery is primarily the same as the current discharge, but with an improvement in temperature, this provided an opportunity to assess the existing marine environment offshore from the refinery after more than 60 years of cooling water discharge. The studies conducted for the EES were able to collect data and evidence of the marine environment condition related to warm water discharges with residual levels of chlorine by taking actual temperature and chlorine samples from the existing refinery plumes to test modelling predictions developed for the project. This empirical evidence has provided a high level of confidence in the assessment of potential marine impacts associated with the project. The marine environment offshore from the refinery was found to be in a healthy condition after 60 years of refinery discharges.

The co-location of the project with the Geelong Refinery and use of existing disturbed pipeline corridors in a semi-rural area where possible means the project has minimal impact on native vegetation and terrestrial ecology. Being close to Victoria's gas transmission network, means only a short gas transmission pipeline (approximately 7 kilometres) is required. Of this, approximately 3 kilometres are on the existing pier or within the refinery resulting in minimised landholder impacts and a reduced cost of injecting gas into the network. The Geelong Refinery has a long history of co-existing with its neighbours and investing in the local community, which would continue as it transforms into the Geelong Energy Hub.

Viva Energy would also be able to draw on their experience as a Major Hazard Facility (MHF) operator of the Geelong Refinery to operate the project safely.

1.3 Project rationale

Natural gas is an essential source of energy for Victoria, meeting around 22% of Victoria's total energy needs. There are over 2 million gas connections in Victoria for heating, cooking and industrial uses.

A decline in the availability of gas from sources such as Bass Strait combined with inadequate transmission infrastructure to the northern Australian gas reserves is predicted to result in a gas shortage for the south-eastern Australian domestic market by the mid-2020s. While Victoria is relying more and more on renewable sources of energy as part of the transition to net zero emissions by 2050, gas will continue to play an important role in Victoria's energy mix during the transition.

Both the Australian Energy Market Operator (AEMO) and the Australian Competition & Consumer Commission (ACCC) have identified a range of measures to address and mitigate the predicted shortfalls, which includes the development of LNG terminals.

An LNG terminal would offer a more cost-effective supply of gas compared to transporting gas long distances via a pipeline network. Gas, like many commodities, can be transported more cost effectively by ship. In this way, the terminal can be thought of as a 'virtual pipeline' bringing gas from where it is available to where it is needed. LNG terminals would form an important part of Victoria's energy infrastructure mix and would be an important measure to avoid the predicted gas supply shortfall.

The project would enable gas imports of up to 160 petajoules (PJ) per year to meet the shortfall and improve energy security and affordability by providing a flexible new source of gas close to major demand centres.

2.0 The project

Construction and commissioning of the project is estimated to take up to 18 months. The project is anticipated to operate for approximately 20 years. Key project components are described in **Figure 2** and an overview of the project area is shown in **Figure 3**.

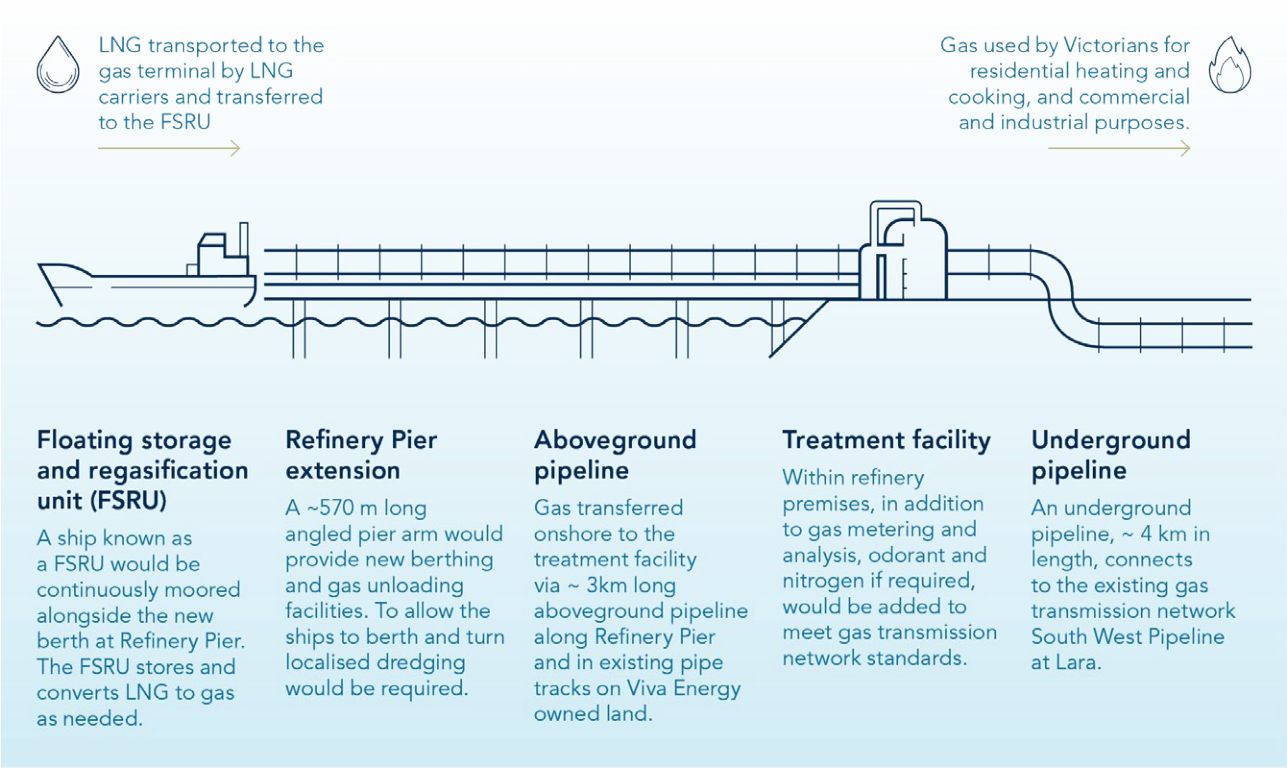

Figure 2 Key project components

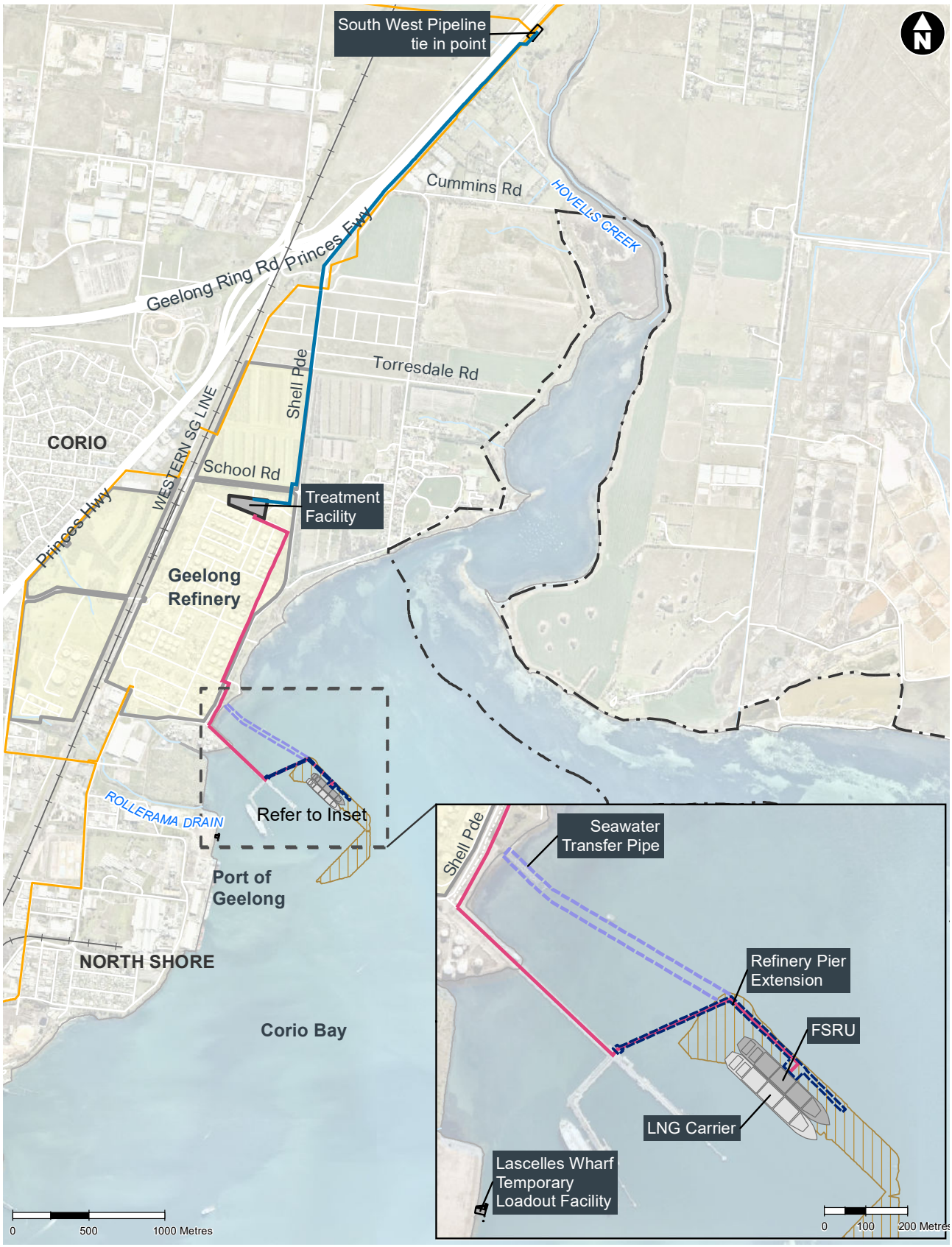

Figure 3 Project area overview

2.1 Construction

The key construction works for the project include:

- Localised dredging of seabed sediment at Refinery Pier to allow water sufficient depth for the new berth pocket and for visiting LNG carriers to turn within the swing basin
- Excavation of a shallow trench in the seabed for the seawater transfer pipe from the pier to the refinery seawater intake
- Construction of a temporary loadout facility at Lascelles Wharf
- Construction of the Refinery Pier extension and supporting infrastructure
- Installation of the aboveground gas pipeline and the treatment facility
- Construction of the underground gas transmission pipeline, connecting to the SWP at Lara.

There are no construction activities required for the FSRU component of the project. The vessel would be built, commissioned and all production and safety systems verified prior to being brought to site.

2.1.1 Localised dredging

Localised dredging of seabed sediments would commence prior to starting construction of the pier extension over a period of approximately 4 months. The new berth pocket would be dredged to a depth of 13.1 metres and the swing basin would be dredged to a depth of 12.7 metres.

An estimated 490,000 cubic metres (m^3) of dredged material would be removed over an area of approximately 12 hectares. Additionally, approximately 8,800 m^3 of sediments would be excavated to create a trench for the installation of the seawater transfer pipe at an approximate depth of 2 metres below the seabed.

The sediments would be removed using a barge-mounted backhoe dredger (BHD) with a large bucket excavator and placed into barges for transport to the spoil disposal ground (refer to **Figure 4**). The dredged material would be deposited within the existing spoil disposal ground at the dredged material ground (DMG) in Port Phillip Bay to the east of Point Wilson, approximately 26 kilometres away from Refinery Pier (refer to **Figure 5**).

Figure 4 Example of backhoe dredger

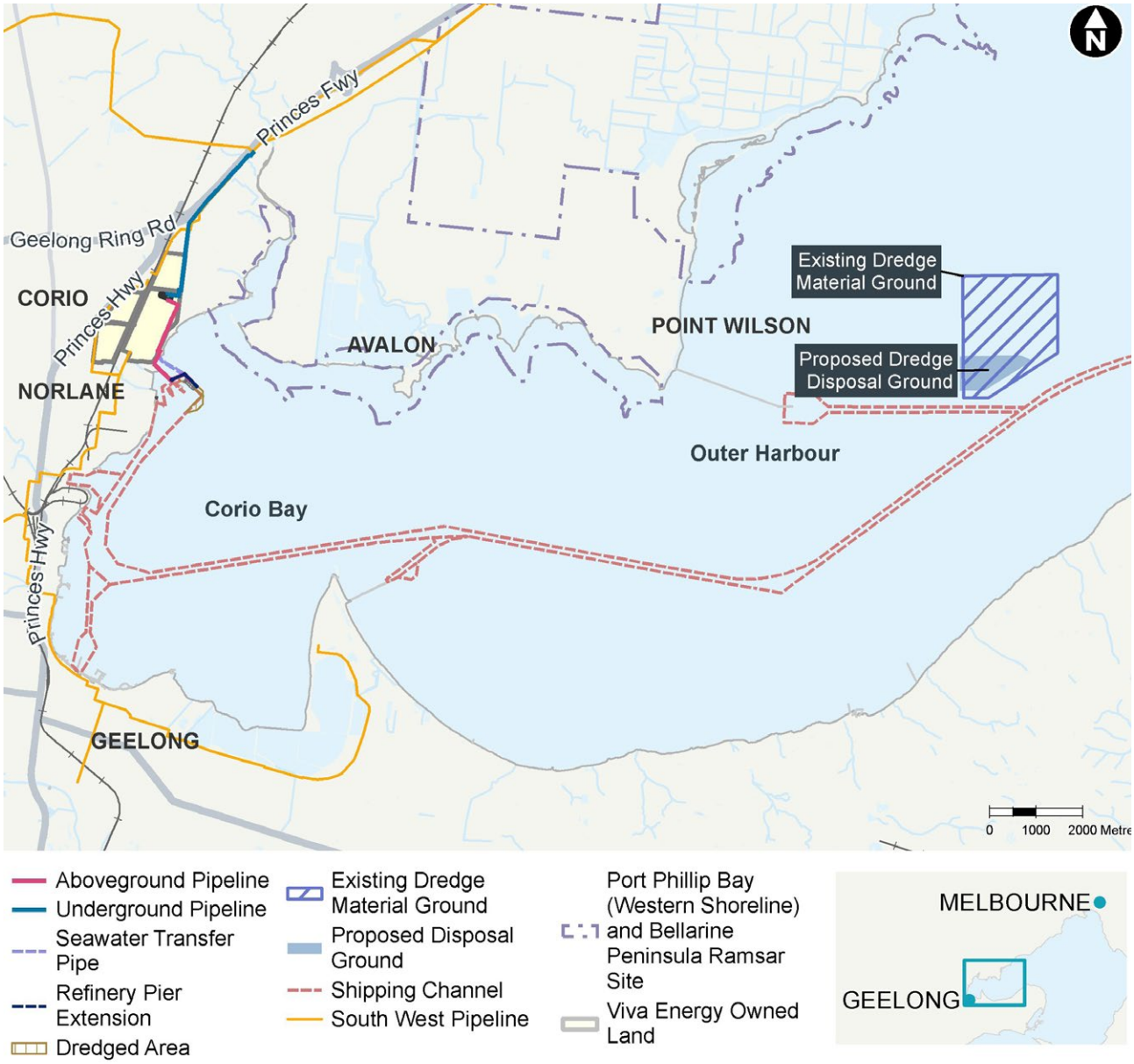

Figure 5 Proposed dredge disposal ground in relation to the project

2.1.2 Refinery Pier extension

To facilitate construction of the Refinery Pier extension, a temporary storage and loadout facility would be constructed and located in the existing Port facilities nearby at Lascelles Wharf.

The new pier arm would be constructed primarily from the water using crane barges to install pre-cast concrete and pre-fabricated steel modular components supported on vertically driven steel piles. The pier piles would be vertically driven into the seabed by cranes mounted on floating piling barges (refer to **Figure 6**).

The Refinery Pier extension and supporting infrastructure are expected to be constructed over 18 months.

Figure 6 Example of pile driving (left) and installation of steel-fabricated module with heavy lift vessel (right)

2.1.3 Pipeline

The aboveground component of the pipeline running from Refinery Pier up to the treatment facility would be placed into position by cranes onto pipe supports. A new road under-crossing (culvert) would be required for the aboveground pipeline at Shell Parade, and this would be installed by either a trenchless method (thrust-boring) or conventional trenching.

The underground component of the pipeline running from the treatment facility to the SWP would be constructed primarily by trenching, however trenchless construction (including horizontal directional drilling (HDD) and thrust-boring) would also be used in specific areas, such as at intersections with major roads or other key pieces of infrastructure.

The pipeline would be constructed within a construction right of way (construction ROW) between 15 to 20 metres wide (refer to **Figure 7**). Once the construction ROW is delineated, vegetation would be removed and placed in a stockpile on the edge of the construction ROW.

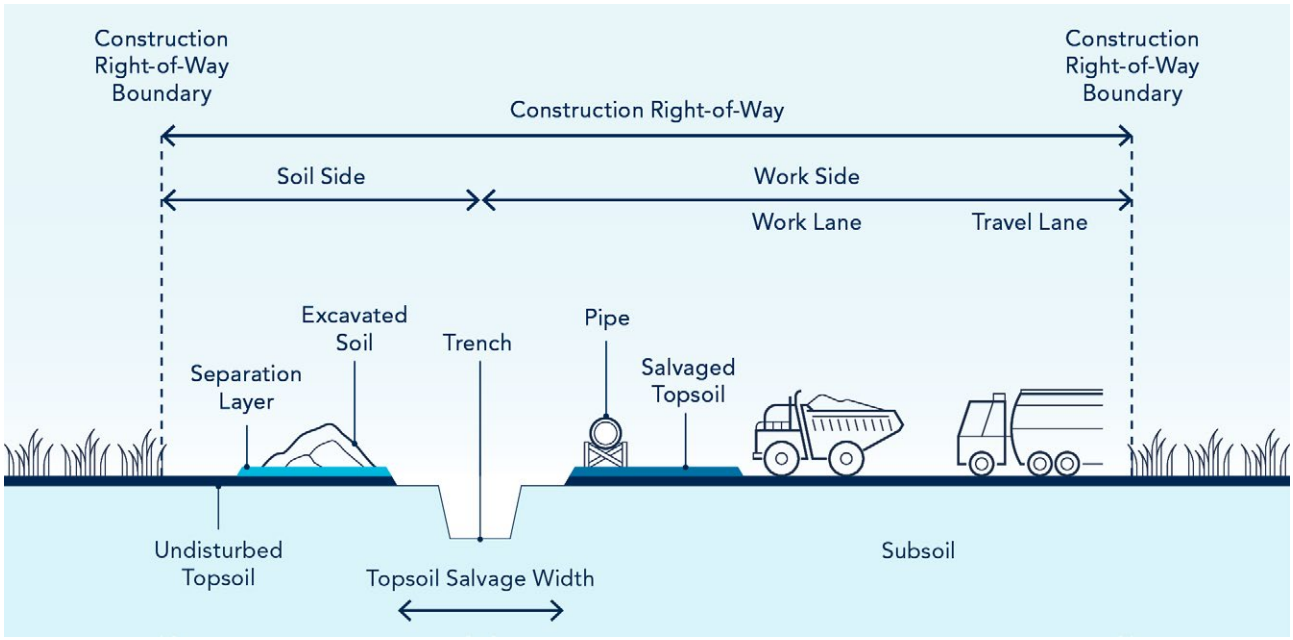

Figure 7 Construction right of way

The trench would typically be excavated to a depth of approximately 2 metres, and the material removed from the trench set aside. When the pipe is in place within the trench, it would be backfilled with soil and the construction ROW reinstated to its pre-existing conditions as far as practicable.

Trenchless construction (HDD or thrust-boring) involves drilling a hole beneath the surface at a shallow angle and then pushing or pulling a welded length of pipe through the hole without disturbing the surface.

Several segments of HDD are proposed along the underground pipeline route (refer to **Figure 8**) as follows:

- HDD-01: 850 metres long at a depth of 25 metres to the north east beneath the Princes Freeway – Shell Parade Off Ramp and parallel with the Princes Freeway and Macgregor Court
- HDD-02: 300 metres long at a depth of 17 metres to the south beneath the Rennie Street – Shell Parade roundabout and parallel with Shell Parade
- HDD-03 and HDD-04 (to be confirmed): along Macgregor Court, parallel with the Princes Freeway.

One segment of thrust-boring is proposed along the underground pipeline route, being:

- TB-01: Beneath School Road.

Figure 8 Underground pipeline construction methodology

2.1.4 Treatment facility

Construction of the treatment facility would take up to 18 months and involve:

- Earthworks and civil construction for foundations
- Installation of structural supports, mechanical equipment, electrical equipment, cabling and instrumentation (to read gas temperature, pressure and flow)
- Pre-commissioning, involving energisation and testing of individual components
- Commissioning to verify that the equipment is operating in accordance with the specified requirements and design.

2.2 Operation

The project would operate 24 hours a day, 7 days a week in line with the refinery's existing hours of operation and at production rates determined by gas demand. LNG would be delivered to the FSRU at the newly constructed Refinery Pier No. 5 from external suppliers by regularly scheduled LNG carriers. Up to 45 LNG carriers would visit the gas terminal annually to deliver LNG, depending on the LNG carrier's storage capacity and gas demand.

The LNG carrier would moor alongside the FSRU with the assistance of four tugboats and transfer their LNG cargo into the FSRU. Once the transfer of LNG is complete, the LNG carrier would depart from their berth with the assistance of the tugboats and leave the port.

When gas is needed, the FSRU would convert the LNG from a liquid state into a gaseous state. The gas would then be transferred into the aboveground pipeline on the pier to the treatment facility, and then through the underground pipeline into the Victorian gas network (via the SWP) at Lara.

2.2.1 FSRU operation

The FSRU has the capacity to store approximately 170,000m^3 of LNG in a liquid state at very low temperatures (approximately -160 °C).

When gas is needed, the FSRU would heat the LNG back to its gaseous form via a process known as 'regasification'. The FSRU is able to operate in different regasification modes, including:

- Open loop mode – this is the usual operating mode that would be used for the project, where seawater is continuously drawn in to the FSRU as the heating medium and discharged at a colder temperature
- Closed loop mode – where water is continuously recycled within the vessel and reheated by gas-fired boilers
- Combined loop mode – where a combination of modes may be used to heat the seawater if it falls below a specified temperature.

Seawater use and discharge

The use and discharge of seawater in the regasification process is important in considering potential environmental effects. The amount of seawater required varies with the regasification mode and amount of gas needed.

The estimated gas production profile and associated seawater consumption is shown in **Table 1**. This indicative profile is based on typical gas demand rates throughout the year operating in open loop mode which is described in the subsequent section. The FSRU is anticipated to produce up to 500 terajoules (TJ) per day of gas which would require approximately 300 megalitres (ML) per day of seawater for the regasification process. On a limited number of peak demand days, the gas production rate would fluctuate throughout the day, but the maximum daily flowrate of seawater would be 350 ML per day.

Table 1 Indicative production profile

Season	Estimated gas production (TJ/day)	No. of regasification trains	Seawater consumption (ML/day)
Summer (Dec – Feb)	250	1	148
Autumn (Mar – May)	350	2	208
Winter (Jun – Aug)	500	2	300
Spring (Sept – Nov)	350	2	208

Seawater being drawn into the FSRU would be subject to an electrical current that would break up the naturally occurring salt molecules and produces hypochlorite (chlorine) to prevent biofouling in the FSRU heat exchange system.

For over 60 years, Viva Energy's Geelong Refinery has been using approximately 350 ML/day of seawater from Corio Bay for cooling purposes. This seawater is then discharged to Corio Bay at temperatures approximately 9°C warmer than the ambient seawater temperature and with residual levels of chlorine, associated with biofouling control, through 4 licensed discharge outlets known as W1, W3, W4 and W5 (refer to **Figure 9**).

The project would also require a maximum of 350 ML/day of seawater to regasify LNG at peak production, particularly during the winter months. This has been identified as a key synergy between the project and the refinery that would avoid discharging the cooled water directly back into the sea. Reuse of the FSRU seawater in the refinery would replace all or some of the existing intake requirements of the refinery from Corio Bay, depending on how much gas is being produced at a given time. For example, there would be days where seawater use in the FSRU is lower than the approximate 350 ML/day refinery intake requirements. In such situations, the refinery would draw the remaining volume of seawater required for cooling through the existing refinery seawater intake, as is done at present.

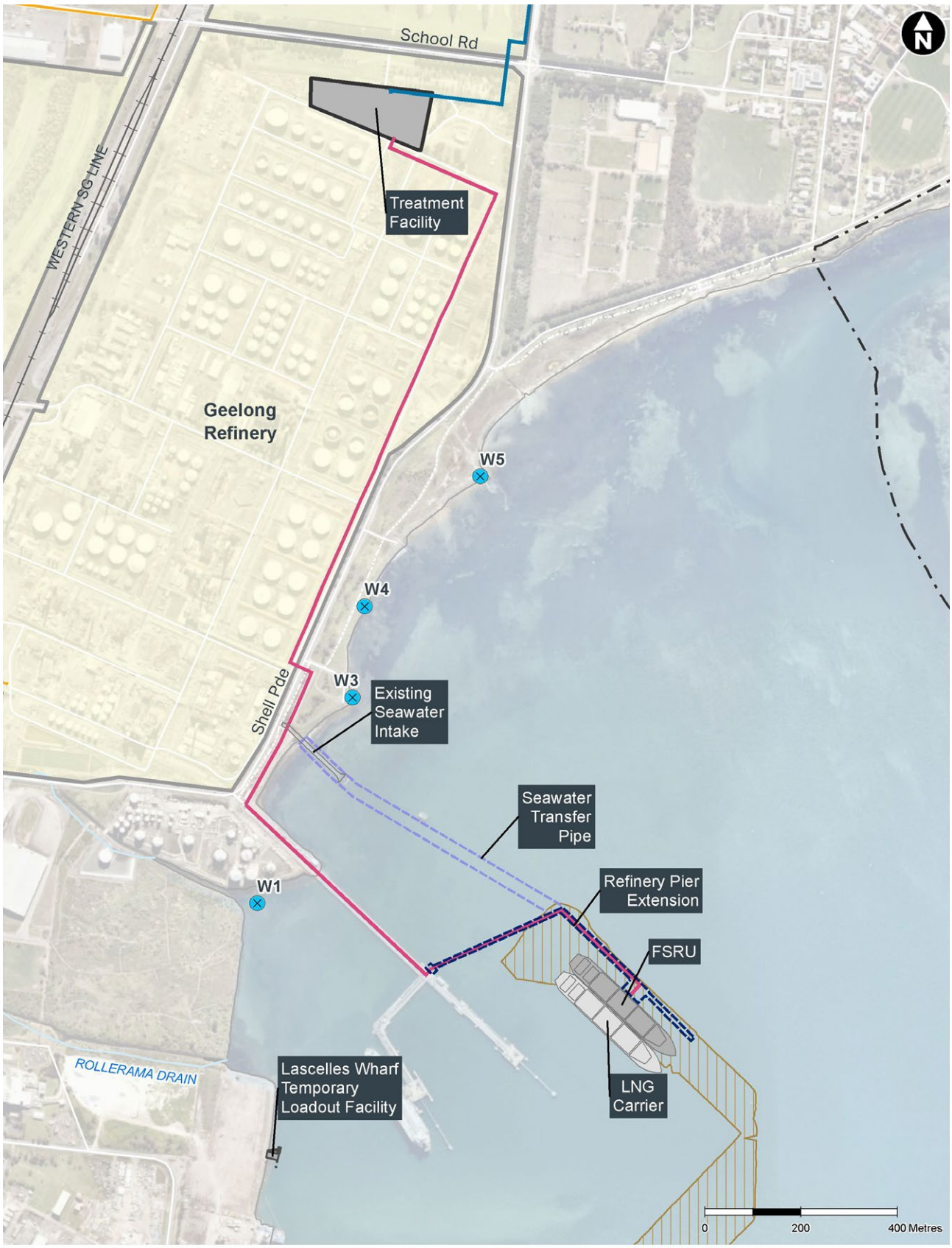

Figure 9 Geelong Refinery existing seawater discharge outlets

Open loop mode

Open loop system regasification on the FSRU would continuously draw in seawater from Corio Bay via the seawater intakes on either side of the vessel, which would then pass once through the heat exchange system to convert the LNG to gas. After the regasification is complete, the seawater would be redirected to the refinery for reuse as cooling water via the seawater transfer pipe.

Following regasification, the cooled seawater from the FSRU redirected into the refinery would be cooler than the current intake (approximately 7°C below ambient water temperature). The cooling process within the refinery would heat the seawater back up and it would then be discharged back into Corio Bay at the licenced discharge outlets, but at a temperature cooler than the existing discharge (approximately 2°C above the ambient seawater temperature when the FSRU is operating at peak production). **Figure 10** shows the existing seawater process at the refinery and the receipt of FSRU discharge water into the refinery for reuse.

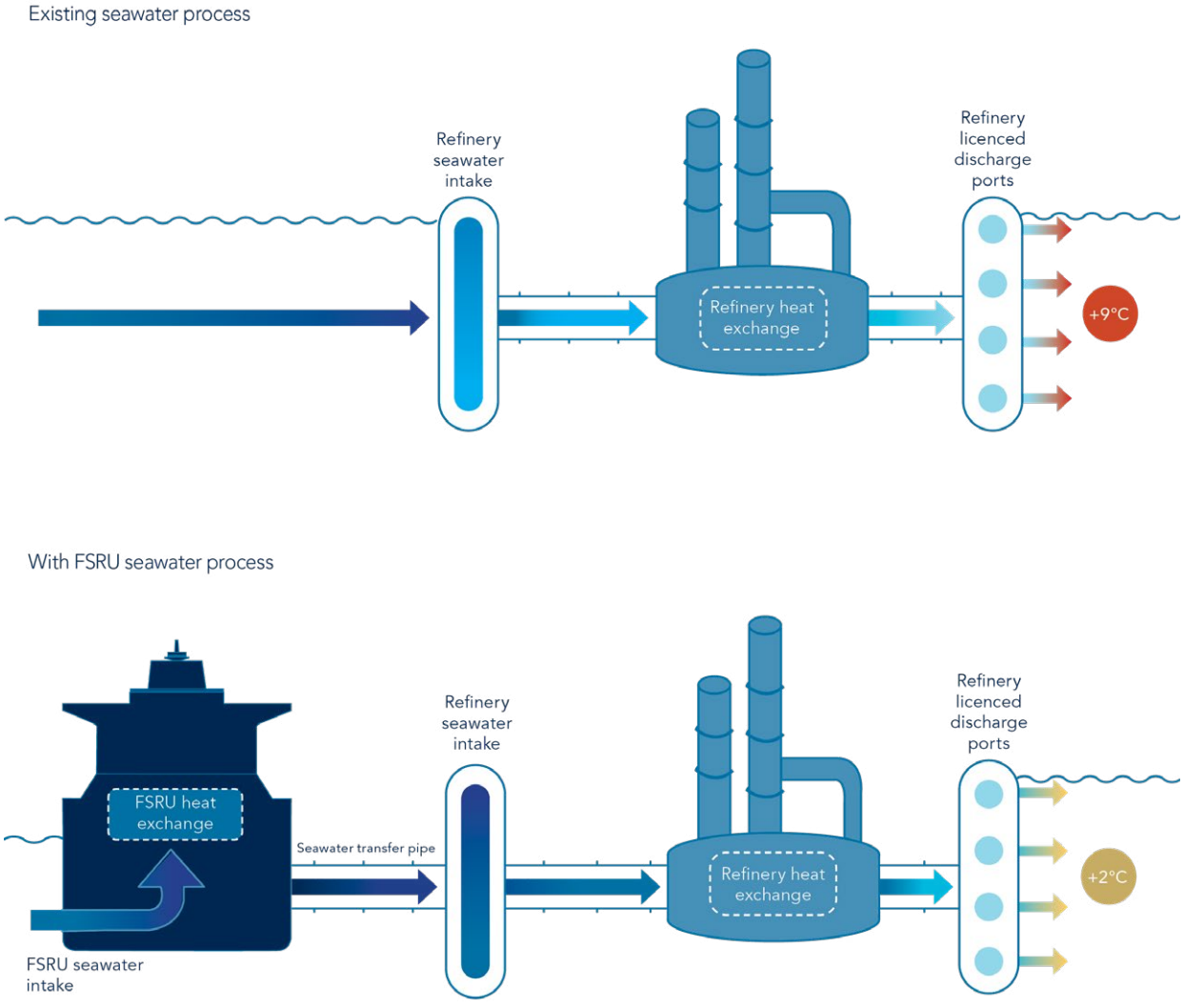

Figure 10 Existing refinery seawater process and FSRU seawater process

The open loop mode of operation provides an environmental enhancement as:

- It removes the need for 2 separate volumes of seawater to be used and discharged from the refinery and the gas import terminal project if they were to be operated independently and without the synergy of co-location
- The project involves no change in the existing refinery seawater intake or discharge rate, no change to the existing refinery residual chlorine concentration at the refinery discharge points, and a reduction in the temperature of the discharge plumes.

If the refinery was shut down for a long period of time or permanently decommissioned in the future and reuse of the FSRU discharge water in the refinery was no longer an option, the seawater from the FSRU would be discharged to Corio Bay through a diffuser installed under the new pier arm that would enable the seawater to rapidly mix and return to ambient conditions.

During refinery maintenance shutdowns, the refinery requires between 200-250 ML/day of cooling water compared with 350 ML/day when fully operational. The major planned refinery shutdowns are conducted over 2-3 months during spring or autumn every second year. Based on forecast gas production, the FSRU would be producing an estimated 208 ML/day of discharge water during these seasons. As such, it is likely the full volume of FSRU discharge water would still be required by the refinery for cooling purposes during shutdowns, with little or no requirement for use of the diffuser.

Closed loop mode

Closed loop mode of operation would be used in the unlikely event that the FSRU was unable to discharge water through the seawater transfer pipe to the refinery, for example, during FSRU maintenance or due to a pump or pipe failure.

Closed loop mode uses gas-fired steam boilers to heat a closed loop of circulating seawater within the FSRU. This would involve a small volume of water being re-circulated in the system (around 0.5 ML), which would be discharged back to Corio Bay when the FSRU reverts back to its usual mode of operation (open loop). Discharged seawater from the closed loop process would be around 5°C warmer than the ambient seawater temperature.

2.2.2 Treatment facility

The treatment facility would receive the natural gas from the FSRU via the aboveground pipeline. At the treatment facility, gas would be treated with nitrogen and odorant to meet Australian gas quality standards before being transferred into the underground pipeline to the Victorian transmission system.

Liquid nitrogen and odorant would be transported to and stored at the facility. Nitrogen injection would occur when any given gas cargo needs to be diluted to meet local specifications. Odorant is added as a safety requirement so that the normally odourless gas can be smelt when in use.

The facility would also include a gas quality analyser, gas flow metering, pipeline inspection and cleaning facilities, and a cold vent for gas release if the pipeline needed to be depressurised for maintenance or during an emergency.

3.0 Project assessment and approvals

The project was referred by Viva Energy to the Victorian Minister for Planning under the *Environment Effects Act 1978* (Vic) ('Environment Effects Act') on 11 November 2020.

What is an EES?

An Environment Effects Statement (EES) describes a project and its potential environmental effects. The EES process is not an approval in itself, but an assessment by the Minister as to whether the project is considered acceptable or otherwise in terms of potential environmental impacts. The Minister's Assessment of the EES informs regulatory authorities on whether or not the project should proceed, and if so, under what conditions. Statutory approvals for a project being assessed under the Environment Effects Act cannot be considered and issued by regulatory authorities until the Minister's Assessment of the EES is made.

3.1 Requirement for an EES

On 28 December 2020, the Victorian Minister for Planning issued a decision determining that an EES was required for the project due to the potential for a range of significant environmental effects. The Minister identified several primary areas of potential environmental impact requiring consideration, namely:

- The project has the potential for significant adverse effects on the marine environment of Corio Bay including marine water quality. Sediment mobilisation and water discharges may impact on the marine ecosystem, including seagrass and other habitat for listed fauna species, some of which are listed under the *Flora and Fauna Guarantee Act 1988* (Vic) and *Environment Protection and Biodiversity Conservation Act 1999* (Cth) ('EPBC Act'), and potentially the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.
- The project has potential for contributing to greenhouse gas emissions which warrant further investigation of the nature and extent.

The Minister also identified a number of secondary areas of potential environmental impact to be addressed through integrated assessments, namely:

- Other potential effects of the project on air quality, noise, land use, Aboriginal and historic heritage, native vegetation, groundwater, traffic and transport, as well as visual amenity.

On the basis of the Victorian Minister for Planning's decision identifying primary and secondary issues for assessment, this EES addresses all potential environmental impacts but with an emphasis on the primary matters raised.

The project was also referred to the Commonwealth Department of Agriculture, Water and Environment (DAWE) under the EPBC Act. On 21 January 2021, the delegate for the Commonwealth Minister for the Environment determined the project to be a controlled action due to potential significant impact on the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site (a wetland of international importance), listed threatened species and ecological communities and listed migratory species.

The EES serves as the accredited environmental assessment process for the purpose of the EPBC Act under a Bilateral Assessment Agreement between the Commonwealth and Victorian governments.

The assessment process, consultation and key project approvals are shown in **Figure 11**.

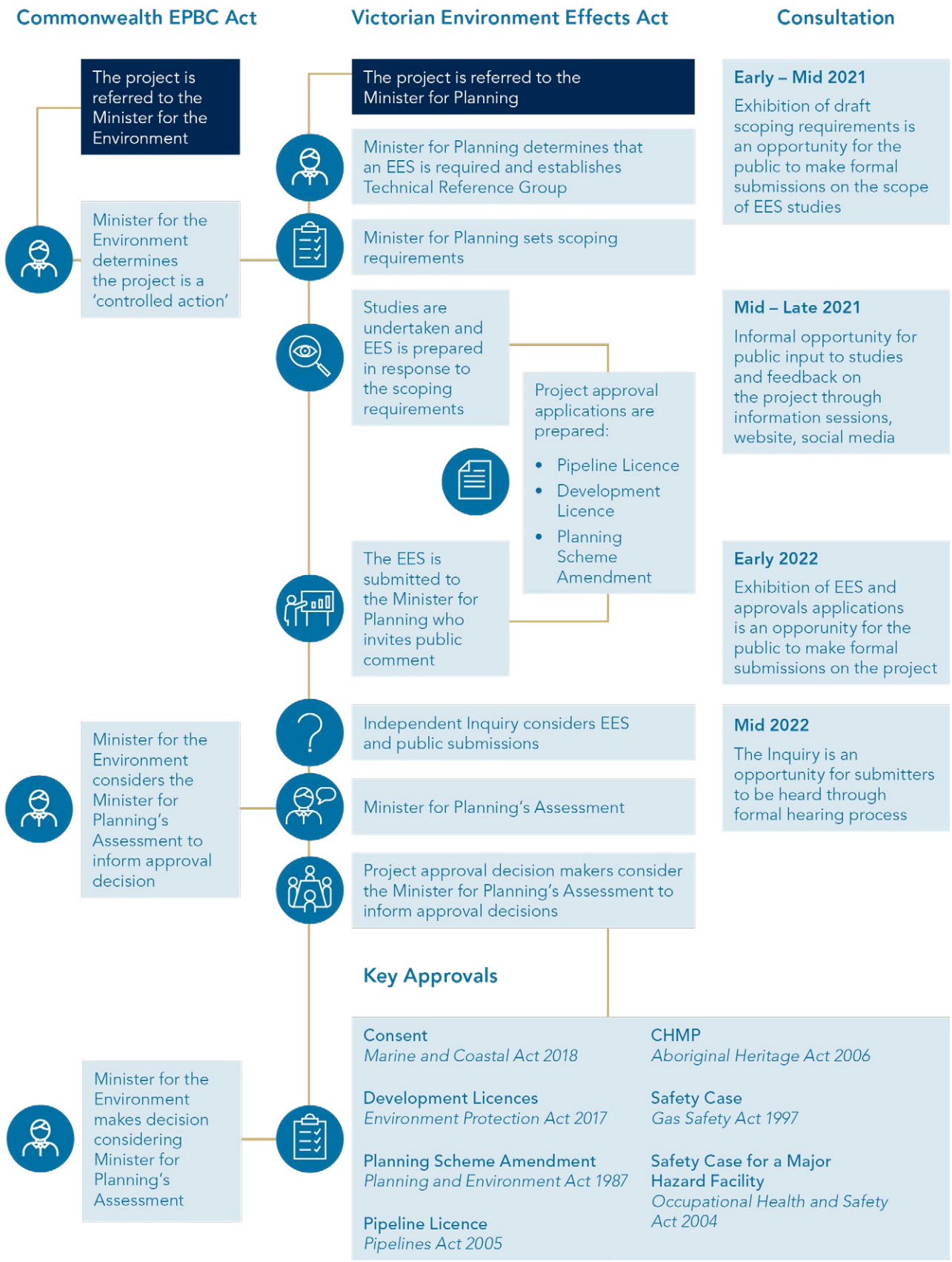

Figure 11 Assessment process, consultation and key approvals

3.2 Approach to the EES

This EES was prepared in accordance with the Victorian Minister for Planning's decision, the scoping requirements for the EES issued by the Victorian Minister for Planning in July 2021, and the Ministerial guidelines for assessment of environmental effects under the *Environment Effects Act* (Ministerial Guidelines).

The scoping requirements for the EES established evaluation objectives that identified key topics to be addressed in the EES. These evaluation objectives provided the framework to guide the integrated assessment of environmental effects and to evaluate the overall implications of the project (refer to **Table 2**).

To ensure that all key issues identified in the scoping requirements were addressed in the EES, 16 technical studies were undertaken. The technical studies assessed potential impacts on the environment from the project construction and operation using a risk-based approach and recommended mitigation measures to address potential impacts. These findings have informed the Environmental Management Framework proposed to avoid, minimise and manage the potential impacts of the project.

The EES has been structured around the primary and secondary areas of assessment identified in the Minister for Planning's decision. The primary issues for assessment represent the potential impacts of most concern for the project that required detailed assessments.

The structure of the EES is shown in **Figure 12**.

Table 2 EES evaluation objectives

Evaluation objectives
Energy efficiency, security, affordability and safety
To provide for safe and cost-effective augmentation of Victoria's natural gas supply having regard to projected demand and supply in context of the State's energy needs and climate policy.
Biodiversity
To avoid, minimise or offset potential adverse effects on native flora and fauna and their habitats, especially listed threatened or migratory species and listed threatened communities as well as on the marine environment, including intertidal and marine species and habitat values.
Water and catchment values
To minimise adverse effects on water (in particular wetland, estuarine, intertidal and marine) quality and movement, and the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.
Cultural heritage
To avoid or minimise adverse effects on Aboriginal and historic cultural heritage
Social, economic, amenity and land use
To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.
Waste
To minimise generation of wastes by or resulting from the project during construction and operation, including dredging and accounting for direct and indirect greenhouse gas emissions.

EES Executive Summary

EES Chapters

Part 1 — Understanding the Viva Energy Gas Terminal Project

- Ch. 1 Introduction
- Ch. 2 Project rationale
- Ch. 3 Project alternatives and development
- Ch. 4 Project description
- Ch. 5 Legislative framework and approval requirements
- Ch. 6 Stakeholder and community engagement
- Ch. 7 Assessment framework

Part 2 — Primary areas of assessment

- Ch. 8 Marine environment
- Ch. 9 Greenhouse gas emissions

Part 3 — Secondary areas of assessment

- Ch. 10 Land environment
  - 10-1 Terrestrial ecology
  - 10-2 Land and water values
- Ch. 11 Amenity and environmental quality
  - 11-1 Air quality
  - 11-2 Noise and vibration
  - 11-3 Landscape and visual
  - 11-4 Transport
  - 11-5 Social and business
  - 11-6 Land use
- Ch. 12 Safety
  - 12-1 Maritime and port operations safety
  - 12-2 Hazard and risk assessments
- Ch. 13 Heritage
  - 13-1 Aboriginal cultural heritage
  - 13-2 Historic heritage

Part 4 — Key findings and environmental commitments

- Ch. 14 Environmental Management Framework
- Ch. 15 Sustainability
- Ch. 16 Key findings

EES Technical Studies (Technical Reports)

- A: Marine ecology and water quality impact assessment
- B: Dredged sediment disposal options assessment
- C: Greenhouse gas impact assessment
- D: Terrestrial ecology impact assessment
- E: Surface water impact assessment
- F: Groundwater impact assessment
- G: Contamination and acid sulfate soils impact assessment
- H: Air quality impact assessment
- I: Noise and vibration impact assessment
- J: Landscape and visual impact assessment
- K: Transport impact assessment
- L: Social and business impact assessment
- M: Land use impact assessment
- N: Safety, hazard and risk assessment
- O: Aboriginal cultural heritage impact assessment
- P: Historic heritage impact assessment

EES Attachments

- I: Energy demand and market statement
- II: Risk to the project from climate change
- III: Legislation and policy report
- IV: Matters of National Environmental Significance
- V: Development Licence Applications
- VI: Pipeline Licence Application
- VII: Draft Planning Scheme Amendment

Figure 12 EES structure

3.3 Consultation

The EES process also aims to inform the public and stakeholders about the project, its potential impacts and how these impacts would be avoided, minimised or managed throughout the project lifecycle. Community consultation and stakeholder engagement would continue to be undertaken during construction and operation of the project.

A consultation plan for the project was developed in response to the requirements of both the *Environment Effects Act and the Pipelines Act 2005* (Vic). The consultation plan guided how Viva Energy informed and consulted with the public and stakeholders during the preparation of the EES and how the proponent consulted with owners and occupiers of land about the proposed pipeline.

Community members and stakeholders are able to provide feedback on the EES and associated approvals applications during the public exhibition period.

4.0 Assessment of environmental effects

4.1 Marine environment

The FSRU would be situated at Refinery Pier in Corio Bay.

The seabed and shoreline of Corio Bay have been substantially modified over the last 170 years with shipping channels being dredged, the western shoreline being established for industrial uses, the Port of Geelong being developed, and seawalls, marinas and jetties constructed as part of Geelong's urbanisation. Despite these developments, field investigations carried out over a 12-month period indicate that Corio Bay has good water quality and a diverse range of marine life that has adapted to the existing conditions of the Bay.

The refinery has been using seawater and discharging seawater back into Corio Bay at elevated temperatures and with residual levels of chlorine for more than 60 years. Empirical evidence from the EES studies undertaken within the existing refinery plume suggests that marine biota has not been adversely affected by the temperature and chlorine discharge over that 60-year period compared to Corio Bay generally.

The studies showed that the offshore area beneath the existing plume had healthy seagrass, marine biota comparable to Corio Bay generally, no residual chlorine found in mussels and the presence of many sea urchins within the existing plume despite sea urchins being considered the most sensitive marine animal to chlorine in toxicity testing. The ability to evaluate potential temperature and chlorine impacts from over 60 years of refinery operation, and the fact that the proposed project discharge is an overall improvement on the current discharge, provides confidence that discharges from the project would not have adverse impacts on the marine environment including Limeburners Bay and the Ramsar site.

4.1.1 Dredging and sediment mobilisation

Localised dredging and seabed excavation for the seawater transfer pipe would disturb and mobilise sediment in Corio Bay. This has the potential to increase turbidity, reduce light availability relied on by phytoplankton (microscopic marine plants which are the foundation of the food chain for most marine life) for growth, modify habitats on the seabed as well as smother seagrass or infauna (animals living in sediment) communities when the suspended solids settle on the seabed. There is also potential to release small amounts of metals and nutrients into the water column from the sediments as they are disturbed. Under certain weather conditions, the release of nutrients has the potential to create an algal bloom after dredging ceases.

Sediment modelling of the dredging activities indicates that there would be short periods of elevated sediments in the water and turbidity would be expected in the dredging zone and potentially surrounding areas. Disposal of the sediments at the Point Wilson DMG would also result in loss of material into the water column and temporary and localised periods of increased turbidity.

Sampling and analysis of the sediment and seawater to examine potential toxicity to ecological receptors indicated that there would be no potential adverse impacts to ecological receptors at both the dredging site and the Point Wilson DMG for the proposed dredging activities. The low levels of contamination (such as metals) identified in some sediment samples would not be bio-available (taken up by marine animals) if mobilised during dredging and disposal.

The area predicted to be impacted by the dredging is shown in **Figure 13**. The background level of suspended solids in Corio Bay is 5 milligrams per litre (mg/L) which increases regularly to around 12 to 20mg/L when waves re-suspend sediment near the shore. The turbidity plume associated with the proposed dredging does not extend to Limeburners Bay, however modelling suggests that there is a localised part of the Ramsar site that would experience an increase in median suspended solids concentration of around 1mg/L which is minor and significantly lower than naturally occurring sediment loads experienced in high wind and storm conditions.

Figure 13 Predicted area of impact (suspended solids) from dredging

Potential impacts from dredging would be managed through avoiding dredging during spring (to avoid early seasonal seagrass growth and when key fish species are potentially in a more vulnerable stage of development); installation of a silt curtain to minimise turbidity in the water column near seagrass beds and at the refinery seawater intake; and turbidity, seabed and plankton monitoring. There would not be long-term changes outside of the zone of dredging from the temporarily elevated turbidity.

4.1.2 Seawater discharge during FSRU operation

The usual operation of the FSRU in open loop regasification mode would require the continuous intake and discharge of seawater at a cooled temperature (approximately 7°C below ambient) containing residual chlorine. If required under certain limited circumstances, the project would also be able to operate in open loop mode and discharge via a diffuser located on Refinery Pier and in closed loop mode (requiring a single intake of seawater and reheating the water using gas-fired boilers) and combined loop mode (using gas-fired boilers to heat a continuous intake of seawater).

The refinery currently uses approximately 350 megalitres (ML) per day of seawater for cooling purposes which heats the seawater to approximately 9°C above the entry water temperature of Corio Bay. Reuse of the FSRU discharge as refinery cooling water would reduce the temperature of the warmed water discharged to approximately 2°C above the entry temperature when the FSRU discharge rate is 350 ML/day. The FSRU discharge would replace all or some of the seawater intake from Corio Bay by the refinery. Following reuse, the seawater would be discharged via the 4 existing refinery discharge outlets at the same flowrate and residual chlorine level as specified in the existing Environment Protection Authority (EPA) Victoria operating licence.

At peak flow from the FSRU into the Geelong Refinery, there would be a smaller temperature plume along the shoreline compared to the existing discharge plume, and most of the plume would only be 1 to 2°C above ambient seawater temperature as a result of the cooled water input from the FSRU (refer to **Figure 14**). At peak flow from the FSRU, the pattern of the chlorine plume would be similar to the existing refinery discharge plume, with minor changes to the spatial extent as a result of reduced spreading due to the lower temperature (refer to **Figure 15**). The reuse of the FSRU water in the refinery as cooling water during project operation would result in no change to the total volume extracted from Corio Bay, no change to the volume of water discharged from the refinery, no change in residual chlorine levels and an improvement in the temperature of the discharge compared to the existing refinery discharge.

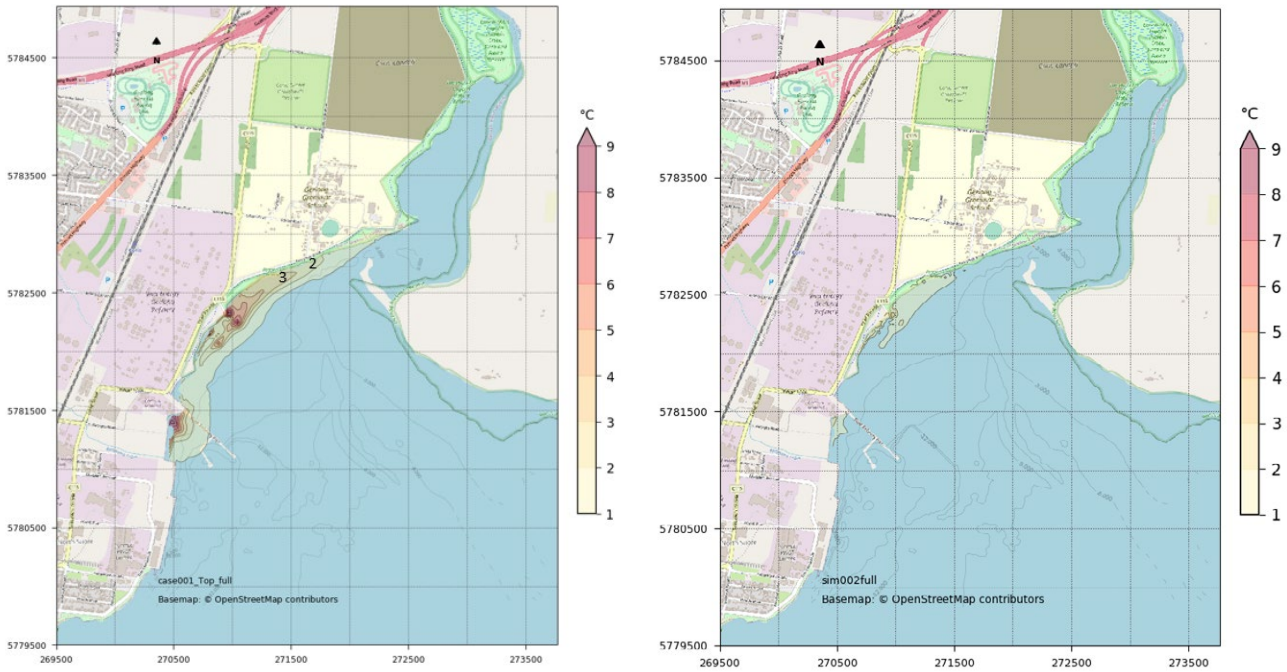

Figure 14 Temperature plumes of existing refinery discharge (left) and with peak FSRU discharge water reuse (right)

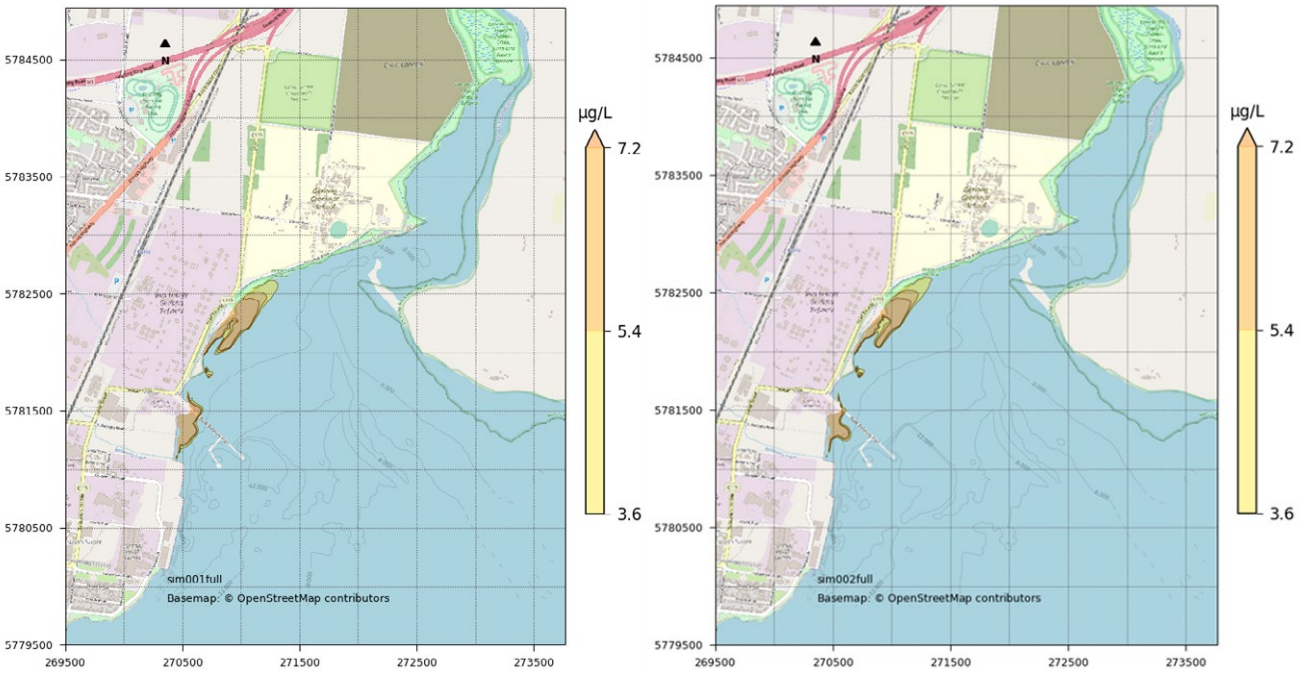

Figure 15 Chlorine plumes of existing refinery discharge (left) and with peak FSRU discharge water reuse (right)

The EES also assessed another discharge arrangement for the project which would involve direct discharge of some, or all, of the cooled FSRU discharge water into Corio Bay via a diffuser located under the Refinery Pier extension. The diffuser would be used during refinery maintenance periods when the rate of FSRU discharge could exceed the refinery demand for seawater or in the event that the refinery was permanently decommissioned in the future and the option for reuse of the FSRU discharge water was no longer available. As the diffuser would be designed to achieve high dilution of 20 parts of seawater to 1 part of discharge water, modelling shows that the resulting chlorine and temperature plumes that would form on the seabed between 0.4 to 0.8°C below ambient temperature and about 3 metres thick, would be localised within the shipping channel and well below temperature and chlorine guideline limits (refer to **Figure 16**).

Figure 16 Temperature plume (left) and chlorine plume (right) with peak FSRU discharge through diffuser

If closed loop mode was used for regasification (in the event that the discharge was unable to be piped to the refinery), when switching back to open loop mode, 0.5ML of discharge water would be discharged at the rear of the FSRU around 5°C warmer than the ambient water temperature. This would create a smaller, less intense temperature plume than the existing plume from the refinery discharge, as the maximum temperature rise is less than 1°C outside a small mixing zone (refer to **Figure 17**).

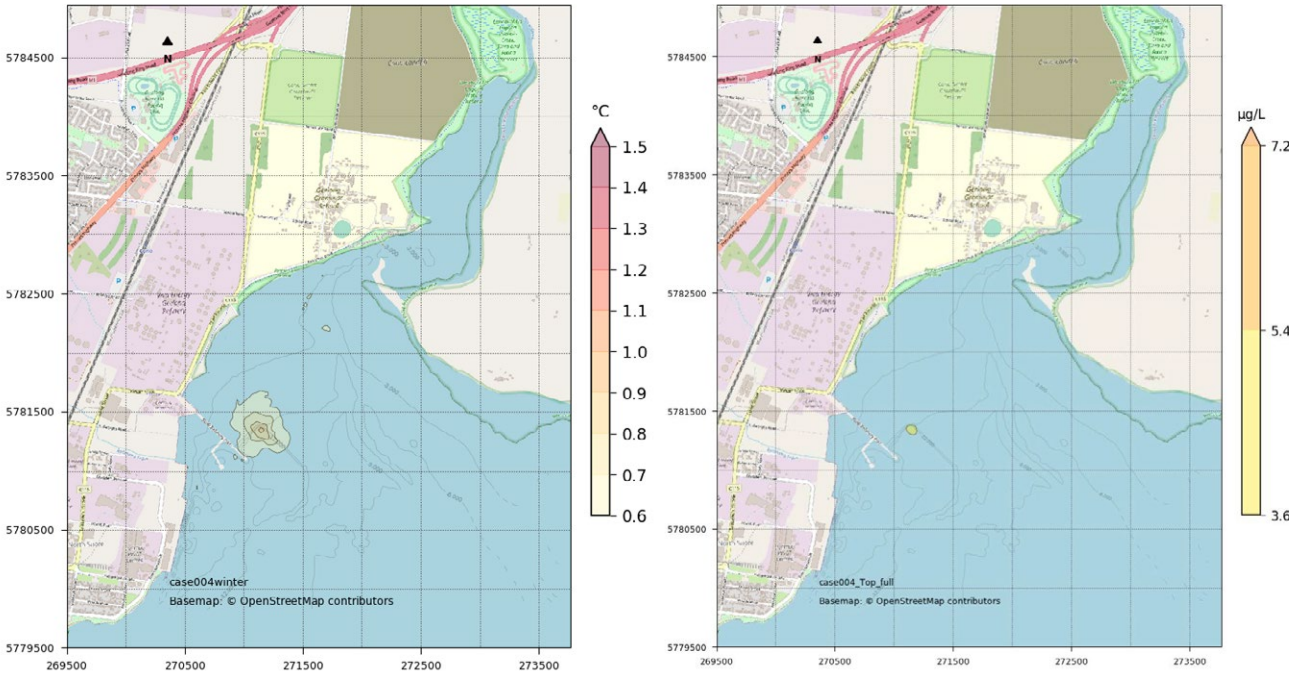

Figure 17 Temperature plume (left) and chlorine plume (right) in closed loop mode

The field surveys for the EES did not identify evidence of negative impacts on marine ecology under the existing refinery discharge plumes that have occurred over the last 60 years compared to other areas of Corio Bay. As such, it was concluded that there would be no adverse impacts on the marine environment from the additional operation of the FSRU in the proposed mode of operation as the discharge is an improvement on that currently occurring. Assessment of the open loop discharge via the diffuser and closed loop operation has indicated that no adverse impacts on the marine environment would occur if these operating modes were utilised.

4.1.3 Ramsar site

The Point Wilson / Limeburners Bay section of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site is located approximately one kilometre to the north of where the FSRU would be moored, on the northern shore of Corio Bay. A Ramsar site is a wetland designated to be of international importance and is protected as a matter of national environmental significance. Seagrass beds and habitat for waterbirds are critical components of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.

Potential impacts on the Ramsar wetlands from the connection with the marine environment would not be significant. Minor increases in turbidity on the edge of the Ramsar site of around 1mg/L suspended solids from dredging may, at worse, slow seagrass growth for a day or two however the effects would not be measurable and is minor when compared with sediment loads of up to 20 mg/L naturally generated in high wind or storm events.

Similarly, the effect of FSRU operation on water quality would not impact the Ramsar site – the warm water and chlorine plumes from the project discharge after reuse in the refinery as cooling water would not enter the Ramsar site. Studies for the EES measured residual chlorine and temperature differentials for the existing refinery discharge which indicated that the current plumes do not extend to the Ramsar site.

Similarly, the EES studies which assessed the existing conditions associated with 60 years of ongoing discharge from the Geelong Refinery concluded that the proposed discharge from the FSRU (being an improvement on the current discharge) would not have adverse impacts on seagrass or marine life beneath the discharge plume.

The food chain supporting marine and terrestrial species, such as migratory shorebirds and waterbirds in Corio Bay and the Ramsar site, would not be impacted by the dredging or FSRU seawater processes and no effects on the critical components and processes of the Ramsar site are anticipated.

4.2 Greenhouse gas emissions

The project would produce greenhouse gas emissions through activities including burning fossil fuels in plant and vehicles during construction and operation, as well as dredging of seabed sediments and the manufacturing of materials used in construction.

How are greenhouse gas emissions measured?

According to the Greenhouse Gas Protocol (GHG Protocol), emissions are split into three categories, known as 'Scopes.' Scope 1, Scope 2 and Scope 3 emissions are defined as:

- Scope 1 – Direct emissions of greenhouse gas from sources that are owned or operated by a reporting organisation (examples include combustion of diesel in company-owned vehicles or used in on-site plant and equipment)
- Scope 2 – Indirect emissions associated with the import of energy from another source (examples include import of electricity from the grid, or heat)
- Scope 3 – Other indirect emissions, other than energy imports which are a direct result of the operations of the organisation, but from sources not owned or operated by them and due to upstream or downstream activities (examples include indirect upstream emissions associated with the extraction, production and transport of purchased construction materials; and business travel by ship, air or rail).

Greenhouse gases are measured as tonnes, kilo tonnes or million-tonnes of carbon dioxide equivalent (CO_2-e). This represents the amount of greenhouse gases emitted as an equivalent amount of CO_2 which has a global warming potential of one. For example, one tonne of CH4 released into the atmosphere will cause the same amount of global warming as 25 tonnes of CO_2. Therefore, one tonne of CH_4 is expressed as 25 t CO_2-e.

Greenhouse gas emissions associated with the construction and operation of the project represent a minor additional contribution to the State's greenhouse emissions as outlined below. Utilising low embodied energy and locally sourced materials and adopting an open loop mode of operations for the FSRU rather than a closed loop mode which burns gas for the regasification process and generates more emissions, would help avoid or minimise greenhouse gas emissions.

Following the implementation of mitigation measures to avoid and minimise greenhouse gas emissions from project construction and operation, residual Scope I and Scope 2 greenhouse gas emissions would be quantified and offset to compensate for emissions produced.

4.2.1 Construction emissions

Scope 1 and 2 emissions during the construction period are estimated to be 6,878 t CO_2-e. This equates to 0.01 per cent of Victoria's annual greenhouse gas emissions and is considered to be a minor additional contribution to the State's greenhouse emissions.

The major contributing activities to the total Scope 1 and Scope 2 emissions for construction are those associated with transport fuel. Diesel fuel consumed by vessels and equipment during construction of the Refinery Pier extension, treatment facility and pipeline, as well as dredging activities are the key contributing activities to greenhouse gas emissions during the construction phase. The majority of the Scope 3 emissions are associated with fuel consumed for the transport of the FSRU to Geelong and the embodied emissions in concrete and steel for Refinery Pier and pipeline infrastructure.

To avoid or minimise emissions where possible, low embodied energy and locally sourced materials would be utilised where possible to minimise embodied and transport emissions. Construction activities would be coordinated to reduce unnecessarily extending the construction period and to avoid inefficient use of equipment. The selection of plant and equipment would also consider fuel/energy efficiency. Together, this would reduce plant and equipment stationery and transport emissions associated with construction.

4.2.2 Operation emissions

Greenhouse gas emissions generated from the project's operation would differ between the operational modes of the FSRU. Fuel consumed by the FSRU would be the primary source of greenhouse gas emissions accounting for majority of the Scope 1 emissions during operation. Other project components and activities would also contribute to the overall greenhouse emissions produced during operation, including electricity consumed at Refinery Pier and within the treatment facility. Fugitive emissions (e.g., gas leaking from pipes or valves) have also been considered for key project components including the treatment facility, pipeline, emergency venting as well as the transfer of LNG from LNG carriers to the FSRU.

The proposed operating mode for the FSRU is open loop. The total annual Scope 1, 2 and Scope 3 operational emissions within the project's operational boundary would be as follows:

- Open loop – 47,906 t CO_2-e
- Closed loop – 178,985 t CO_2-e
- Combined system – 65,280 t CO_2-e

For each of the three operating scenarios, these emissions would equate to 0.05 per cent (open loop), 0.19 per cent (closed loop) and 0.07 per cent (combined loop) of Victoria's annual greenhouse gas emissions per annum.

Therefore, the most significant opportunity to minimise greenhouse gas emissions from the project's operation would be to adopt the preferred open loop operating mode for the FSRU as this would emit four times less greenhouse gas emissions than the closed loop operating mode. To further avoid or minimise emissions, plant and equipment for the project's operation would be selected with consideration of fuel efficiency to reduce the consumption of fossil fuels. Engaging a local workforce where possible would reduce transport emissions associated with transport and air travel.

Viva Energy has committed to offset the residual Scope 1 and Scope 2 emissions associated with the project throughout its construction and operation. Following the implementation of mitigation measures to avoid and minimise greenhouse gas emissions from project construction and operation, residual Scope 1 and Scope 2 greenhouse gas emissions would be quantified and offset to compensate for emissions produced.

4.3 Land environment

The land environment comprises the onshore land traversed by the pipeline. The EES considered the impacts on terrestrial ecology and land and water values, including surface water, groundwater and contamination and acid sulfate soils.

4.3.1 Terrestrial ecology

Potential impacts associated with construction of the onshore pipeline from Refinery Pier to the SWP tie-in point include removal of native vegetation, threatened ecological communities, habitat for threatened species, the injury or death of wildlife, disturbance of wildlife and exacerbation of threatening processes.

Field assessments indicated that no threatened flora species are likely to occur within the onshore construction footprint, however some threatened fauna species and migratory species may be present.

Removal of vegetation and habitat

Potential impacts on terrestrial flora and fauna have been avoided to the extent possible by refinement of the onshore pipeline alignment, which, where possible, utilises existing Geelong Refinery land, existing pipeline corridors and avoids sensitive land uses.

Native vegetation that may be removed during construction of the pipeline comprises 0.091 hectares of Plains Grassland from within the road verge and Viva Energy's paddocks. This is considered to represent the Heavier Soils Plains Grassland threatened ecological community, which is listed as endangered under the *Flora and Fauna Guarantee Act 1988* ('FFG Act') in the Victorian Volcanic Plain bioregion. Although a minor amount, No-Go Zones (NGZs) would be established during construction to minimise potential impacts to native vegetation. No threatened flora species or EPBC Act listed ecological communities would be impacted by construction of the project.

Swift Parrot (listed as critically endangered under the EPBC Act and the FFG Act) and Grey-headed Flying-fox (listed as vulnerable under the EPBC Act and the FFG Act) may occasionally use some planted overstorey trees for foraging and rest. Pipeline construction would result in the removal of up to 0.354 hectares of small, planted eucalypts from within Viva Energy's paddocks. Similar habitat would be retained adjacent to the pipeline construction ROW and loss of habitat is unlikely to have significant impact.

Additionally, the Golden Sun Moth (listed as vulnerable under the EPBC Act and the FFG Act) may occur in the exotic Chilean Needle-grass adjacent to the SWP connector at Lara. This has resulted in design modifications to the construction footprint to minimise impacts on this potential habitat to 0.512 hectares of which 0.48 ha is considered potential habitat for the Golden Sun Moth. Removal of this habitat is not likely to have a significant impact on Golden Sun Moth. This habitat is low quality and within a heavily disturbed area at the northern edge of a more extensive area of higher-quality habitat within the surrounding public recreation reserve.

Migratory birds and the Ramsar wetland

Migratory shorebirds are unlikely to be impacted by construction or operation of the project. There is marginal habitat for migratory species on the shoreline of Corio Bay adjacent to the existing refinery and adjacent to the pipeline construction footprint. The Limeburners Bay area of the Ramsar site, situated approximately one kilometre from the FSRU, provides important habitat for shorebird species.

Offshore dredging which would disturb and mobilise sediments as well as disposal of dredged sediments would have minor impacts on plankton productivity, which provide the foundation of the food chain for shorebirds. However, the effects would be localised and short in duration, and are not predicted to impact on the availability of food resources for shorebirds.

Given the current levels of industrial activity in the vicinity of the project, migratory birds would be unlikely to be affected by the minor additional noise and measurements at the Ramsar site suggest that noise levels are well below those considered to create disturbance to birds. Lighting from the project would be designed in accordance with guidelines to minimise impacts on wildlife noting that the project setting is within a highly lit port and industrialised area. No important roosting areas are within range of potential disturbance from project activities.

As outlined in **Section 4.1.2**, entrainment impacts on plankton and larvae, which form part of the food chain for migratory waders and other waterbirds, are minimal and would not have adverse effects on birds in the Ramsar site or Corio Bay.

4.3.2 Surface water

Surface water from the area surrounding the proposed pipeline drains to the Hovells Creek floodplain which flows into the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site and Corio Bay.

If not managed properly, construction activities have the potential to impact local and downstream sensitive receiving waterbodies and watercourses through the mobilisation of sediment, changes in water quality, changes in stream hydrology/ stability and pollution incidents (e.g., spills) as well as alteration in downstream flood behaviour.

Construction of the pipeline through a minor watercourse

The project is not located within a floodplain and does not intersect any low-lying or flat areas that are subject to flooding. The proposed underground pipeline would cross one waterway near the tie-in point to the SWP (refer to **Figure 18**). This minor, artificially constructed, ephemeral watercourse is located within Hovells Creek Reserve and drains into a constructed dam, which overflows into Hovells Creek after significant rainfall events. To avoid sediments from construction of the pipeline flowing into Hovells Creek, the watercourse would be trenched and construction to occur during no flow conditions, with reinstatement occurring as soon as possible. Weather forecasts would be monitored to avoid having the watercourse trench open when high rainfall events are expected.

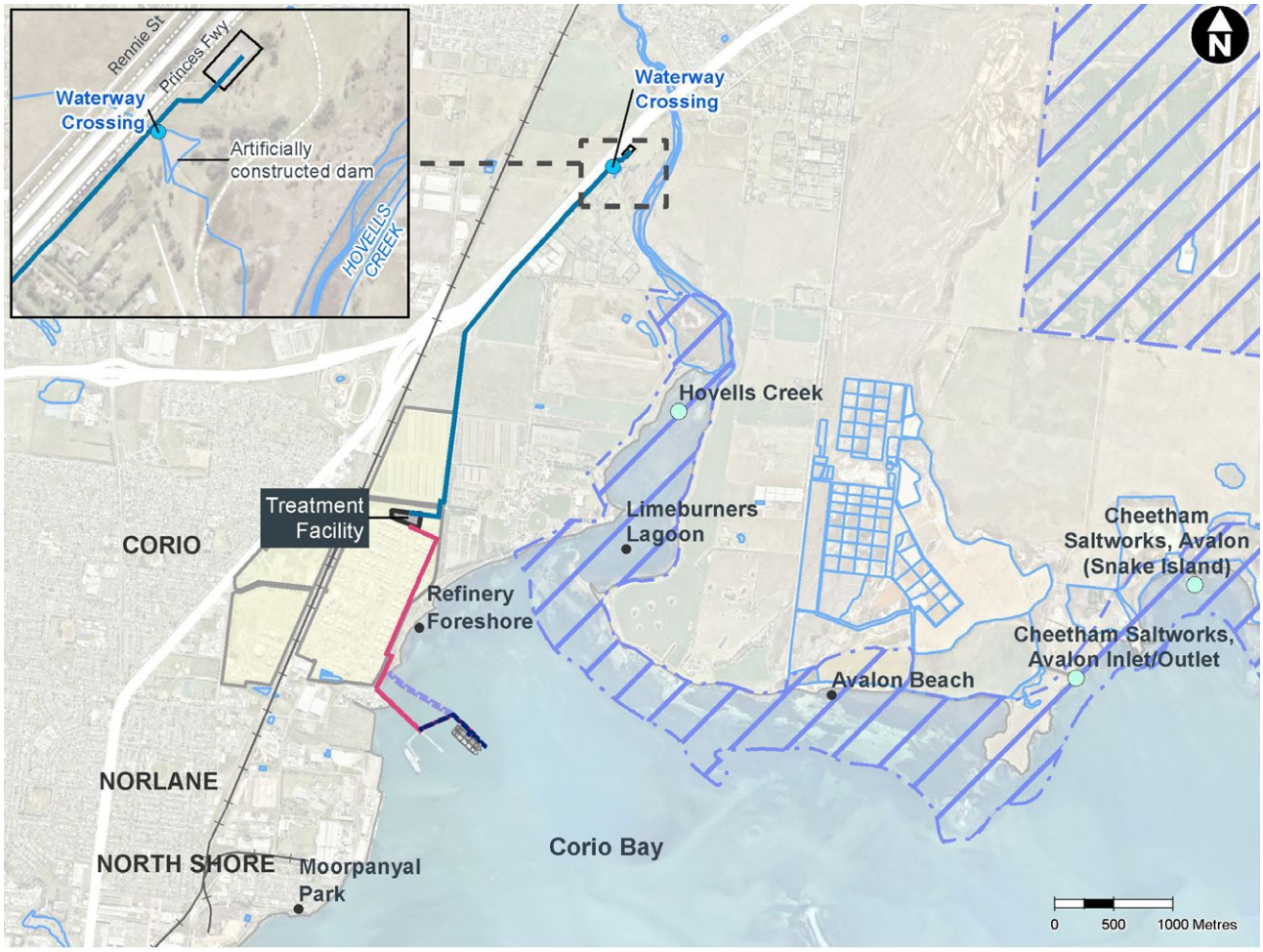

Figure 18 Waterway intersected by the project

Sediment and contaminants in runoff

Runoff from disturbed areas may carry sediments or contaminants into nearby watercourses. Sediment control devices such as bunding or silt fences would be set around stockpiled material, earthworks and disturbed areas to minimise loss of sediment to the receiving environment.

If surface water needs to be pumped from open trenches or excavations after heavy rainfall, it would be recycled or reused where possible, for activities such as dust suppression. Where reuse is not possible, measures to manage potential sediment in the trench water would be employed, including not discharging directly into or within 50 metres of any watercourse. Trench water may also contain other contaminants and would be tested and discharged, or disposed of, in accordance with surface water management and contamination protocols.

Runoff and spills during operation

The treatment facility is proposed to be located on the existing refinery site and rainfall runoff would be treated and managed in accordance with the refinery's existing runoff water system. Due to the absence of watercourses in the area immediately surrounding the treatment facility, it is unlikely that a spill would impact a receiving waterbody. In the event that a spill occurs, it would be managed as part of the refinery's well-established spill management practices.

4.3.3 Groundwater

The depth to groundwater varies from 3 to 4 metres below ground surface (mbgs) in proximity to the Shell Parade culvert in the project's south and varies between 4 and 7 mbgs at the treatment facility location. Further north, along the underground pipeline route, the depth to groundwater increases from 5 mbgs to greater than 8.5 mbgs. A depth to groundwater of 2.9 mbgs was measured in the lower-lying area close to the unnamed watercourse towards the northern extent of the project area.

Groundwater flow is anticipated to be generally east towards Corio Bay, with a localised component of north-easterly flow towards Hovells Creek in the northern portion of the project area. Hovells Creek discharges to Corio Bay via Limeburners Lagoon, which is part of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.

Groundwater levels and flow

Trenching to install the underground pipeline is not expected to intersect groundwater due to the depth of groundwater being below the depth of the trench which would typically be less than 2 metres below ground surface. In the unlikely instance where groundwater is intersected during trenching, dewatering of the trench may be required, which may temporarily reduce groundwater levels in the vicinity of the pipeline with little or no impact.

For sections of the underground pipeline constructed using HDD, it is likely that groundwater would be intersected. However, it is considered that the HDD sections of the pipeline would not obstruct groundwater levels or flow, given its small dimensions, and residual impacts would be negligible. Dewatering is not required for this construction method.

Groundwater levels and flow would unlikely be affected by foundations and piling for the treatment facility. While the detailed design of the facility is not yet finalised, the anticipated 1.5 mbgs foundations and piles would not be expected to intersect groundwater.

4.3.4 Contamination and acid sulfate soils

Contamination at the refinery is well documented and is under active monitoring and management by Viva Energy in consultation with regulatory authorities. North of the refinery, soil sampled within the proposed underground pipeline alignment was generally not contaminated, consistent with the historic agricultural land use in the area. Groundwater too is generally not contaminated although phosphorous and nitrate were detected, potentially representing regional fertiliser use. Per- and polyfluoroalkyl substances (PFAS) was reported in one groundwater monitoring well north of the refinery at concentrations above the ecological screening level but is a considerable distance from the refinery and not considered to have come from this source.

Contaminated soil and groundwater

Construction activities have the potential to disturb contaminated soils and groundwater (although groundwater is unlikely to be intersected by trenching activities). This could result in the mobilisation of contaminants and adversely impact the environment and human health.

Due to the contained nature of the identified contamination, disturbance of contaminated soils and groundwater during the project's construction and operation has limited potential to impact on human health and the environment with the implementation of industry standard management measures. Contaminated soil is more likely to be encountered within the boundary of the Geelong Refinery and would be managed as industrial waste in accordance with current practices within the refinery. All excavated soils would be carefully managed to avoid spreading potential contamination and runoff carrying contaminants entering nearby waterways.

Unknown contamination may be encountered in soil or groundwater (as identified by staining or strong odours), the presence of asbestos and/or other anthropogenic material. In the event that unknown contamination is encountered during construction, ground disturbance works would cease, and the appropriate assessments and remediation would be undertaken, as required.

Acid sulfate soils

Potential acid sulfate soils were identified at a single location within the Geelong Refinery along the proposed aboveground pipeline route. Soils within the refinery (excluding the treatment facility area) would be managed in accordance with a management strategy, that would be developed and implemented within the Construction Environment Management Plan (CEMP) to manage potential issues related to acid sulfate soils.

Leaks and spills during operation

During the operation of the project, impacts to soil and groundwater from leaks and spills would be managed through industry standard measures. Hazardous materials and chemicals would be stored in accordance with the relevant safety data sheets (SDSs) and Australian Standards and given that the bulk storage of material would be located at the Geelong Refinery, these materials would be subject to the refinery's established management procedures.

4.4 Amenity and environmental quality

Although the project is located in an industrial setting with limited sensitive receptors in the vicinity, construction and operation of the project has the potential to have impacts on the amenity and environmental quality of its surrounds. Amenity and environmental quality include air quality, noise and vibration, visual amenity, transport, land use and social and business impacts.

4.4.1 Air quality

Air quality impacts could be generated from dust and exhaust emissions during construction and from FSRU emissions during operation.

Construction dust

The two main activities of the project where construction dust could be generated include construction of the underground pipeline and treatment facility located within the refinery. Nearby sensitive receptors would only be exposed to construction dust emissions for a limited period of time in the event that they do occur, due to the absence of sensitive receptors in most of the project area, and the progressive nature of excavation and construction of the underground pipeline. With the implementation of industry standard mitigation measures such as dust control and suppression techniques, restricting vehicle movements to paved roads and implementing speed restriction and dust monitoring, potential dust impacts from the construction of the project would be avoided and minimised to an acceptable level.

Exhaust emissions during construction from vehicles, barges and support vessels are also expected to be a minor contributor to air quality impacts, especially given their temporary and transient nature. Vehicles, vessels and equipment used for construction would be kept in good condition through regular maintenance in accordance with manufacturer specifications to manage air emissions.

Operational emissions

Air quality modelling undertaken to assess potential air quality impacts of the project during operation, particularly from the regasification process on the FSRU, indicate that emissions would be minor, meet regulatory requirements and are unlikely to have regional or state significant effects on the air environment. All modelled scenarios of emissions from the FSRU and adjacent LNG carrier demonstrated that there are no exceedances of the adopted air quality criteria for modelled pollutants, such as nitrogen dioxide, carbon monoxide, sulphur dioxide, particulate matter, benzene, formaldehyde or polycyclic aromatic hydrocarbons at any of the sensitive receptors.

Other operational infrastructure such as the treatment facility are not expected to produce air emissions on a regular basis, with vent stacks only expected to release emissions during infrequent maintenance periods or in an emergency.

Residual air quality impacts from the FSRU would be localised in the vicinity of the Refinery Pier and Geelong Refinery and minimised to the extent practicable by regular maintenance of the equipment and the burners in the boilers and engines to manufacturer's specifications. Emissions testing and ongoing ambient air quality monitoring would confirm that FSRU emission rates comply with design specifications and any EPA operating licence requirements.

4.4.2 Noise and vibration

Construction noise and vibration

Noise and ground-borne vibration from most construction activities for the project are predicted to be below guideline levels and are unlikely to disturb sensitive receivers. However, some short-duration onshore pipeline works and unavoidable night works (such as HDD and hydrotesting) are predicted to exceed the derived guidelines and may cause temporary adverse impacts to sensitive receivers. The highest noise levels during these construction activities would be expected at Geelong Grammar, Biddlecombe Avenue and School Road dwellings and Macgregor Court, Cummins Road and Rennie Street dwellings.

Noise from dredging works or construction of the Refinery Pier extension are not predicted to exceed the guideline levels at sensitive receivers during daytime, evening or night-time periods.

No buildings near the project construction works were identified as being exposed to vibration at high enough levels to cause structural damage. Vibration intensive equipment is not proposed for pipeline construction, however if used, a number of dwellings along Macgregor Court, Lara would be in proximity to vibration levels that could affect human comfort.

Onsite and offsite mitigation measures, including conducting work during normal hours, informing noise affected receptors, scheduling noisy activities for less sensitive times and scheduling respite periods to provide breaks for sensitive receptors from ongoing noise emissions would minimise noise emissions so far as reasonably practicable. Additional, targeted best practice control measures, such as noise barriers and temporary relocation of residents, would be adopted to minimise and manage potential impacts from unavoidable night works.

Operational noise

Predicted noise levels during operation of the project are expected to comply with Noise Protocol limits at noise sensitive receivers. The assessment identified that under one 'worst case' modelled scenario there is the potential for cumulative noise impacts from the existing industries, combined with the noise emissions from the project during the night, at Geelong Grammar, Biddlecombe Avenue and School Road dwellings. However, it is considered highly unlikely that this exceedance would occur as it would require multiple operational activities coinciding with one another during the night and could be readily avoided through scheduling of operations, for example, avoiding truck deliveries of nitrogen during the night.

With the scheduling of operations to minimise cumulative noise emissions, there would be no residual noise impacts at sensitive receivers during operation of the project. Operational noise monitoring would be undertaken within the first 3 months of operation to confirm operational noise levels and verify cumulative noise impacts.

4.4.3 Landscape and visual

While the project would occur within an existing, heavily industrialised setting, its construction and operation have the potential to impact visual amenity.

Visual impacts associated with the operational phase of the project would represent the 'worst-case' visual scenario. Any potential visual impacts from the construction phase would be of a lesser magnitude than the operation of the project and the temporary duration of construction activities would result in negligible visual impacts.

The visual impact of the operation of the project on the surrounding landscape was assessed by identifying 7 sensitive visual receptor viewpoints from which the project would be visible (refer to **Figure 19**). These included:

- View location 1: Geelong waterfront
- View location 2: The Esplanade in North Shore
- View location 3: St George's Road, approximately 1.7 kilometres east of the project footprint
- View location 4: The northern nature strip of School Road, looking south at Geelong Refinery, approximately 50 m from the proposed treatment facility
- View location 5: Geelong Grammar facing south west towards proposed FSRU/LNG carrier
- View location 6: The Lagoon Boat Club in Limeburners Bay
- View location 7: Avalon Beach Boat Ramp

Figure 19 Viewpoints assessed for the project's visual impact

Visual impacts from viewpoints 1 and 2 to the south of the project are considered to be low on the basis that the FSRU and LNG carrier (when berthed adjacent to the FSRU) would only be partially visible and would not obstruct any important features within the existing views.

The anticipated visual impact from viewpoints 3, 5, 6 and 7 is considered moderate due to the increased visibility of the FSRU and the LNG carrier (when berthed adjacent to the FSRU), which obstructs views beyond the industrial setting of the project (refer to **Figure 20** from viewpoint 6). At viewpoint 4, visual impacts are considered moderate due to the increased visibility of the treatment facility (refer to **Figure 21**).

Figure 20 Photomontage of the FSRU and LNG carrier at Refinery Pier from the Lagoon Boat Club (viewpoint 6)

Figure 21 Photomontage of the treatment facility from School Road (viewpoint 4)

Measures to minimise impacts to visual amenity are not considered necessary at viewpoints 3, 5, 6 and 7 given that the project would not obstruct higher value views from these viewpoints. Along School Road, planting of large native trees would screen the view of the treatment facility, resulting in a low visual impact.

Overall, location of the project in an industrialised port setting with major infrastructure as a backdrop and regular visits of ships is not considered to have adverse impacts on visual amenity.

4.4.4 Transport

Surveys conducted during the traffic assessment indicated that the existing capacity of the local road network, including intersections, is more than adequate to accommodate additional traffic volumes from the construction and operation of the project.

Construction traffic

Peak construction is anticipated to occur during Q2 2023, resulting in approximately 105 vehicle trips travelling to and from the main construction laydown area located off School Road each day. Standard mitigation measures including the preparation and implementation of a Traffic Management Plan (TMP) and detour routes would ensure minimal impact to local traffic during construction. Ongoing consultation with relevant stakeholders would be undertaken to manage potential impacts on public bus services and school buses during construction and where necessary, larger truck movements may not operate during periods when public buses or school buses are operating, impacts if potential conflicts cannot be suitably managed.

Operational traffic

Regular deliveries of nitrogen and odorant would occur during the operation of the project with delivery trucks accessing the treatment facility via Refinery Road. It is estimated that when nitrogen deliveries are required, there would be up to a maximum of 8 trucks per day (most likely B-Doubles). Odorant delivery to the treatment facility is anticipated to be less frequent than nitrogen deliveries (10 deliveries per year). The overall traffic generation during the operation phase is low and can be readily accommodated by the local and wider road network without any adverse impacts. The development of an operational transport plan in consultation with the relevant road authorities would ensure potential impacts are minimised.

4.4.5 Social and business

The construction and operation of the project needs to be considered in the context of the potential impacts and opportunities for local traders, residents, and the wider community surrounding the project area. This includes Corio, Norlane and North Shore in particular.

The siting of the project in an existing port and industrial area, together with the existing amenity in the immediate vicinity of the project area, the limited number of businesses, limited number of residents nearby and the absence of social infrastructure in close proximity to the project means that potential social and business impacts from the construction and operation of the project are considered minor.

Access to social infrastructure and businesses

Access to social infrastructure and community services would not be impacted by the proposal due to the siting of the project.

Recreational boating access is currently restricted in the vicinity of Refinery Pier and the project would result in a slight increase to the boating exclusion zone. This would represent a very small area of wider Corio Bay.

During construction of the project, localised dredging and pier construction works would limit recreational boating and fishing in the immediate project area within Corio Bay, however this would be localised in the context of the wider extent of waters in the bay. There would be no change to public foreshore access during operation and the small increase in vessels visiting Corio Bay is not anticipated to disrupt recreational boating and fishing.

Other business stakeholders that use Refinery Pier would be able to maintain access to Refinery Pier No. 1 to No. 4 during construction works and the limited number of car parks near the pier would be monitored by the project team to ensure car parks remain a shared space for port users. Engagement with local business stakeholders would ensure that other users of Refinery Pier No. 1 would not be impacted by scheduled LNG carrier visits.

Construction activities would result in short term traffic and noise impacts to Geelong Grammar School. Traffic related impacts would be controlled through consultation and the implementation of a Traffic Management Plan. Mitigation measures would minimise noise emissions so far as reasonably practicable to reduce any potential disruption to Geelong Grammar School.

As a result of the perceived risk to public safety from the construction and operation of the project, there was some concern the project may negatively impact student enrolments at Geelong Grammar School. Sharing the results of the EES technical studies relevant to public safety, marine ecology and greenhouse gases would assist to alleviate worry or stress related to the project. Ongoing consultation would ensure sensitive receptors, such as Geelong Grammar School and residents along the pipeline route, and the community are fully informed about the project schedule and activities.

Local employment opportunities and community program

In support of the local community, construction and operation of the project would have a positive benefit to local employment, generating up to 150 to 200 employment opportunities during construction and 50 to 70 during operation. A large number of these opportunities would be sourced locally, where possible. An employment plan would be prepared and implemented with a commitment to prioritise employing locals from northern Geelong, Indigenous groups and individuals from disadvantaged or low socio-economic backgrounds to enhance the employment benefits to the local community. During operation, the project would also leverage existing refinery personnel for inspection and maintenance services.

Viva Energy is already heavily involved in supporting community programs and have a well-established Community Program that delivers positive outcomes to the Geelong community. Benefits from the program include supporting non-for-profit community organisations, local sporting teams, disaster relief, awards for local volunteers and other community causes. The project contributes to the ongoing viability of the Geelong Refinery operations and would result in increased contributions to the Community Program and associated community benefits.

4.4.6 Land use and planning

The Greater Geelong Planning Scheme is the only planning scheme applicable to the project. It is a statutory document that sets out objectives, policies and provisions relating to the use, development, protection and conservation of land in the City of Greater Geelong and is established under the *Planning and Environment Act 1987* (Vic) (Planning and Environment Act).

Approval under the Planning and Environment Act is required for all components of the project via a Planning Scheme Amendment to the Greater Geelong Planning Scheme except for the 7-kilometre pipeline which is subject to a Pipeline Licence. It is proposed to apply a Specific Controls Overlay (SCO) to the pier works, the FSRU and the treatment facility works with an Incorporated Document outlining relevant planning controls. A SCO would provide a consistent and holistic set of controls on the use and development of land for the project.

Land use policy

The project is consistent with relevant land use policy and positively responds to technical considerations and potential future impacts on land, affecting:

- Crown land
- Road reserves and existing infrastructure alignments
- Port and industrial land
- Where unavoidable, parts of land reserved for conservation purposes within the former New Corio Estate subdivision.

Part of the underground pipeline traverses the former New Corio Estate subdivision, reserved for conservation purposes. The underground pipeline operation would not include aboveground activities except for infrequent inspection and monitoring, and therefore would not diminish the role of this land as a grassland reserve.

The project would support the overarching strategic imperatives of the port and its surrounds. It would support the port's ongoing role as a key economic driver for Geelong by creating new employment opportunities and helping to secure Victoria's future energy supplies.

Limitations on land use

Construction of the project would result in temporary land use changes over an approximate 18-month period. Land use changes would be temporary and the number of locations used for construction activities would be minimised, ensuring potential impacts to current land use are minimised.

During operation of the project, an easement would be introduced across the underground pipeline alignment limiting the use of land within that easement and allowing occasional alignment inspection. The proposed alignment of the pipeline utilises existing road corridors and existing pipeline corridors where possible, however the pipeline would traverse two residential properties and an area of conservation land adjacent to Shell Parade. While there would be limitations on the type of structures that could be built and deep-rooted vegetation that could be planted over the easement area, the pipeline would not impact the existing or future use of land for residential purposes and would not diminish the role of the conservation land as a grassland reserve.

4.5 Safety

Safety, hazard and risk assessments have been conducted to demonstrate that the project can be designed, constructed and operated safely. The safety risks to workers, the community and local residents during construction and operation are expected to be limited and not disproportionate to those already experienced by current operations at Geelong Refinery (an existing MHF) and within the Port of Geelong.

A number of safety studies have been conducted by Viva Energy in order to meet the legislative requirements that enable a Pipeline Licence and MHF Licence to be granted. The studies and reviews undertaken to date have identified all events leading to a potential major incident. This allowed for the effective development of safeguards and controls which are consistent with those adopted by hazardous industries and those accepted by the nominated regulators as providing sufficient protections and mitigations against major incidents. These studies and safeguards would continue to be refined during the project life and subject to approval from the relevant regulatory authorities after detailed design is completed.

The main potential incident associated with operation of the project would be the unplanned release of flammable gases and liquids, with subsequent ignition leading to a fire or explosion. This is particularly relevant where dangerous goods are stored and distributed, including the FSRU, pier infrastructure, pipeline and treatment facility. LNG carriers travelling through Corio Bay, to Refinery Pier, would store up to 170,000m^3 of LNG.

The results of the safety studies undertaken indicate that the risk profile within the study area, and on nearby public land uses, would be within the suggested acceptable thresholds as defined by the NSW Hazardous Industry Planning Advisory Paper (HIPAP) 4 "Risk Criteria for Land Use Safety Planning" which is the recognised guideline for safety assessments of this nature. The risk of major incident from operation of the project is considered low. The risk contours from the FSRU are confined to the area over water around the vessel and pier and do not encroach on the shoreline. The 'once in 2,000,000 years likelihood of fatality' risk contour (considered tolerable for sensitive land uses) for the treatment facility combined with the existing Geelong Refinery extends into open space utilised by Geelong Grammar School for outdoor equestrian activity; however, does not extend to the school's Equestrian Centre building.

Additionally, components of the project such as the pipeline have been conservatively designed for a residential environment, exceeding the relevant requirements based on the Australian Standard.

While there would be up to 45 LNG deliveries per year, LNG carriers have multiple layers of protection to prevent a significant loss of containment, including double hull design and construction, insulating material between storage tanks and inner hull and operate under limited vessel speeds within shipping channels within the port. Additionally, the security of port operations is managed by GeelongPort and documented in the Maritime Security Plan which must be approved by the Aviation and Maritime Security (AMS) Division (Commonwealth Department of Home Affairs). This would ensure that there is a minimal likelihood of security threats developing into major incidents during the transit of LNG carriers.

Further mitigation measures that would be implemented to minimise safety risks associated with the project pipeline include, but are not limited to, corrosion protection, conservative design and regular operational patrols.

4.6 Heritage

Ground disturbance works associated with construction of the project, such as trenching and excavation, have the potential to result in damage to or destruction of historic heritage places, historic archaeological sites and Aboriginal cultural heritage places and values.

4.6.1 Aboriginal cultural heritage

A desktop study undertaken for the Aboriginal cultural heritage impact assessment determined that it was reasonably possible for Aboriginal cultural heritage to be present within the least disturbed portions of the project area. The archaeological surveys conducted in proximity to the South West Pipeline tie in point and along the proposed pipeline alignment at Shell Parade comprised 2 test pits and 26 shovel test pits. One test pit and 2 shovel test pits contained stone artefacts, and as a result of the detailed surveys undertaken, one new Aboriginal place was identified.

No ground disturbance works are proposed to occur within the newly identified Aboriginal place. The identified Aboriginal place would be included in a protection zone delineated by temporary fencing for the duration of the construction works to avoid impacts.

Surveys undertaken in the project area have reduced uncertainty in relation to the potential presence of Aboriginal cultural heritage. While it is unlikely that unknown Aboriginal places would be present, the approved Cultural Heritage Management Plan (CHMP) would outline procedures (unexpected finds protocol) in the event that previously unrecorded Aboriginal places are encountered during the construction phase of the project.

Considering that all operation activities would occur in areas already disturbed by the construction phase of the project, no potential impacts to Aboriginal cultural heritage were identified during project operation.

4.6.2 Historic heritage

There are no known historic heritage places located within the project area or within proximity to the project area. Examination of historical maps and aerial photographs suggests that it is unlikely that any unrecorded historical places would be present as these sources do not contain any indication of the presence of historical places. Due to the activity area having a long history of substantial disturbance, including offshore dredging, it is highly unlikely that unknown and unrecorded historic heritage places or maritime heritage items would be present. Unexpected finds protocols would be implemented for the unlikely event that historic heritage places or maritime heritage items are encountered during project construction works.

4.7 Managing environmental effects

The assessment of potential impacts of the project on environmental assets has informed the development of an Environmental Management Framework (EMF).

The EMF is a framework for incorporating recommended mitigation measures arising out of the EES technical studies and project design process and represents the environmental commitments made by Viva Energy for the project. The EMF will assist in informing the Minister for Planning's assessment of the project and the required regulatory approvals should the project receive a favourable assessment as a result of the EES process. The mitigation measures set out in the EMF would be given effect through the relevant statutory approvals where they are incorporated into conditions of approval by regulatory authorities including, but not limited to, the EPA Development Licence, Pipeline Licence and *Marine and Coastal Act 2018* (Vic) consent. These mitigation measures, commitments and conditions attached to statutory approvals would also be included in management plans such as the CHMP, construction and operational environmental management plans and other subordinate management plans where they are given effect during construction and operation of the project.

The project would be delivered in accordance with these environmental commitments, including stakeholder and community engagement, project approvals, design, construction and operation. Viva Energy would ensure that construction and operational contractors used for the project prepare management plans which incorporate all required conditions of approval and mitigation measures. Contractors would also be required to comply with legislation and other relevant guidelines and policies and obtain other approvals, licences, permits or consents that may be required.

The EMF outlines the procedures for community consultation, stakeholder engagement and communications during the construction, operation and decommissioning of the project.

5.0 Next steps in the EES process

The EES together with the draft Greater Geelong Planning Scheme amendment (PSA), the EPA Development Licence applications for the FSRU and the amendment to the Geelong Refinery activities, and the Pipeline Licence application are expected to be placed on public exhibition for 30 business days from late February / early March. Please refer to the EES Summary Document for the starting and closing dates for written submissions.

5.1 How to access the EES and exhibited documents

The EES, draft PSA, EPA Development Licence applications and the Pipeline Licence application will be available to read and download at www.vivaenergy.com.au/gas-terminal-ees.

Should COVID-19 restrictions allow hard copies of the EES, draft PSA, EPA Development Licence applications and the Pipeline Licence application will be made available at the following locations during the exhibition period:

Name of place	Location
Geelong Library & Heritage Centre	51 Little Mallop St, Geelong VIC 3220
Corio Library	Cox Rd, cnr Moa St Norlane VIC 3214
State Library of Victoria	328 Swanston St, Melbourne VIC 3000

Subject to COVID-19 restrictions on Community Facilities. Please check the COVIDSafe Settings for Victoria for updates: www.coronavirus.vic.gov.au/coronavirus-covidsafe-settings.

Please also check the project website for updates on viewing locations: www.vivaenergy.com.au/gas-terminal.

You can request an EES information pack, free of charge. The pack contains:

1. USB loaded with the complete EES, draft PSA, EPA Development Licence applications and Pipeline Licence application
2. Printed EES Summary Document
3. Printed information sheet on 'How to Navigate the EES'.

For those who may have accessibility issues, or where electronic options are impractical, hard copies may be requested, free of charge.

An EES information pack or hard copy documents can be requested by phoning Viva Energy 1800 515 093 or emailing energyhub@vivaenergy.com.au.

5.2 How to make a submission

Submissions on the EES, draft PSA, EPA Development Licence applications and the Pipeline Licence application must be made in writing and be received by the closing date specified in the EES Summary Document.

Each submission is a public document and will be treated as a submission on the EES and on the other exhibited documents (draft PSA, EPA Development Licence applications and the Pipeline Licence application). Only one submission is needed to address all of your views about the project, its effects and the relevant documents.

Online submissions are preferred and can be lodged via the Victorian Government's engagement website: www.engage.vic.gov.au.

Where a submitter is unable to lodge a submission online, they must contact Planning Panels Victoria (PPV) through the DELWP Customer Call Centre on 136 186 (select option 6) and request a hardcopy submission coversheet. Each hardcopy submission must be accompanied by a coversheet issued by PPV for privacy reasons.

All submissions must state the name and address of the person making the submission. Petitions will be treated as a single submission and only the first names from a petition or pro-forma submission will be registered and contacted.

Submissions will be treated as public documents and will be published on the Engage Victoria website. Do not include personal information in the body of your submission (such as your email address or phone number or photos of people, particularly children). Your submission and your name will be made public.

The submission process is independently managed by PPV and any inquiries regarding the management of submissions and the Inquiry and Hearing process should be directed to PPV on 136 186 (select option 6) or email vivagasterminal.iac@delwp.vic.gov.au.

5.3 Inquiry and advisory committee process

The Minister for Planning will appoint a joint Inquiry and Advisory Committee (IAC) under the EE Act and the *Planning and Environment Act 1987* to hold an inquiry onto the project and its environmental effects. The IAC will review the public submissions, the EES, the draft PSA and the EPA Development Licence applications. It will consider the environmental effects of the project in accordance with the Terms of Reference issued by the Minister for Planning.

The IAC may also be appointed by the Minister for Energy, Environment and Climate Change as a panel under the Pipelines Act to consider written submissions and the Pipeline Licence application.

After the exhibition period, the IAC will hold a Directions Hearing, where the necessary arrangements and timetable for the public hearing will be established.

Further information about the Directions Hearing arrangements (including whether it will be held in person or conducted online by video conference) will be published on www.engage.vic.gov.au when determined. The IAC will follow the health advice from the Victoria Government and the Chief Health Officer in making this decision.

Please refer to the EES Summary Document for the likely dates for the Directions Hearing and commencement of the Public Hearing process.

Members of the public and any other parties seeking to be heard at the public hearing are required to submit a written submission and indicate on the online submission form or hard copy submission coversheet that they would like to be heard at the hearing.

Information on the hearing process and timetable will be published as it becomes available at www.engage.vic.gov.au.

The IAC will provide a report to the Minister for Planning, who will consider this report to inform the Minister's assessment of the project's environmental effects. The Minister's assessment of the project will make recommendations about whether the environmental effects of the project are acceptable and will inform statutory decision-makers responsible for issuing environmental approvals for the project.

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