

Chapter 16

Key findings



This chapter presents an overview of the key findings of the Viva Energy Gas Terminal Project (the project) Environment Effects Statement (EES).



16.1 Environmental matters to be assessed

The scoping requirements provided by the Minister for Planning for the project set out the specific environmental matters to be investigated and documented in the EES. The evaluation objectives of the scoping requirements provide a framework to guide an integrated assessment of environmental effects and identify the desired environmental outcomes of the project.

To address the potential environmental effects identified in the scoping requirements, 16 specialist technical studies have been undertaken. The specialist studies are included as technical appendices to this EES.

In the Minister's decision 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.

The following section presents the key findings of the primary areas of assessment (marine environment and greenhouse gas emissions) and secondary areas of assessment (land environment, amenity and environmental quality, safety and heritage) in the context of the evaluation objectives identified in the EES scoping requirements.

16.2 Assessment overview

A summary of the key findings of the primary and secondary matters assessed in the EES are presented in **Table 16-1** with further description found in the following sections.



Table 16-1 Key findings of the EES technical studies

Topic	Key findings	Further information
Primary areas of assessment		
Marine environment	<p>The marine environment offshore from the current refinery discharge was found to be healthy after more than 60 years of warm water and residual chlorine discharges from the Geelong Refinery operations.</p> <p>Dredging in Corio Bay would increase turbidity in the water and could have minor impacts on plankton productivity and seagrass growth for a short period during dredging. The sediment plume from the proposed dredging does not extend to the Ramsar site.</p> <p>Operation of the floating storage and regasification unit (FSRU) in open loop regasification mode would require the continuous intake and discharge of seawater at a cooled temperature containing residual chlorine. It is intended that the FSRU discharge water will be reused in the Geelong Refinery as cooling water prior to discharge into Corio Bay providing a significant environmental enhancement and resulting in an improved discharge over the current refinery discharge. Reuse of the FSRU discharge water at the Geelong Refinery would result in an environmental benefit, as the temperature of the water discharged into Corio Bay would be closer to the ambient temperature of water in Corio Bay. If required under certain limited circumstances, the project would also be able to operate in open loop mode with a discharge via a diffuser 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). In all operating modes, the discharge plumes would be localised.</p>	<p>Section 16.3.1</p> <p>Chapter 8: <i>Marine environment</i></p> <p>Technical Report A: <i>Marine ecology and water quality impact assessment</i></p> <p>Technical Report B: <i>Dredged sediment disposal options assessment</i></p>

Topic	Key findings	Further information
	<p>The impact of taking in and discharging seawater back into Corio Bay is anticipated to be similar to the existing Geelong Refinery processes. It is proposed to reuse the FSRU water in the refinery for cooling water and discharge the water through the existing refinery discharge points, although a diffuser would also be installed on the pier to discharge the cooled seawater if the Geelong Refinery seawater reuse is unavailable. The proposed mode of operation and reuse of seawater would involve no change in the amount of seawater being withdrawn from Corio Bay, no change in the amount of residual chlorine in the seawater discharge and reduced temperature of the seawater discharge (which is considered to be an environmental improvement). Discharge via the diffuser would result in a cold water discharge into Corio Bay with rapid dilution of residual chlorine and mixing of the cold water in a small, localised plume adjacent to the FSRU in the dredged area and shipping channel.</p> <p>Potential impacts from the seawater intake and discharge on threatened and migratory species and the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site would not be significant as temperature and chlorine plumes from the discharge do not extend to or change conditions at the Ramsar site.</p>	
Greenhouse gas emissions	Greenhouse gas emissions from the construction of the project represent 0.01% of Victorian annual emissions and operation of the FSRU in the preferred 'open loop' mode represents 0.05% of Victorian annual emissions. These Scope 1 and 2 emissions would be offset during the life of the project in accordance with Viva Energy's climate change commitments.	<p>Section 16.3.2</p> <p>Chapter 9: <i>Greenhouse gas emissions</i></p> <p>Chapter 15: <i>Sustainability</i></p> <p>Technical Report C: <i>Greenhouse gas impact assessment</i></p>
Secondary areas of assessment		
Land environment	Terrestrial ecology impacts have been predominantly avoided due to placement of the onshore pipeline on existing pipe tracks on Refinery Pier and within the refinery and the pipeline outside the refinery being a short length and located largely within existing pipeline corridors. 0.091 hectares of native vegetation would be removed for construction of the pipeline which is considered a negligible impact. No threatened flora would be impacted, however there is potential for marginal impacts on habitat that may be suitable for threatened fauna species such as Swift Parrot (<i>Lathamus discolor</i>), Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) and Golden Sun Moth (<i>Synemon plana</i>).	<p>Section 16.4.1</p> <p>Chapter 10: <i>Land environment</i></p> <p>Technical Report D: <i>Terrestrial ecology impact assessment</i></p> <p>Technical Report E: <i>Surface water impact assessment</i></p> <p>Technical Report F: <i>Groundwater impact assessment</i></p> <p>Technical Report G: <i>Contamination and acid sulfate soils impact assessment</i></p>

Topic	Key findings	Further information
	<p>Migratory waders and other waterbirds in Corio Bay and the Ramsar site would not be affected by marine discharges or by entrainment of key elements of the food chain such as plankton and larvae in the FSRU seawater intake, which would be minor when compared with natural morbidity and predation rates for these species.</p> <p>Potential impacts to nearby surface waterbodies, including Hovells Creek and the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site would be avoided or minimised by implementing controls on runoff. The proposed underground pipeline would cross one minor constructed watercourse within the Hovells Creek Reserve, however the watercourse crossing would be constructed during no flow conditions and reinstated as soon as possible.</p> <p>Trenching during construction is unlikely to intersect groundwater as it is typically below the trench and pipeline depth of approximately 2 metres. Potential impacts to groundwater levels and flow during operation are considered negligible.</p> <p>Contaminated soils are expected to be encountered during construction of the project within the Geelong Refinery but are unlikely to be encountered along the underground pipeline alignment. Potential acid sulfate soils were identified at a single location within the Geelong Refinery. Due to the contained nature of the identified contamination within the existing refinery and potential acid sulfate soils, disturbance of 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.</p>	
Amenity and environmental quality	<p>Social and business impacts have been mostly avoided as the project is situated within an existing port and industrial area. The general amenity of the area is industrial and is characterized by a limited number of businesses and residents nearby and the absence of social infrastructure which is generally located outside of the project area. Most community services such as schools, childcare, sporting facilities, medical facilities and the like are distant from the project area and community access to these facilities would not be disrupted by the project. During operation there would be no change to public foreshore access, and an increase in vessel movements to Corio Bay per year is not anticipated to disrupt recreational boating and fishing. The opportunity to provide local employment during project construction and operation presents a significant benefit of the project.</p>	<p>Section 16.4.2</p> <p>Chapter 11: <i>Amenity and environmental quality</i></p> <p>Technical Report H: <i>Air quality impact assessment</i></p> <p>Technical Report I: <i>Noise and vibration impact assessment</i></p> <p>Technical Report J: <i>Landscape and visual impact assessment</i></p> <p>Technical Report K: <i>Transport impact assessment</i></p> <p>Technical Report L: <i>Social and business impact assessment</i></p> <p>Technical Report M: <i>Land use impact assessment</i></p>

Topic	Key findings	Further information
	<p>Potential impacts to air quality from dust and exhaust emissions during construction would be negligible due to the progressive nature of construction of the pipeline and application of industry standard mitigation measures. FSRU emissions during operations have been characterised and modelled and impacts would be minor and unlikely to have regional or State significant effects on the air environment.</p> <p>Short duration and unavoidable night-time construction works may disturb noise sensitive receivers at several locations during construction and would require some mitigation measures to be adopted. Predicted noise levels during operation of the project are expected to comply with regulatory limits at noise sensitive receivers.</p> <p>The location of the project within a port and industrial area means the proposed infrastructure is consistent with surrounding land uses and has a backdrop of the existing refinery and other industries. Potential visual amenity impacts from a range of viewpoints were considered to range from low to moderate during project operation but not out of keeping with the surroundings. Planting of vegetation along School Road would screen the proposed treatment facility within the refinery site from the road reducing the visual impact at this location to low.</p> <p>Transport impacts relating to construction and operation of the project are considered minor as the port and industrial area is well serviced by roads capable of accommodating heavy vehicles. The surrounding road network and intersections have been assessed as being able to readily accommodate all projected traffic. Nitrogen deliveries to the site during operation would be in the order of 8 trucks per day and able to access the site without any adverse impacts.</p> <p>The project supports the overarching strategic imperatives of the port and its surrounds and would be consistent with the relevant policy and land uses for the area. The project would not inhibit the use of properties in the project area and surrounds.</p>	

Topic	Key findings	Further information
Safety	A number of safety studies have been conducted by Viva Energy in order to meet the legislative requirements that enable a Pipeline Licence and Major Hazard Facility (MHF) Licence to be granted. The safety, hazard and risk impacts during project construction and operation are expected to be limited and not disproportionate to those already experienced due to current operations at Geelong Refinery and within the Port of Geelong. Risk contours for the FSRU are confined to the waters around the vessel and pier and do not extend to the land. Risk contours for the treatment facility are contained within the existing MHF contours. The safety issues associated with LNG carriers visiting the port have been assessed with risks considered to be minor due to a combination of factors including vessel design, vessel speeds and active management of the carrier during berthing and departure.	Section 16.4.3 Chapter 12: <i>Safety</i> Technical Report N: <i>Safety, hazard and risk assessment</i>
Heritage	One new Aboriginal heritage place was identified in the project area; however, no ground disturbing works are proposed to occur within the Aboriginal place. The CHMP would outline an unexpected finds protocol to manage previously unrecorded Aboriginal places in the unlikely event these are encountered. No known historic heritage places are located within the project area or within proximity to the project area.	Section 16.4.4 Chapter 13: <i>Heritage</i> Technical Report O: <i>Aboriginal cultural heritage impact assessment</i> Technical Report P: <i>Historic heritage impact assessment</i>

16.3 Primary areas of assessment

The primary issues for assessment identified by the Minister for Planning are considered to represent the potential impacts of most concern for the project and requiring detailed assessments in the EES.

The key findings of these assessments are discussed in the following sections.

16.3.1 Marine environment

The key issues relating to impacts on the marine environment are dredging in Corio Bay, which would mobilise sediments during the dredging and the intake and discharge of seawater back into Corio Bay from the FSRU.

The impacts of these processes on the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site, of which the Point Wilson / Limeburners Bay section is approximately one kilometre to the north of the proposed FSRU location, is also a key consideration in the assessment of potential impacts.

The evaluation objectives relevant to the marine environment are described in **Table 16-2**.

Table 16-2 Evaluation objectives - marine environment

Evaluation objectives
<p>Energy efficiency, security, affordability and safety</p> <p>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.</p>
<p>Biodiversity</p> <p>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.</p>
<p>Water and catchment values</p> <p>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.</p>
<p>Cultural heritage</p> <p>To avoid or minimise adverse effects on Aboriginal and historic cultural heritage.</p>
<p>Social, economic, amenity and land use</p> <p>To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.</p>
<p>Waste</p> <p>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.</p>

Dredging and sediment mobilisation impacts

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 spoil disposal site, if approved, would also result in sediments in the water column and temporary and localised periods of increased turbidity. Detailed assessments and modelling indicate that the settlement of mobilised sediments after dredging would be at levels well below that required to result in any adverse impacts such as smothering of seagrass.

Extensive sampling of sediments to identify potential contamination was undertaken at the proposed dredging site and at the Point Wilson disposal ground and was used to inform the proposed spoil disposal approach. It was found that the low levels of contamination identified in some sediment samples would not be bio-available to marine species if mobilised during dredging and disposal and that sediments could be disposed of at the preferred Point Wilson disposal ground without adverse environmental impacts.

Dredging may release small amounts of metals and nutrients into the water column from the sediments as they are disturbed, however this would not have

adverse ecological impacts, other than the potential for elevated nutrients to instigate an algal bloom.

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.

FSRU operation and seawater processes

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 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 FSRU would take in seawater at the same slow velocity as the existing refinery intake, which would enable most mobile marine species to avoid the

intake but has the potential to entrain small marine organisms such as plankton and larvae into the piping. The hydrodynamic modelling indicates that there would be a slight increase to the proportion of plankton and larvae entrained from the Ramsar site and northern and southern Corio Bay in the FSRU intake compared to the existing refinery intake, however, these entrainment rates are negligible in comparison to natural predation and other losses.

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.

The reuse of the FSRU water in the refinery as cooling water during project operation would result in no change to the total volume of seawater 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. As the refinery discharge has been occurring for more than 60 years, the EES studies were able to assess empirical evidence of potential effects associated with the chlorine and temperature levels. The field surveys for the EES did not identify evidence of negative impacts on marine life under the existing refinery discharge plumes compared to other areas of Corio Bay. Seagrass in the vicinity of the plume was observed to be abundant and healthy; sea urchins, which are considered to be sensitive to chlorine, were abundant in the current discharge plume; and tests on mussels from the vicinity showed no detectable residual chlorine. As such, it was concluded that there would be no adverse impacts on the marine environment from the additional operation of the FSRU as the proposed discharge is an overall improvement when compared with the quality of the existing discharge.

In the event that the refinery was permanently decommissioned in the future and the option for reuse of the FSRU discharge water in the refinery was no longer available, direct discharge of some, or all, of the FSRU discharge water into Corio Bay would be via a diffuser located under the Refinery Pier extension. The diffuser would be designed

to achieve high dilution of 20 parts of seawater to 1 part of discharge water. As the diluted plume is cooler water, it is slightly more dense than ambient seawater and would form a plume between 0.4 to 0.8°C below ambient temperature, about 3m thick, on the seabed in the dredge shipping channel.

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.

Ramsar site

Potential impacts on the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site from the connection with the marine environment would not be significant.

Minor increases in median suspended solids concentration of around 1 milligram per litre mobilised by dredging on the edge of the Ramsar site may, at worst, slow seagrass growth for a day or two however the effects would not be measurable. Dredging for the project is of short duration and no unacceptable short term or lasting effects have been identified by the marine studies.

The effect of FSRU operation on water quality would not impact the Ramsar site – the warm water and chlorine plumes would not extend to the site and are not anticipated to have adverse effects on marine life.

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 site are anticipated. Potential entrainment of plankton and larvae (food chain species) in the FSRU seawater intake was assessed and was found to be negligible in the context of populations in Corio Bay.

Meeting the evaluation objective

Through the marine assessment, it is considered that the EES has demonstrated that the project would be consistent with the evaluation objectives to avoid and minimise potential adverse effects on the marine environment, including intertidal and marine species and habitat values; and to minimise adverse effects on water (in particular wetland, estuarine, intertidal and marine) quality and movement, and to the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine

Peninsula Ramsar site. Water quality changes would not exceed current refinery levels and based on the health of the existing environment, adverse impacts from the future discharges are not anticipated.

16.3.2 Greenhouse gas emissions

The key issue relating to the project's greenhouse gas emissions are from using fuel during the operation of the FSRU.

The evaluation objective relevant to greenhouse gas emissions is described in **Table 16-3**.

Table 16-3 Evaluation objective – greenhouse gas

Evaluation objective

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.

Construction emissions

The total construction Scope 1, 2 and Scope 3 emissions within the project's operational boundary for construction is estimated to be 62,168 t CO₂-e. Scope 1 and 2 emissions during the project construction period is estimated to be 6,878 t CO₂-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 majority of total Scope 1 and 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. Most 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.

Operation emissions

Greenhouse gas emissions generated from the project's operation would differ between the available operational modes of the FSRU (refer to Chapter 4 *Project description* for details of the different FSRU operating modes). Fuel consumed by the FSRU would be the primary source of greenhouse gas emissions accounting for the majority of the Scope 1 emissions during operation. Other project components and activities which would also contribute to the overall greenhouse gas emissions produced during operation, include 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 usual 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 CO₂-e
- Closed loop – 178,985 t CO₂-e
- Combined system – 65,280 t CO₂-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.

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.

Following implementation of proposed mitigation measures during project construction and operation, Viva Energy has made the commitment to offset residual Scope 1 and Scope 2 emissions from the project. Offsetting emissions would be in accordance with the framework provided by the Climate Active Standards.

Meeting the evaluation objective

Overall, the project is considered to be consistent with the evaluation objective 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.

Greenhouse gas emissions associated with the construction and operation of the project represent a minor additional contribution to the State's greenhouse gas emissions. Utilising low embodied energy and locally sourced materials and adopting an open loop mode of operation for the FSRU would help avoid or minimise greenhouse gas emissions. In addition, residual Scope 1 and Scope 2 emissions from the project during construction and operation would be quantified and offset.

16.4 Secondary areas of assessment

The secondary issues for assessment are considered to represent potential impacts that may be of lesser significance for the EES as a result of factors including location of the project within an existing port and industrial area and the significant separation distances from sensitive land uses.

The key findings of these assessments are discussed in the following sections.

16.4.1 Land environment

The evaluation objectives relevant to the land environment are described in **Table 16-4**.

Table 16-4 Evaluation objectives - land environment

Evaluation objective
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.
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.

Terrestrial ecology

Impacts to terrestrial ecology, including to the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site, have been predominantly avoided by the refinement of the onshore pipeline route. Where possible, the proposed pipeline alignment utilises existing Geelong Refinery infrastructure and land, existing pipeline corridors and avoids sensitive land uses.

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

Native vegetation

Native vegetation that may be removed during construction comprises 0.091 hectares of Plains Grassland, from the road verge and Viva Energy's paddocks, which is considered a negligible impact. The grassland 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. No-Go Zones would be established during construction to minimise potential impacts to native vegetation. No threatened flora species or EPBC Act listed ecological community would be impacted by construction of the project.

Threatened fauna

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 be impacted by the removal of up to 0.354 hectares of small, planted eucalypts. 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 Chilean Needle-grass (exotic species) 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

The impacts on the food chain for migratory birds via the marine environment have been assessed as a key consideration of the EES. The marine assessment concluded that the project would not result in long-term impacts to the marine environment and would not have adverse impacts on the food chain supporting terrestrial shorebirds and other waterbirds in Corio Bay and the Ramsar wetland.

Migratory birds present in the intertidal areas of Point Abeona, Limeburners Bay and Avalon Beach are unlikely to be affected by additional noise and lighting as a result of the project, given the distance from the project and the sound levels being lower than the levels at which responses have been detected in birds.

Light spill from the project, which is located in an already extensively lit port industrial area, would be localised and not impact on bird species in the Ramsar site.

Surface water

With the implementation of standard management measures, construction activities would be unlikely to impact local and downstream sensitive receiving waterbodies and watercourses.

Construction of the underground pipeline would involve trenching through a minor, artificially constructed ephemeral watercourse located within the Hovells Creek Reserve which flows into an artificially constructed dam. The dam is a low point in the landscape which fills up after heavy rainfall and overflow from the dam flows into Hovells Creek. Potential sedimentation impacts if a significant rainfall event occur would be avoided by trenching the watercourse during no flow conditions, with reinstatement occurring as soon as possible.

To manage runoff from disturbed areas, 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. This would avoid or minimise potential sediment or contaminant impacts to nearby waterways.

Due to the absence of watercourses in the area immediately surrounding the treatment facility, it is unlikely that a spill at the site during operation 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.

Groundwater

Construction and operation of the project is not anticipated to impact groundwater flow or levels.

Groundwater is not anticipated to be intersected during trenching for laying of the gas pipeline due to the depth of groundwater being below the base of the trench which will typically be two metres below the surface. In the unlikely instance where groundwater is intersected, short-term dewatering may be required which may temporarily reduce groundwater levels in the vicinity of sections of the pipeline but with no lasting impact.

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

Contamination and acid sulfate soils

A soil and groundwater contamination assessment was conducted for the project primarily along the pipeline alignment from Refinery Pier to the SWP tie in point at Lara. The study found that there are areas of existing contamination within the boundary of the Geelong Refinery which is actively managed in consultation with regulatory authorities. Contaminated soils are expected to be encountered during construction of the project within the Geelong Refinery and waste soil and groundwater excavated during construction in the refinery would be managed as industrial waste. The pipeline alignment outside of the refinery boundary was found to be largely uncontaminated.

Potential acid sulfate soils were only identified in a single location within the Geelong Refinery, and if encountered elsewhere within the project area during construction would be managed in accordance with accepted regulatory practices.

In the event that unknown contamination was encountered during construction, ground disturbance works would cease and the appropriate assessments and remediation would be undertaken, as required. Waste would be managed to avoid spreading contamination and discharging to waterways and in accordance with the *Environment Protection Act 2017*.

During operation of the project, impacts to soil and groundwater from leaks and spills would be managed through industry standard measures, including the implementation of project Operational Environmental Management Plans (OEMPs). 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.

Meeting the evaluation objectives

Locating the proposed project within an existing port and industrial area, with much of the infrastructure located on Refinery Pier and within the existing Geelong Refinery grounds; and locating the gas pipeline largely within or adjacent to existing disturbed easements, would result in an overall low level of impact on the land environment. With the implementation of industry standard mitigation measures, construction and operation of the project would avoid and minimise adverse effects on native flora and fauna, water quality and the ecological character of the Port Phillip Bay (Western Shoreline) and Bellarine Peninsula Ramsar site.

A sustainability lens has been applied to the project, such that wastes would be minimised and managed in accordance with the refinery's established management procedures.

16.4.2 Amenity and environmental quality

Although the project is located in an existing port and 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, land use, visual amenity, transport and social and business impacts.

The evaluation objective relevant to amenity and environment quality is described in **Table 16-5**.

Table 16-5 Evaluation objectives – amenity and environmental quality

Evaluation objective
<p>Social, economic, amenity and land use – To minimise potential adverse social, economic, amenity and land use effects at local and regional scales.</p>
<p>Air quality</p> <p>There are limited sensitive receptors near the project that would be exposed to construction dust emissions. Dust could be generated near these receptors, particularly in the vicinity of Macgregor Court near the pipeline connection point, for a short period of time due to the progressive nature of excavation and construction of the underground pipeline. With the implementation of industry standard mitigation measures such as dust suppression, potential dust impacts from the construction of the project are expected to be negligible.</p> <p>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 and would have no material effects on amenity.</p> <p>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 and localised in the vicinity of Refinery Pier and the Geelong Refinery. All modelled scenarios of emissions from the FSRU and adjacent LNG carrier demonstrated that pollutants are well below the adopted air quality criteria at all of the modelled receptors. Air quality emissions are unlikely to have regional or State significant effects on the air environment.</p> <p>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.</p> <p>Noise and vibration</p> <p>Noise and ground-borne vibration from most construction activities for the project are predicted to comply with 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.</p> <p>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.</p> <p>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.</p> <p>Onsite and offsite mitigation measures, including conducting work during normal hours, informing noise affected receivers, scheduling noisy activities for less sensitive times and scheduling respite periods to provide breaks for sensitive receivers from ongoing noise emissions would minimise harm from noise emissions so far as reasonably practicable. Additional, targeted best practice control measures such as noise barriers would be adopted where unavoidable night works are required to minimise impacts.</p> <p>Modelling shows that predicted noise levels during operation of the project are expected to comply with regulatory limits at noise sensitive receivers. 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 involved assessment of a worst-case noise event which would require multiple operational activities coinciding with one another during the night and could be readily avoided through scheduling.</p>

Landscape and visual

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. Location of the project within the existing port and industrial setting means the project has a backdrop of large infrastructure including the Geelong Refinery with visual elements considered to be consistent with the existing surrounds.

The visual impact of the project on the surrounding landscape was assessed by identifying 7 sensitive visual receptor viewpoints from which the project would be visible. These included:

- View location 1: Geelong waterfront
- View location 2: The Esplanade in North Shore
- View location 3: St Georges Road, approximately 1.7km 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

Visual impacts from viewpoints 1 and 2 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, however the views obstructed are not considered higher value views and no mitigation measures are proposed.

At viewpoint 4, visual impacts are considered moderate due to the increased visibility of the treatment facility, and screen planting of large native trees along School Road are proposed, which would result in a low visual impact.

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 construction and operation of the project.

Peak construction is anticipated to occur during Q2 2023, resulting in approximately 105 vehicle trips each day travelling to and from the main construction laydown area located off School Road. 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, if potential conflicts cannot be suitably managed.

Regular deliveries of nitrogen and odorant during the operation of the project would occur as required and would access 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 any potential impacts are minimised.

Potential cumulative traffic impacts associated with other developments such as the recent relocation of the TT Line Tasmanian ferry to the Port of Geelong were considered and considered to be minimal with the current road network operating well within capacity for the combined projects.

Land use and planning

Being located within the Port of Geelong and surrounding industrial area, the project is considered to be consistent with relevant land use policy and relevant Planning Scheme zonings for the area.

The project would support the overarching strategic imperatives of the port and its surrounds and would be a positive response to the relevant policy and land uses. 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.

Construction of the project would result in temporary land use changes over an 18-month period. These changes would comprise the establishment of a 15-20 metre construction right of way for construction activities, including stockpiling and laydown areas, and temporary construction access areas. Land use changes would be temporary and recoverable after construction is complete and the number of locations used for construction activities would be minimised, ensuring potential impacts to 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 inspections. 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 former New Corio Estate subdivision conservation land as a grassland reserve.

Social and business

As the project is situated within an existing port and industrial area, adverse social and business impacts are considered minor. The general amenity of the area is industrial and is characterized by a limited number of businesses and residents nearby and there is an absence of social infrastructure which is used by the local community which is generally located outside of the project area. The opportunity to provide local employment presents a significant benefit of the project. The project does not disrupt community access to key services such as schools, childcare, sporting facilities and medical services which are generally remote from the project area.

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

During the construction of the project, localised dredging and pier construction works would limit recreational boating and fishing in the immediate project area within Corio Bay. Access to Refinery Pier No. 1 to No. 4 would not be impacted by construction works.

There would be no change to public foreshore access during operation, and an approximate 5% increase in vessel movements per year, from LNG carriers visiting Corio Bay, is not anticipated to disrupt recreational boating and fishing.

In support of the local community, the 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.

Meeting the evaluation objective

Overall, the project is considered to be consistent with the evaluation objective to minimise potential adverse social, economic, amenity and land use effects at local and regional scales. Amenity and environmental quality impacts of the project are considered minor, particularly due to the siting of the project within an existing port and industrial area, while the opportunity to provide local employment presents a significant benefit.

16.4.3 Safety

The evaluation objective relevant to the safety assessment is described in **Table 16-6**.

The safety, hazard and risk impacts during project construction and operation are expected to be limited and not disproportionate to those already experienced due to current operations at Geelong Refinery and within the Port of Geelong.

Table 16-6 Evaluation objective - safety

Evaluation objective

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.

The results of the safety studies undertaken indicate that the risk profile within the study area, and on nearby 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 guideline typically adopted for assessment of safety and risk on surrounding land uses. Additionally, components of the project such as the pipeline have been conservatively designed for a residential environment, exceeding the relevant requirements based on Australian Standard.

The risk contours for the FSRU are confined to an area over water and Refinery Pier and do not extend onto land. The contours for the treatment facility located in the refinery are generally contained within the existing MHF contours for the refinery.

The FSRU and 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 limited vessel speed. 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.

Meeting the evaluation objective

The safety studies conducted allow for the effective development of safeguards and controls consistent with hazardous industries and accepted by the nominated regulators as, providing sufficient protections and mitigations against major incidents. As such, it is considered that the project would be consistent with the evaluation objective to provide for safe augmentation of Victoria’s natural gas supply.

16.4.4 Heritage

The evaluation objective relevant to heritage is described in **Table 16-7**.

Table 16-7 Evaluation objective - heritage

Evaluation objective
Cultural heritage – To avoid or minimise adverse effects on Aboriginal and historic cultural heritage

Aboriginal cultural heritage

As part of the archaeological surveys for the project, 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. While it is unlikely that any unknown Aboriginal places would be present within the activity area, the approved 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.

Historic heritage

There are no known historic heritage places located within the project area or within proximity to the project area. Unexpected finds protocols would be implemented for the unlikely event that historic heritage places or maritime heritage items are encountered during project construction works.

Meeting the evaluation objective

It is considered that the project would be consistent with the evaluation objective to avoid or minimise adverse effects on Aboriginal and historic cultural heritage by implementing the CHMP and unexpected finds protocols for cultural heritage.

16.5 Responding to the key findings

The assessment of potential impacts of the project on environmental assets has informed the development of an Environmental Management Framework (EMF) that includes Viva Energy's environmental commitments for the project.

16.5.1 Environmental Management Framework

The EMF is a framework for outlining the environmental commitments made by the project proponent to manage potential environmental impacts associated with the project and to clearly identify accountabilities for implementation. The EMF is informed by recommendations arising from the 16 specialist technical studies conducted for the EES.

The mitigation measures set out in the EMF are the environmental commitments made by Viva Energy and, subject to a favourable assessment of the project by the Minister for Planning, would be given effect through the relevant statutory approvals including, but not limited to, the EPA Development Licences, the Pipeline Licence, Planning Scheme Amendment, the Marine and Coastal Act consent and various safety approvals. These commitments, as well as conditions required by regulatory authorities, would also be included in management plans such as the CHMP, construction and operational environmental management plans and other subordinate management plans and the proponent and its contractors would be responsible for their implementation.

The project would be delivered in accordance with these environmental commitments, including stakeholder and community engagement, project approvals, design, construction and operation.