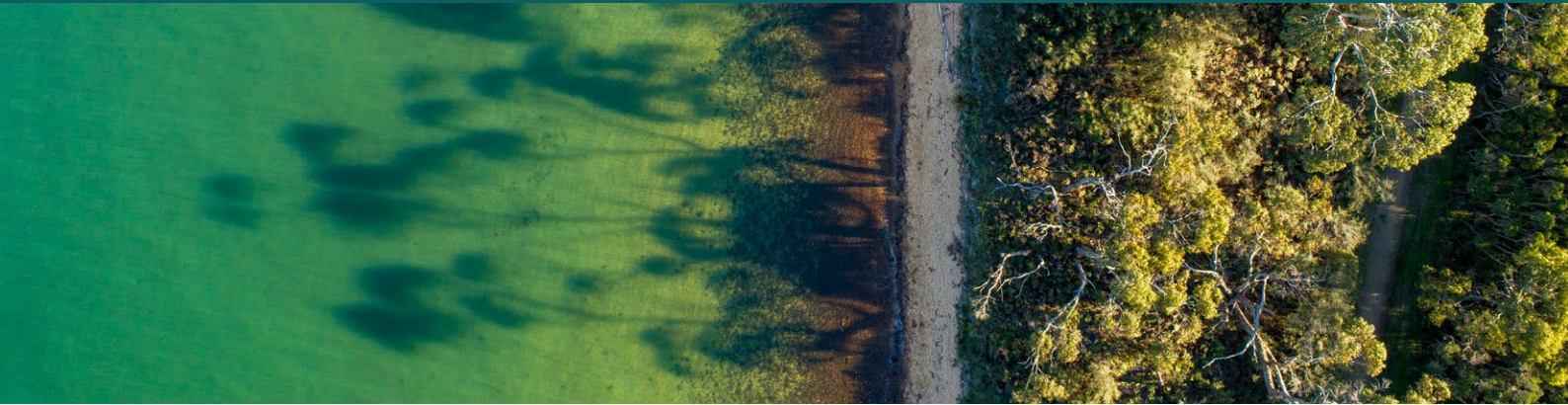


Chapter 8

Surface water



This chapter discusses the impacts on surface water associated with the construction and operation of the Gas Import Jetty and Pipeline Project (the Project). This chapter is based on the impact assessment presented in EES Technical Report C: *Surface water impact assessment*.

8.1 Overview

Construction of infrastructure within rural surface water catchments has the potential to alter flow characteristics and impact water quality within waterways and receiving waters.

Understanding the condition of existing waterways and the environmental values that require protection enables construction methods to be developed to minimise or prevent impacts to waterways.

The key potential impact of the proposed Project on water quality relates to sediments from construction activities entering waterways and being discharged into Western Port. Construction of the Project particularly the Pipeline Works, have the potential to cause sedimentation in waterways. Sedimentation in large loads entering waterways draining into Western Port has the potential to smother seagrass beds which are an important ecological feature of the wetlands and a critical component of the Ramsar values of the site. Adverse impacts on seagrass beds have the potential to have flow-on impacts affecting fish, waterbirds, invertebrates and threatened species.



Ramsar Convention on Wetlands

The Convention on Wetlands of International Importance was the first modern treaty between nations that aims to conserve natural resources. The Convention became known as the Ramsar Convention because it was signed in the Iranian town of Ramsar in 1971.

The broad aims of the Ramsar Convention are to halt the worldwide loss of wetlands and to conserve those that remain. Under the Convention, wetlands can include swamps, marshes, billabongs, lakes, salt marshes, mudflats, mangroves, coral reefs, fens, peat bogs, or bodies of water – whether natural or artificial, permanent or temporary.

8.2 EES evaluation objective

The scoping requirements for the EES set out the following relevant draft evaluation objectives:

Water and catchment values – To minimise adverse effects on water (including groundwater, waterway, wetland, estuarine, intertidal and marine) quality and movement particularly as they might affect the ecological character of the Western Port Ramsar site.

Waste management - To minimise generation of wastes by or resulting from the project during construction and operation, including accounting for direct and indirect greenhouse gas emissions.

To assess the potential impact of the Project on waterways and catchment values, a surface water impact assessment was undertaken.

8.3 Methodology

The approach adopted for the surface water impact assessment involved the following key tasks:

- a review of relevant legislation and policy at Commonwealth, state and local level
- a review of relevant baseline data and reports, including water quality monitoring data
- site inspections of waterways and drainage line crossings across the study area in December 2018, February 2019 and September 2019
- consultation with relevant authorities and landholders on construction methodology, discharge water and impacts on waterways
- characterisation of existing floodplains and waterway conditions
- assessment of surface water quality and flow impacts during construction and operation of the Project
- a risk assessment as described in **Chapter 5** Key approvals and assessment framework to inform the impact assessment and development of additional mitigation measures
- development of mitigation measures in response to the surface water impact assessment.

8.4 Study area

The study area for the surface water impact assessment contains 64 watercourses the pipeline would cross. These include seven main watercourses and 57 minor watercourses and surface drains. The main watercourses crossed by the pipeline are: Warringine Creek, Rutherford Creek, Watson Creek, Cardinia Creek, Lower Gum Scrub Creek, Toomuc Creek and Deep Creek. The study area and the locations of these watercourses are shown in **Figure 8-1**.

More broadly, the study area consisted of the Western Port catchment which covers an area of approximately 3,700 square kilometres (km²) and contains 2,200 kilometres of rivers and creeks. The topography of this catchment varies from hilly regions near the Bunyip State Park and Strzelecki Ranges to the low-lying flat to undulating terrain of the former Koo Wee Rup swamp and the marine environment of Western Port. Western Port is the primary receiving water for surface water flows from the Western Port catchment.



◀ **Figure 8-1:** Surface water study area

8.5 Existing conditions

The existing conditions assessment considered the Western Port catchment, including its flood characteristics, waterway condition and water quality and the Western Port Ramsar site.

8.5.1 Catchment overview

The Western Port catchment is divided into five sub-catchments. The pipeline would pass through three of the sub-catchments: Lower Bunyip, Lang Lang and Bass system, Cardinia system and Mornington Peninsula systems.

Significant features of the Western Port catchment include surface and groundwater springs which support many streams and wetlands. Several of the rivers and creeks within the Bunyip, Cardinia and Mornington sub-catchments flow into Western Port, creating estuaries that provide habitat for estuary dependent species. The proposed pipeline alignment would traverse coastal floodplains adjoining Western Port and intersect the Western Port Ramsar site at two locations: Warringine Park and Watson Creek.

Most of the catchment is modified to support rural and green wedge land uses. The lower portion of the Western Port catchment has been substantially cleared of native vegetation and is now predominantly used for farming.

The local hydrology of part of the catchment was substantially altered in the 1800s when creeks were enlarged and large open drains were excavated to drain the Koo Wee Rup Swamp. This large area of sunken land is now known as the Koo Wee Rup-Longwarry Flood Protection District.

8.5.2 Flood characteristics

The Pipeline Works would traverse low-lying flat areas which are subject to flooding. The pipeline would also cross a number of waterways which flood during large storms.

The proposed site of the Pakenham Delivery Facility is not within an area of land subject to flooding.

The eastern boundary of the proposed site of the Crib Point Receiving Facility can be subject to minor coastal inundation, based on flood modelling conducted by Mornington Peninsula Shire.

Flood overlays, including Land Subject to Inundation Overlays (LSIO) and Special Building Overlays (SBO) were used to identify existing floodplains. Flooding is widespread across the Koo Wee Rup Longwarry Flood Protection District. Approximately 19 kilometres of the pipeline alignment is within this floodplain, between Pearcedale and Pakenham, as shown in **Figure 8-1** above. Assets within this floodplain vary in size, from small drains to large open drains with levee banks to manage floodwater.

8.5.3 Waterway condition

Many of the waterways along the pipeline alignment have been significantly modified over time or are constructed waterways. The waterways support flood mitigation, recreational uses such as fishing and picnicking as well as fauna species. The waterways include shallow ephemeral drainage lines with intermittent flow as well as more substantial waterways with constructed flood protection levees.

Figure 8-2 shows an example of a shallow waterway. **Figure 8-3** shows Cardinia Creek, one of the more substantial waterways along the pipeline alignment.

The area where the lower section of the pipeline alignment is proposed from Crib Point to Pearcedale is dominated by waterways with largely intact physical form and vegetation, including meandering stream systems and wetlands. This lower section can be expected to be relatively stable with lower likelihood of major channel changes in the absence of alterations to catchment and stream conditions. Within this lower section, the pipeline alignment would generally follow existing pipeline infrastructure corridors, including a 1.7 kilometre crossing of a local conservation reserve called Warringine Park.

The section of the pipeline alignment from Pearcedale to Pakenham traverses multiple waterways that have been subject to significant clearing and drainage works, including within the Koo Wee Rup Longwarry Flood Protection District. These waterways, including Cardinia Creek, Toomuc Creek, Deep Creek and Lower Gum Scrub Creek, are predominantly constructed waterways and are more prone to ongoing instabilities.



◀ **Figure 8-2:**
Unnamed waterway
towards southern
end of pipeline
alignment



◀ **Figure 8-3:**
Cardinia Creek

8.5.4 Water quality

Changes in land use and removal of riparian and aquatic vegetation have impacted water quality within the catchment. Historically, the clearing of land and agricultural land use has contributed to increases in sediment and nutrient loads within the waterways of the Bunyip sub-catchment. The subsequent changes in volumetric runoff have increased the potential for bed and bank erosion.

Yarra and Bay is a public website supported by Melbourne Water, the Department of Environment, Land, Water and Planning (DELWP) and the Environment Protection Authority Victoria (EPA Victoria) which publishes the results of annual water quality assessments from water quality monitoring in some of the waterways that discharge to Western Port. The assessment measures six water quality parameters: clarity; metals; pH; nutrients; dissolved oxygen; and salinity. These parameters are used to determine an overall water quality index (WQI).

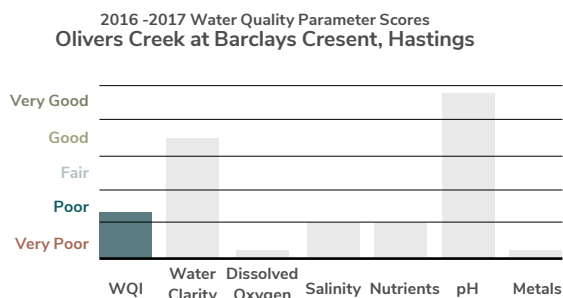
At each site, the individual water quality indicators are calculated from annual monitoring data using the relevant statistic that applies to each indicator in the State Environment Protection Policy (Waters of Victoria [SEPP WoV]). The SEPP (WoV) has now been superseded by SEPP (Waters) 2018 but the SEPP (WoV) was the relevant policy document for evaluation of water quality data collected prior to 2018. These results are then compared with the SEPP (WoV) environmental quality objectives and its Schedule F6 (Waters of Port Phillip Bay) that apply at each site.

Data from the Yarra and Bay website shows clearly that water quality in the Western Port catchment has consistently been rated as poor since 2000 when the monitoring program commenced. Water quality data from the Yarra and Bay website for 2016-17 for waterways that the pipeline would cross (where data is available) are provided in **Figure 8-4** to **Figure 8-7**. This data indicates that waterways in the sub-catchments where Pipeline Works would occur are in poor or very poor condition and under considerable stress, with the other waterways in the lower catchment under severe stress.

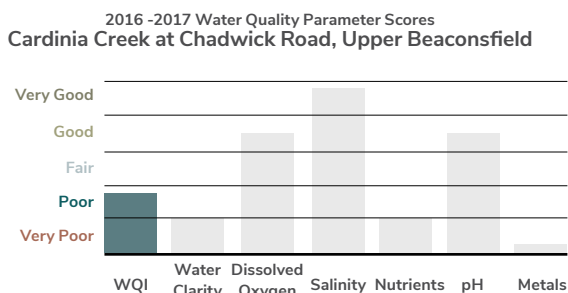
The cumulative water quality index (WQI) for each waterway shown is typically in the range of poor to very poor with nutrients, metals and water clarity generally in these categories in all waterways. The poor water quality can be attributed to the significant changes to land use over time, including the removal of native vegetation, the introduction of agricultural practices and the channelisation of waterways. All these practices are considered to have increased the runoff volumes and frequency, contributing to erosion and scour of waterways, which has elevated sediment loads.

The key potential impact of the proposed Pipeline Works on water quality relates to sediments from construction activities entering waterways and being discharged into Western Port. Sedimentation in Western Port is an issue of particular importance due to the susceptibility of seagrass beds to smothering from excessive sediment loads. The loss of seagrass can result in flow-on effects including potential impacts on fish, waterbirds, invertebrates and threatened species.

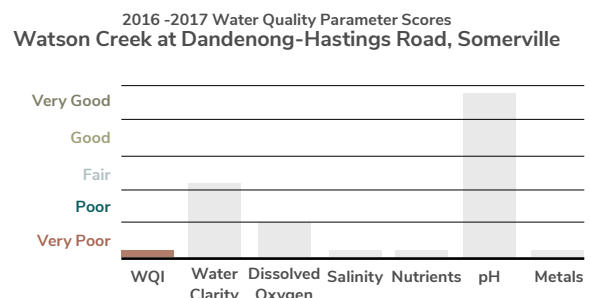
▼ **Figure 8-4:** Water quality summary, Oliver Creek



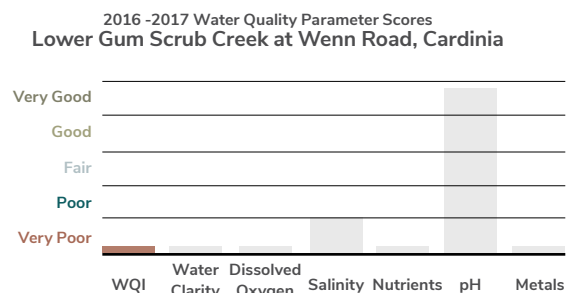
▼ **Figure 8-6:** Water quality summary, Cardinia Creek



▼ **Figure 8-5:** Water quality summary, Watson Creek



▼ **Figure 8-7:** Water quality summary, Lower Gum Scrub Creek



8.5.5 Waterway crossing assessment and construction method

The proposed pipeline alignment would cross 64 separate waterways. These waterways were assessed to determine the most appropriate pipeline construction method for each crossing to minimise impacts on waterways and receiving waters.

The assessment of each waterway considered its catchment area (km²), channel width (m), if it was natural or constructed, the condition of its vegetation and whether it was ephemeral or permanent.

The categorisation of waterways as major or minor also determined the proposed construction method. A major waterway is a waterway or creek that may convey flow for extended periods after a storm and is well defined with a catchment area exceeding 10 hectares. Minor waterways predominantly consist of surface drains, swales and roadside swales. **Figure 8-8** shows an example of a major waterway the pipeline would cross. **Figure 8-9** shows an example of a minor waterway the pipeline would cross.

The characteristics of the 64 waterways the pipeline would cross and the construction method proposed for each are summarised in **Table 8-1** below.

▼ **Figure 8-8:** Christies Drain
Example of a major waterway



▼ **Figure 8-9:** Unnamed waterway
Example of a minor waterway



The primary considerations in determining the construction method proposed for each waterway crossing included:

- ability of the waterway bed and banks to be adequately reinstated to avoid future erosion
- ability to undertake construction works while minimising the amount of sediment entering the downstream waterway
- ability to undertake the construction works without significantly interrupting flows during a storm to minimise changes to floodplain characteristics.

Construction options for the crossings include open trenching, horizontal boring or horizontal directional drilling (HDD). See **Chapter 4** Project description for further information on these construction methods.

The least intrusive construction option is HDD which has a negligible impact on a waterway and minimal ground disturbance. Trenching across a waterway creates a greater disturbance but sediment deposition in the downstream waterway can still be minimised if controls are implemented, such as undertaking the works in dry periods and immediately reinstating the affected area. For trench works outside the waterway, controls such as methods to dewater to disperse flows would be required to manage risks.

HDD is proposed for waterway crossings where risks such as sedimentation of downstream waterways or damage to riparian zones or levees could not be adequately mitigated by controls if trenching was adopted. Trenching is proposed for waterways and drainage lines where construction risks could be managed and other impacts (such as dewatering and reinstating bell holes required to accommodate boring machines) could be avoided.

In assessing the suitability of the proposed construction method for crossing each waterway, the following factors were considered:

- whether the waterway is natural or has been significantly modified from its original form (constructed)
- whether vegetation is intact or cleared, the extent of vegetation and its ability to re-establish
- a combination of upstream catchment area and channel width, which provides an indication of whether the trench could be excavated and reinstated with certainty before rain is forecast so that sediment accumulating in the downstream waterway could be prevented – waterway size also provides an indication of how easily the channel can be reinstated to match its existing form
- whether the waterway is ephemeral or permanent.

A summary of these factors for each waterway is provided in **Table 8-1**. They have informed the reasoning for the construction method proposed for each waterway. Waterways with permanent flow, substantial vegetation or which may be difficult to manage flooding would be crossed using HDD. In addition, trenchless construction methods are proposed to minimise vegetation clearing at locations that are known habitat areas for the Southern Brown Bandicoot, as well as waterways that may provide suitable habitat for Dwarf Galaxias and Australian Grayling.

A complete summary of the waterway assessment is provided in Section 5.5 of EES Technical Report C: *Surface water impact assessment*. Waterways along the pipeline alignment are shown in EES Attachment VII Map book.

Where vegetation exists and the construction method would require its removal, the flora and habitat for sensitive fauna species in that waterway have been assessed. For more information on flora and fauna see **Chapter 7 Terrestrial and freshwater biodiversity**.

Table 8-1: Waterway assessment summary

ID	Name	Catchment area (km ²)	Channel width (m)	Natural or constructed	Existing vegetation	Construction method	Reason for construction method
1	Unnamed	1.3	<1	Natural	Intact	Trench	Narrow waterway, works can be reinstated quickly
2	Warringine Creek	20	4	Natural	Intact	HDD	Substantial vegetation, larger upstream catchment and within LSIO
3	Kings Creek	13.9	2	Natural	Intact	HDD	Substantial vegetation, larger upstream catchment and within LSIO
4	Unnamed	<0.1	<1	Natural	Intact	HDD	Substantial vegetation, and within Kings Creek LSIO
5	Unnamed	<0.1	<1	Constructed	Narrow	Trench	Narrow and constructed waterway
6	Olivers Creek	35.3	3	Natural	Cleared	Trench	Cleared and narrow waterway and can be reinstated quickly
7	Unnamed	11.1	2	Natural	Intact	HDD	Substantial vegetation and within LSIO
8	Unnamed	0.6	<1	Natural	Intact	Trench	Narrow waterway, works can be reinstated quickly
9	Unnamed	0.6	<1	Natural	Intact	Trench	Narrow waterway, works can be reinstated quickly
10	Watson Creek	36.9	3	Natural	Intact	HDD	Substantial vegetation and large upstream catchment
11	Unnamed	1.6	3	Natural	Intact	HDD	Combined with Watson Creek
12	Langwarrin Creek	31.4	2	Natural	Intact	HDD	Narrow waterway with tidal flows. Waterway recently reinstated.
13	Unnamed	0.4	<1	Constructed	Cleared	Trench	No defined watercourse. Can reinstate quickly
14	Unnamed	0.4	<1	Constructed	Cleared	Trench	No defined watercourse. Can reinstate quickly
15	Unnamed	9.3	3	Natural	Cleared	HDD	Shallow watercourse and can be reinstate quickly

ID	Name	Catchment area (km ²)	Channel width (m)	Natural or constructed	Existing vegetation	Construction method	Reason for construction method
16	Unnamed	0.8	3	Constructed	Cleared	Trench	Small watercourse and can be reinstated quickly
17	Unnamed	1.5	<1	Natural	Cleared	Trench	Small watercourse and can be reinstated quickly
18	Unnamed	<0.1	2.5	Constructed	Cleared	Trench	Small watercourse and can be reinstated quickly
19	Unnamed	0.5	3	Constructed	Cleared	Trench	Small watercourse and can be reinstated quickly
20	Unnamed	0.5	<1	Constructed	Cleared	Horizontal boring	Boring as part of road crossing
21	Unnamed	0.4	<1	Constructed	Cleared	Trench	Poorly defined channel, can be reinstated quickly
22	Quail Inlet Drain	2.3	3	Constructed	Cleared	Trench	No vegetation and can be reinstated quickly
23	Unnamed	0.3	2	Constructed	Cleared	Trench	Poorly defined channel, can be reinstated quickly
24	Drain at Fisheries Road	6.9	2	Constructed	Cleared	HDD	Boring as part of road crossing
25	Christies Drain	9.8	2	Constructed	Cleared	Trench	No vegetation and can be reinstated quickly
26	Unnamed	4	2	Constructed	Cleared	Trench	Small waterway that can be reinstated quickly
27	Unnamed	0.8	<1	Constructed	Cleared	Horizontal boring	Boring as part of road crossing
28	Rutherford Creek	21.3	2	Constructed	Cleared	HDD	HDD viable due to proximity to South Gippsland Highway
29	Western Outfall Drain	22	11	Constructed	Cleared	Trench	No vegetation, can be reinstated quickly
30	Muddy Gates Drain	27.5	3	Constructed	Cleared	HDD	HDD due to proximity to road
31	Manks Rd Drain	0.4	<1	Constructed	Narrow	Horizontal boring	Minor drain and can be reinstated quickly. Drain and Southern Brown Bandicoot habitat is unlikely to be disturbed due to the method selected
32	Unnamed	0.1	<1	Constructed	Narrow	Trench	Minor drain and can be reinstated quickly
33	Unnamed	1.4	2	Constructed	Cleared	Trench	No vegetation and can be reinstated quickly
34	Unnamed	1.4	2	Constructed	Cleared	Trench	No vegetation and can be reinstated quickly
35	Tooradin Road Drain	50.9	2	Constructed	Cleared	Horizontal boring	Boring due to proximity to road and Southern Brown Bandicoot habitat

ID	Name	Catchment area (km ²)	Channel width (m)	Natural or constructed	Existing vegetation	Construction method	Reason for construction method
36	Unnamed	0.1	<1	Constructed	Cleared	Trench	Minor drain, very small catchment and can be reinstated quickly
37	Unnamed	1.9	<1	Constructed	Cleared	Trench	Minor drain, poorly defined and can be reinstated quickly
38	Tooradin Inlet Drain	1	6	Constructed	Cleared	Trench	No vegetation and can be reinstated quickly
39	Ridgeways Drain	<0.1	2	Constructed	Cleared	Trench	Very small drain catchment and can be reinstated quickly
40	Unnamed	0.1	<1	Constructed	Cleared	Trench	Very small drain catchment and can be reinstated quickly
41	Unnamed	0.1	2	Constructed	Cleared	Trench	Very small drain catchment and can be reinstated quickly
42	Dalmore Rd Drain	0.4	4	Constructed	Cleared	Horizontal boring	Boring due to proximity to road
43	Unnamed	0.1	2	Constructed	Narrow	Trench	Gravel road drain and can be reinstated quickly
44	Unnamed	<0.1	<1	Constructed	Cleared	Trench	Poorly defined drainage channel and can be reinstated quickly
45	Unnamed	0.4	3	Constructed	Cleared	HDD	HDD due to proximity to Cardinia Creek and Southern Brown Bandicoot habitat
46	Cardinia Creek	70.2	10	Constructed	Cleared	HDD	Large catchment and waterway cannot be obstructed. Southern Brown Bandicoot habitat
47	Unnamed	0.3	2	Constructed	Cleared	Trench	Very small drain catchment and can be reinstated quickly
48	Unnamed	<0.1	2	Constructed	Cleared	Trench	Poorly defined drainage and can be reinstated quickly
49	Gum Scrub Creek	39	5	Constructed	Cleared	HDD	Large catchment and waterway cannot be obstructed. Identified Southern Brown Bandicoot habitat
50	Toomuc Creek	62	7	Constructed	Cleared	HDD	Large catchment and waterway cannot be obstructed
51	Deep Creek	56.2	12	Constructed	Cleared	HDD	Large catchment and waterway cannot be obstructed. Identified Southern Brown Bandicoot habitat

ID	Name	Catchment area (km ²)	Channel width (m)	Natural or constructed	Existing vegetation	Construction method	Reason for construction method
52	Unnamed	3.9	12	Constructed	Cleared	Trench	Poor vegetation and can be reinstated quickly
53	Unnamed	0.5	2	Constructed	Cleared	Trench	No vegetation and can be reinstated quickly
54	Soldiers Road West Drain	<0.1	<1	Constructed	Cleared	Horizontal boring	Horizontal boring due to proximity to road
55	Hagelthornes	1.3	2	Constructed	Cleared	Trench	No vegetation and can be reinstated quickly
56	McGregors Drain	2.8	2	Constructed	Cleared	Horizontal boring	Horizontal boring due to proximity to road and Southern Brown Bandicoot habitat.
57	Unnamed	0.2	3	Constructed	Cleared	Trench	Poorly defined channel and can be reinstated quickly
58	Unnamed	0.1	<1	Constructed	Cleared	Trench	Poorly defined channel and can be reinstated quickly
59	Deep Creek	22.5	5	Constructed	Cleared	HDD	Large catchment and waterway cannot be obstructed
60	Unnamed	<0.1	<1	Constructed	Cleared	Trench	Poorly defined drainage channel and can be reinstated quickly
61	Unnamed	1.9	2	Constructed	Cleared	Trench	Poorly defined drainage channel and can be reinstated quickly
62	Unnamed	0.1	<1	Constructed	Cleared	Trench	Small waterway and can be reinstated quickly
63	Unnamed	4	<1	Constructed	Cleared	Trench	No vegetation and can be reinstated quickly
64	Unnamed	10.8	2	Constructed	Cleared	Trench	Large catchment, downstream of railway culvert

8.5.6 Western Port Ramsar site

A large portion of Western Port was designated as a wetland of international importance in 1982 under the Convention on Wetlands of International Importance, especially as a habitat for water birds. The Western Port Ramsar site occupies approximately 60,000 hectares and consists of large shallow intertidal areas dissected by deeper channels and a narrow strip of adjacent coastal land in some areas. The extent of the Ramsar site is shown in **Figure 8-1**.

The 'Western Port Ramsar Site Ecological Character Description' (Kellogg Brown & Root, 2010) which had an addendum issued in 2016 (Hale, 2016) identified components, processes and services that are critical to the ecological character of the Ramsar site. These processes are: wetland bathymetry; geomorphology and sedimentation; seagrass; saltmarsh; mangroves; waterbirds; invertebrates; fish; and threatened species. That report has established baseline values for the Western Port wetlands against which potential impacts can be assessed.

The primary concern relating to sediments entering Western Port from the catchment is the potential for smothering seagrass beds. These have an important ecological function and are a critical component of the Ramsar values of the site. Adverse impacts on seagrass beds have the potential to have flow-on impacts affecting waterbirds, invertebrates, fish and threatened species. The channelization of rivers through the Koo Wee Rup swamp before the 1950s and the subsequent sediment mobilisation have been suggested as a possible primary cause of historical seagrass degradation in Western Port.

Recent investigations indicate that when the wetlands were listed in 1982, total sediment loads were 40,000 tons per year. However, this had increased to 62,000 tons per year in 2010 with finer sediment deposited in Cardinia and Bunyip Creeks (Department of Sustainability, Environment, Water, Population and Communities, 2010).

Modelling data (EPA Victoria 2011) estimates that additional suspended sediments entering Western Port from greenfield and infill developments between 1996-2030 could be 60 tonnes per year if urban development is not adequately managed.

The study 'Understanding the Western Port Environment' (Melbourne Water, 2018) also investigated sediment accumulation in Western Port. The study found the primary sources of sediment inputs are rivers, coastal erosion and run-off. Sediment inputs from the catchments are primarily due to land use change in the catchments with sources of sediment input including agriculture, coastal development and unsealed roads. The contributions of each sub-catchment to the total river total suspended solids (TSS) load over this period were Cardinia 12 per cent, Bunyip 31 per cent, Lang Lang 41 per cent and Bass 16 per cent.

The Western Port Ramsar Site Management Plan identifies sediment and nutrient inputs into Western Port as high priority threats to the wetlands. A primary strategy is to reduce nutrient and sediment inflow by supporting the implementation of riparian, in-stream and catchment works. The potential sedimentation impacts in Western Port associated with activities in the catchment have historically had adverse impacts on the ecology and Ramsar values of the bay.

8.5.7 Stormwater drainage at Crib Point and Pakenham

The external catchment upstream of the site for the Crib Point Receiving Facility measures approximately seven hectares in area. Stormwater runoff in the catchment is directed towards the site via overland flow and major natural drainage channels.

At the northern edge of the site, a small stormwater swale diverts stormwater flows from the existing site towards the shoreline. At the southern side of the Crib Point Jetty, a culvert under The Esplanade directs upstream stormwater flow towards the existing facility.

It is estimated the site for the Crib Point Receiving Facility would encounter half of the flow from the culvert and the remainder is anticipated to flow towards the jetty. The site is free from flooding, except for an existing swale along the southern boundary.

The site for the Pakenham Delivery Facility is situated in an open grassed paddock with well maintained grass cover. The site generally grades from east to west with an average grade of around two per cent. The contributing external stormwater catchment extends approximately 160 metres to the east across Oakview Lane to the top of a small knoll in the adjacent property, which forms the high point of the catchment.

8.5.8 Beneficial uses

SEPP (Waters) aims to provide a coordinated approach for protecting and rehabilitating the health of Victoria's water environments. The SEPP (Waters) identifies 'beneficial uses' of waterways and establishes environmental quality objectives at levels to protect these beneficial uses. In addition to general provisions, Schedule 5 to the SEPP (Waters) provides for Areas of High Conservation Values, which includes Ramsar wetlands.

SEPPs are statutory instruments that provide the cornerstone for a wide range of environmental protection and management activities in Victoria. The beneficial uses of the waterways in the study area that are relevant to the Project are listed in **Table 8-2**.

Table 8-2: Beneficial uses of waterways in study area

Segment	Beneficial uses
Estuaries and inlets	<p>Marine and estuarine waters – Aquatic ecosystems:</p> <ul style="list-style-type: none"> • slightly to moderately modified <p>Water suitable for:</p> <ul style="list-style-type: none"> • primary contact recreation • secondary contact recreation • aesthetic enjoyment • Traditional Owner cultural values • cultural and spiritual values • aquaculture • industrial and commercial use • human consumption of aquatic foods.
Western Port	<p>Marine and estuarine waters – aquatic ecosystems:</p> <ul style="list-style-type: none"> • largely unmodified (Entrances and North Arm) • slightly to moderately modified (East Arm) <p>Water suitable for:</p> <ul style="list-style-type: none"> • human consumption of aquatic foods • aquaculture • industrial and commercial • primary contact recreation • secondary contact recreation • aesthetic enjoyment • Traditional Owner cultural values • cultural and spiritual values • navigation and shipping (entrances and north arm sub-segment).
Rivers and streams – foothills and coastal plains	<p>Aquatic ecosystems:</p> <ul style="list-style-type: none"> • slightly to moderately modified. <p>Water suitable for:</p> <ul style="list-style-type: none"> • primary contact recreation • secondary contact recreation • aesthetic enjoyment • Traditional Owner cultural values • cultural and spiritual values • agriculture and irrigation • aquaculture • industrial and commercial use • human consumption of aquatic foods.

8.6 Risk assessment

The risk assessment identified the risks associated with surface water as a result of the Project's construction and operation in accordance with the method described in **Chapter 5** Key approvals and assessment framework.

The assessment included consideration of the environmental, social, economic and health and safety consequences of each risk and their likelihood of occurring. **Table 8-3** summarises the surface water risks identified. A complete risk register, including the likelihood and consequence of each risk pathway, is located in EES Attachment III *Environmental risk report*.

In addition to this surface water impact assessment, the risk of spills to groundwater and to the marine environment are discussed in:

- **Chapter 6** Marine biodiversity
- **Chapter 10** Contamination and acid sulfate soils.

Risk ratings were applied to each identified risk pathway, assuming that initial mitigation measures were in place. Where the initial risk ratings were categorised as medium or higher, additional mitigation measures were developed to lower the residual risk where possible.

Due to the Project design being well progressed to avoid or minimise surface water impacts when the EES process started, the initial surface water risks are rated as low or very low with the exception of Risk ID HD3 (rated medium).

The initial pipeline construction design was to trench through Langwarrin Creek (Risk ID HD3) but due to the potential for downstream erosion and flow to be above EPA Victoria water quality limits for sediments, HDD was included in the design.

The potential for stormwater runoff to exceed EPA Victoria limits for sediments and to enter waterways and the Western Port Ramsar site is considered a key risk (Risk IDs HD2 and HD3). To manage this risk, HDD was adopted as a construction method for waterways where it was considered that managing sediment loads when it rained may be difficult. By avoiding these waterways, the residual risk (after adopting HDD) is low.

The Victorian Minister for Planning issued a decision determining that an EES was required for the Project as a whole due to the potential for a range of significant environmental effects, including the 'potential effects from construction and operation of a gas pipeline on water quality of waterways and the Western Port Ramsar site'.

The construction and operation impacts are discussed in **Section 8.7** (Construction impacts) and **Section 8.8** (Operation impacts) of this chapter.

Section 8.9 (Mitigation measures) of this chapter and **Chapter 25** Environmental Management Framework set out the mitigation measures.

Table 8-3: Risks – surface water

Risk ID	Works area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
Construction						
HD1	Pipeline Works	Dewatering of the trenches following a storm event results in water discharged from site above EPA Victoria water quality limits ultimately enters receiving water bodies.	<u>MM-SW01</u> Discharge water	Low	<u>MM-SW01</u> Discharge water	Low
HD2	Gas Import Jetty Works and Pipeline Works	Stormwater runoff (from trench intercepting surface waterway and excavated material from the ROW or construction sites) is above EPA Victoria water quality limits for sediments and enters waterways and the Western Port Ramsar site.	<u>MM-SW02</u> Managing runoff <u>MM-SW03</u> Watercourse trenching during no flow conditions <u>MM-SW04</u> Watercourse trenching <u>MM-SW05</u> Watercourse trenchless crossing	Low	No additional mitigation measures identified	Low

Risk ID	Works area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
HD3	Pipeline Works	Stormwater and tidal flows within waterways need to be temporary diverted during trenching of Langwarrin Creek and results in downstream erosion and flow that is above EPA Victoria water quality limits for sediments.	MM-SW03 Watercourse trenching during no flow conditions MM-SW04 Watercourse trenching	Medium	MM-SW05 Watercourse trenchless crossing	Low
HD4	Pipeline Works	Sediment laden runoff from disturbed surfaces at HDD drilling sites into local waterways.	MM-SW02 Managing runoff MM-SW05 Watercourse trenchless crossing MM-SW09 Discharge from drill sites	Low	No additional mitigation measures identified	Low
HD5	Gas Import Jetty Works and Pipeline Works	A spill of hazardous materials during construction results in contaminated discharge to surface water.	MM-SW06 Fuel and chemical storage MM-SW07 Spills MM-SW08 Refuelling of vehicles and mobile machinery MM-SW09 Discharge from drill sites	Low	No additional mitigation measures identified	Low
HD6	Pipeline Works	Temporary excavated material results in obstruction of waterways or floodplain function (construction).	MM-SW10 Stockpiling MM-SW03 Watercourse trenching during no flow conditions MM-SW04 Watercourse trenching	Very low	MM-SW10 Stockpiling	Very low
Operation						
HD7	Gas Import Jetty Works and Pipeline Works	Permanent infrastructure results in changes to waterway or floodplain function (operation).	MM-SW11 Facilities design	Very low	No additional mitigation measures identified	Very low
HD8	Gas Import Jetty Works and Pipeline Works	A spill of hazardous materials results in contaminated discharge to the surface water environment.	MM-SW06 Fuel and chemical storage MM-SW07 Spills MM-SW08 Refuelling of vehicles and mobile machinery	Low	No additional mitigation measures identified	Low
HD9	Gas Import Jetty Works and Pipeline Works	Reduced water quality discharged from the facilities sites.	MM-SW12 Water Sensitive Urban Design treatments	Low	No additional mitigation measures identified	Low

8.7 Construction impacts

The highest risk to the beneficial uses of waterways (see **Table 8-2**) is from potential surface water impacts from construction activities associated with the Pipeline Works and the Gas Import Jetty Works at the Crib Point Receiving Facility.

Particular consideration is required for potential impacts resulting from stormwater runoff containing sediments and to a lesser degree, contaminants from spills entering waterways and being deposited in Western Port.

The likelihood of these potential impacts being unacceptable is considered low provided that management and mitigation measures were implemented during construction activities, including construction of the Crib Point Receiving Facility and Pakenham Delivery Facility.

8.7.1 Site dewatering (Risk ID HD1)

If it rains during the pipeline's construction, it may be necessary to pump water from open trenches which could be high in sediment, turbidity and other pollutants. There is a risk that stormwater high in sediment would discharge to a nearby waterway or deposit into the Western Port Ramsar site. The primary concern with this risk is the possibility of sediment loads contributing to seagrass degradation in the Ramsar site.

Sedimentation impacts from the Pipeline Works would be managed using widely accepted and effective sediment control measures, supplemented by HDD at waterways where an increased risk of sediment transport has been identified (see mitigation measure MM-SW01). Sediment control measures involve managing construction runoff that has been collected within excavated trenches. Water collected from the trenches would be appropriately handled and treated if turbidity exceeded EPA Victoria requirements before its discharge from the construction site.

Water in trenches may contain other contaminants including salinity or potentially acidic water. Trench water would be tested for pH and salinity before its discharge to adjacent land. If it exceeds acceptable limits, the water would be treated or disposed of by alternative means such as to an EPA Victoria licensed facility.

Surface water management techniques would be included in the Pipeline Works Construction Environmental Management Plan (CEMP) exhibited with the Pipeline Licence Application, and developed in accordance with the *Best Practice Environmental Management: Environmental Guidelines for Major Construction Sites* (EPA Victoria Publication 480) and EPA Victoria (1991) *Construction Techniques for Sediment Pollution Control* (EPA Publication 275). Methods to implement the CEMP would be informed by the International Erosion Control Association (IECA) *Best Practice Erosion and Sediment Control Appendix P* (2008).

Construction management techniques may include discharging hydrotest water, trench water or bell hole water to low gradient stable, grassed areas within and adjacent to the right of way (ROW), if relevant water quality criteria are met. This includes not discharging into or within 50 metres of a watercourse or stormwater drains connected to a watercourse (see mitigation measure MM-SW01). Sediment control devices to remove suspended solids and dissipate flow would be used where required.

With the implementation of relevant mitigation measures, dewatering of the trenches following a storm that resulted in discharged water quality being above EPA Victoria limits is rated as a low risk.

8.7.2 Runoff from disturbed areas (Risk IDs HD2, HD3 and HD4)

Runoff from laydown areas, HDD sites, haulage routes, stripped surfaces and stockpiled material have the potential to increase sediment loads and turbidity in receiving water bodies, as the runoff may contain sediments or other pollutants.

HDD is proposed for waterways that are likely to convey larger volumes of water following significant rain to reduce the risk of transporting sediment downstream to the Western Port Ramsar site (see mitigation measure MM-SW02).

The mitigation measures as identified in **Table 8-4** involve managing the runoff from stockpiled materials and disturbed areas including open cut trenching and HDD across waterways (see mitigation measure MM-SW02). This involves conducting works in accordance with:

- *Best Practice Environmental Management: Environmental Guidelines for Major Construction Sites* (EPA Victoria Publication 480)
- The International Erosion Control Association (IECA) *Best Practice Erosions and Sediment Control Appendix P* (2008).

Managing runoff from disturbed areas may include the placement of flow diversion banks upstream of spoil material, construction of an overflow spillway to allow runoff from external catchments to pass over the spoil material and monitoring weather forecasts to avoid open trenches when high rainfall is expected.

The initial construction design for the Pipeline Works involved open cut trenching through Langwarrin Creek, which would require additional works involving temporary diversions around the trench to maintain waterway flow. These additional works would introduce further complexities at Langwarrin Creek and increase the risk of erosion and reducing water quality. Further assessment throughout the EES process has resulted in the adoption of HDD as the construction method for the crossing of Langwarrin Creek. This mitigates the potential risks of erosion and potential water quality impacts associated with the open trenching method at this creek crossing (see mitigation measure MM-SW05).

Measures to employ where open cut trenching would be undertaken include reinstating the exposed trench within the watercourse and riparian zones immediately following pipeline installation as well as providing suitable compaction and revegetation. In addition, the pipeline would be assembled and prepared for immediate installation once the trenching over a watercourse was undertaken (see mitigation measure MM-SW04).

Although HDD is less intrusive to surface waterways and riparian zones, it does come with other environmental constraints associated with managing drilling muds and runoff from drilling sites. For watercourses managed by Melbourne Water, the HDD profile design would meet or exceed Melbourne Water's minimum design requirements (see mitigation measure MM-SW05). Measures to mitigate potential impacts associated with HDD include placing earth bunds and drainage channels around the high side of drill sites and work areas to divert natural runoff away from sites to prevent mixing with drilling compound runoff (see mitigation measure MM-SW09).

With the implementation of the above mitigation measures, it is unlikely that stormwater runoff from the ROW, HDD sites, haulage routes, stripped surfaces and stockpiled material would be above EPA Victoria limits for sediments. The risk of runoff entering the Western Port Ramsar site that is above these limits is therefore considered to be low.

8.7.3 Spills (Risk ID HD5)

During the construction of the Project there is the potential for fuels or other liquid pollutants to spill which may then flow into local waterways or drainage lines. Potential spills are most likely to be associated with refuelling and liquids used in the drilling process. The primary concern with this potential impact is the possibility of hazardous materials entering waterways and the Western Port Ramsar site.

As identified in the risk assessment in **Table 8-3**, impacts associated with spills of hazardous materials are considered low risk. Controls to manage spills and hazardous materials would be included in the Pipeline Works CEMP and the Gas Import Jetty Works Environmental Management Plan (EMP). These controls may include minimising storage of chemicals on site, installing bunds around stored liquids, and storing fuels away from waterways (see mitigation measures MM-SW06, MM-SW07, MM-SW08, and **Chapter 16** Safety, hazard and risk). On this basis, it is considered that potential spills of hazardous materials would not have unacceptable impacts on waterways and Western Port as a result of the construction activities.

8.7.4 Increase in flood levels (Risk ID HD6)

The temporary placement of stockpiled materials from excavation along the pipeline alignment during construction could potentially increase flood levels within flood-prone areas by impeding surface water flow. In the event of major rainfall, this could have possible impacts on neighbouring properties. A large portion of the Pipeline Works would occur in the Koo Wee Rup Flood Protection District, with lower flow velocities in a large section of this district. The lower velocities mean increases in water levels would be less significant provided that stockpiled material did not fully impede the flow.

Consideration would be given to how stockpiled materials are located to minimise the potential to impede flow and subsequently increase flood levels (see mitigation measure MM-SW10). Measures that may be implemented include avoiding the creation of continuous rows of stockpiled materials and providing gaps to allow flow. Stockpiling near waterways would be avoided and material located away from the top of banks so there was no restriction to the flow conveyance area.

The Pipeline Works CEMP would indicate locations where surface flows need to be maintained. By maintaining surface flows, it is unlikely that temporary excavated material would obstruct waterways or impact floodplain function and the risk of this occurring during construction is considered to be low.

8.8 Operation impacts

This section provides an assessment of impacts to surface water during the Project's operation. An increase in impervious areas at the above-ground facilities may increase flood levels as well as pose a risk to runoff water quality. The potential for spills to water during operation of the Crib Point and Pakenham facilities are also assessed.

8.8.1 Increase in flood levels (Risk ID HD7)

The potential risk of the pipeline, the Pakenham Delivery Facility or the Crib Point Receiving Facility increasing flood levels is very low. Once constructed, the pipeline would be fully covered with no change to the surface topography or obstruction to waterways. The Pakenham Delivery Facility and Crib Point Receiving Facility would result in a small increase in impervious area, which would increase runoff. However, this runoff is not expected to be detrimental to the receiving waterways and could be managed by standard design practices. Existing overland flow paths and localised flooding would need to be considered in the detailed facility design.

Once constructed, the pipeline would have no permanent impact to existing surface levels or waterway conveyance capacity.

Permanent surface structures, including the Pakenham Delivery Facility and the Crib Point Receiving Facility, would be designed to maintain existing overland flow paths and not result in increased flood levels upstream of the sites (see mitigation measure MM-SW11).

Tidal influence is a key consideration in the design of the Crib Point Receiving Facility given the proximity of Western Port. Data from the Australian Bureau of Meteorology states the Highest Astronomical Tide (HAT) for Western Port in 1.62 metres Australian Height Datum (AHD).

During design of the Crib Point Receiving Facility, consideration of high tide levels plus storm surge would need to be given to the proposed floor level and a further allowance of 0.61 to 1.1 metres provided to account for sea level rise as a result of 2090 climate change projections.

Overall, the potential impacts associated with increased flood levels are considered to be negligible for the operation of the Project.



Highest Astronomical Tide

The Highest Astronomical Tide (HAT) refers to the highest tidal level that can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions.

8.8.2 Spills (Risk ID HD8)

During the operation of the Pakenham Delivery Facility and the Crib Point Receiving Facility there is potential for spills of fuels or other hazardous substances which may flow into local waterways or directly into Western Port.

The potential impacts of a spill at these facilities are considered to be minor as the facilities would be designed in accordance with regulatory requirements for storage of chemicals and fuels. The sites can be designed so that areas used to store chemicals are located outside of overland flow paths so the risks of a spill entering a waterway or Western Port are low.

As previously identified, appropriate mitigation measures for the risks associated with spills include minimal storage of chemicals on site, installing bunds around stored liquids, and storing fuels away from waterways. Operational procedures to manage spills at the Crib Point Receiving Facility and the Pakenham Delivery Facility would be included in the relevant Operational Environmental Management Plans (see mitigation measure MM-SW06).

8.8.3 Runoff quality (Risk ID HD9)

The increase in impervious surfaces due to the development of the Pakenham Delivery Facility and the Crib Point Receiving Facility has the potential to increase sediment and nutrients in stormwater runoff. The potential impact has been rated minor as it is intended that the design of both sites meet the pollutant reduction targets specified in the *Best Practice Environmental Management Guidelines* (CSIRO, 1999). Achieving the best practice performance objectives for nutrients and sediment would achieve compliance with the SEPP (Waters) receiving water objectives.

Measures to manage runoff water quality include the implementation of Water Sensitive Urban Design to remove pollutants from stormwater runoff, retain water on site and reduce the frequency runoff discharging. Biofilters are likely to be an appropriate treatment for the sites as they require a small area, minimal maintenance and have a high treatment performance (see mitigation measure MM-SW12).

8.9 Mitigation measures

The Pipeline Works CEMP and Gas Import Jetty Works EMP, which would include a section of surface water management, will be developed before construction starts and developed in accordance with the *Best Practice Environmental Management: Environmental Guidelines for Major Construction Sites* (EPA Victoria Publication 480) and EPA Victoria (1991) *Construction Techniques for Sediment Pollution Control* (EPA Victoria Publication 275) in order to meet the SEPP (Waters) requirements. The mitigation measures outlined in **Table 8-4** would be incorporated into the EMP for the Gas Import Jetty Works and the CEMP for the Pipeline Works.

Methods to implement the Pipeline Works CEMP and Gas Import Jetty Works EMP can be informed by the International Erosion Control Association (IECA) *Best Practice Erosion and Sediment Control Appendix P* (2008).

The mitigation measures developed for surface water impacts are summarised in **Table 8-4**.

Table 8-4: Mitigation measures - surface water

Mitigation measure ID	Mitigation measure	Works area	Project phase
MM-SW01	<p>Discharge water</p> <p>Water collected from within excavated trenches/hydrostatic testing will be collected and treated if it exceeds EPA Victoria requirements prior to discharging. The relevant suggested measures outlined in EPA Victoria publication 480 (Section 4.4 Dewatering work sites) and in EPA Victoria publication 275 (Section 16 Water treatment) will be incorporated into the Pipeline Works CEMP.</p> <ol style="list-style-type: none"> Non-contaminated groundwater and surface runoff that enters the open trenches and bell holes will be managed in accordance with SEPP (Waters) A description of the post-test (for hydrostatic testing) or post-extraction (for groundwater) treatment of the water will be included in the Pipeline Works CEMP as per direction from EPA Victoria. Discharge of water to land will avoid soil erosion or sedimentation of land or water. Sediment control devices to remove suspended solids and dissipate flow will be used where required. Water will not be discharged to waterways or into stormwater drains without approval from relevant authorities. Water will be tested for pH and salinity prior to discharge to land. pH will be between 4 and 9, and salinity will not exceed 6,000 µS/cm. Water that cannot be treated to meet the relevant discharge criteria will be disposed to an EPA Victoria licensed facility. Relevant landholder(s) and water authorities will be consulted and permission obtained prior to discharge to land Discharge to land will not occur within 50 metres of watercourses. Discharge will be to low gradient, stable, grassed areas and be undertaken in accordance with landholder requirements and through "irrigation type" system to prevent scour or erosion. Visual monitoring during land discharge will be undertaken to ensure water does not enter existing waterways. Contaminated water will be managed in accordance with mitigation measures described in Chapter 10 Contamination and acid sulfate soils (MM-C04). 	Pipeline Works	Construction

Mitigation measure ID	Mitigation measure	Works area	Project phase
MM-SW02	Managing runoff <ol style="list-style-type: none"> Flow diversion banks will be placed upstream of the spoil material if required. An overflow spillway will be constructed to allow runoff from external catchments to pass over the spoil material at a controlled location without causing erosion. 	Gas Import Jetty Works and Pipeline Works	Construction
MM-SW03	Watercourse trenching during no flow conditions Where practicable, all trenched crossings of ephemeral watercourses will be constructed during no flow conditions and reinstated as soon as possible.	Pipeline Works	Construction
MM-SW04	Watercourse trenching Where trenching is undertaken over a watercourse the following mitigation measures will be undertaken: <ol style="list-style-type: none"> Weather forecasts will be monitored to minimise the likelihood of having open trenches at the waterway when high rainfall events are expected. Where watercourses are trenched, all obstructions to flow will be removed as soon as practicable after the pipe has been laid and backfilled. The pipeline will be assembled and prepared so that it can be immediately installed once the trenching over the watercourse has been undertaken. Waterway reinstatement will be carried out in consultation with the relevant authorities. The exposed trench within the watercourse and riparian zones will be reinstated immediately following the installation and commissioning of the pipeline, including providing suitable compaction and revegetation. Waterway reinstatement will be designed to avoid future erosion over the pipeline alignment. This may include the use of riprap made of stones to stabilise the waterway. If necessary, a geofabric will be provided to prevent erosion and scour until the vegetation has established. Visual monitoring will be undertaken downstream of the trench during flow events if the trench has not been reinstated. Temporary diversions will be provided if there is permanent or tidal flow in the waterway in accordance with International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control Appendix P: Land-based Pipeline Construction (2008). 	Pipeline Works	Construction
MM-SW05	Watercourse trenchless crossing Subject to further detailed geotechnical investigations confirming suitability, the following watercourses will be crossed by trenchless construction techniques: Kings Creek (KP7), Warringine Park Swamp (KP4.8), Watson Creek (KP 18.9), Vowell Drive Wetlands (KP22.9), Cardinia Creek (KP40.1), Toomuc Creek (KP41.1), Lower Gum Scrub Creek (KP41.0), Deep Creek (KP41.2), Langwarrin Creek (KP20.9). For watercourses managed by Melbourne Water, the HDD profile design will meet or exceed Melbourne Water's minimum design requirements.	Pipeline Works	Construction
MM-SW06	Fuel and chemical storage The following measures will be implemented to ensure that fuel and chemical storage is safe and spilt liquids do not cause environmental harm: <ol style="list-style-type: none"> Fuels and chemicals stored on site will be minimised. Fuels and chemicals will not be stored close to surface waters. Bunds or other appropriate containment methods will be installed for stored liquids. Dangerous goods will be stored and handled, and storage facilities monitored as per Chapter 16 Safety, hazard and risk (MM-HR05, MM-HR06). 	Gas Import Jetty Works and Pipeline Works	Construction and operation

Mitigation measure ID	Mitigation measure	Works area	Project phase
MM-SW07	Spills prevention and management <ol style="list-style-type: none"> Spill kits will be available at locations where machinery/plant are operating, refuelling points and fuel and chemical storage locations. Spills of hazardous materials will be rendered safe, and where required, collected and transported by licenced waste contractors for disposal at appropriately licenced facilities, including cleaning materials, absorbents and contaminated soils. Staff training will include spills management procedures. Emergency response plans for spills will be developed as per Chapter 16 Safety, hazard and risk (MM-HR07). 	Gas Import Jetty Works and Pipeline Works	Construction and operation
MM-SW08	Refuelling of vehicles and mobile machinery Refuelling of vehicles and machinery (excluding hand-held machines) on the ROW will: <ol style="list-style-type: none"> be undertaken with appropriate measures to contain spills utilise auto shut off valves not occur within 50m of a watercourse. 	Gas Import Jetty Works and Pipeline Works	Construction
MM-SW09	Discharge from trenchless drilling sites Specific construction techniques to prevent discharge of hazardous material from the trenchless drilling sites include: <ol style="list-style-type: none"> Earth bunds and/or drainage channels will be placed around the upper edges of drill sites and work areas to divert natural runoff around and away from the site and prevent mixing with drilling compound runoff. Sump pits will be constructed at the bottom of the drill site. The sump pit will be positioned to capture runoff from the drilling compound. An earth bund will be placed around the sump pit to contain any spillage. 	Pipeline Works	Construction
MM-SW10	Stockpiling To minimise the impacts to upstream flood levels and allow flow to be conveyed across the ROW, the following measures will be adopted: <ol style="list-style-type: none"> Avoid the creation of a continuous row of stockpiled materials that can cause water to pond on the upstream side. Provide regular gaps to allow flood water to pass through Avoid stockpiling material near waterways. Material will be located away from the top of banks so that there is no restriction to the flow conveyance area. 	Pipeline Works	Construction
MM-SW11	Facilities design Permanent surface structures, including the Pakenham Delivery Facility and Crib Point Receiving Facility will be designed to maintain existing overland flow paths and not result in increased flood levels upstream of the sites.	Gas Import Jetty Works and Pipeline Works	Design
MM-SW12	Water Sensitive Urban Design (WSUD) treatments WSUD treatments will be incorporated into the site design for the Crib Point Receiving Facility and the Pakenham Delivery Facility to capture surface runoff and reduce pollutants in accordance with the <i>Best Practice Environmental Management Guidelines</i> (CSIRO, 1999).	Gas Import Jetty Works and Pipeline Works	Design

8.10 Conclusion

The surface water impact assessment has identified the risks and potential impacts of the construction and operation of the Project.

The construction phase of the Project would be more likely to impact the surrounding surface water environment than the operational phase. However, construction impacts would be temporary.

Runoff from disturbed areas containing sediment has been identified as a key risk during the Pipeline Works. Trenching, stockpiling of material, the creation of disturbed areas and trenching across waterways all increase the potential for sediment to discharge to nearby waterways and be deposited in the Western Port Ramsar site.

Stockpiling of materials for significant lengths also has the potential to increase flood levels, which would impact neighbouring properties. These impacts would be managed through different mitigation measures involving the management of construction runoff so that spills do not cause environmental harm and to reduce the potential to increase flood levels.

Waterways that would be crossed by the pipeline have been assessed, with appropriate construction methods adopted at each crossing to reduce the risk of impacts for each individual waterway. In particular, HDD has been adopted as the construction method for waterways where there is risk that sediment will enter waterways which drain into Western Port. This construction methodology reduces the risk of sedimentation being above EPA Victoria limits to low.

Measures to further manage sediment based on the International Erosion Control Association described in **Section 8.7.1** would be incorporated into the Pipeline Works CEMP.

This impact assessment has therefore concluded that with appropriate mitigation measures in place there are no potentially unacceptable environmental impacts on surface water from construction activities associated with the Project.

The pipeline would be entirely underground which means no permanent change to existing topography would occur which could redirect flows or increase flood levels. Potential impacts on surface water are therefore unlikely during operation of the pipeline.

Potential impacts identified during operation include the spilling of hazardous chemicals or substances, and the changes in floodplain function from the construction of permanent infrastructure. Appropriate mitigation measures would be implemented to manage these impacts.

Overall, the assessment has concluded that potential impacts on surface water quality during construction of the Project could be managed with a combination of industry accepted mitigation measures. The operation of the Project would have no potentially unacceptable environmental impacts.

In response to the waste management and water catchment and values draft evaluation objectives, impacts of the Project on surface water have been assessed and mitigation measures have been identified to reduce or minimise these impacts.

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