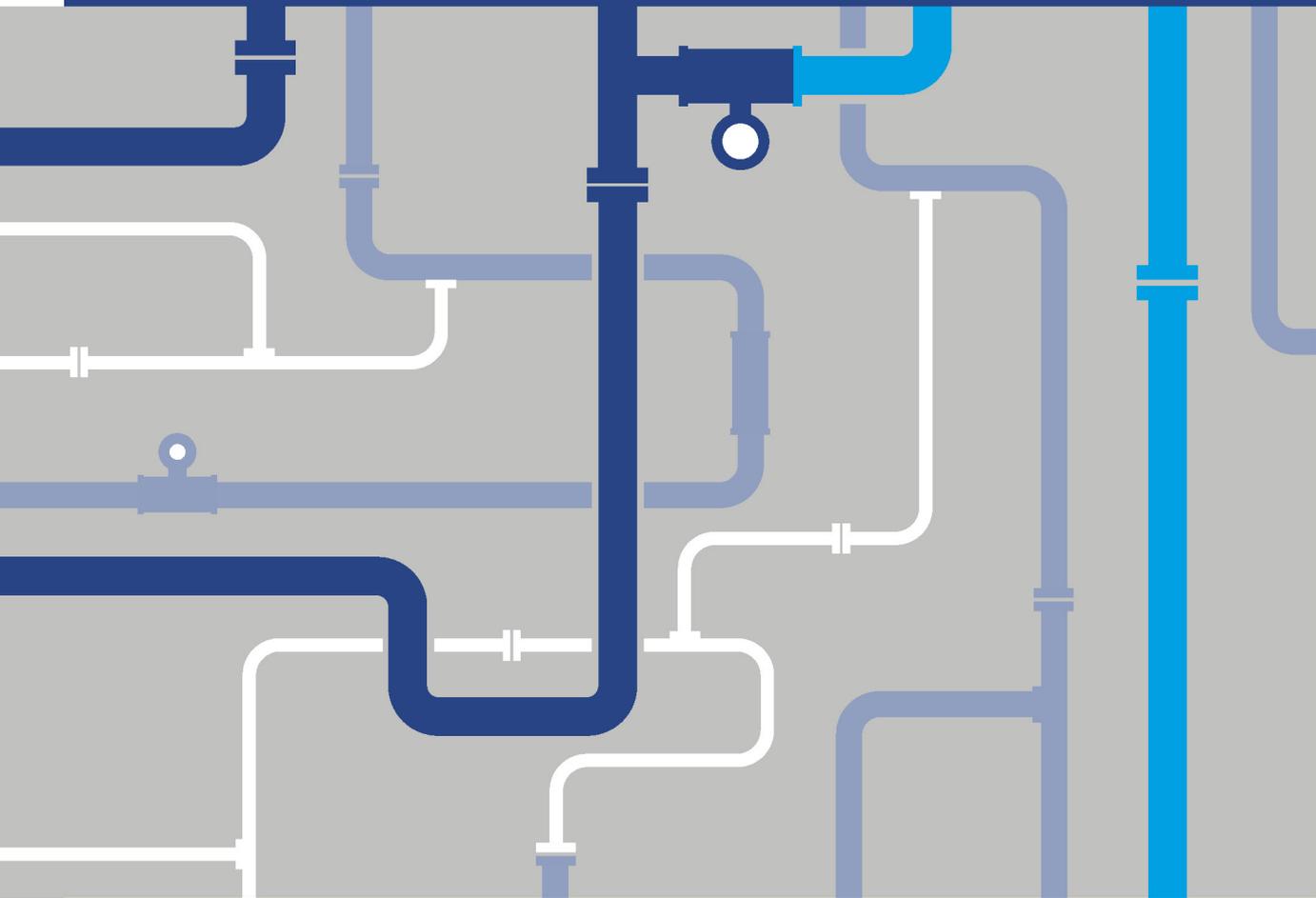


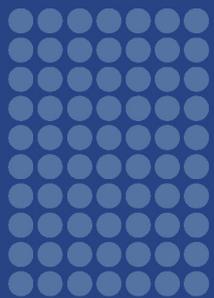


chapter 10

waste (contamination and greenhouse gas).



Environment Effects Statement | May 2021



western outer
ring main



Contents

Chapter 10

10.1	Introduction	10-1
10.2	Method – greenhouse gas	10-2
10.3	Method - contamination.....	10-3
10.4	Existing conditions - greenhouse gas	10-6
10.4.1	Victorian greenhouse gas emissions.....	10-6
10.4.2	Australian greenhouse gas emissions.....	10-6
10.5	Existing conditions - contamination.....	10-7
10.5.1	Geology, topography and hydrogeology	10-7
10.5.2	Existing and historic land uses	10-8
10.5.3	Soil contamination investigation	10-10
10.5.4	Groundwater and surface water contamination investigation	10-11
10.5.5	Summary of potential sources of contamination	10-13
10.5.6	Acid sulfate soils.....	10-16
10.6	Risk assessment – greenhouse gas	10-18
10.7	Risk assessment - contamination	10-19
10.8	Construction impact assessment – greenhouse gas	10-22
10.9	Construction impact assessment – contamination	10-23
10.9.1	Existing contamination disturbance, exposure and management.....	10-24
10.9.2	Mobilisation of contaminated groundwater	10-27
10.9.3	Unidentified contamination, uncontaminated spoil and spills.....	10-28
10.9.4	Contaminated hydrostatic test water	10-30
10.9.5	Drilling fluids used for HDD	10-30
10.9.6	Construction residual impacts summary	10-31
10.10	Operation impact assessment – greenhouse gas	10-32
10.11	Operation impact assessment – contamination	10-33
10.11.1	Leaks or spills	10-33
10.11.2	Waste streams.....	10-34
10.11.3	Operation residual impacts summary.....	10-34
10.12	Cumulative impact assessment	10-34
10.13	Environmental management - greenhouse gas	10-35
10.13.1	Environmental management measures.....	10-35
10.13.2	Best practice in greenhouse gas	10-36
10.14	Environmental management - contamination	10-37
10.14.1	Environmental management measures.....	10-37
10.14.2	Performance criteria and management	10-44

Contents (continued)

- 10.15 Conclusion 10-45
 - 10.15.1 Greenhouse gas 10-45
 - 10.15.2 Contamination 10-46

10.1 Introduction

This chapter provides an assessment of potential wastes, with a focus on greenhouse gas emissions and contaminated soil, generated by the construction and operation of the Western Outer Ring Main (WORM) gas pipeline project (the Project). This chapter is based on the technical reports presented in Technical report E *Contamination* and Technical report H *Greenhouse gas*.

Since the Industrial Revolution, the Earth's climate has been altered as a direct result of anthropogenic climate change. As a direct result, global atmospheric and sea surface temperatures are increasing, sea levels are rising and glaciers and ice sheets have decreased in size. In Australia, climate change exacerbates existing climate risks and creates new risks, such as affected temperatures, rainfall, and fire weather. The largest contributing factor driving anthropogenic climate change is the increase in atmospheric carbon dioxide (CO₂) concentrations since 1750 (CSIRO, 2016).

What is a waste?

The EES scoping requirements for the Project identify issues relating to waste management as:

- Greenhouse gases emitted during construction and operation
- Spills and leakages
- Contaminated, sodic and acid sulfate soils
- Other solid and liquid wastes generated by the Project.

Construction and operation of the Project would involve activities that generate CO₂ and other greenhouse gases which would contribute to the greenhouse effect and climate change. It is therefore important to quantify the greenhouse gas emissions from the Project to understand the implications of these emissions for Victorian and Commonwealth greenhouse gas emission targets and the *Climate Change Act 2017*.

Construction projects have the potential to encounter contaminated soil and groundwater and also generate a range of waste materials. Sources of this material can be from anthropogenic activities such as industrial land uses and practices, such as former or current landfilling, or can be naturally occurring, such as acid sulfate soils. Additionally, spills and leaks can occur during construction and operation, causing contamination. Contaminated materials and wastes can potentially impact project scheduling and budgets, as well as pose a threat to human health and the environment. Contaminated materials and other wastes must be managed appropriately in accordance with Victorian and Commonwealth legislation and guidelines.

The EES scoping requirements set out the following evaluation objective:

- Waste management – Minimise generation of wastes from the Project during construction and operation, and to prevent adverse environmental or health effects from storing, handling, transporting and disposing of waste products.

The EES scoping requirements for waste management identify key issues relating to waste materials, emissions of greenhouse gases and contaminated soil.

A greenhouse gas assessment and a contamination assessment were undertaken to address these key issues and form the basis of this chapter. Impacts associated with an unplanned spill or leak of gas primarily relate to safety and are addressed in Technical report M and Chapter 17 *Safety*. Sodic soils are naturally occurring with potential impacts primarily relating to land stability and are addressed in Technical report D and Chapter 9 *Land stability and ground movement*.

Other aspects closely related to the waste management evaluation objective include vegetation removal, surface water runoff, dust generated from stockpiled soils, contaminated groundwater and land uses indicating the potential for contamination. These are addressed in the following reports:

- Technical report A and Chapter 7 *Biodiversity*

- Technical report B and Chapter 8 *Surface water*
- Technical report G and Chapter 11 *Air quality*
- Technical report C and Chapter 8 *Groundwater*
- Technical report K and Chapter 15 *Land use*.

10.2 Method – greenhouse gas

The greenhouse gas assessment comprised the following key tasks:

- Review of relevant legislation and policy at an international, national, state and local level
- Establishment of a study area for greenhouse gas. This was defined as the area required for the construction and operation of the Project, as well as broader potential impacts of the Project. These include embodied emissions associated with material use during construction and electricity use during construction and operation
- Desktop assessment and baseline data review to provide a base case. Emissions data was sourced from Australian National Greenhouse Accounts: State and Territory Greenhouse Gas Inventories 2018
- Characterisation of existing conditions based on the regional context. The Project is intended to play a key role in avoiding gas supply shortages in Victoria and should be reviewed in a state and national level emissions context
- A risk-based review of potential impacts to prioritise the focus of the impact assessment to risks with a medium or higher rating and/or where additional mitigation measures are required
- Assessment of the potential greenhouse gas impacts, including Scope 1, Scope 2 and Scope 3 emissions from the construction and operation of the Project, in accordance with the principles set out in:
 - National Greenhouse and Energy Reporting (NGER) (Measurement Determination 2008 and *NGER Act 2007*
 - The Greenhouse Gas Protocol (GHG Protocol), the World Business Council for Sustainable Development and the World Resources Institute
 - ISO 14064-1:2006 Greenhouse gases – Part 1: Specification with guidance at the organisation level for quantification and reporting of greenhouse gas emissions and removals
 - ISO 14040:2006 Environmental management – Lifecycle assessment – Principles and framework and ISO 14044:2006 Environmental management – Lifecycle assessment – Requirements and guidelines. These standards are applicable to the calculation of materials lifecycle impacts using the Infrastructure Sustainability (IS) Materials Calculator

What are scope 1, 2 and 3 emissions?

Scope 1 emissions - the release of greenhouse gas into the atmosphere as a direct result of the Project activities (ie fuel consumption in site plant).

Scope 2 emissions - the release of greenhouse gas into the atmosphere as a direct result of one or more activities that generate electricity, heating, cooling or steam that is consumed by the Project but that do not form part of the facility (ie the use of grid electricity during construction).

Scope 3 emissions - other indirect release of greenhouse gas emissions during construction that are generated in the wider economy (ie the production of raw materials used for construction, such as steel, which is a consequence of the activities of the Project, but from sources not owned or controlled by the Project).

For the purposes of the Project, only material Scope 3 emissions have been estimated. This includes construction and operation fuel consumption, and embodied emissions associated with pipeline construction materials (steel and concrete). Materiality has been determined in accordance with accepted practice under the NGER legislation.

- Estimation of the greenhouse gas emissions sourced from the following references:
 - National Greenhouse Accounts Factors, August 2019
 - IS Materials Calculator v. 2.0 2010-05-31
 - Carbon Gauge GHG Calculator v 01.130612
- A key assumption underpinning the greenhouse gas assessment is that the purpose of the Project is not to increase consumption beyond current fuel gas usages, but to maintain and transfer gas more efficiently across the Victorian Gas Transmission network. For this reason, emissions associated with consumption of the fuel gas transported by the Project have not been calculated. Refer to Chapter 2 *Project rationale* for further detail on the Australian Electricity Market Operator (AEMO) report and the forecast of gas in Victoria
- Development of environmental management measures (EMMs) in response to the impact assessment to avoid and/or minimise impacts. Refer to Chapter 19 *Environmental management framework* for the full list of EMMs
- Assessment of the residual impacts of the Project assuming implementation of the environmental management measures
- Specifying the monitoring required to evaluate whether the Project meets the environmental management measures and detailing contingency measures as required.

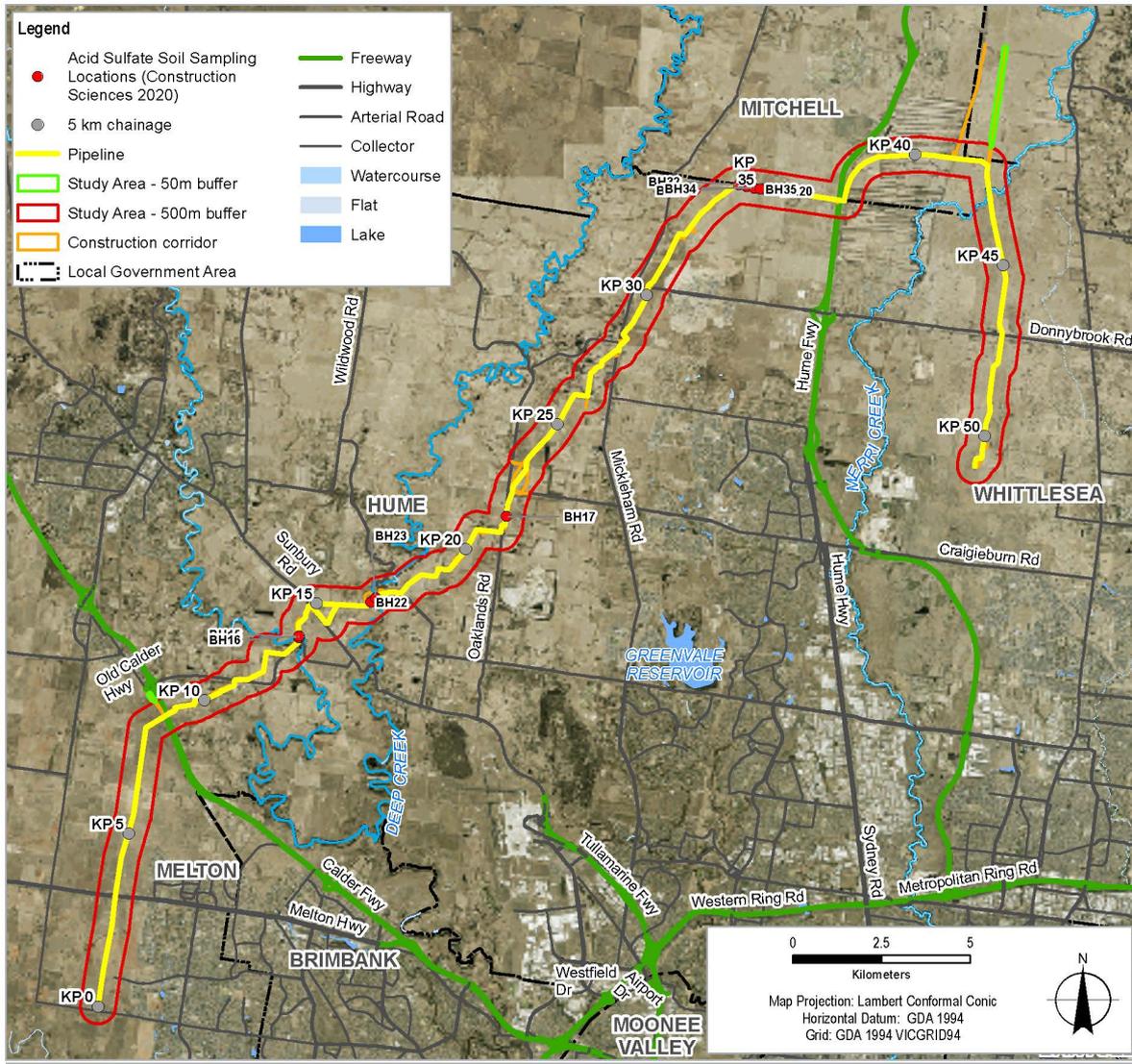
10.3 Method - contamination

The contamination assessment comprised the following key tasks:

- Review of relevant legislation and policy at a national, state and local level
- Establishment of a study area for contamination. This was defined as including the Project construction corridor as well as a 500 metre buffer (on either side of the corridor) to assess the nature of potential contamination source areas, as shown in Figure 10-1
- Desktop assessment and baseline data review in general accordance with the National Environmental Protection (Assessment of Site Contamination) Measure 1999, as amended in 2013 ('ASC NEPM') and the following publicly available data sources:
 - Published geological, topographical and hydrogeological maps including GeoVic – Explore Victoria Online
 - Web-based hazard assessment tool for acid sulfate soils - the Atlas of Australian Acid Sulfate Soils (CSIRO)
 - Acid sulfate soil results reported in Constructions Sciences (2020) Pipeline ROW, Water Crossing and HDD Crossing Geotechnical Report
 - Environment Protection Authority (EPA) Victoria's website:
 - EPA Victoria's Landfills Register (Victoria Unearthed) which lists all current and known closed landfills in Victoria
 - EPA Victoria's issued Environmental Audits (Victoria Unearthed) to identify specific areas of land on which a Statutory Environmental Audit was conducted
 - EPA Victoria's Priority Sites Register (Victoria Unearthed) to identify the number of potentially contaminated sites in the study area

- EPA Victoria Licenced Sites Register (Victoria Unearthed) to identify the number of potentially contaminated sites in the study area. Licences allow businesses to run certain licenced activities such as waste treatment and disposal
- Groundwater Quality Restricted Use Zones (GQRUZ) (Victoria Unearthed) to identify GQRUZ located within the study area, as declared by EPA Victoria
- Historical aerial photographs to assist in detecting areas of historical earthmoving
- Current Google Maps search to assess current land uses
- Field investigation including:
 - Site inspection at 140 Duncans Lane, Diggers Rest (approximately between KP 9.95 to KP 10.14) and the Kalkallo retarding basin (inspected between approximately KP 34 to KP 35.54). Both sites are located within the construction corridor and identified as a potential source of contamination
 - Site inspection from a publicly accessible area near the Bulla Tip and Quarry in Bulla (KP 14.85 to KP 15.85) and the former quarry in Beveridge (near KP 37.5)
 - Soil sampling during groundwater well installation from 11 locations, analysed for a broad screen of contaminants and acid sulfate soil sampling at two locations (BH09 and BH12)
 - Groundwater sampling at 12 groundwater bores, analysed for a broad screen of contaminants
 - Preliminary per- and polyfluoroalkyl substances (PFAS) surface water and groundwater sampling at Jacksons Creek and Deep Creek (BH15, BH22 and BH23a)
- Characterisation of existing conditions based on the desktop assessment and fieldwork undertaken, considering potentially contaminated land, acid sulfate soils and groundwater
- A risk-based review of potential impacts to prioritise the focus of the impact assessment
- Assessment of the potential contamination impacts during construction and operation of the Project
- Development of environmental management measures (EMMs) in response to the impact assessment. Refer to Chapter 19 *Environmental management framework* for the full list of EMMs
- Assessment of the residual impacts of the Project assuming implementation of the environmental management measures
- Specifying the monitoring required to evaluate whether the Project meets the environmental management measures and detailing contingency measures as required.

Figure 10-1 Contamination study area



10.4 Existing conditions - greenhouse gas

The following section outlines the existing conditions of the Project study area in relation to greenhouse gas. The existing conditions assessment considered greenhouse gas emissions on a state and national level.

How are greenhouse gases measured?

Greenhouse gases are measured as tonnes, kilo tonnes or million-tonnes (Mt) of carbon dioxide equivalent (CO₂-e). This represents the amount of greenhouse gases emitted as an equivalent amount of CO₂.

10.4.1 Victorian greenhouse gas emissions

Victoria's total greenhouse gas emissions for 2018 are presented in the State and Territory Greenhouse Gas Inventories 2018 (DISER, 2020). This report provides the most up-to-date official greenhouse gas emissions data. Victoria's total net emissions in 2018 was 102.2 Mt CO₂-e, which represents a reduction of 17.5% from 2005 levels.

Table 10-1 Victorian greenhouse gas emissions by sector for 2018 (DISER, 2020)

Sector	Greenhouse gas emissions (Mt CO ₂ -e)	Contribution to state emissions (%)
Electricity generation	46.4	45%
Other energy industries	3.1	3%
Manufacturing and construction	4.8	5%
Other sectors	9.8	10%
Transport	23.5	23%
Fugitive fuels	3.9	4%
Industrial processes	3.9	4%
Agriculture	15.7	15%
Waste	2.6	3%
Land use, land use change and forestry	-11.5	-11%
Total	102.2	100%

10.4.2 Australian greenhouse gas emissions

Emissions from the Project should also be viewed in terms of its contribution to national totals. Total emissions for 2018 was 537.4 Mt CO₂-e, which represents a reduction of 12.8% from 2005 levels. National greenhouse gas emissions for 2018 are presented in Table 10-2.

Table 10-2 Australian greenhouse gas emissions by sector for 2018 (DISER, 2020)

Sector	Greenhouse gas emissions (Mt CO ₂ -e)	Contribution to national emissions (%)
Electricity generation	183.2	34%
Other energy industries	30.7	6%
Manufacturing and construction	40.7	8%
Other sectors	25.8	5%
Transport	100.8	19%
Fugitive fuels	54.4	10%
Industrial processes	34.2	6%
Agriculture	75.6	14%
Waste	12.7	2%
Land use, land use change and forestry	-20.6	-4%
Total	537.4	100%

10.5 Existing conditions - contamination

The following section outlines the existing conditions of the Project study area in relation to contamination.

10.5.1 Geology, topography and hydrogeology

The geology within the Project construction corridor is dominated by the Newer Volcanics basaltic flows and stony rises. Alluvium is present around Jacksons Creek and Deep Creek with colluvium and alluvial terraces in Mickleham. The bedrock beneath the younger geological units is comprised of the Humevale Siltstone. The presence of alluvium also presents the possibility for acid sulfate soil to be present.

The topography of the study area is generally flat to gently undulating, with the exception of significant low elevations at Jacksons Creek and Deep Creek where the valley sides are steep compared to the surrounding plains.

Groundwater salinity is expected to be generally brackish in the order of 2,000 mg/L to 10,000 mg/L with low to moderate yields. The depth to water table varies considerably across the study area from less than five metres to more than 50 metres below ground level based on regional information. The water table is expected to be much shallower in areas close to watercourses and deeper at higher elevations.

Why is geology, topography and hydrogeology important for assessing potential contamination?

Knowledge of the geology, topography and hydrogeology allows for a more informed interpretation of laboratory data, understanding of the potential for contaminant migration via runoff to streams and leaching into groundwater.

Many geological formations contain elements that can be naturally elevated, for example metals such as chromium and nickel are often elevated in basalts. While they exceed Fill Material Criteria (EPA Publication IWRG 621) this does not indicate contamination.

Further information on the topography, geology and hydrology of the construction corridor is provided in EES Chapter 8 *Water*.

10.5.2 Existing and historic land uses

Review of publicly available information from selected aerial photographs indicates that existing land uses within the study area include farming and agriculture, residential, freeway, railway and municipal roads, and industrial land uses including quarrying and landfill. With the exception of industrial land use, the existing land uses are considered to have a relatively low potential for soil and groundwater contamination. Within the industrial land use areas, there are several properties that have been identified as having industrial uses related to quarrying, landfilling and poor environmental practices such as uncontrolled dumping or storage of wastes such as old car bodies. The Kalkallo retarding basin is also present within the study area, which also has the potential to be a collection point for contamination from its catchment.

An access road running adjacent to the railway line in Beveridge is proposed as an option for use by the Project. The access road is an existing access track recently constructed by Yarra Valley Water and no construction is proposed by the Project. As such this access track has not been considered with regards to the potential for contamination.

The Wollert Compressor Station comprises of an above ground oil water separator and associated triple interceptor trap as well as minor chemical storage on site. The site currently operates under the VTS Operational Environmental Management Plan (OEMP). Whilst the risk of the Project encountering contamination at this site is considered low, its land use suggests some investigation is required.

Historical information indicates that from 1946, land uses within the study area included grazing land and associated farming infrastructure, dams, rural residential houses and to a lesser extent horticultural activities such as crops. Evidence of quarry activity was observed in 1968 to the south-east of KP 14.85-KP 15.85 (now known as the Bulla Tip and Quarry). The construction corridor runs adjacent to the quarry.

Over the last few years, low density residential development has commenced within the study area. A rural property located at 140 Duncans Lane, Diggers Rest (KP 9.95-10.14) contains hundreds of wrecked cars. The construction corridor runs through the eastern portion of this property.

The landfills and fill sites identified within the study area include:

- The Bulla Tip and Quarry, an operational prescribed industrial waste landfill located at 500 Sunbury Road, Bulla (located 20 metres south-east from the construction corridor near KP 14.85 – KP 15.85)
- The Hi-Quality Sunbury Quarry and Landfill, an operational prescribed industrial waste landfill located at 600 Sunbury Road, Bulla (located 300 metres north from the construction corridor near corridor KP 15)
- A small feature labelled quarry identified in a historical map from 1916 near KP 37.5 adjacent to the Hume Highway in Beveridge. Based on the available images, the quarry does not appear to extend into the construction corridor but the nature and former maximum extent of the quarry is not known.

EPA licences are required for all scheduled premises, including landfills, unless the premises are exempted in the Regulations. Licences cover the actual operation of the site, and set operating conditions and discharge limits. A search of the EPA Licensed Site Register indicates that as of 25 May 2020, a total of one licensed facility and one EPA works approval site are located within the study area. They are:

- The Bulla Tip and Quarry (Licence no. 11758) – prescribed industrial waste landfill located approximately 20 metres south-east of the construction corridor (KP 14.85 – KP 15.85)
- The Hi-Quality Sunbury Quarry and Landfill, EPA works approval for quarrying and composting, located approximately 300 metres north of the construction corridor (KP 15).

Statutory Environmental Audits are undertaken by an EPA Victoria-appointed independent Environmental Auditor. A search of the Victorian EPA Interaction Portal indicates that as of 15 May 2020 there are three properties in the study area that have been subject to a Statutory Environmental Audit, including the two landfill sites:

- 1027-1051 Taylors Road, Deanside, 205 Bulla-Diggers Rest Road (75 metres south-east of KP 0)
- The Bulla Tip and Quarry located at 500 Sunbury Road, Bulla (20 metres south-east of KP 14.85 to KP 15.85)
- The Hi-Quality Sunbury Quarry and Landfill located at 600 Sunbury Road, Bulla (300 metres north of KP 15).

Based on the audits reviewed, the proximity of the sites to the construction corridor and the proposed construction methodology adjacent to the sites, it is considered unlikely these sites would impact on construction activities. This is with the exception of potential landfill gas within the vicinity of the Bulla Tip and Quarry (KP 14.85 to KP 15.85).

The EPA Victoria Priority Sites Register lists sites that have been issued with a formal Clean Up Notice (CUN) or Pollution Abatement Notice (PAN). At these sites, EPA Victoria considers the condition of the site to require assessment/management to reduce risks to human health or the environment. A search of the Register indicated that as of 25 May 2020 two sites were listed: 205 Bulla-Diggers Rest Road, Diggers Rest (30 metres south of KP 11.3) and Bulla Tip and Quarry (20 metres south-east of KP 14.85 to KP 15.85).

Groundwater Quality Restricted Use Zones (GQRUZ) are areas where groundwater pollution is present as a result of previous industrial uses or other activities, and the site has been assessed as part of a Section 53X audit in accordance with the *Environment Protection Act 1970*. These zones have been subject to clean-up, in line with the relevant environmental standards, but not all beneficial uses of groundwater have been restored. As such, restrictions remain on what the groundwater can be used for, if it is abstracted or discharged to a surface water body. If a GQRUZ was present in the study area, it would indicate the need to assess that area in more detail to assess risks to the Project. However, a search of the EPA Victoria GQRUZ map indicates that as of 25 May 2020 there are no GQRUZs within the study area.

10.5.3 Soil contamination investigation

A total of 22 soil samples were collected from 11 locations during drilling of groundwater bores in August and September 2020, generally at shallow depths of 0.1 and 0.5 metres below ground level. Soil samples were analysed for a broad suite of contaminants in line with EPA Victoria Industrial Waste Resource Guideline (IWRG) 621: Soil hazard categorisation and management, to provide an indication of the presence of contamination in those areas sampled.

On-site indicators of contamination including stains, odours and anthropogenic materials were not observed at the locations sampled. All samples also reported analytical results below the upper fill material threshold limit, indicating that soils sampled would be classified as fill material in accordance with IWRG 621. Fill material is considered suitable for offsite disposal and reuse on site.

Further soil sampling within the construction corridor between approximately KP 34.2 and KP 35.4 would be required to characterise the soil quality at the Kalkallo retarding basin, including analysis of PFAS, in order to confirm categorisation of this soil prior to construction.

Soil samples have not been collected at other sites identified from desktop review as potential contamination sources, including the Diggers Rest property storing wrecked vehicles (KP 9.95 to KP 10.14), within or immediately adjacent to the railway reserves likely within shallow soils only (KP 8.3 and KP 41.1) and along the construction corridor opposite a possible former quarry (KP 37.5). Further site investigations would be required to characterise soil quality at these locations and confirm categorisation of this soil prior to construction, these are described in more detail in Section 6.4.2 in Technical report E *Contamination*.

It is noted that the entry and exit pits for HDD at the two railways are anticipated to be located outside of the rail reserves. Given contamination is likely to be limited to shallow soils within the rail reserves, sampling is not required unless shallow soils (less than 1 metres below surface) are to be intercepted by the Project.

How are soil hazards categorised and managed?

Under the new Environment Protection Act 2017, waste must be classified in accordance with the proposed Environment Protection Regulations (61, 62, and 66 to 69).

These regulations are currently under review and contain the following waste categories:

- **Industrial Waste (IW)** - broad covering all waste
 - Fill material: Non-hazardous fill material that may include soil, rock and stone from naturally occurring materials (below Category D levels).
- **Priority Waste (PW)** - industrial waste requiring additional controls. **Reportable PW** is a subset of PW and includes:
 - Category A: Cannot be disposed of to landfill without being treated
 - Category B: Contaminated soil accepted at only one licensed Victorian landfill
 - Category C: Accepted at several licensed Victorian landfills
 - Category D: Lower levels of contamination that can be safely contained at the same project site where the soil was unearthed.

10.5.4 Groundwater and surface water contamination investigation

APA has established a groundwater monitoring network consisting of 17 bores to provide information on groundwater levels and quality. A total of 12 such bores were sampled and analysed in accordance with Victorian EPA publication 669 – *Groundwater sampling guidelines*. Section 6.3.2 of EES Technical report E *Contamination* details the contaminants analysed.

The groundwater samples were collected to provide information on groundwater quality and the potential presence of contamination. The results are not meant to direct any clean-up of groundwater but to inform potential management requirements should groundwater be extracted for any purpose such as dewatering excavations.

Concentrations of ammonia (as N), total nitrogen and total phosphorus were reported above the adopted criteria (SEPP (Waters) and Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2018 (ANZG, 2018) – Freshwater 95% species protection) for water dependent ecosystems. Such chemicals can have a natural origin but may also be related to agricultural practices. These may preclude groundwater disposal to the environment, such as disposal to waterways (if required). Additional assessment would need to be undertaken prior to any such disposal. In addition, the salinity of the majority of the groundwater exceeds the criteria adopted to assess for irrigation and as such the groundwater is likely to be too saline for long term irrigation use. Refer to Technical report C and Chapter 8 *Groundwater* for further detail on disposal to land.

Analytes that are more indicative of anthropogenic contamination included E.coli, total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAH), oil and grease surfactants (MBAS), organochlorine pesticides (OCPs), semi-volatile and volatile organic compounds (SVOCs and VOCs), monocyclic aromatic hydrocarbons (MAHs), and polychlorinated biphenyls (PCBs). All of these were reported below the laboratory limit of reporting for samples analysed. The preliminary PFAS sampling and results are discussed below.

All samples reported metals in excess of the water dependent ecosystems criteria (Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2018 (ANZG, 2018) – Freshwater 95% species protection). However, these are considered to represent background groundwater conditions as the distribution was consistent and widespread and not related to any obvious contamination source.

A preliminary surface water investigation was also completed with one sample collected at each of Jacksons Creek and Deep Creek in October 2020. Surface water samples were analysed for salinity, nutrients and PFAS. Concentrations of phosphorus and total nitrogen were reported above the adopted criteria to assess water dependant ecosystems (SEPP Waters Environmental Quality Indicators). Phosphorus was also reported above the adopted criteria to assess long term irrigation. This may impact the management options for any surface water extracted as part of the Project works.

Preliminary PFAS sampling was completed in groundwater and surface water at Jacksons Creek and Deep Creek to investigate the potential for regional groundwater pollution from the Bulla Landfill and Hi-Quality Landfill. The key findings of the preliminary sampling are:

- PFAS was analysed in groundwater at BH15 (Jacksons Creek) and BH22 and BH23a (Deep Creek) and was reported below laboratory limit of reporting (less than 0.002 ug/L) in all three wells sampled.
- Jacksons Creek
 - Surface water sample was initially collected near the Project crossing in October 2020. Further sampling was completed in February 2021 to confirm results and included sampling upstream, downstream and at the Project crossing.
 - All surface water samples reported concentrations of perfluorooctanoic acid (PFOA) and Perfluorooctane sulfonate (PFOS), with PFOS reported close to the laboratory limit of reporting and above the adopted criteria to assess water dependant ecosystems (PFAS NEMP 99% species protection ecological investigation level).
 - It is noted that groundwater well (BH15), installed to assess conditions near Jacksons Creek, is screened within the siltstone at 17.3 to 20.3 metres and is unlikely to be representative of the shallower groundwater conditions to be encountered during dewatering. Further investigation of shallow groundwater and sediments to be disposed offsite at Jacksons Creek will be undertaken in order to inform disposal and management options as well as seeking relevant EPA approvals, if required.
 - The source of PFAS contamination within Jacksons Creek is unclear but may be attributed to historical discharge from the Sunbury Recycled Water Treatment Plant located approximately 4.5 kilometres upstream of the crossing at Jacksons Creek.
- Deep Creek
 - Surface water sample reported PFAS below the laboratory limit of reporting.
 - It is understood that HDD under Deep Creek would occur at least 16 metres below the surface within the siltstone unit. Groundwater well BH22 was screened at 27.2-30.2 metres and BH23a was screened at 22-25 metres. Although the groundwater wells are screened deeper than the anticipated depth of HDD, given the analytical results it is highly unlikely that PFAS would be present within drilling fluids at this depth. Further investigation of PFAS at Deep Creek is not considered warranted.

10.5.5 Summary of potential sources of contamination

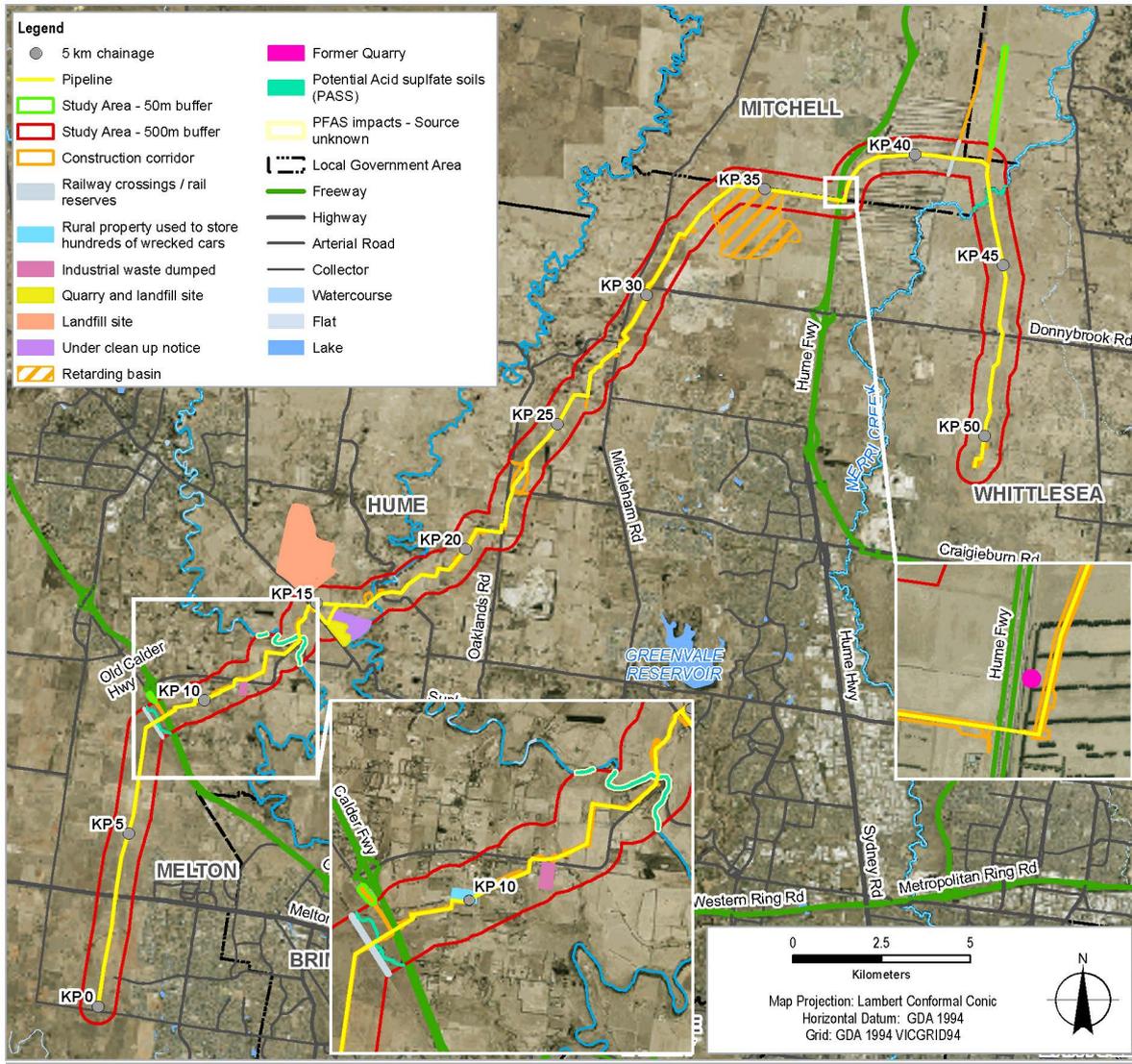
A summary of the potential sources of contamination, their locations in relation to the Project, how the potential contamination could be interacted with and the associated potential contaminants of concern is presented in Table 10-3 and illustrated in Figure 10-2.

Table 10-3 Summary of potential sources of contamination

Potential sources of contamination	Location	Distance/direction from construction corridor	Potential impact pathway	Potential contaminants of concern
Railway crossings/ rail reserves	Sunbury Railway Line crossing in Diggers Rest (KP 8.3). Railway crossing in Beveridge (KP 41.1)	Pipeline runs beneath railway lines	Excavation of soil (unlikely to be realised based on construction method)	Metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP), asbestos
Rural property used to store hundreds of wrecked cars	140 Duncans Lane, Diggers Rest (KP 9.95-10.14)	Pipeline runs directly through the eastern portion of the property	Excavation of soil Soil vapour migration Abstraction of groundwater (unlikely to be realised based on construction method)	Metals, TRHs, BTEX, PAHs and solvents.
Industrial waste dumped	205 Bulla-Diggers Rest Road, Diggers Rest (KP 11.3)	Approximately 30m to the south of the construction corridor	Abstraction of groundwater (unlikely to be realised based on construction method)	Metals, TRHs, BTEX, PAHs
Quarry and landfill site	Bulla Tip and Quarry – 500 Sunbury Road, Bulla (KP 14.85-15.85)	Approximately 20m to the east of the Project construction corridor	Gas migration Abstraction of groundwater (unlikely to be realised based on construction method)	Landfill gas (methane, carbon dioxide, hydrogen sulphide and carbon monoxide), heavy metals, nutrients (ammonia, nitrate, phosphorous), TRHs, BTEX, PAHs, chlorinated hydrocarbons, per- and polyfluorinated alkyl substances (PFAS)
Landfill site	600 Sunbury Road, Bulla (KP 15)	Approximately 300m north of the construction corridor	Abstraction of groundwater (unlikely to be realised based on construction method)	TRHs, BTEX, PAHs, chlorinated hydrocarbons, PFAS

Potential sources of contamination	Location	Distance/ direction from construction corridor	Potential impact pathway	Potential contaminants of concern
Unknown, but is known to have received a Clean Up Notice	40 Batey Court, Bulla (KP 16)	Approximately 25m to the east of the construction corridor	Gas migration Abstraction of groundwater	Unknown
Retarding basin	Kalkallo (KP 34-35.54)	Construction corridor runs along the northern boundary	Excavation of soil Abstraction of groundwater (unlikely to be realised based on construction method)	Contaminants dependent on surrounding land uses – potentially metals, TRHs, BTEX, PAHs, OCPs, asbestos, E.Coli and nutrients, PFAS
Former Quarry	300 Hume Hwy, Beveridge (KP 37.5)	30m to the west of the construction corridor	Excavation of soil Abstraction of groundwater (unlikely to be realised based on construction method)	Metals, TRHs, BTEX, PAHs, aesthetics, asbestos
Wollert Compressor Station	Wollert (KP 50.78 to KP 51.045)	Forms part of the construction corridor	Excavation of soil Abstraction of groundwater (unlikely to be realised based on open cut trench construction method)	Metals, TRHs, BTEX, PAHs, solvents, OCPs.
Source unknown possibly due to historical discharge from the Sunbury Recycled Water Treatment Plant (outside of the study boundary)	Jacksons Creek (KP 13.6)	Jacksons Creek	Abstraction of shallow groundwater, surface water and sediments	Nutrients and PFAS
Potential Acid sulfate soils (PASS)	Jacksons Creek (KP 13.6). Merri Creek (approx. KP 42.8)	Jacksons Creek Merri Creek	Exposing sediments to oxygen from dewatering	PASS

Figure 10-2 Potential sources of contamination



Data source: APA, 2020; GH-D, 2020; DELWP, Vicmap, 2020 Created by:kgardner

10.5.6 Acid sulfate soils

Desktop review

Actual and potential acid sulfate conditions are a natural phenomenon associated with specific soil and rock types, notably alluvium and swamp deposits and some bedrock types that contain metal sulphides. Metal sulphides generally occur at very low concentrations in rock, where the risk of adverse environmental impact due to acid generation is minimal.

The presence of acid sulfate soils and acid sulfate rock can become a potential constraint to construction activities, requiring the implementation of controls to manage the spoil during excavation activities.

The potential presence of acid sulfate soils was assessed using the Atlas of Australian Acid Sulfate Soils as compiled by the Commonwealth Scientific and Industrial Research Organisation (CSIRO). The study area is located within an area classified as extremely low to low probability of acid sulfate soil occurrence, as shown in Figure 10-3. The confidence rating for this classification is four, which indicates that the classification is provisional as it is inferred from surrogate data with no on ground verification.

The construction corridor is largely underlain by basalt and alluvium in the creek beds. Of these, the alluvium poses the most likely risk of PASS, notably below the water table.

Field investigation

Two sampling events have been conducted to assess acid sulfate soil:

- Construction Sciences (2020) completed an acid sulfate soil assessment on 49 samples from 13 locations along the construction corridor as part of the geotechnical investigation
- GHD collected eight samples from two soil bores in August 2020.

PASS and AASS were not identified in the samples assessed but further sampling and analysis may be required if excavating soils beneath the water table in alluvium such as at creek crossings at Jacksons Creek and Merri Creek. Further assessment of acid sulfate soils at the Kalkallo retarding basin is not required as the Project is unlikely to intercept groundwater at this location.

What are acid sulfate soils?

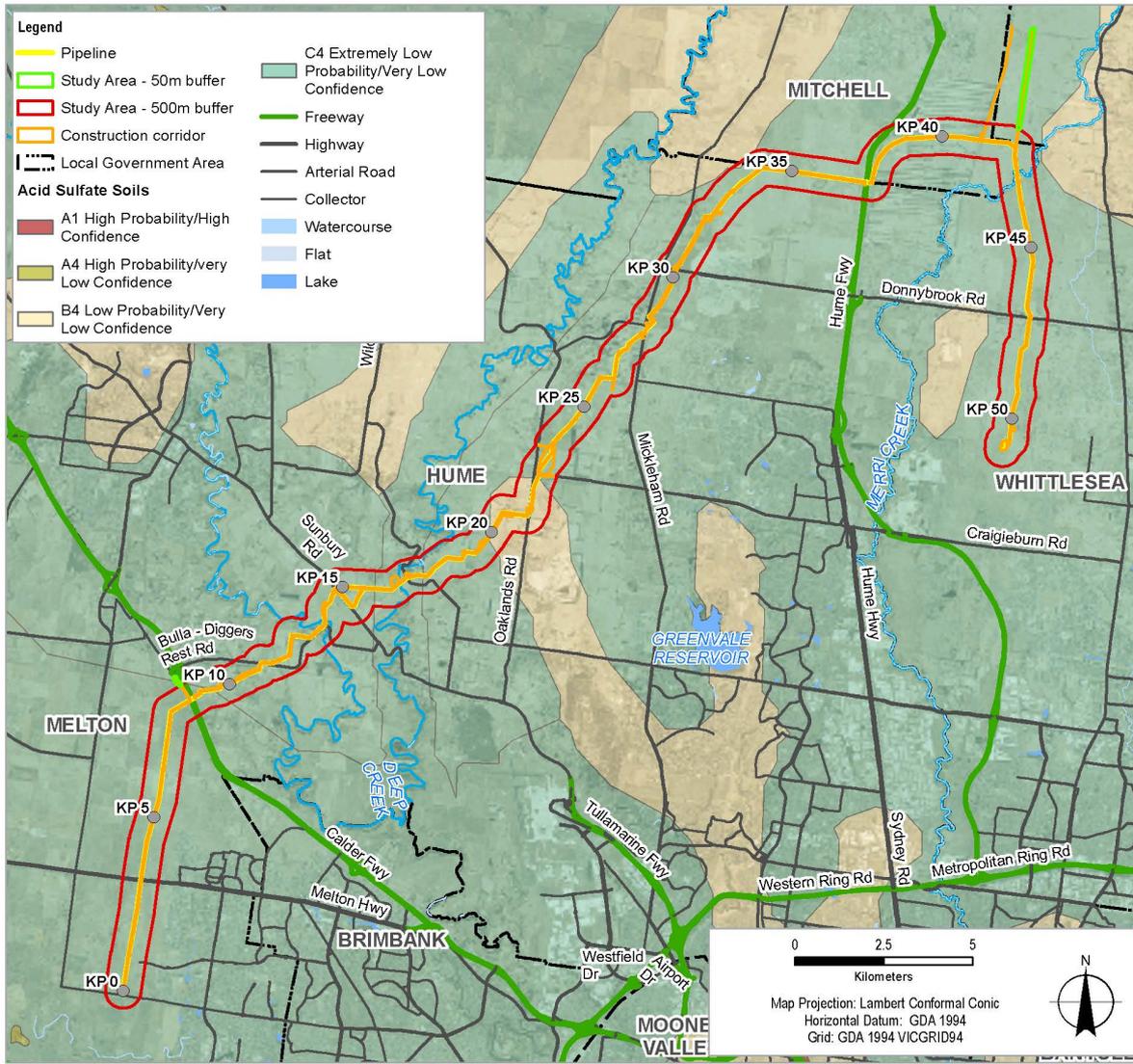
Acid sulfate soil is the common name given to soils affected by iron sulphide minerals, which can occur naturally in coastal environments such as estuarine systems, mangrove swamps and back-swamps and in inland environments such as river and stream channels, lakes, wetlands, billabongs, floodplains and marshes. Acid sulfate soil can generally be classified into two broad types:

- Potential Acid Sulfate Soils (PASS) materials containing pyrite and/or monosulphides that are still waterlogged but have the potential to produce acid if oxidised
- Actual Acid Sulfate Soils (AASS) material containing sulphuric acid and pyrite, which has already been oxidised.

Acid sulfate soil in Victoria is currently regulated by the Industrial Waste Management Policy (Waste acid sulfate soil) No. S 125, 1999 under sections 16(1A), 16(2) and 17(1A) of the Environment Protection Act (1970). Subordinate to the Policy is EPA Publication 655.1 Acid sulfate soil and rock, July 2009 which defines assessment methods and criteria and management options.

Where alluvial material is to be disturbed during open cut trench construction below the water table in the three major stream crossings, this has the potential to contain PASS. The sampling conducted to date has been based on drill locations from approximately 10 to 240 metres from the actual creek beds so material directly within and under the creek beds (below the water table) has not been directly assessed. Therefore, additional sampling would be required to be completed by the Contractor before construction, to inform spoil management planning at these specific locations.

Figure 10-3 Acid sulfate soils



Data source: APA, 2020; GHD, 2020; DELWP, Vicmap, 2020 Created by kgardner

10.6 Risk assessment – greenhouse gas

The risk assessment identified the risks associated with greenhouse gas as a result of the Project's construction and operation in accordance with the method described in Chapter 5 *Evaluation and assessment framework*.

Table 10-4 below presents a summary of the four construction risks and three operation risks identified and assessed as a part of the greenhouse gas assessment.

Table 10-4 Greenhouse gas risk assessment summary

Risk ID	Works area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
Construction						
GG1	All	Embedded emissions associated with the production of raw materials consumed	EMM GG1(a) - Low embodied energy materials, GG1(c) - Locally sourced materials, GG1(e) - Construction emissions to be monitored	Medium	No additional measures identified	Medium
GG2	All	Fuel use for onsite equipment, transportation of materials and electricity consumption	EMM GG1(b) - Use of fuel efficient plant and equipment during construction and GG1(e) - Construction emissions to be monitored	Medium	No additional measures identified	Medium
GG3	All	Vegetation removal within construction corridor and associated loss of stored carbon	EMM GG1(d) - Vegetation removal reduction, GG1(f) - Mulching trees for recycling, and GG1(e) - Construction emissions to be monitored	Medium	No additional measures identified	Medium
GG4	All	Explosive use	EMM GG1(g) - Minimise fossil fuel based explosives during construction and GG1(e) - Construction emissions to be monitored	Low	No additional measures identified	Low
Operation						
GG5	Compressor	Gas consumption at the Wollert compressor station, fossil fuel use in vehicles and the use of electricity during operation	EMM GG2(a) - Implementation of PEM, GG2(b) - Compliance with licence conditions, GG2(c) - Monitoring and reporting	Medium	No additional measures identified	Medium

Risk ID	Works area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
GG6	Pipeline and compressor	Unplanned activity, incident or emergency leading to venting during operation	EMM GG3 - Implement industry standards	Negligible	No additional measures identified	Negligible
GG7	Pipeline and MLVs	Fugitive emissions and leaks associated with the pipeline infrastructure	EMM GG4 - Design Project to standards	Low	No additional measures identified	Low

10.7 Risk assessment - contamination

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

Table 10-5 below presents a summary of the nine construction risks and one operation risk identified and assessed as part of the contamination assessment.

Table 10-5 Contamination risk assessment summary

Risk ID	Works area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
Construction						
C1	All	Disturbance and management of existing contamination (inferred conditions) Construction activities disturb contaminated soil, acid sulfate soil and/or contaminated materials impacting human health and the environment which require management, transport and disposal	EMM C1 - Implement spoil management measures EMM C3 - Minimise impacts from disturbance of acid sulfate soil	Low	No additional measures identified	Low

Risk ID	Works area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
C2	All	Disturbance and management of existing contamination (unidentified contamination). Construction activities disturb unknown contaminated soil, acid sulfate soil and/or contaminated materials impacting human health and the environment which require management, transport and disposal	EMM C1 - Implement spoil management measures EMM C2 - Managing any unknown contamination EMM C3 - Minimise impacts from disturbance of acid sulfate soil	Low	No additional measures identified	Low
C3	All	Disturbance and management of uncontaminated spoil. Construction works would disturb a large volume of uncontaminated spoil as part of open cut trench construction which could impact human health and the environment from dust generation and runoff to waterways	EMM C1 - Implement spoil management measures	Low	No additional measures identified	Low
C4	Pipeline	Mobilisation of contaminated groundwater Construction works cause mobilisation of existing contaminated groundwater impacting beneficial uses	EMM C4 - Minimise risks from contaminated groundwater/ trench water	Low	No additional measures identified	Low
C5	All	Leaks or spills during construction from plant/machinery operations, fuel and chemical storage affects soil quality, surface water quality and/or groundwater quality	EMM C6 - Manage chemicals, fuels and hazardous materials	Low	No additional measures identified	Low
C7	All	Exposure to ground gases and vapour. Construction activities releasing vapours and/or ground gases from contaminated soil and/or contaminated groundwater, impacting human health or beneficial uses	EMM C5 - Minimise risks from vapour and ground gas intrusion (initial)	Medium	EMM C5 - Minimise risks from vapour and ground gas intrusion (additional)	Low

Risk ID	Works area	Risk pathway	Initial mitigation measures	Initial risk rating	Additional mitigation measures	Residual risk rating
C8	All	Management of waste streams. Mismanagement of waste streams generated during Project construction affects human health, aesthetics and the environment	EMM C7 - Management of waste streams	Low	No additional measures identified	Low
C10	Pipeline	Contaminated hydrostatic test water Handling, storage or disposal of water from hydrostatic testing affects human health and the environment from exposure to contamination	EMM C8 - Management of hydrostatic test water	Negligible	No additional measures identified	Negligible
C11	Pipeline	Drilling fluids used for HDD Drilling fluids used for HDD sections impacting groundwater quality, surface water quality and land	EMM C9 - Management of drilling fluids	Negligible	No additional measures identified	Negligible
Operation						
C6	All	Leaks or spills Ongoing operation of the facility and MLV leads to leaks (due to maintenance works) or spills affecting soil quality, surface water quality and/or groundwater quality	EMM C10 - Minimise contamination risks during operation	Low	No additional measures identified	Low
C9	All	Management of waste streams Mismanagement of waste streams generated during Project operation affects human health, aesthetics and the environment	EMM C10 - Minimise contamination risks during operation8	Low	No additional measures identified	Low

10.8 Construction impact assessment – greenhouse gas

This section discusses the construction impacts associated with the Project in relation to greenhouse gas emissions. Emission sources include:

- Land use change due to site clearing and site establishment
- Construction of the pipeline including fuel consumption by equipment and vehicles
- Embedded emissions in construction materials.

Table 10-6 summarises the predicted greenhouse gas emissions associated with construction of the Project.

How do materials generate greenhouse gas emissions?

The production of all materials requires the use of energy which is termed 'embedded emissions' or 'embodied energy'. This is associated with the manufacture and transport of goods. Embedded emissions are considered in the assessment of greenhouse gas emissions for the Project.

Table 10-6 Predicted greenhouse gas emissions from the Project construction

Emission source Category	Emission source	Risk ID*	Greenhouse gas emissions (t CO ₂ -e)			
			Scope 1	Scope 2	Scope 3	Total
Fuel use	Stationary equipment	GG2	3,800		190	3,990
	Site vehicles	GG2	2,270		120	2,390
Materials	Construction materials	GG1			30,930	30,930
Land use changes	Vegetation removal	GG3	13,500			13,500
Total			19,570		31,240	50,810

Note: construction emissions are not recurrent (ie once off emissions generated during construction).

The Project's estimated Scope 1 construction emissions are predicted to be the equivalent of approximately 0.019 percent of Victoria's total annual emissions. State and national Scope 3 emissions are not reported under the NGER scheme (as they potentially double count another entities Scope 1 emissions) and hence are not compared.

The majority of the Scope 1 construction emissions is attributed to land use changes due to removal of vegetation in the construction corridor. For the purposes of the greenhouse gas assessment, it was conservatively assumed that 100 percent of vegetation within the construction corridor would be cleared, which is unlikely to be the case. To manage this emissions impact, vegetation removal would be further avoided and minimised along the pipeline alignment (EMM GG1(d)). This would also be managed by EMM B7 - Site rehabilitation, which requires that the construction corridor is reinstated with consideration of the native vegetation composition indigenous to the area and ground surface, including reinstatement of habitat features.

Fuel use emissions also contribute significantly to Scope 1 emissions. While the use of stationary equipment and site vehicles is unavoidable, environmental management measures would be implemented that seek to reduce emissions, such as use of fuel efficient plant and equipment (EMM GG1(b)).

It is noted that explosive consumption has not been included in Table 10-6. This is because it is assumed that ammonium nitrate/fuel oil (ANFO) based explosives would be used during construction of the Project, in quantities that would lead to greenhouse gas emissions which are immaterial to this assessment. The type and quantity of explosives used during construction of the Project have not yet been determined. A blast management plan would be developed by a specialised blasting contractor prior to the works. Construction emissions would be managed by minimising the amount of fossil fuel based explosives required (EMM GG1(g)). Other measures required include:

- Provision of construction greenhouse gas data as per NGER requirements (Scope 1 emissions) to APA by contractors
- Quarterly audits during the construction period to assess compliance with the Project's CEMP. Quarterly audits will be undertaken by APA HSE Advisors
- An audit at the end of the construction period (undertaken by APA) to confirm NGER Reporting requirements.

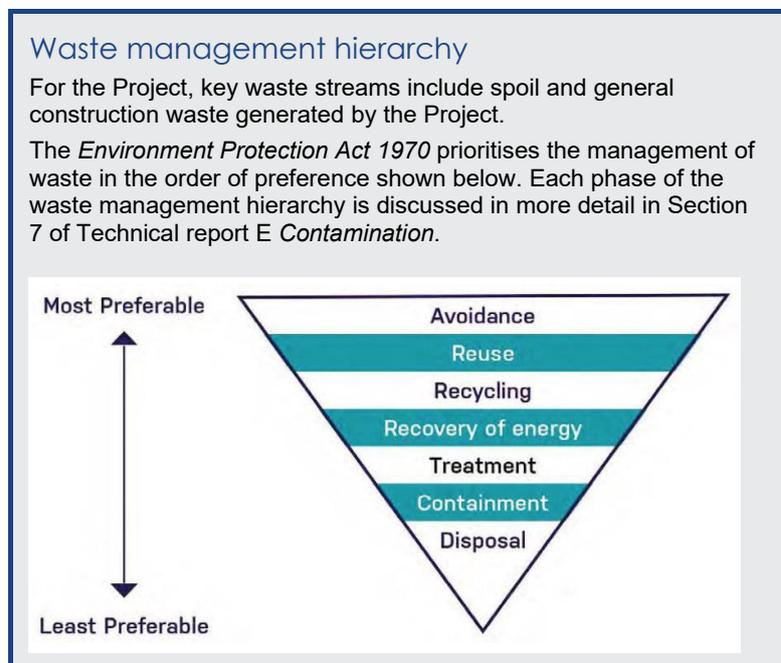
Scope 3 emissions from the use of construction materials have significant impacts, due to the size of the emissions sources. Construction emissions would be monitored via audit/monitoring processes by a suitably qualified APA HSE Advisor (EMM GG1(e)).

For further detail on the assumptions relevant to each emissions source, refer to Technical report H *Greenhouse gas*.

10.9 Construction impact assessment – contamination

This section discusses construction impacts associated with the Project in relation to contamination. These are grouped into five main themes based on the risk pathways:

- Existing contamination disturbance, exposure and management
- Mobilisation of contaminated groundwater
- Unidentified contamination, uncontaminated spoil and spills
- Contaminated hydrostatic test water
- Drilling fluids used for HDD.



10.9.1 Existing contamination disturbance, exposure and management

Disturbance and management of existing contamination (inferred conditions)

The contamination assessment has indicated that there is a low risk of encountering contaminated soils that have arisen from existing and historical land uses during construction of the Project and that any contamination is likely to be limited in extent (refer to Table 10-2).

Based on land use history within close proximity to the Project, contaminated soils are most likely to be encountered within and immediately adjacent to rail reserves (within shallow soils), the rural property in Diggers Rest (KP 9.95-KP 10.14), which is being used to store hundreds of wrecked cars, a possible former quarry in Beveridge (KP 37.5), the retarding basin in Kalkallo (KP 33-KP 35.54), and the Wollert Compressor Station (KP 50.78 to 51.045).

The acid sulfate soil desktop review indicates that acid sulfate soils are unlikely to be present within the construction corridor and as such it is not anticipated that an EPA approved acid sulfate soil management plan would be required, however further assessment is required where dewatering within alluvium soils, specifically at Jacksons Creek and Merri Creek.

Avoidance of potentially contaminated sites based on the construction corridor is not possible. Therefore, environmental management measures to minimise potential impacts are described in EMM C1 and C3, and would broadly include:

- Contaminated soil to be managed in accordance with the SEPP (Prevention and Management of Contaminated Land) and the EPA Victoria Industrial Waste Resource Guidelines (IWRGs) 621 and 702: Soil sampling
- Areas of potential contaminated soils would be identified in the CEMP and assessed against the ASC NEPM and the EPA Victoria Industrial Waste Resource Guidelines (IWRGs) prior to construction
- Where possible, contaminated soils would be avoided or left in situ to the extent possible
- Where construction works are required during wet weather, contaminated soils and surface water impacts would be managed to minimise runoff into and from areas of contamination and stockpiles
- Regularly monitor weather conditions and plan works accordingly to avoid or minimise impacts to sensitive receptors
- Where it is necessary to excavate contaminated soils, they would be stockpiled separately, with containment measures appropriate to the type of contamination present
- Handling and transport of contaminated spoil for off-site treatment/disposal would be in accordance with EPA IWRG 621 and 702 and waste management standards set out in the CEMP
- Assessing the potential presence of and managing any acid sulfate soils in accordance with the Industrial Waste Management Policy (Waste Acid Sulfate Soils), EPA Victoria Publication 655.1 Acid Sulfate Soil and Rock, and the Department of Sustainability and Environment's Victorian Best Practice Guidelines for Assessing and Managing Coastal Acid Sulfate Soil
- All spoil handling and transport is conducted in accordance with the EPA IWRGs
- All stockpiles of potentially contaminated spoil are appropriately secured, lined and bunded to prevent leaching

- All stockpiles of potentially contaminated spoil are appropriately covered and bunded to limit rainwater ingress, dust generation and contact by fauna
- Stockpiling of contaminated soil is kept to a minimum and removed to landfill or other use at the earliest opportunity
- Transport companies must be licensed by EPA Victoria to carry contaminated soil
- Any material imported for use as backfill would be categorised as Fill Material in accordance with IWRG 621 and must be accompanied by relevant documentation confirming its compliance to the 'Fill Material' criteria
- Opportunities for reuse be investigated by the contractor and spoil that is unable to be reused be removed from site via designated haulage routes
- The waste management hierarchy to be considered.

Following implementation of the environmental management measures described above, the residual impacts associated with disturbance and management of existing contamination (inferred conditions) would be low. This is due to the following key factors:

- The extent of contaminated soils is anticipated to be localised at very few sites across the construction corridor as identified in Section 10.5.5
- Stockpile management measures would minimise exposure to contamination via limiting dust generation and stormwater runoff
- Disturbance and handling of potentially contaminated spoil would be short term
- In the unlikely event that contamination was mobilised the extent of impact would be expected to be very localised and impact reversible through containment and clean up measures
- Appropriate personal protective equipment and standard hygiene protocols would minimise potential impact on human health.

Exposure to ground gases and vapour

Vapours and landfill gases associated with contaminated soil and/or contaminated groundwater that could be encountered during excavation activities have the potential to impact human health. Exposure to soil vapours and landfill gases can have an adverse impact on human health through the generation of volatiles, odour, inhalation or flammability and explosion.

Excavation of surface soils during construction has the potential to expose volatile contamination at depth, creating a pathway for gases and vapours to migrate from a subsurface source of vapour-forming chemicals into trench excavations, buildings or other enclosed spaces. However, based on existing conditions described above, the likelihood of encountering volatile contaminants in soil or groundwater is considered low. One possible source of vapour-forming chemicals is in the vicinity of the Diggers Rest property (approximately KP 9.95-KP 10.14) where old car bodies have been dumped and containers of solvents were observed.

The primary source of ground gases is from the adjacent landfill and quarry in Bulla (located between KP 14.85 and KP 15.85). The potential impact on the Project is that landfill gas (notably methane) can accumulate in trenches during construction and potentially result in conditions where there is an explosion or asphyxiation risk to human health. The initial impact from ground gas and landfill gas was considered medium due to the potential consequence if gases were present without prior assessment which would include a range of different scenarios which are difficult to measure given the uncertainty of ground conditions.

As described in EMM C5, environmental management measures would include:

- Continuous monitoring of landfill gas conditions when any person is in the trench or during hot works or works that could potentially produce a spark within the trench when within 500 metres of the waste boundary
- Setting of trigger values and appropriate and proportionate contingencies for the management of work depending on concentrations of landfill gas detected
- Contingencies to address any breaches of trigger values including temporary cessation of work until a reappraisal of risks is conducted, implementation of additional safety measures and / or vapour extraction systems in response to the risk assessment.

In addition, a shallow soil vapour assessment and risk assessment at the auto wreckers site in Diggers Rest would be required depending on soil investigation.

Following implementation of the mitigation measures, the residual impact is considered to be low as the contractor would be aware of the current gas conditions, and setting of trigger values would enable the contractor to respond appropriately to gas conditions.

Management of waste streams

The following waste streams relating to the Project have been considered and include:

- Commercial and industrial waste such as those relating to pipelining wastes, timber and steel
- Construction waste such as excess spoil and rock, bitumen and drilling fluids
- Domestic waste such as putrescible and general waste, plastic, paper and cardboard packing.

The waste streams described above are generally inert with limited potential to impact human health other than aesthetics. The primary risk relates to impacts on the environment where waste streams may enter sensitive receptors such as creeks, flow into drains and be accessible to fauna such as birds.

Avoidance of waste is generally not considered possible. Therefore, to manage this potential impact, the CEMP would include measures to minimise potential impacts on the environment and human health, by requiring (EMM C7):

- Construction wastes to be managed in accordance with the EPA Industrial Waste Resource Guidelines (IWRG)
- An assessment of potential wastes to be generated for the construction phase of the Project that identifies waste elimination, reduction measures and opportunities for the re-use and recycling of construction waste
- Appropriately designated/designed facilities to handle the identified waste streams including necessary segregation and storage requirements
- Dedicated and labelled on site disposal locations, which segregates wastes into streams for offsite disposal or recycling
- Waste facilities located away from natural drainage systems and low-lying areas
- Prescribed industrial waste (PIW) (such as waste oils, oily water mixtures, oily rags and oil filters) are segregated, labelled and securely stored and transported to a facility licensed to accept these wastes
- Use of appropriate waste classification and disposal, including a licensed waste contractor and completion of waste transport certificates for PIW

- Toolbox meetings would include specific awareness on chemical management/refuelling and differences between waste types to facilitate correct segregation, storage and disposal
- Sufficiently enclosing putrescible wastes for odour control
- No comingling of PIW with other waste streams.

Following implementation of these environmental management measures, the residual impact on human health and the environment is considered to be low due to:

- Wastes are generally inert and generally do not pose a risk to human health
- Wastes would be present on-site for a short duration and contained within specified areas (limited extent) reducing the likelihood of interaction with sensitive receptors
- Wastes would be recycled or disposed off-site to an appropriate facility which also limits the likelihood of interaction with sensitive receptors.

10.9.2 Mobilisation of contaminated groundwater

The potential for contaminated groundwater to be intercepted across the construction corridor, resulting in adverse exposure to humans and the environment, is considered to be low. This is because the majority of identified potential sources of contaminated soil are located where groundwater is expected to be greater than five metres below ground level (mbgl) and unlikely to be intercepted during Project construction.

The Project is likely to intercept groundwater at Jacksons Creek and Deep Creek, which has the potential to be affected by regional groundwater impacts from other sources such as landfills within the study area, including PFAS pollution. However, the potential for the groundwater to be contaminated is considered to be remote, due to the distance of creek crossings within the construction corridor from what is considered the main potential source of groundwater contamination - the landfills.

Preliminary PFAS sampling was completed in groundwater and surface water at Jacksons Creek and Deep Creek to investigate the potential for regional groundwater pollution from the Bulla Landfill and Hi-Quality Landfill. PFAS was reported below the laboratory limit of reporting at all three wells sampled within the regional aquifer and the limited groundwater assessment was not indicative of landfill impacts. A surface water sample from Jacksons Creek reported elevated concentrations of PFOA and PFOS in which the source of contamination is unclear. Further investigation of shallow groundwater and sediments to be disposed offsite at Jacksons Creek will be undertaken in order to inform disposal and management options as well as seeking relevant EPA approvals, if required.

What is PFAS?

PFAS stands for **per- and polyfluoroalkyl substances**.

Former or current land uses, such as the retarding basin, may act as sources for PFAS contamination to soil and groundwater on the construction corridor, although the presence of PFAS has not been confirmed.

The risk of the Project mobilising unexpected contamination and impacting human health and the environment is considered low when mitigation measures are implemented due to:

- Encountering widespread contamination as a part of the Project is considered unlikely and would be anticipated to be within discreet and localised locations, if any
- Environmental mitigation measures to cease ground disturbance and assess contamination minimises exposure by limiting contact with soils and allows the opportunity to plan the management measures specific to the contamination identified
- The disturbance to unexpected contamination would be of short duration prior to removal or containment
- Should further investigations identify PFAS in spoils, it should be managed in accordance with the PFAS NEMP and in consultation with the EPA.

Avoidance of potentially contaminated groundwater is not considered possible. To minimise the potential impacts on human health and the environment, EMM C4 requires the following environmental management measures for potential contaminated water:

- Contaminated groundwater would be managed in accordance with SEPP (Waters) and disposal as per EPA Guidelines with EPA approval
- Groundwater from areas that have been identified as contaminated would not be discharged to the environment (land or waterways). Options for management of this water would need to be in accordance with EPA regulations and guidelines and in consideration of the EPA's waste hierarchy
- Contaminated groundwater would either be treated onsite, depending on contaminants encountered (this may require approval from the EPA Victoria) or disposed offsite to an EPA Victoria licensed facility. Alternatively, a construction approach may be adopted where contaminated groundwater is left in situ (ie not abstracted for dewatering of excavation purposes or disturbed).

Refer to Technical report B and Chapter 8 *Water* for further detail relating to potential groundwater impacts and management measures.

Following implementation of the environmental management measures, the residual impact is low due to the following key factors:

- Groundwater is not likely to be intercepted by the open cut trench construction works at identified potential sources of contamination
- Groundwater from areas that have been identified as contaminated would not be discharged to the environment (land, waterways), unless groundwater conditions are investigated and subject to EPA approval
- Dewatering is of short duration, localised extent and at locations where source areas have not been identified, so the Project is unlikely to mobilise existing contamination to areas previously not impacted
- Appropriate personal protective equipment and standard hygiene protocols would minimise potential impact on human health.

10.9.3 Unidentified contamination, uncontaminated spoil and spills

Disturbance and management of existing unidentified contamination

Unidentified contamination can occur due to illegal dumping of waste and historical uncontrolled waste disposal that was unable to be identified during the desktop review. Disturbance of this material during construction could lead to releases of contamination and potential adverse impacts to human health and the environment.

Avoidance of unidentified contaminated sites is not possible. To manage this risk, EMM C2 requires that the CEMP includes a procedure and contingency plan for identifying and managing any unexpected contamination. Assessment and management of any unexpected contamination must be conducted in accordance with relevant legislation, regulations and guidelines. This includes contaminated soil management procedures as a part of EMM C1.

Following implementation of the environmental management measures, it is unlikely that the Project would mobilise unexpected contamination and impact human health and the environment. This is largely due to the discrete, localised locations of potential contamination, and requirements to cease ground disturbance and assess and remove or contain unexpected contamination (EMM C2). Therefore the residual impact is considered low.

Disturbance and management of uncontaminated spoil

Uncontaminated spoil in stockpiles and open excavations as a part of construction can impact on human health through inhalation of dust and exposure to the environment through runoff and potential silting of waterways.

Avoiding spoil generation is not considered possible and therefore the Project would be required to implement environmental management measures to minimise potential impacts. Key environmental management measures include stockpiling uncontaminated spoil during construction in accordance with EPA Victoria Publication 1834 - Civil construction, building and demolition guide (November 2020) and EPA Publication 1895 Managing Stockpiles, to reduce dust and runoff. Refer to Technical report B and Chapter 8 *Surface water* and Technical report G and Chapter 11 *Air quality* for further detail on spoil and runoff management.

Following implementation of the environmental management measures, it is unlikely that the Project would generate dust and runoff at a rate that would impact human health and the environment. Therefore the residual impact is considered low.

Leaks or spills

There is a possibility that spills may occur during the refuelling of vehicles, plant and machinery or the use of chemicals required as part of the construction which may impact soil quality. Any such spills would be expected to be relatively small volumes at discreet locations rather than widespread contamination due to the small volumes anticipated to be kept and used on site. The risk of fuel or chemical spills causing contamination to soil is assessed as low but could cause local adverse impacts to soil and human health.

To minimise potential impacts associated with leaks and spills, EMM C6 provides controls to limit both human and environmental exposure from fuels and chemicals in accordance with relevant regulations, standards and EPA Victoria Publication 1834 - Civil construction, building and demolition guide (November 2020). This includes contingency and emergency response procedures to handle fuel and chemical spills and spill kits available at all locations where machinery and plant are operating, refuelling and fuel and chemical storage locations.

Following implementation of the environmental management measures, the residual impact is considered to be low given that any potential spills are expected to be relatively small volumes (reducing the potential magnitude) and at discreet locations (limited extent).

10.9.4 Contaminated hydrostatic test water

To avoid potential contamination impacts from hydrostatic test water, which may create an issue for water disposal, the following mitigation measures would be implemented (EMM C8):

- Water to be used for hydrostatic testing would be sampled to determine water quality prior to use
- Hydrostatic test water would be managed in accordance with SEPP (Waters)
- Prior to hydrostatic testing, the pipeline would be cleaned to remove weld debris, dust and surface scale.

What is hydrostatic testing?

Hydrostatic testing is a process where sections of the pipeline are filled with water and pressurised.

Water is proposed to be collected from nearby dams or from water mains where suitable supply exists close to the construction corridor.

The used water would be discharged to land adjacent to the construction corridor.

As chemicals may need to be added to the water, it could potentially be impacted by contaminants and disposal of the water needs to be managed.

Environmental management measures to minimise potential contamination impacts from hydrostatic test water would include (EMM C8):

- Water would be reused where practicable to minimise the number of discharge locations and conserve water
- Hydrostatic test water discharge to land would only be undertaken where water designated for release into the environment is of a quality that is within relevant statutory water quality guidelines. Currently this is informed by the SEPP Waters but any new legislation in place at the time of construction must be considered. Relevant landholder(s) would be consulted prior to any discharge of hydrostatic test water to land
- Any discharge of hydrostatic test water would be managed so that it does not result in soil erosion or sedimentation of land or water. Sediment control devices to remove suspended solids such as geotextile fabric filters would be used
- No direct discharge would occur to watercourses or drains unless approved by EPA Victoria.

Following implementation of the measures described above, the residual impact is considered to be negligible as the water quality of hydrostatic testing would be known prior to discharge. In the worst-case scenario that contamination is detected, completion of hydrostatic testing is of short duration and limited to the pipeline at a localised scale, thereby limiting the extent of impact.

10.9.5 Drilling fluids used for HDD

The use of temporary drilling fluids (such as bentonite) during trenchless HDD or pipe-jacking operations can result in blow-out (or fracking), where the drilling fluid leaks through the bore into the surrounding soil, surface water or aquifer. Blow-out is typically associated with the over-pressurisation of bore support fluid in cohesionless granular materials. Based on Technical report D - *Land stability and ground movement*, this is considered to be a rare circumstance for the trenchless crossings expected for construction of the pipeline.

To assess potential impacts of blow-out and drilling fluids from a contamination perspective, the following scenarios have been considered:

- Blow-out across land which may run off into sensitive receptors such as waterways and flow into drains

- Blow-out into surface water, silting the waterway
- Blow-out into the aquifer beyond the drilling location.

To minimise potential impacts, environmental management measures described in EMM C9 would be implemented. These include:

- Spill kits or similar would be available to contain spills on land, preventing runoff into surface water and drains
- Identification of contingency measures when HDD activities are in the vicinity of waterway zones
- Disposing of drilling fluids in accordance with Environment Protection (Industrial Waste Resource) Regulations 2009 and EPA Victoria Industrial Waste – Classification for Drilling Mud, Victoria Government Gazette G37
- If HDD occurs through a potentially contaminated site, sampling for contaminants of concern at a frequency consistent with the IWRG 621 and 702 would be considered to provide a waste classification to inform for offsite disposal.

Following implementation of these measures as well as those listed in Technical report D and Chapter 9 *Land stability and ground movement*, residual impacts from contamination if blow-out does occur are expected to be low. This is due to the limited movement of drilling fluids into the aquifer system, and also due to the fact that the type of drilling fluids used are generally inert and standard personal protective equipment for handling such materials would limit exposure.

10.9.6 Construction residual impacts summary

With the implementation of mitigation measures, residual impacts associated with contamination and waste during construction are as follows:

- Disturbance and management of existing contamination (inferred conditions) and exposure to ground gases and vapour are minimised and considered to be low
- Mobilisation of contaminated groundwater is minimised and considered to be low due to the short duration and localised extent of dewatering. Groundwater is not likely to be intercepted by the open cut trench construction works at identified potential sources of contamination, and standard hygiene protocols are required
- Disturbance and management of unidentified contamination, and leaks and spills are considered to be low due to the discreet, localised locations of potential contamination and potential spill events, and requirements to cease ground disturbance and assess and remove or contain unexpected contamination, and manage spills
- The Project is unlikely to generate dust and runoff at a rate that would impact human health and the environment
- Residual impacts associated with contamination in hydrostatic test water are considered to be negligible, as the water quality of hydrostatic testing would be known prior to discharge, and therefore would be managed prior to testing. In the worst-case scenario that contamination is detected, residual impacts would be limited in extent and duration as completion of hydrostatic testing is of short duration and limited to the pipeline at a localised scale
- Residual impacts from contamination if blow-out does occur are expected to be low. This is due to the limited movement of drilling fluids into the aquifer system, and the type of drilling fluids used are generally inert. Standard personal protective equipment for handling such materials would limit exposure.

10.10 Operation impact assessment – greenhouse gas

This section discusses the operational impacts associated with the Project in relation to greenhouse gas. Emission sources include:

- Pipeline operation
- Compressor station operation.

Table 10-7 summarises the predicted annual greenhouse gas emissions associated with operation of the Project.

What are fugitive emissions?

The emissions of gases from pressurised equipment due to leaks or other unintended or irregular releases.

Fugitive emissions from operation of the pipeline have been estimated using Method 1, as per Section 3.72 of the National Greenhouse and Energy Reporting (NGER) Measurement Determination.

Table 10-7 Predicted annual greenhouse gas emissions from the Project operation

Emission source category	Emission source	Risk ID*	Greenhouse gas emissions (t CO ₂ -e)			
			Scope 1	Scope 2	Scope 3	Total
Fuel Use	Compressor fuel use	GG5	13,750		1,040	14,790
	Fugitive emissions	GG7	590			590
Total			14,340		1,040	15,380

The Project's estimated annual Scope 1 operation emissions are predicted to be the equivalent of approximately 0.014 per cent of Victoria's total annual emissions. State and national Scope 3 emissions are not reported under the NGER scheme (as they potentially double count another entities Scope 1 emissions) and hence are not compared.

The majority of operation emissions are attributed to fuel use at the compressor station. For the purposes of this assessment, it is assumed that the compressor unit would be operating at 100 per cent capacity for 200 days a year.

Energy efficiency best practices would be further considered in the design and operation of the compressor station upgrade (EMM GG2(a)).

Fugitive emissions from operation of the pipeline and compressor station are unavoidable and do not contribute significantly to operation impacts. To mitigate the risk of operational leaks, design and operation of the Project would be to industry standards, including ASME B31.3 - Process Piping Code and AS2885 Pipelines - Gas and Liquid Petroleum and would include routine maintenance and inspection in line with the existing Victorian Transmission System (VTS) Operational Environmental Management Plan (VTS OEMP) maintenance and inspection (EMM GG4).

Operational emergencies have not been included in the operation impact assessment in Table 10-7, as they are not planned events or expected annually. To minimise the risk of operational emergencies, industry standards including AS2885 would be implemented in design and operation to inspect and maintain the pipeline and Wollert compressor station (EMM GG3).

Operation emissions would be monitored via audit/monitoring processes by a suitably qualified APA HSE Advisor (EMM GG2(c)), which include:

- Annual reporting of operation emissions or as per the requirements of the VTS OEMP
- Annual assurance audit in accordance with the NGER Act. This audit would be undertaken by an independent auditor and includes all APA assets.

In its annual Victorian Gas Planning Reports (VGPR), the Australian Energy Market Operator (AEMO) provided comments on the business case for construction of the Project. Operation of the Project is estimated to result in a net reduction in emissions of 10,700 t CO₂-e per annum due to operational improvements gained in the VTS. Given the contribution of 590 t CO₂-e due to fugitive emissions from operation of the Project, the net reduction in state and national emissions would equate to 10,110 t CO₂-e per annum. This net reduction is considered to improve the cumulative position of greenhouse gas impacts.

Table 10-8 Predicted annual VTS improvement with the Project

VTS efficiency (t CO ₂ -e)	Project fugitive emissions (t CO ₂ -e)	Net reduction in Victorian emissions (t CO ₂ -e)
10,700	590	10,110

Due to the avoided emissions resulting from the Project, there may be emissions benefit in operation compared to the no-Project scenario. In the context of emissions reduction targets, the Project would contribute positively to achieving:

- Net zero emissions in Victoria by 2050 (The *Climate Change Act 2017*)
- The targets outlined in the local council frameworks (refer to Section 4.5 of Technical report H *Greenhouse gas*).

The Project is predicted to have a positive impact on state and national emissions reductions targets and initiatives if the efficiency gains estimated by AEMO are achieved.

10.11 Operation impact assessment – contamination

This section presents a discussion of the operational impacts associated with the Project in relation to contamination and focus on the key operational contamination impact, leaks or spills.

10.11.1 Leaks or spills

There is a possibility that leaks or spills may occur during the refuelling of vehicles, plant and machinery or the use of chemicals required as part of the maintenance works during operation, which may impact soil quality and human health.

The Project would be managed in accordance with the existing VTS Operational Environmental Management Plan (VTS OEMP). The risk of fuel or chemical spills causing contamination to soil is assessed as low when considering the management measures provided within the VTS OEMP as detailed in EMM C10. Key management measures include requirements for chemical and fuel storage along the pipeline corridor, conditions of the compressor location, waste collection, weed control, spill kits, inspections, testing and monitoring, and alignment with the relevant IWRGs. Refer to Technical report E *Contamination* for the full list of contamination environmental management measures.

Following implementation of the environmental management measures, the residual impact of fuel or chemical spills causing contamination to soil is considered to be low as any spill event would be expected to be relatively small volumes at discreet locations, of short duration and promptly remediated.

10.11.2 Waste streams

The Project would not likely generate large amounts of wastes associated with ongoing operation and maintenance activities. Spills relating to fuel and chemical use are considered above.

Inappropriate management and disposal of waste streams is considered to have a low impact on human health and the environment and would be mitigated through measures such as managing waste in accordance with Environment Protection (Industrial Waste Resource) Regulations 2009 and reusing and recycling wastes where practicable. The Project would be managed in accordance with the existing VTS Operational Environmental Management Plan (VTS OEMP) (EMM C10).

Following implementation of the environmental management measures, the residual impact of waste impacting human health and the environment is considered to be low as wastes would be present on site for a short duration, contained within specified areas and disposed off-site to an appropriate facility which limits the likelihood of interaction with sensitive receptors.

10.11.3 Operation residual impacts summary

With the implementation of mitigation measures, residual impacts associated with contamination and waste during operation include:

- Fuel or chemical spills causing contamination to soil is considered to be low as any spill event would be expected to be relatively small volumes at discreet locations, of short duration and promptly remediated
- Waste impacting human health and the environment is considered to be low as wastes would be present on site for a short duration, contained within specified areas and disposed off-site to an appropriate facility which limits the likelihood of interaction with sensitive receptors.

10.12 Cumulative impact assessment

The greenhouse gas assessment presented in sections 0 and 10.10 of this chapter has assessed emissions in the context of the current Victorian and Australian emissions estimates.

Current spoil volume estimates anticipated to be disposed off-site have not yet been prepared for the Project, and so it was not possible to undertake a cumulative impact assessment. Given the scale and construction methodology for the Project, most of the spoil removed during construction would be reused as a part of the reinstatement phase. Therefore, subject to a market assessment of landfill capacity, it is expected there would be limited spoil required to go directly to landfill and the Project is unlikely to create a material impact on landfill capacity for other construction projects, such as the Sunbury Road Upgrade, the Bald-Hill - Yan Yean Pipeline and the Western Victoria Transmission Network project and potentially the North East Link and West Gate Tunnel.

10.13 Environmental management - greenhouse gas

10.13.1 Environmental management measures

Table 10-9 lists the environmental management measures (EMMs) relevant to the greenhouse gas assessment.

The mitigation hierarchy has been applied in the development of the mitigation measures. It is the nature of construction projects and the operation of pipelines that the complete avoidance of greenhouse gas emissions is not possible. For this reason, the next highest level of the hierarchy has been applied in that measures taken to reduce the duration, intensity and extent of greenhouse gas impacts have been proposed.

Table 10-9 Greenhouse gas environmental management measures

EMM #	Environmental management measure	Stage	Mitigation hierarchy
GG1	<p>Construction emissions</p> <p>Reduce greenhouse gas emissions during construction by:</p> <ul style="list-style-type: none"> a Using low embodied energy materials where they are of comparable quality, utility, availability and cost b Using fuel efficient plant and equipment used where practicable during construction c Using locally sourced materials, including those provided by suppliers, where they are of comparable quality, utility, availability and cost d Reducing the amount of vegetation removal along the pipeline alignment as far as reasonably practicable e Monitoring construction greenhouse gas emissions via audit/monitoring processes f Mulching trees for recycling g Minimising the amount of fossil fuel based explosives required during the construction phase <p>Performance monitoring of these requirements are described in Section 12.2. of the CEMP.</p>	Construction	Minimisation

EMM #	Environmental management measure	Stage	Mitigation hierarchy
GG2	<p>Normal operation of Wollert Compressor Station</p> <p>Implement the Protocol for Environmental Management (PEM): Greenhouses Gas Emissions and Energy Efficiency in Industry 2001 during operation of the Wollert compressor including consideration of energy efficiency best practice in the selection of the compressor type (greenhouse gas emissions and energy efficiency in industry)</p> <p>Comply with the conditions associated with the Pipeline Licence.</p> <p>Monitor operation greenhouse gas emissions via audit/monitoring processes.</p> <p>Performance monitoring of these requirements are described in Section 12.2. of the CEMP.</p>	Design/operation	Minimisation
GG3	<p>Operational emergencies</p> <p>Implement industry standards including AS2885 in design, inspect and maintain the pipeline and Wollert compressor station to minimise the risk of operational emergencies</p>	Design/operation	Minimisation
GG4	<p>Operational leaks</p> <p>Perform ongoing maintenance and inspection on the Project to avoid leaks. Design to be undertaken in accordance with AS2885.</p>	Design/operation	Minimisation

10.13.2 Best practice in greenhouse gas

To mitigate the risk of operational leaks, design and operation of the Project would be to industry standards, including AS2885 and would include routine maintenance and inspection in line with the existing VTS Operational Environmental Management Plan (VTS OEMP) (EMM GG3 and GG4).

Compressor selection is based on the required compression power requirements for the Project. When compared to steam turbines and diesel propulsion systems, gas turbines offer greater power for a given size and weight, high reliability, long life, and more convenient operation.

No two vendors would produce identical machines for direct comparison of power output versus thermal efficiency. The thermal efficiency of the selected Solar Centaur 50 Gas Turbine is within industry and best practices and the typical Simple Open Brayton Cycle operating envelopes for gas turbines. It is representative of a best practice, effective and efficient compression equipment selection for a typical long distance gas pipeline. Solar Turbines is a reputable international company with a long history of supply, service and overhaul of gas compression and gas turbine equipment in Australia. The compressor has an engine efficiency of 30 per cent which is comparable to other gas compressors. For the power output requirement Solar Turbines is considered the market leader.

Operation emissions would be monitored via audit processes, as per environmental management measure GG2(c): Operation. Greenhouse gas emissions would be monitored via audit processes, which include:

- Annual reporting of operation emissions or as per the requirements of the VTS OEMP
- Annual assurance audit in accordance with the NGER Act. This audit will be undertaken by an independent auditor and includes all APA assets.

10.14 Environmental management – contamination

10.14.1 Environmental management measures

The environmental management measures have been developed with consideration of the EPA waste management hierarchy and have endeavoured to default to the most preferable options before consideration of less preferable management options.

Avoidance was considered as a first preference. Based on the current pipeline alignment, avoidance of spoil generation is not considered possible. However, there is scope for avoiding potentially contaminated soils through realignment away from areas identified as potentially contaminated although considered unnecessary based on risk.

Reuse of spoil as backfilling is considered the most viable option for the majority of the spoil, although there may be an excess of spoil remaining after this process. This remaining spoil would need to be managed under a CEMP and in accordance with the EPA's waste regulations and guidelines. It is considered unlikely that gross contamination is present on site such that options involving soil treatment should not be required.

The EMM's prescribe the management and mitigation measures to manage spoil at all stages of the Project from assessment to excavation to completion and operation.

Table 10-10 Contamination environmental management measures

EMM #	Environmental management measure	Stage	Mitigation hierarchy
C1	<p>Implement spoil management measures</p> <p>Prepare and implement spoil management measures in accordance with relevant regulations, standards and guidelines including EPA Publication 1834 Civil construction, building and demolition guide. The spoil management measures must be developed in consultation with the EPA Victoria and include processes and measures to manage all spoil types, ie all excavated material. The main spoil types would include mostly uncontaminated soils and potentially small volumes of prescribed industrial waste (PIW) in the vicinity of the potential sources noted in Technical report E <i>Contamination</i>.</p> <p>The spoil management measures must define roles and responsibilities and include requirements and methods for:</p> <p>General</p> <ul style="list-style-type: none"> • Complying with applicable regulatory requirements including EPA Publication 1834 Civil construction, building and demolition guide and SEPP (Prevention and Management of Contaminated Land) • Investigations in accordance with the Australian Standard AS 4482.1:2005 Guide to the investigation and sampling of sites with potentially contaminated soil, the ASC NEPM and the EPA Victoria Industrial Waste Resource Guidelines (IWRGs) • Leaving contaminated soils in situ to the extent possible • Assessment of any material imported to the site for use as backfill in accordance with IWRG 621 and 702. Imported material must meet the 'Fill Material criteria as defined in Table 2 of IWRG621. 	Construction	Minimisation

EMM #	Environmental management measure	Stage	Mitigation hierarchy
	<p>Assessment</p> <ul style="list-style-type: none"> • Completing further soil investigations to assess soil quality for the analysis detailed in Technical report E <i>Contamination</i> prior to construction in order to inform the CEMP: <ul style="list-style-type: none"> – At the Diggers Rest (KP 9.95 - KP10.14), which is being used to store hundreds of wrecked cars, – A possible former quarry in Beveridge (KP 37.5) along the construction corridor to ascertain if the former quarry extents encroaches onto the Project – The retarding basin (KP 34-35.5) prior to any excavation in these areas. – Wollert Compressor Station (KP 50.78 to KP 51.045) – Shallow sediments in Jacksons Creek. • Following these further investigations, updating the CEMP to include areas of potential contaminated soils. • Identifying where any contaminated or hazardous material is exposed during construction and how it would be made safe for the site owner and the environment. Beneficial uses of land and ASC NEPM guidance on criteria protective of those beneficial uses must be considered for the land uses in these areas. <p>Unexpected contamination</p> <ul style="list-style-type: none"> • Identifying, containing and managing unexpected contamination in accordance with applicable regulatory requirements including EPA IWRG 621 and 702 <p>Handling, stockpiling and transport</p> <ul style="list-style-type: none"> • Conducting all spoil handling and transport for offsite disposal in accordance with the EPA IWRGs • Managing construction works during wet weather which can lead to runoff of contaminated and uncontaminated soil from stockpiles and excavations into nearby waterways, in accordance with SW1 and SW4. • Regularly monitoring weather conditions and planning works accordingly to avoid or minimise impact to sensitive receptors from works during adverse weather (ie runoff from rainfall). • Implementing personal protective equipment and standard hygiene practices when handling contaminated spoil • Separating stockpile of trench spoil into contaminated and uncontaminated soil. As both of these waste types can adversely impact the environment (eg through runoff to waterways), all stockpiles must be managed in accordance with EPA Victoria Publication 1834 Civil construction, building and demolition guide and EPA Publication 1895 Managing Stockpiles, 2020. 		

EMM #	Environmental management measure	Stage	Mitigation hierarchy
	<ul style="list-style-type: none"> • Where it is necessary to excavate contaminated soils, stockpiling these separately, with containment and treatment measures appropriate to the type of contamination present. This must include: <ul style="list-style-type: none"> – All stockpiles of potentially contaminated spoil must be appropriately secured, lined and banded to prevent leaching – All stockpiles of potentially contaminated spoil must be appropriately covered and banded to limit rainwater ingress, dust generation and contact by fauna – Stockpiling of contaminated soil must be kept to a minimum and removed to landfill or other use at the earliest opportunity. • Handling and transport of contaminated spoil for off-site treatment/disposal in accordance with Environment Protection (Industrial Waste Resource) Regulations 2009. Transport companies must be licensed by EPA Victoria to carry contaminated soil • Managing of PFAS-impacted soil (if any) in accordance with the PFAS NEMP and EPA guidance • Monitoring, recording and tracking spoil and other waste handling including but not limited to stockpile management, trucking and destination tracking, and sampling results. <p>Reuse or Disposal</p> <ul style="list-style-type: none"> • Assessing potentially contaminated spoil, which is to be disposed of offsite, in accordance with IWRG 621 and 702 • Considering the waste management hierarchy including opportunities for reuse, with spoil that is unable to be reused to be removed from site via designated haulage routes • Disposing drilling muds in accordance with Environment Protection (Industrial Waste Resource) Regulations 2009 and EPA Victoria Industrial Waste – Classification for Drilling Mud, Victoria Government Gazette G37. 		
C2	<p>Managing any unknown contamination</p> <p>The spoil management measures referenced in EMM C1 must include requirements and methods to address and manage any contamination that was not expected during construction.</p> <p>Such material may be identified by visual or olfactory observations, the presence of asbestos and other anthropogenic material. The spoil management measures must include contingency plans and appropriate responses in accordance with EPA guidelines. These must include, as a minimum:</p> <ul style="list-style-type: none"> • Cease ground disturbance at the unknown contamination location and within the immediate vicinity • Assess site contamination and identify appropriate management action. 	Construction	Minimisation

EMM #	Environmental management measure	Stage	Mitigation hierarchy
C3	<p>Minimise impacts from disturbance of acid sulfate soil</p> <p>PASS may be present in saturated alluvium beneath and within close proximity to the creeks. Carry out further assessment where dewatering of alluvium may occur, specifically at Jacksons Creek and Merri Creek.</p> <p>The spoil management measures referenced in EMM C1 must include requirements and methods to minimise impacts from disturbance of acid sulfate soil, including but not limited to:</p> <ul style="list-style-type: none"> • Characterising acid sulfate soil and rock prior to excavation in accordance with EPA Publication 655.1 Acid sulfate soil and rock. • Developing appropriate stockpile areas including lining, covering and runoff collection to prevent release of acid to the environment • Identifying suitable sites for re-use management or disposal of acid sulfate soil • Preventing oxidation that could lead to acid formation if practicable, through cover and/or scheduling practices, for example by minimising the length of time that acid sulfate soil is left in stockpiles as far as reasonably practicable and/or addition of neutralising compounds • Completing further acid sulfate soil assessment prior to construction in order to inform the CEMP at: <ul style="list-style-type: none"> – Jacksons Creek – Merri Creek • Requirements and methods must be in accordance with the Industrial Waste Management Policy (Waste Acid Sulfate Soils), EPA Victoria Publication 655.1 Acid Sulfate Soil and Rock, and the Department of Sustainability and Environment's Victorian Best Practice Guidelines for Assessing and Managing Coastal Acid Sulfate Soil. 	Construction	Minimisation
C4	<p>Minimise risks from contaminated groundwater</p> <p>Develop and implement groundwater management measures in accordance with EMM G3.</p>	Construction	Minimisation
C5	<p>Minimise risks from vapour and ground gas intrusion</p> <p>Relevant sections of the Project must consider vapours and gases associated with any construction that interfaces with landfill sites (within 500 metres of the boundary of the waste) or contaminated areas. These include the sections of the alignment adjacent to the Bulla Landfill (approx. KP 15 to KP 16) and near the Diggers Rest property (approx. KP 9.95 - KP 10.14).</p> <p>The spoil management measures referenced in EMM C1 must include requirements for assessment, monitoring and management of intrusive vapour, including potentially flammable or explosive conditions, in enclosed spaces within 500 metres of the Bulla Landfill (approx. KP 15-KP 16) and Diggers Rest (KP 9.95- KP 10.14) property and trenches in those areas.</p> <p>The spoil management measures must address vapour risks associated with excavation of impacted soils, extraction of impacted groundwater, open excavations and stockpiles and gases.</p> <p>Specifically associated with the Bulla Landfill (KP 154-KP 16), this must include, where relevant:</p> <ul style="list-style-type: none"> • Securing of the excavation and stockpile area from the public and livestock including signage warning of open excavations 	Construction	Minimisation

EMM #	Environmental management measure	Stage	Mitigation hierarchy
	<ul style="list-style-type: none"> • Continuous monitoring of landfill gas conditions when any person is in the trench or during hot works or works that could potentially produce a spark within the trench. • Setting of trigger values that require action within areas being trenched and including any temporary structures within the vicinity of the landfill. These must be developed in accordance with EPA Victoria Publication 788 Best Practice Management; Siting, design, operation and rehabilitation of landfills (landfill BPEM) and relevant occupational health and safety regulations and compliance codes • Contingencies to address any breaches of trigger values including temporary cessation of work until a reappraisal of risks is conducted, additional monitoring at a higher frequency, implementation of additional safety measures and/or vapour extraction systems in response to the risk assessment. <p>Specifically relevant to the Diggers Rest property (approx. KP 9.95- KP 10.14), this must include, prior to construction to inform the CEMP:</p> <ul style="list-style-type: none"> • Investigation of soils within the construction corridor to assess for the presence contamination including metals, TRHs, BTEX, PAHs and solvents • If volatile contamination is identified a risk assessment to determine the risk from vapours to construction workers during open cut trench construction may be required. 		
C6	<p>Manage chemicals, fuels and hazardous materials</p> <p>The spoil management measures must include requirements for management of chemicals, fuels and hazardous materials including to:</p> <ul style="list-style-type: none"> • Minimise chemical and fuel storage on site and store hazardous materials and dangerous goods in accordance with the relevant guidelines and requirements • Comply with the Victorian WorkCover Authority and Australian Standard AS1940 Storage Handling of Flammable and Combustible Liquids and EPA Victoria publications 1834 Civil construction, building and demolition guide and Publication 1698: Liquid storage and handling guidelines – EPA Victoria. • Develop and implement management measures for dangerous substances, including: <ul style="list-style-type: none"> – Creating and maintaining a dangerous goods register – Disposing of any hazardous materials, including asbestos, in accordance with Industrial Waste Management Policies, regulation and relevant guidelines – Implementing requirements for the installation of bunds and precautions to reduce the risk of spills. • Develop and implement contingency and emergency response procedures to handle fuel and chemical spills, including availability of on-site hydrocarbon spill kits • Make spill kits available at all locations where machinery/plant are operating, refuelling points and fuel and chemical storage locations • Limit the type and volume of liquid material (fuel, oil, lubricant) stored on-site for construction activities to only that which is required • Liquid material must not be stored within 50 metres of waterways. 	Construction	Minimisation

EMM #	Environmental management measure	Stage	Mitigation hierarchy
C7	<p>Management of waste streams</p> <p>Implement the following measures to manage non-hazardous waste:</p> <ul style="list-style-type: none"> • Manage wastes in accordance with the IWR Regulations • Undertake an assessment of potential wastes to be generated for the construction phase of the Project that identifies waste elimination, reduction measures and opportunities for the re-use and recycle of construction waste • Use appropriately designated/designed facilities to handle the identified waste streams including necessary segregation and storage requirements. This must include dedicated and labelled on site disposal locations, which segregates wastes into streams for offsite disposal or recycling • Locate waste facilities away from natural drainage systems and low-lying areas • PIW (such as waste oils, oily water mixtures, oily rags and oil filters, etc) must be segregated, labelled and securely stored and transported to a facility licensed to accept these wastes • Classify and dispose waste in accordance with the IWR Regulations, including by using a licensed waste contractor and completing waste transport certificates for PIW • Carry out toolbox meeting including specific awareness on chemical management/refuelling and differences between waste types to facilitate correct segregation, storage and disposal • Sufficiently enclose putrescible wastes for odour control (eg use of suitable bins) • No PIW shall be comingled with other waste streams • Document and implement a detailed process for monitoring, recording and tracking waste handling. 	Construction	Minimisation
C8	<p>Management of hydrostatic test water</p> <p>Implement measures for management of hydrostatic testing water including:</p> <ul style="list-style-type: none"> • Manage hydrostatic test water in accordance with SEPP (Waters) • Sample water to be used for hydrostatic testing to determine water quality prior to use • Prior to hydrostatic testing, pre-clean the pipeline to remove weld debris, dust and surface scale • Reuse water where practicable to minimise the number of discharge locations and conserve water • Only discharge hydrostatic test water discharge where water designated for release into the environment is of a quality that is within relevant statutory water quality guidelines. Relevant landholder(s) must be consulted prior to any discharge of hydrostatic test water to land • Any discharge of hydrostatic test water must not result in soil erosion or sedimentation of land or water. Sediment control devices to remove suspended solids such as geotextile fabric filters must be used • Direct discharge must not occur to watercourses or drains. 	Construction	Minimisation

EMM #	Environmental management measure	Stage	Mitigation hierarchy
C9	<p>Management of drilling fluids</p> <p>Implement measures for management of drilling fluids including:</p> <ul style="list-style-type: none"> • Making spill kits or similar available to contain spills on land, preventing runoff into surface water and drains • Identifying and implementing contingency measures when HDD activities are in the vicinity of waterway zones • Disposing drilling fluids in accordance with Environment Protection (Industrial Waste Resource) Regulations 2009 and EPA Victoria Industrial Waste – Classification for Drilling Mud, Victoria Government Gazette G37 • If HDD occurs through a potentially contaminated site the IWRG 621 and 702 must be followed for offsite disposal • Selecting appropriate inert drilling fluids. 	Construction	Minimisation
C10	<p>Minimise contamination risks during operation</p> <p>Operate the Project in accordance with the existing VTS OEMP. Key design and operation measures must include:</p> <ul style="list-style-type: none"> • Conducting all operations and maintenance (including wastes) in accordance with EPA Industrial Waste Resource Guidelines • No permanent storage of fuel or other chemicals along the pipeline corridor • Compressor on a concrete area and surrounded by crushed rock hard stand and under cover with a shelter roof • Above ground oily water separator with triple interceptor and underground overflow pit with level sensors serviced annually • Provision of general and regulated waste collection bins • Use of quick break detergents suitable for oily water separator • Annual stack test monitoring and servicing of compressors • Ensuring PIW (such as waste oils, oily water mixtures, oily rags and oil filters, etc) are segregated, labelled and securely stored and transported to a facility licensed to accept these wastes • Appropriately classifying and disposing waste, including using a regulated waste contractor and completion of waste transport certificates for PIW • Maintain spill kits onsite at all times and providing training for use of spill kit • Inducting all staff and contractors into the APA HSE policies and procedures including risks and controls associated with: waste management, chemical management and refuelling, weed and pest management and incident response. • Carrying out toolbox meetings including specific awareness on chemical management/refuelling and differences between waste types to facilitate correct segregation, storage and disposal • Pre-start checks of plant, equipment and vehicles would be conducted to check for oil leaks • Sorting any fuels or chemicals on site in an AS1940 compliant bund or double skinned tanks to prevent any spills impacting soil or water • Regular inspections on spill controls/bunding • Designating chemical and waste storage and refuelling areas away from watercourses to minimise the risk of contamination during handling and use 	Operation	Minimisation

EMM #	Environmental management measure	Stage	Mitigation hierarchy
	<p>Refuelling to be carried out on hardstand or over a drip tray to capture spills and minor leaks</p> <p>Collecting spilt material into regulated waste bins to be taken offsite by an EPA licenced third party to an approved facility. Regulated waste disposal records must be provided</p> <p>Providing designated covered bins for general waste to minimise litter generation</p> <p>Providing a detailed process for monitoring, recording and tracking waste handling.</p>		

10.14.2 Performance criteria and management

The mitigation measures to meet the performance criteria scoping requirements have been included within Table 10-10.

Table 10-11 Performance criteria and management

Scoping requirement	Performance criteria
Describe proposed measures to monitor the management of solid and liquid wastes during all Project phases.	Development and implementation of a detailed process for monitoring, recording and tracking spoil and other waste handling including stockpile management, trucking and destination tracking, sampling results etc.
Describe proposed measures to reduce, monitor and audit discharges to water from the Project	<p>Management of contaminated groundwater in accordance with SEPP (Waters) and disposal as per EPA Guidelines and approvals process.</p> <p>Direct the management of contaminated groundwater. This would either be treated onsite, depending on contaminant encountered or disposed offsite to an EPA Victoria licensed facility. Alternatively, a construction approach may be adopted where contaminated groundwater is left in-situ (ie not abstracted or disturbed).</p> <p>No direct discharge of hydrostatic water would occur to watercourses or drains.</p> <p>Identification of contingency measures when HDD activities are in the vicinity of waterway zones.</p> <p>Spill kits or similar would be available to contain drilling fluid spills on land, preventing runoff into surface water and drains.</p>
Describe contingency measures for responding to unexpected impacts resulting from waste management or discharges.	<p>Development and implementation of a procedure for identifying, containing and managing unexpected contamination in accordance with applicable regulatory requirements including EPA IWRG 621 and 702.</p> <p>The spoil management measures would need to include contingency plans and appropriate responses in accordance with EPA guidelines. These might include, as a minimum:</p> <ul style="list-style-type: none"> • Cease ground disturbance at the unknown contamination location and within the immediate vicinity. • Assess site contamination and identify appropriate management action. • Contingency and emergency response procedures to handle fuel and chemical spills, including availability of on-site hydrocarbon spill kits

10.15 Conclusion

This chapter has identified and assessed existing conditions, impacts, mitigation measures and residual impacts related to greenhouse gas and contamination for the Project.

In response to the EES evaluation objective described at the beginning of this chapter, key issues relating to waste management, and specifically to greenhouse gas and contamination, have been assessed and environmental management measures have been identified to avoid or minimise impacts.

10.15.1 Greenhouse gas

The greenhouse gas assessment for the construction and operation of the Project concludes the following:

- The Project's estimated Scope 1 and Scope 2 construction emissions are estimated to contribute the equivalent of 0.019% of Victoria's and 0.004% of Australia's annual greenhouse gas emissions. This is largely attributed to land use changes due to removal of vegetation in the construction corridor and emissions associated with fuel use
- The Project's annual Scope 1 and Scope 2 operation emissions are estimated to contribute the equivalent of 0.014% of Victoria's and 0.003% of Australia's annual greenhouse gas emissions. This is largely attributed to fuel use at the compressor station
- Operation of the Project is predicted by AEMO to lead to efficiency gains in the overall Victorian gas supply network, leading to a net reduction in total greenhouse gas emissions across the VTS. The net reduction in state and national emissions would equate to 10,110 t CO₂-e per annum, which equates to a reduction of 0.010% and 0.002% of state and national totals respectively.

Application of the Project environmental management measures would minimise impacts associated with greenhouse gas by further reducing construction and operation emissions, including:

- Low embodied energy materials would be considered and used where they are of comparable quality, utility, availability and cost (EMM GG1(a))
- Fuel efficient plant and equipment would be considered and used where practicable during construction (EMM GG1(b))
- Locally sourced materials, including those provided by suppliers, would be considered and implemented where they are of comparable quality, utility, availability and cost (EMM GG1(c))
- The amount of vegetation removal along the pipeline alignment would be reduced as far as reasonably practicable (EMM GG1(d))
- Implementation of the Protocol for Environmental Management (PEM): Greenhouse Gas Emissions and Energy Efficiency in Industry 2001 for the operation of the compressor station including consideration of energy efficiency best practice (EMM GG2(a)).

Where the effect of the mitigation measure is known, the estimated greenhouse gas emissions represent the residual impacts (for example, the consideration of energy efficiency best practice in the selection of the compressor type). In other cases, the residual impacts are not currently known (for example, emissions from low embodied energy materials is not possible without knowing the specific materials to be used). However, as Technical report H *Greenhouse gas* has assessed standard practice and is therefore considered conservative, by implementing the mitigation measures, the residual impacts are expected to be reduced and emissions impacts are expected to be minor.

10.15.2 Contamination

The contamination assessment identifies the associated risks and potential impacts of the construction and operation of the Project on human health and the environment as a result of disturbance and management of contaminated soils and groundwater, acid sulfate soils and other wastes.

Based on the desktop assessment and limited soil sampling undertaken, no contamination was identified at locations sampled and the results indicated that shallow soils are likely suitable for reuse at the site of origin in areas not identified as potential sources of contamination. There is potential for regional groundwater contamination impacts from landfills but due to the Project design and construction methodology, the Project is unlikely to interact with groundwater in these areas. Analysis of groundwater to date at locations sampled has also not identified contamination.

It is noted that further testing is required at a small number of potential contaminant sources, including additional testing for PFAS at two creek crossings where there is higher risk of contaminated groundwater. Although potential acid sulfate soils and actual acid sulfate soils were not identified in the samples assessed, further sampling and analysis may be required, especially if excavating soils beneath the water table.

The Project environmental management measures require spoil to be managed in accordance with relevant regulations, standards and guidelines, and the CEMP. The CEMP would include measures to prevent adverse environmental or health effects including:

- Management of existing contamination (known conditions and unexpected) (EMM C1)
- Management of HDD fluids (EMM C1 and EMM C9)
- Management of uncontaminated spoil (EMM C1)
- Management of any unknown contamination (EMM C2)
- Minimising impacts from disturbance of acid sulfate soil (EMM C3)
- Minimising risks from contaminated groundwater (EMM C4)
- Minimising risks from vapour and ground gas intrusion (EMM C5)
- Management of chemicals, fuels and hazardous materials (EMM C6)
- Management of waste streams during construction (EMM C7)
- Management of hydrostatic test water (EMM C8).

Operational contamination risks from leaks and spills would be managed in accordance with the existing VTS OEMP (EMM C10).

With the implementation of mitigation measures, residual impacts including disturbance and management of existing contamination, exposure to ground gases and vapour, mobilisation of contaminated groundwater, disturbance of unidentified contamination, leaks and spills, and contamination due to blow-out, are minimised and considered to be low. Furthermore, residual impacts associated with contamination in hydrostatic test water is considered to be negligible. During operation, residual impacts associated with fuel or chemical spills causing contamination to soil and waste impacting human health and the environment are considered to be low.