PART 3 ADDITIONAL IMPACT ASSESSMENT SUMMARIES

11 Effects on Physical Environment

This chapter details how potential adverse effects on community, businesses and land uses with regard to noise and vibration, groundwater, contaminated land, surface water and air quality will be avoided, minimised or mitigated.

11.1 Overview

This chapter summarises the Environment Effects Statement (EES) Scoping Requirements and relevant Evaluation Objectives, methodology, risk and impact assessment processes, and Environmental Performance Requirements (EPRs) associated with five key aspects of the physical environment: noise and vibration, groundwater, contaminated land, surface water and air quality.

The chapter reports the results of assessments of the Project's impacts on:

- Sensitive uses associated with human health, including residences, places of work and recreation, education and community facilities
- Sensitive receptors associated with the environment, including waterways (flows and water quality), groundwater (flows and water quality), soil health and aesthetics (e.g. litter, odours).

This chapter has been informed by the following specialist technical assessments and the risk report found in Attachment III *Environmental Risk Report:*

- Technical Report I – *Noise and Vibration Impact Assessment (WSP 2020)*
- Technical Report J – *Groundwater Impact Assessment (Arcadis 2020)*
- Technical Report K – *Contaminated Land Impact Assessment (Arcadis 2020)*
- Technical Report L – *Surface Water Impact Assessment (WSP 2020)*
- Technical Report M – *Air Quality Impact Assessment (WSP 2020).*

To understand the potential impacts of the Project on the physical environment, each specialist technical assessment first identified and characterised existing conditions in the project area and its surrounds, including sensitive receptors. This was followed by a risk assessment.

The outcome of the risk assessment indicated that, in general, most of the initial risks of an impact by the Project on the physical environment would be low or medium in all phases of construction, operation and maintenance. However, the initial risk of noise and vibration impacts from construction activities was assessed to be potentially significant.

The residual risks (following the implementation of appropriate mitigation measures as required by the EPRs) were assessed to be low in most cases. The exception to this would be noise and vibration impacts during the earthworks and civils and structures construction phases – these were assessed as medium residual risks. Relevant EPRs have been developed to address and mitigate the identifies risks and associated impacts (refer to Section 11.6).

Given the generally low initial risks of the Project identified in the risk assessment, it is considered appropriate to combine and present all potential impacts to the physical environment in one chapter.

11.1.1 EES Scoping Requirements

On 14 October 2018, the Minister for Planning determined an Environment Effects Statement would be required under the *Environment Effects Act 1978* to assess the potential for significant environmental effects of the Project.

The Minister determined an EES was required for the Project due mainly to the potential significant effects on biodiversity and social and cultural values as a result of the proposed clearance of a very large number of trees and habitat, including potential cumulative effects on the habitat of the Swift Parrot.

The Minister provided Evaluation Objectives specifically for:

- Transport capacity and connectivity – refer to Chapter 7 *Effects on Transport Capacity and Connectivity*
- Biodiversity – refer to Chapter 8 *Effects on Biodiversity*
- Social and cultural values – refer to Chapter 9 *Effects on Social and Cultural Values.*

In addition to these specific Evaluation Objectives, the Scoping Requirements also include a general requirement for the EES to identify other potential adverse environmental effects of the Project and canvass an environmental management approach and performance measures to ensure any effects are identified and avoided, minimised or mitigated.

Accordingly, this chapter details how potential adverse effects on community, businesses and land uses with regard to noise and vibration, groundwater, contaminated land, surface water and air quality will be avoided, minimised or mitigated.

11.2 Methodology

This section summarises the methodology used to assess the Project's impacts in relation to the physical environment. Five separate specialist technical assessments were completed to develop this chapter.

11.2.1 Existing conditions assessment

In each specialist technical assessment, the first step was to assess the existing conditions of the project area and, if required, the wider context. The purpose of the existing conditions assessment was to characterise the existing environmental and social context of the area surrounding the Project, which formed the baseline for the risk and impact assessments.

The same project area was used for each specialist technical assessment as described in Chapter 5 *Project Description*. Individual study areas were tailored to the different specialist technical assessments as required. The project area is shown in Figure 11.1 and Figure 11.2.

The scope of existing conditions assessments is described below.

Desktop assessment

Desktop studies were undertaken using various web-based resources and publicly available data such as previous and current studies and reports, aerial images, topographic data, historical records, relevant GIS data if available (e.g. waterways and wetlands) and relevant information in the Nillumbik and Whittlesea Planning Schemes such as relevant planning overlays (e.g. Land Subject to Inundation Overlay, Floodway Overlay and Special Building Overlay).

Impact assessments were completed to determine the potential impacts of the Project during the construction, operational and maintenance phases.

Site investigations

Where the desktop assessment found that further information was required, site surveys and investigations were undertaken to develop an understanding of the existing environment. The following site investigations have been undertaken for the Project:

- **Noise and vibration** – Road traffic noise monitoring was conducted at seven locations between 8 May and 16 May 2018. The monitoring involved placing a microphone externally one metre from a habitable room window facing the project alignment. Refer to Figure 5.1 in Technical Report I – *Noise and Vibration Impact Assessment* for the noise monitoring locations
- **Groundwater** – Two geotechnical bores were installed as part of the site-specific investigations for the groundwater assessment. Refer to Figure 4 in Appendix B of the Technical Report J – *Groundwater Impact Assessment* for the location of the project bores
- **Contaminated land** – Soil sampling was undertaken at 34 locations across the project area that were selected based on the result of the desktop review and targeted areas of potential concern. Refer to Figure 3 in Technical Report K – *Contaminated Land Impact Assessment* for the location of the soil sampling.

11.2.2 Risk assessment

As required by the EES Scoping Requirements, a risk-based approach was adopted to understand the key risks and those impact pathways with the potential to lead to significant impacts on the environment and/or on local communities. The risk assessment included reassessing impact pathways identified as relevant to the Project and investigating additional design options to minimise environmental impacts.

Chapter 4 *Environment Effect Statement Assessment Framework* and Attachment III *Environmental Risk Report* provide more details about the risk assessment methodology.

11.2.3 Impact assessment

Impact assessments were completed to determine the potential impacts on physical effects during the construction, operational and maintenance phases of the Project. As part of the assessments, potential positive impacts (benefits) associated with the Project were also identified.

Specialists applied their own methods (defined by relevant legislation, policies, standards and guidelines and their professional judgement and experience) to assess the magnitude of the key impacts, taking into consideration management and mitigation measures where appropriate. As a result, the approach to impact assessment was specific to each specialist aspect. Key legislation and policies that guided the impact assessments are detailed in Attachment II *Legislation and Policy Report*.

A summary of the specialists' methods for impact assessment is provided in Table 11.1.

Table 11.1 Specialists' methods for impact assessment

Key aspect	Summary of impact assessment methodology
Noise and vibration	• Establishing the existing road traffic noise level by undertaking road traffic noise monitoring as discussed in Section 11.2.1 under 'Site investigations' • Undertaking road traffic noise assessment through three-dimensional modelling (as described below) • Developing a comparative study to assess differences in noise environment (existing vs. future) • Theoretical estimation of construction noise and vibration impacts to inform appropriate mitigation measures. *Modelling approach:* A noise model of the project area was prepared using SoundPLAN v8.1 noise modelling software. The model was set up to predict traffic noise levels using the Calculation of Road Traffic Noise algorithm, which is an accepted algorithm to predict noise from road traffic, primarily because it predicts an $L_{10,18hr}$ parameter. $L_{10,T}$ is described in Section 11.3.2 (Noise and vibration). Refer to Technical Report I – *Noise and Vibration Impact Assessment* for more details.
Groundwater	• Review of desktop information and available data sources from nearby groundwater monitoring sites and publicly available data • Assessment of the potential for intersection with groundwater and changes to groundwater level and quality based on the construction methods likely to be employed along the Project alignment (considering the need for piling and cut and fill activities), as well as the potential for spills during construction, operation and maintenance • Assessment of how the proposed works could permanently alter the groundwater regime, as well as the potential impact of spills during maintenance works. Refer to Technical Report J – *Groundwater Impact Assessment* for more details.
Contaminated land	• Assessment of historical activities in and adjacent to the project area that may have caused contamination to soil, which is likely to be encountered during construction • Identifying contaminants of potential concern (CoPC) associated with historical activities within and adjacent to the project area • Review of available information relating to the presence of acid sulfate soils that may be encountered during construction • Soil assessment at 34 locations throughout the project area (refer to Section 11.2.1 under 'Site investigations') comparing analytical results against the applicable protected beneficial uses of land criteria • Assessment of the potential impact of existing contamination on the current project design • Assessment of the spoil management options to appropriately manage spoil produced during the construction of the Project. Refer to Technical Report K – *Contaminated Land Impact Assessment* for more details.

Key aspect	Summary of impact assessment methodology
Surface water	• Assessment of potential changes to flooding conditions such as frequency and duration of flooding, increases in flood levels or flow velocities • Development of a drainage model to assess the potential for reduction of floodplain storage or other changes to flow regimes leading to increases in peak flows or floodwater volumes (as described below) • Using a stormwater quality model to assess the potential for discharge of polluted water (as described below) • Assessment of the potential for the Project to interface with existing and future drainage assets. Modelling approach: Two models have been used for the surface water assessment: • Stormwater quality assessment – a MUSIC model was used to determine the stormwater pollutant source loads from the existing and new impervious areas within the road drainage outfall catchments. MUSIC was then used to calculate if the required pollutant reduction targets are met for the new impervious surfaces • Drainage flow and flow regime impact assessment – XPSWMM 1D modelling software package was used to estimate existing drainage conditions (e.g. peak flood levels and flows) for transverse drainage crossings, using ARR2016/19 methodology. • Refer to Technical Report L – *Surface Water Impact Assessment* for more details.
Air quality	• Review of applicable national and state air quality legislation and policies • Assessing the potential impacts to the local air quality during the construction phase by identifying the construction activities that may lead to emission generation • Predicting the potential emission generated during operation for two scenarios of 'with Project' and 'without Project' for 2021 and 2031 (as described below) • Characterising the local air quality environment using publicly available data obtained from the Environment Protection Authority Victoria's ambient air quality monitoring station (AAQMS) located at Alphington • Assessing the potential impacts from greenhouse gas emissions during construction, operation and maintenance by undertaking the following: – Establishing the fuel use of construction equipment and material movements to estimate greenhouse gas emissions during the construction period of 18 months – Establishing the fuel use of the vehicles using and maintaining the road during operation and estimating greenhouse gas emissions during the construction period of 18 months – Using comparative greenhouse gas emissions data as a basis for the assessment. *Modelling approach:* The American Meteorological Society (AMS)/US EPA Regulatory Model (AERMOD Version 15181) was used as the current regulatory model for the assessment of air quality impacts in Victoria in accordance with EPA publication 1551: Guidance notes for using the regulatory air model AERMOD in Victoria. This model requires a range of inputs such as topography and land use data, meteorology data, source emission rates for identified pollutants and background data. Refer to Technical Report M – *Air Quality Impact Assessment* for more details.

11.2.4 Consultation

Consultation has been ongoing throughout the different stages of the Project's development and preparation of the EES. This included community consultation to gain an understanding of the concerns and preferred outcomes of local residents, businesses and other interested parties, as well as ongoing engagement with Councils and relevant government agencies to identify the key issues and policy priorities of State and local government.

Chapter 6 *Communications and Engagement* provides further information regarding the consultation process.

11.3 Existing conditions

The project area encompasses a section of the existing Yan Yean Road that is an important north-east arterial road providing connection to the established suburbs of Doreen and Yarrambat. The existing physical environment surrounding this section of Yan Yean Road is characterised predominantly by low density residential and rural living areas such as farmland and agricultural areas. However, the northern and western end of the project area, within the suburb of Doreen, is experiencing rapid land use change from rural living to residential.

In this section, the existing conditions have been identified in relation to 'environmental values' (formerly known as beneficial uses) and 'environmental features', which include noise, air quality and water and land environments.

Environmental values

The Victorian Government is implementing a major overhaul of Victoria's environmental protection laws, shifting the focus to a proactive, preventative approach designed to minimise risks of harm to the environment or to human health. The *Environment Protection Amendment Act 2018* introduces a new general environmental duty (GED), a new permissions scheme and a new type of instrument – an Environment Reference Standard.

The purpose of an Environmental Reference Standard is to identify the environmental values that are important to Victorians and to establish indicators and objectives that can be measured to determine if these values are being achieved or maintained. The *Environment Protection Amendment Act 2018* was due to come into effect in June 2020, but has been postponed and will now come into effect from 1 July 2021. However, all impact assessments conducted for this EES have been undertaken in accordance with the existing State Environmental Policy Plans (SEPPs) and the draft Environment Reference Standard developed to operate under the new legislation, as this is considered to be the applicable regulation during the construction of the Project.

The new Environment Reference Standard contains environmental values, indicators and objectives for four elements of the environment: air, noise, land and water. Environmental values are the uses (e.g. sensitive uses), attributes and functions of the environment that Victorians value, such as having safe water to drink and being able to breathe clean air and sleep without unreasonable noise disturbance. The indicators and objectives establish the environmental conditions necessary to achieve or maintain these values. Examples include the different water quality parameters that are acceptable for different types of use, such as human consumption, agriculture and recreational activities such as swimming.

Environmental features

Environmental features are the key features and elements in the existing environment in relation to the project area. These key features and elements may be subject to impacts as the result of the Project. Examples include specific waterways, areas of public land, dwellings or businesses, or existing soil conditions and water quality within or near to the project area.

11.3.1 Environmental values

Understanding the existing environmental values is essential to understanding the potential of the Project to impact these values and developing responses, where required, to protect them.

For the purpose of this EES summary, the environmental values have been grouped into two main categories:

- Sensitive uses that directly relate to people's health and wellbeing
- Environmental values that are present in the water and land environments, including natural and human-made features.

Sensitive uses

Sensitive uses normally refer to areas of regular human habitation, including residences, places of work and educational, recreational and community facilities. The quality of the ambient air, acoustic, land and water environments play a key role in sustaining life, health and wellbeing in relation to these uses.

The following sensitive uses have been identified in relation to the project area and are shown in Figure 11.1:

- Residential properties, particularly in the township of Doreen to the north where rapid development is occurring and where there are more residents (which generally translates to greater sensitivity) compared to other lower density sections of the project area
- Educational facilities such as Plenty Valley Christian College and Yarrambat Primary School, and childcare centres located to the east and west
- Community and recreational facilities and public places such as Yarrambat War Memorial Park
- Places of work such as all active business facilities within and surrounding the project area.

➔ **Stormwater wetland**

Stormwater treatment wetlands are designed to capture nutrients and sediment from urban stormwater before it enters the waterways.

Water sensitive receptors

Within and surrounding the project area, 'water sensitive receptors' exist in relation to both surface water and groundwater. For this report, the water sensitive receptors in relation to the project area have been divided into two groups: water sources and storages both natural and human-made (e.g. wetlands and groundwater) and water dependent users and activities (e.g. agricultural activities).

According to the Melbourne Water's Healthy Waterways Strategy, the Project is in the Yarra Catchment and Plenty River Lower Sub-catchment. The surface water impact assessment conducted for this EES reports that the nearest stormwater wetland to the Project is located west of the Plenty River and south of Wilton Vale Road with no flow path from / to the project area. In addition, this assessment specifies that there are no Melbourne Water designated watercourse crossings at Yan Yean Road. However, Council drainage infrastructure within the Shire of Nillumbik exists within proximity to the project area with the potential to intersect with the Project.

The water sensitive receptors that were identified within and surrounding the project area are identified in Figure 11.2 and include the following:

- Water sources and storages:
  - Vaucluse Wetland at Orchards Road (Melbourne Water asset)
  - Shire of Nillumbik wetland (at Youngs Road and Yan Yean Road junction)
  - Yarrambat Lake (west of Bannons Lane and Yan Yean Road junction)
  - A constructed school dam at Plenty Valley Christian College
  - Potable mineral water supply
  - Plenty River, Scrubby Creek, Sawpit Creek and Dry Creek within the two kilometres buffer of the project area, which are dependent on the surface expression of groundwater and have a moderate potential for groundwater interaction
  - Several creeks and tributaries of the Plenty River located to the west and tributaries of Sawpit Creek to the south east.
- Water-dependent users / features / activities:
  - Two registered bores (approximately 79 metres and 170 metres from project area) indicating groundwater users are present within approximately 500 metres of the project area
  - Water dependent ecosystems and species, including seven ecosystems dependent on the subsurface presence of groundwater within two kilometres of the project area. These ecosystems were identified as having potential for groundwater interaction: refer to Figure 5 in Appendix B of Technical Report J – *Groundwater Impact Assessment*
  - Several potential uses for groundwater that are required to be protected from impacts by the Project. These protected uses include:
    - Agricultural and irrigation activities (irrigation and stock watering) – as discussed earlier in this section, the project area and its surrounds include farmland and agricultural areas
    - Industrial and commercial activities that exist within the project area and are dependent on water sources
  - Water based recreation (primary contact recreation) – this relates to activities such as swimming
  - Buildings and structures – this relate to ensuring groundwater is maintained to a quality such that if it were to interact with buildings, structures, property and materials it would not result in adverse impacts.

Land sensitive receptors

Land sensitive receptors generally refer to values, features, uses and activities that can be impacted by changes in the quality of the land environment. The Project has a responsibility to ensure it does not adversely impact on the following environmental values (as defined by the draft Environment Reference Standard):

- Human health – land quality must be suitable for the specific land use and safe for the human use of that land
- Maintenance of ecosystem – land quality must be suitable to protect soil health and the integrity and biodiversity of natural ecosystems, modified ecosystems and highly modified ecosystems
- Buildings and structures – land quality must not be corrosive to buildings, structures, property and materials, due to introduced contaminants
- Aesthetics – ensure aesthetic issues (such as litter or odours) do not adversely impact the use of land.

Figure 11.1 Sensitive uses

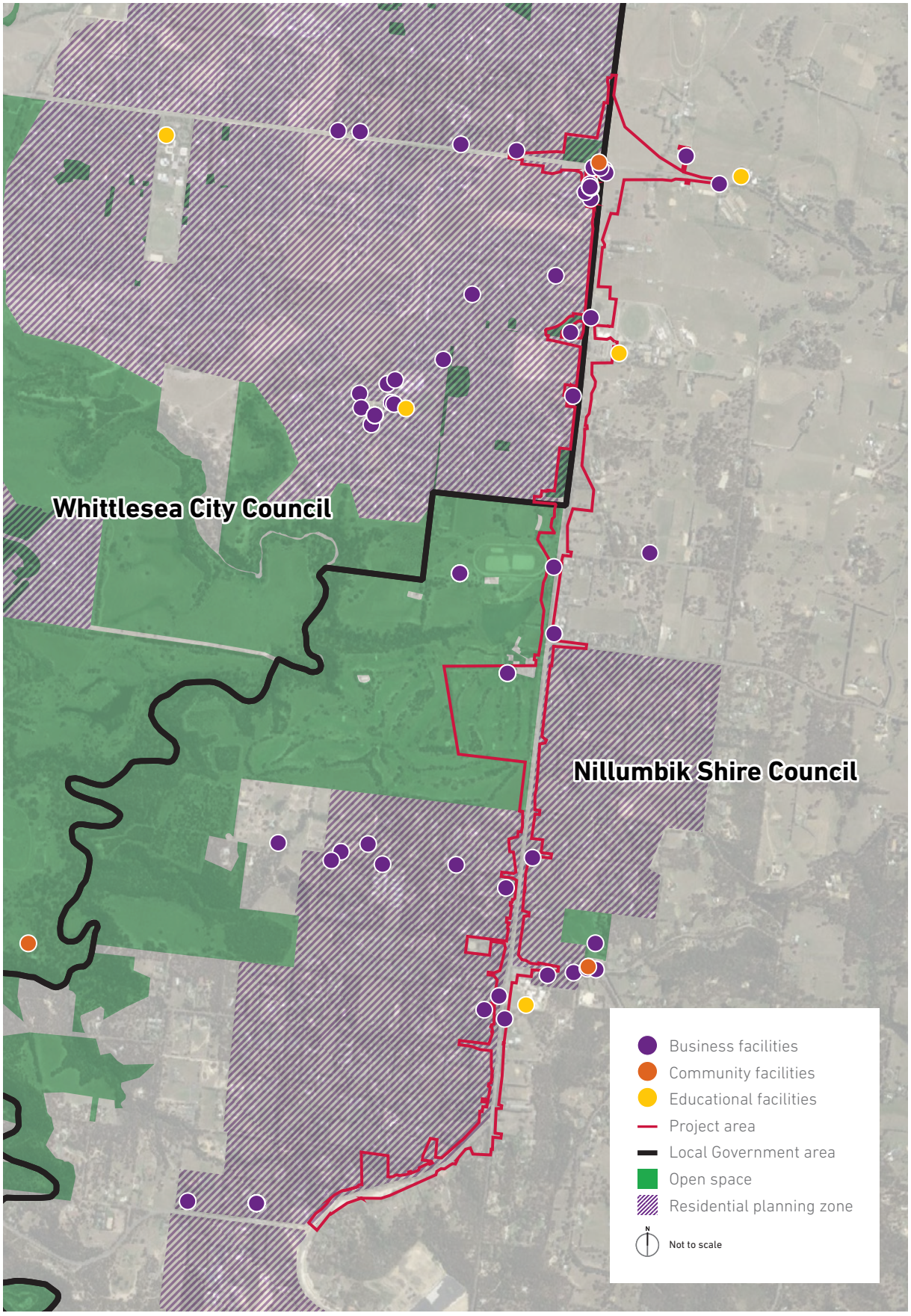
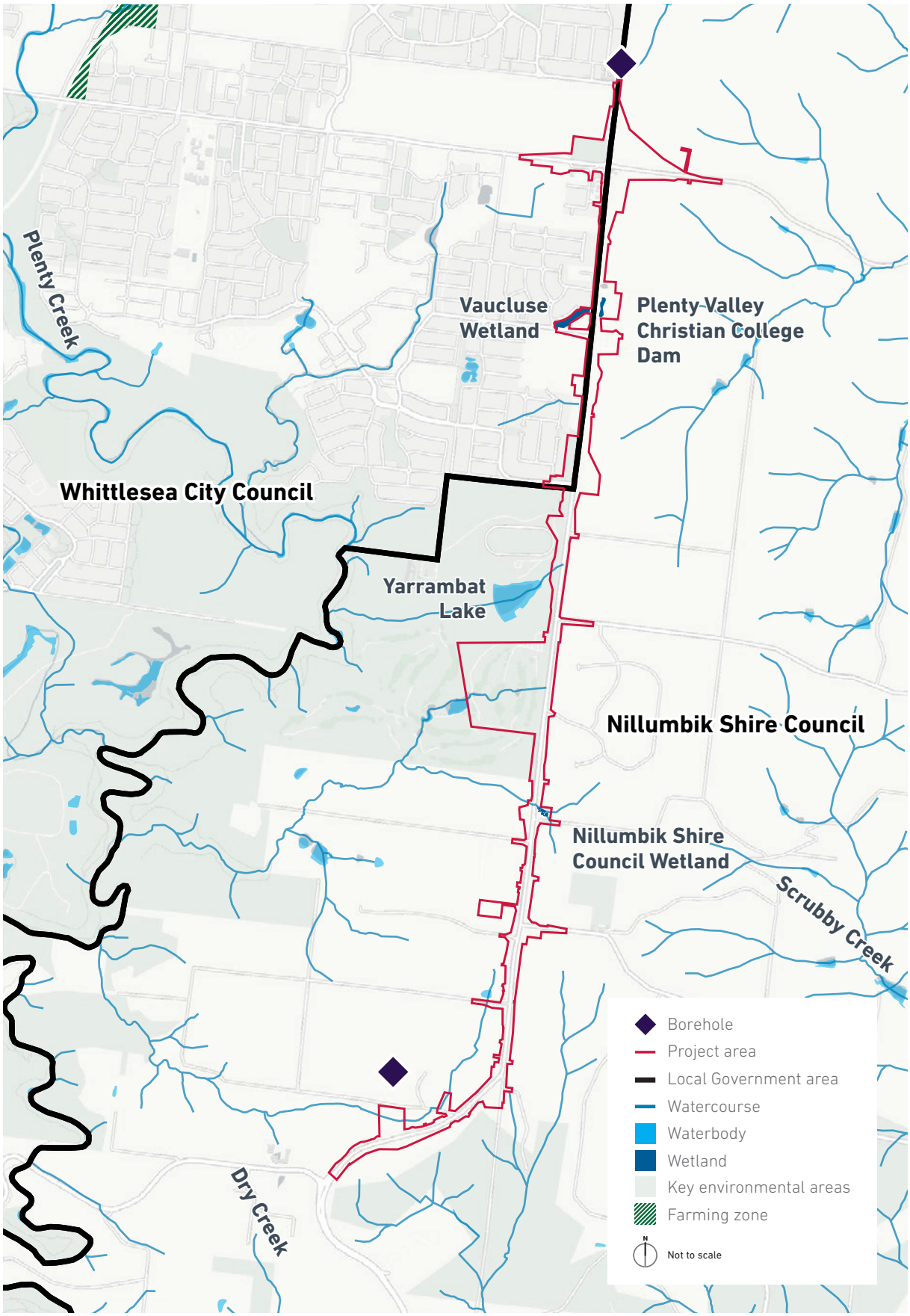


Figure 11.2 Water values



11.3.2 Environmental features

Noise and vibration

The acoustic environment includes the properties or qualities of the environment that relate to sound and / or noise and vibration. The current acoustic environment is mostly defined by the traffic noise and vibration from Yan Yean Road alongside the project area.

The existing road traffic noise is composed of tyre and engine noise from cars, trucks and other vehicles using the roads. To understand noise levels, the A-weighted levels are measured. A-weighted level of noise (measured in decibels or dBA) varies continuously over time and therefore requires measurement over a defined time period.

The outcome of noise monitoring conducted for the EES impact assessment indicated that the average existing noise levels ranged from 50 to 71 $L_{10,\,18hr}$ dBA. For comparison, common noise levels are shown in Figure 11.3.

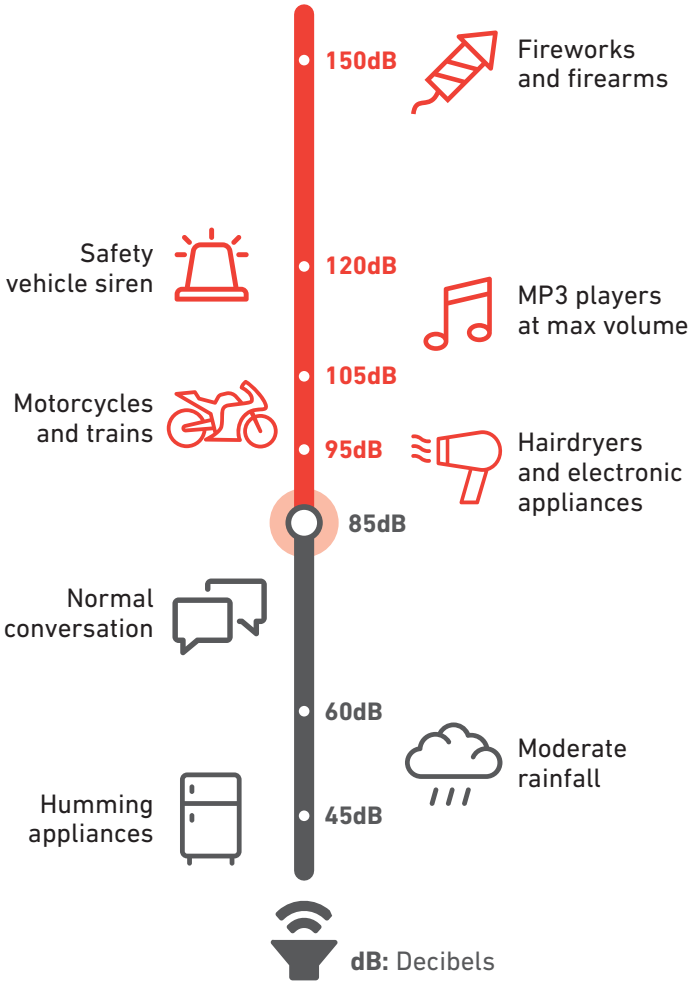
A-weighting

This is a frequency weighting devised to attempt to take into account the fact that human response to sound is not equally sensitive to all frequencies. It consists of an electronic filter in a sound level meter, which attempts to build this variation into an indicated noise level reading so that it will correlate, approximately, with human response.

$L_{10,\,T}$

This indicates the A-weighted sound pressure level in decibels exceeded for 10% of the measurement period (T).

Figure 11.3 Common noise levels



Air quality

Air quality is a measure of the suitability of air for humans and for the physical environment such as plants and animals. The local air quality of the project area was characterised by identifying existing sources of emissions, as well as using ambient air monitoring data to understand the level of existing air pollutants.

The outcome of the air quality assessment showed that the main sources of local emissions to air included traffic (vehicles), industrial manufacturing facilities and domestic fuel burning, while the regional sources relate to bushfire, prescribed burns and dust events.

The air quality impact assessment characterised the existing air quality by comparing the amounts of concentrations for pollutants (NO_2, PM_{10} and $PM_{2.5}$) with the objectives for ambient air environment prescribed in the Environment Reference Standard.

Pollutants

PM_{10}: Particulate matter with a diameter of 10 micrometres or less. If inhaled, these particles can be eliminated through coughing or sneezing.

$PM_{2.5}$: Particulate matter with a diameter of 2.5 micrometres or less. These fine particles are small enough to travel into the lungs via breathing and could cause lung and heart problems.

NO_2: A gas, nitrogen dioxide, primarily produced from burning fuel, with the main source being from motor vehicle exhausts. NO_2 can cause or aggravate respiratory problems, including asthma and respiratory infections.

A review of existing ambient monitoring data from the Alphington air quality monitoring station between 2014 and 2018 found that:

- PM10 concentrations exceeded the 24-hour average objective four times in 2014 and three times in 2018, with annual average concentrations below the relevant objective for all years
- PM2.5 concentrations exceeded the 24-hour average objective for all years. Annual average concentrations also exceeded the annual average of the relevant objective for all years, except for 2016
- NO2 concentrations for the monitoring period 2014 to 2018 were below the one-hour and annual average of the relevant objective.

In summary, the existing air quality is characterised by higher levels of $PM_{2.5}$ pollutants compared to levels of PM_{10} and NO_2. The PM_{10} and $PM_{2.5}$ exceedances are attributed to bushfires, planned burns, local dust storms and smoke from wood heaters during winter.

Water and land environments

This section outlines the key water and land features identified in, or close to, the project area. These have been identified as features with the potential to be impacted by the Project. Refer to Figure 11.2 for the location of the water and land values in relation to the project area.

Groundwater

The groundwater level in the project area has been assessed to be more than 60 metres below ground level based on the records from the Plenty Landfill After Care Management Plan (Golder 2015) and site-specific geotechnical bores (refer to Section 11.2.1). In addition, Stage One of the Yan Yean Road upgrade is located to the south of the project area and in a similar geological setting. Groundwater was not intersected during the construction of Stage One of the Yan Yean Road upgrade project.

Plenty River

The Plenty River is the closest river to the project area, located approximately two kilometres west of Yan Yean Road. The stream condition of Plenty River varies from poor to very poor. The stream condition for the reach of the Plenty River adjacent to the Project is very poor. A number of small tributaries to Plenty River intersect with Yan Yean Road (refer to Figure 11.2).

Flood and drainage conditions

The Project does not intersect any planning scheme overlays relevant to surface water (e.g. Floodway Overlay).

The Project intersects with the Doreen Drainage Scheme, which is a master plan for existing and future drainage works in the area. However, the drainage scheme does not show any planning works intersecting the project.

Water management systems within private properties

Several properties may require relocation of onsite wastewater treatment areas. Seventeen properties located on Yan Yean Road, between Bannons Lane and Laurie Street, possibly discharge stormwater offsite to the roadside drain (then to Yarrambat Lake). This will be confirmed during the detailed design phase via a features survey and other relevant tools.

Potential sources of contamination

The outcome of the soil assessment indicated that all analysed soil samples were below the adopted human health assessment criteria for an urban residential / open space scenario applicable to the project area. However, some localised soil contamination may exist in the project area as a result of historical or present-day activities.

Existing contamination could be uncovered or disturbed by the Project and would need to be managed appropriately to avoid impacting the identified sensitive uses. (refer to Section 11.3.1). The potential sources of contamination were identified through a review of current and historical information and are outlined in Table 11.2 below.

Table 11.2 Potential sources of contamination

Location	Contaminating activity	Historical or current
Within the project area	Roadway (e.g. imported materials)	Historical
Within 150m of the project area	1. Farmland (pastoral and agricultural purposes) 2. Butchers 3. Former gold mining activities 4. Motor garages and service stations 5. Boarding kennels and cattery	1. Historical 2. Historical 3. Historical 4. Historical and current 5. Current
Other potential nearby sources	1. The former Plenty Landfill 2. Nillumbik Recycling and Recovery Centre	1. Historical 2. Current

Three sites within the project area are subject to an Environmental Audit Overlay (EAO): 573 Yan Yean Road (the Yarra Valley Water site) and 501 and 499 Yan Yean Road. The EAOs are related to the presence of suspected contamination. The EAOs do not require that an audit is prepared as part of the Project as a road is not considered a sensitive use.

11.4 Risk assessment

A risk assessment was undertaken in relation to the environmental aspects of the existing conditions discussed in Section 11.3. For more information on the risk assessment process, refer to Chapter 4 *Environment Effects Statement Assessment Framework* and Attachment III *Environmental Risk Report*. The outcome of this assessment indicated that the initial risks were generally 'low' or 'medium' (refer to Attachment III *Environmental Risk Report)*.

Key risks are defined as those having an initial rating of 'significant' and above and are shown in Table 11.3 below. Refer to Attachment III *Environmental Risk Report* for the complete list of initial and residual risks. These risks require management through the Project and are addressed through the EPRs listed in Section 11.6 and the Environmental Management Framework described in Chapter 12.

A discussion of the impact pathways and the likely effectiveness of the proposed EPRs to minimise risk of impacts is provided in Section 11.5.

Table 11.3 Key risks

Risk number	Aspect	Impact pathway	Phase	Initial rating	EPR #	Residual rating
33	Noise and vibration	Noise and/or vibration from construction activities potentially impacting on sensitive receptors	Earthworks	Significant	NV1	Medium
53	Noise and vibration	Noise and/or vibration from construction activities potentially impacting on sensitive receptors	Civils and structures	Significant	NV1	Medium

11.5 Impact assessment

This section describes the potential impacts on the physical environment during the design, construction, operation and maintenance phases of the Project and appropriate mitigation measures to avoid or otherwise minimise adverse impacts.

The technical specialists have assessed the potential impacts of the Project by using the methods described in Table 11.1.

11.5.1 Design and construction impacts

Construction activities associated with road projects may result in adverse impacts to environmental values and features. The specialist assessments conducted for the EES have concluded that the potential impacts from the Project's construction activities, with the exception of noise generation, are expected to be minimal following the implementation of appropriate mitigation measures. However, there is potential for significant impacts in the case of noise generation from construction activities (e.g. bulk earthworks, corridor clearing and paving). This is detailed further below.

All identified impacts are required to be managed appropriately to ensure adverse impacts to physical environmental values and features are avoided or otherwise minimised. Accordingly, the specialists have recommended mitigation measures to address the impacts based on their extent and intensity, and in accordance with the relevant Environment Reference Standard, other applicable statutory requirements and industry best practice. These mitigation measures were used to inform the EPRs (refer to Section 11.6) and are detailed below.

Noise and vibration

By its nature construction can be a noisy activity, which can cause annoyance to neighbouring communities. An assessment of the potential noise and vibration from the Project's construction activities is included in Technical Report I – *Noise and Vibration Impact Assessment.* This assessment has determined the typical noise levels from some indicative construction scenarios, such as corridor clearing and paving, and concluded that significant levels of noise may occur from construction activities.

To minimise the potential noise and vibration impacts arising from construction activities, the Project would be managed, where possible, in accordance with the Victorian EPA's Publication 480: Environmental Guidelines for Construction Sites and Publication 1254: Noise Control Guidelines. Where it is not possible to meet these guidelines – for instance, when works need to be undertaken outside of normal operating hours – the Project would follow the requirements of the Construction Noise and Vibration Monitoring Plan (refer to EPR NV1).

Implementing this plan would minimise risks from construction noise and vibration generating activities through measures such as:

- Where an activity is likely to cause a noise nuisance to nearby residents, restrict operating hours to between 7 am and 6 pm weekdays and 7 am to 1 pm Saturday, except where, for practical reasons, the activity is unavoidable (refer to EPRs EMF3 and NV1)
- Fit and maintain appropriate mufflers on earth-moving and other vehicles on the site (refer to EPR NV1)
- Enclose noisy equipment (refer to EPR NV1)
- Provide noise attenuation screens, where appropriate (refer to EPR NV1)
- Undertake targeted noise monitoring of construction activities that are expected to cause higher impacts (if required), and modify management actions as necessary (refer to EPR NV1)
- Advise local residents when unavoidable out-of-hours work will occur (refer to EPRs EMF3 and NV1)
- Schedule deliveries to the site so that disruption to local amenity and traffic are minimised (refer to EPRs EMF3 and NV1)
- Conduct a study on the impact of ground vibration from construction activities, where these operations occur within 50 metres of a building and take appropriate action (refer to EPR NV1)
- A noise communications plan for advising and informing the community of work scheduling and working hours (refer to EPRs EMF3 and NV1).

Groundwater

Construction activities are unlikely to result in significant impact to groundwater. The construction works (e.g. road cuttings and piling works) are unlikely to intersect and/or impact groundwater level and quality due to the depth of groundwater at 60 metres below ground level. In addition, the potential of groundwater being impacted by fuel or chemical spills during construction is considered unlikely given the depth to groundwater and the nature of the surrounding geological formations, which typically comprise sandstones, siltstones and mudstones.

To address the potential impacts, the Project's Construction Environmental Management Plan (CEMP) would detail actions to be implemented in the unlikely event that groundwater is encountered unexpectedly during construction activities (refer to EPRs EMF2 and GW1).

Contaminated land

Potential impacts from construction activities in relation to contaminated land have been identified as follows:

- There is low potential for disturbing or interacting with contaminated soil or acid sulfate soils in such a way that it would impact the identified environmental values or features
- There is some potential for fuel or chemical spills during construction that could result in health, environmental or amenity impacts, including contaminating soil
- There is some potential that the incorrect management of contaminated material could result in environmental impacts.

To manage these potential impacts, the following mitigation measures have been developed:

- Manage known contaminated soil and unexpected contaminated material encountered during construction of the Project through developing and implementing a CEMP in accordance with relevant legislation and guidelines (refer to EPRs EMF2 and CL1)
- Address potential impacts from chemical leaks or spills during construction in the CEMP (refer to EPRs EMF2 and CL2).

Surface water

Construction activities are expected to result in the following impacts to surface water:

- During construction there is potential that the works will result in a reduction in flood conveyance or floodplain storage, leading to increases to flood levels, flow velocities and flood frequency due to the placement of temporary works, stockpiles, equipment and plant
- There is potential of a release of increased sediment loads to downstream areas as a result of erosion at the construction site
- There is potential for construction activities to release spills into surface water
- If local water sources are used during construction for controlling dust and other purposes, there is also a potential for impacts to other users of those water sources and / or the aquatic flora and fauna present
- The water quality of Shire of Nillumbik Wetland located north of Youngs Road may be impacted by construction activities.

The risk of construction activities directly impacting drinking water, other than the planned works at Yarra Water pumping station, has been assessed as negligible

These impacts would be mitigated appropriately by preparing and implementing a CEMP in consultation with relevant authorities that includes measures to protect surface water impacts in accordance with relevant water quality objectives and other statutory requirements (refer to EPRs EMF2 and SW1).

Air quality

The potential impacts to air quality from construction activities are described below:

- There is potential for impacts to the local air quality from construction activities (e.g. release of dust during earthworks, clearing and grubbing vegetation)
- Additional emission generation due to fuel combustion (e.g. diesel and petrol) from construction vehicles and plant and equipment use may result in impacts to air quality
- While considered a low risk, there is potential for odour emissions to be generated during excavation of contaminated material
- There is also the potential for release of greenhouse gas emissions from construction activities (e.g. demolition and earthworks).

Technical Report M – *Air Quality Impact Assessment* outlines an extensive list of measures to mitigate these potential impacts and manage air quality in accordance with relevant air quality objectives and other statutory requirements. These measures would be incorporated within the CEMP (refer to EPRs EMF2 and AQ1) and include:

- Ensure vehicles and machinery fitted with appropriate emission controls
- Review construction works during dry and windy weather conditions and in response to community complaints
- Ensure best practice construction measures to reduce emission such as turning off idle machinery and vehicle engines on site
- Integrate sustainable design and construction practices to minimise, to the extent practicable, resource use particularly greenhouse gas emissions from construction of the Project.

11.5.2 Operational and maintenance impacts

The operational and maintenance impacts to the physical environment are predicted to be minimal, as detailed below. While considered minimal, these impacts will not necessarily lead to negative outcomes due to external factors such as improvements in technology. For instance, the air quality assessment has concluded that air emissions from traffic are expected to reduce during operation due to improved fuel composition and associated combustion technologies, tighter emission standards and the increased use of less polluting vehicles. However, the Project's potential adverse impacts are required to be managed through the mitigation measures and EPRs that have been developed for the operational and maintenance phases.

Noise and vibration

There is a low risk that the increase in traffic on the new road could lead to a perceptible increase in noise levels. Noise modelling has indicated that the majority of sensitive uses along Yan Yean Road are predicted to have an increase of no more than 3 dBA as a result of the Project. This is characterised as 'barely perceptible'. Modelled changes in operational noise levels are summarised as follows:

- Approximately 95 percent of sensitive receptors will experience an increase of less than 3 dBA (460 sensitive receptors)
- Less than five percent of sensitive receptors will experience an increase between 3 to 4 dBA (17 sensitive receptors)
- Approximately one percent of sensitive receptors will experience an increase between 4 to 5 dBA (4 sensitive receptors)
- No sensitive receptors will experience a noise level increase above 5 dBA.

The detailed design of the road would be undertaken in accordance with the VicRoads Traffic Noise Reduction Policy 2005 (refer to EPRs EMF5 and NV2).

Groundwater

It is unlikely groundwater will be impacted by the Project during operation and maintenance as groundwater is located more than 60 metres below ground.

Any potential operational and maintenance impacts would be managed by the Department of Transport (refer to EPR EM5).

Contaminated land

There is a low risk of potential impacts from interaction with known or unidentified contaminated soils as excavation work, or other activities with the potential to interact with soils, during operation and maintenance is expected to be minimal.

There is a low risk of potential impacts from fuel or chemical spills as a result of operation and maintenance works.

Any potential operational and maintenance impacts would be managed by the Department of Transport through its environmental management system and standards for managing declared roads in Victoria (refer EPR EM5).

Surface water

Potential operational and maintenance impacts on surface water have been identified as follows:

- There is the potential for changes to drainage or flooding behaviour during the Project's operation due to changes to ground levels (e.g. new embankments) and changes to drainage elements, including culvert extensions and road drainage catchments
- The increase in impervious surfaces could lead to an increase of stormwater runoff flow rates at outfall locations, resulting in an increase in water volumes and flood levels at downstream receptors
- There is no potential for increasing the stormwater pollutant load contributing to Vaucluse Wetland. No additional stormwater treatments, other than the proposed road swales, are required upstream of Vaucluse Wetland
- There is no potential impacts on the Shire of Nillumbik Wetland's cells or embarkments. Changes to the transverse crossing inlet arrangement at Yan Yean Road are required, however, these can be managed so as not to impact on the water quality treatment function of the wetland.
- There is potential for an increase in the pollutant loading at Yarrambat Lake as a result of increased runoff
- The Project's footprint directly impacts the capacity of the constructed dam at Plenty Valley Christian College.

To address these potential impacts, the following mitigation measures would be implemented (refer to EPRs SW2 and EMF5):

- Include a spill risk assessment to understand the potential for changes to the hydrologic and / or hydraulic regime of waterways
- Prepare detailed design drainage works in accordance with Melbourne Water, Austroads and Council requirements.
- Ensure the detailed design meets the relevant Austroads criteria
- Avoidance of drainage impacts on the two River Red Gum trees at the intersection with Bridge Inn Road would be included as part of detailed design
- If water quality impacts at Vaucluse Wetland are identified due to changes to the carpark at Plenty Valley Christian College at the next design stage, Integrated Water Management elements would be required prior to Vaucluse Wetland receiving carpark runoff
- To maintain Yarrambat Lake, the detailed design must consider a 50 m^2 bioretention basin upstream of the lake
- Consultation with school authorities (Plenty Valley Christian College) would be required during the detailed design process to ensure the reinstated dam is of an appropriate capacity
- Investigations would be conducted to confirm that water management systems within private properties are not impacted. If impacted, options during detailed design include replacing the existing systems at the properties or incorporating connections from private properties into the detailed drainage design
- The table drains located at the toe of embarkments would be upgraded to grassed swales and connections made to the kerb outlets
- Detention would be required at outfalls to mitigate flows.

Air quality

Operational and maintenance impacts on air quality are expected to be minimal:

- During maintenance works, there is low potential for air emissions to be generated by maintenance activities such as use of maintenance vehicles and future road surface upgrades
- There is a low potential for generating greenhouse gases as a result of operating plant and equipment during the operational and maintenance phases.

Any potential operational and maintenance impacts would be managed by the Department of Transport (refer to EPR EMF5).

11.6 Environmental Performance Requirements

This EES includes an Environmental Management Framework (refer to Chapter 12 *Environmental Management Framework*) which provides a transparent and integrated framework for managing environmental risk for the Project. It contains Environmental Performance Requirements, which set the environmental outcomes that must be achieved during design, construction and operation.

Initial EPRs for the Project were prepared to inform the environmental risk assessment. This performance-based approach defines the legislative requirements, standards, limits and processes that the Project must meet or follow, while still providing flexibility to accommodate minor modifications during the detailed design process – provided the outcomes specified in the EPRs are achieved.

In developing the EPRs, the following hierarchy of control was used to identify potential mitigation and management measures:

- Avoidance through design refinements
- Minimisation through timing of the activities
- Mitigation or management through physical/engineering controls
- Mitigation or management through operational controls
- Induction, training and awareness
- Monitoring and measurement
- Adaptive management and contingency protocols.

EPRs relevant to the physical environment have been grouped by Evaluation Objective and are shown in Table 11.4.

➔ This EES includes an Environmental Management Framework (refer to Chapter 12 *Environmental Management Framework*) which provides a transparent and integrated framework for managing environmental risk for the Project. It contains these Environmental Performance Requirements, which set the environmental outcomes that must be achieved during design, construction and operation.

Table 11.4 Environmental Performance Requirements

Performance objective	Applicable legislation, policy and guidelines	Impact pathway	EPR code	Environmental Performance Requirement	Project phase
Environmental Management Framework To provide a transparent framework with clear accountabilities for managing and monitoring the environmental effects associated with the Project	Legislation and policy as identified in all EPRs	These EPRs are relevant for all impact pathways across the Project	EMF2	**Environmental Management Plans** Prepare and implement a Construction Environmental Management Plan (CEMP) and other relevant plans as required by the EPRs and in accordance with this Environmental Management Framework (EMF). The development of the CEMP and sub-plans must include consultation with relevant stakeholders as listed in this EMF and as required under any statutory approvals. The CEMP and all sub-plans shall be approved by MRPV before construction commences (excluding preparatory buildings and works permitted under the Incorporated Document).	Design and construction
			EMF5	**Operation and maintenance** Any potential impacts during operation and maintenance will be managed in accordance with the Department of Transport's environmental management system and standards for managing declared roads in Victoria.	Operation and maintenance
Effects on physical environment Identify other potential adverse environmental effects of the project, such as on social and community amenity, canvass an environmental management approach and performance measures to ensure any effects are identified and avoided, minimised or mitigated.					

Performance objective	Applicable legislation, policy and guidelines	Impact pathway	EPR code	Environmental Performance Requirement	Project phase
Air quality To protect beneficial uses of the air environment	State Environment Protection Policy (Ambient Air Quality) EPA Publication 480 (EPA Environmental Guidelines for Major Construction Sites) EPA Publication 1517.1: Demonstrating Best Practice	Generation of air emissions from construction works impacting on sensitive receptors such as hospitals, schools or residences	AQ1	The CEMP must include processes and measures to manage air quality during construction, including in accordance with the relevant air quality objectives set out in the State Environment Protection Policy (Ambient Air Quality) and other relevant statutory requirements. These measures will include, but not be limited to: • Ensure that all vehicles and machinery are fitted with appropriate emission control equipment, maintained frequently and serviced to the manufacturers' specifications • Smoke from internal combustion engines must not be visible for more than ten seconds • Protect stockpiles to prevent and minimise dust emissions • Review construction methodology in response to potential dust generation during dry and windy weather conditions, and in response to site inspection, monitoring results or complaints related to air and / or dust disruption • Provide the opportunity for the community to raise issues / concerns through a 24-hour phone number (see also EPR S2).	Design and construction

Performance objective	Applicable legislation, policy and guidelines	Impact pathway	EPR code	Environmental Performance Requirement	Project phase
Contaminated land To protect the beneficial uses of land and minimise risk to human health and ecosystems from exposure to contaminated soils	State Environment Protection Policy (SEPP) – Prevention and Management of Contamination of Land PFAS National Environmental Management Plan 1.0 2018 EPA Publication 480 (EPA Environmental Guidelines for Major Construction Sites) Environment Protection (Industrial Waste Resource) Regulations 2009 Industrial Waste Management Policy (Waste Acid Sulphate Soils) 1999 National Environment Protection (Assessment of Site Contamination) Measures 2013	Excavation, stockpiling, transport and/or disposal of known or previously unrecorded contaminated material (including acid sulfate soils) leading to potential risks to human health and the environment	CL1	The CEMP must include processes and measures to manage contaminated soil in accordance with the relevant objectives set out in State Environment Protection Policy (SEPP) – Prevention and Management of Contamination of Land and other relevant statutory requirements and guidelines. These include, but are not limited to: • Environment Protection (Industrial Waste Resource) Regulations 2009 • Industrial Waste Management Policy (Waste Acid Sulfate Soils) 1999 • National Environment Protection (Assessment of Site Contamination) Measures 1999, amended 2013 (ASC NEPM) • WorkSafe Occupational Health and Safety Regulations 2007 (Asbestos) • PFAS National Environmental Management Plan 1.0 2018 • AS 4482.1-2005 Guide to the investigation and sampling of sites with potentially contaminated soil.	Design and construction

Performance objective	Applicable legislation, policy and guidelines	Impact pathway	EPR code	Environmental Performance Requirement	Project phase
Continued: Contaminated land	**Continued:** As above	**Continued:** As above	CL2	The processes and measures must include: • Characterising soil prior to disposal or reuse • Identifying soil containing asbestos and if present, developing management strategies in accordance with the WorkSafe Regulations • Assessing geological formations with naturally enriched metals and applicable spoil management options and or off-site disposal to the satisfaction of EPA Victoria • Identifying suitably licensed facilities for the disposal or treatment of contaminated soil • Management measures for storage, handling and transport of spoil for the protection of health, amenity and the environment • Management of wastewater • Management of dust, potential stormwater run-off and seepage from stockpiled materials • Undertaking a baseline site assessment of areas proposed for construction laydown prior to use • Protection of the beneficial uses of land associated with current and planned future use.	Design and construction
Groundwater To protect beneficial uses of groundwater	State Environment Protection Policy (Waters) EPA Publication 480 (EPA Environmental Guidelines for Major Construction Sites) Water Industry Regulations 2006 (Vic) National Environment Protection (Assessment of Site Contamination) Measures 2013	Potential changes to groundwater levels or flows from construction works, resulting in impacts on groundwater quality and / or beneficial uses	GW1	**Groundwater management** The CEMP must include measures to manage groundwater impacts in accordance with the relevant water objectives set out in the State Environment Protection Policy (Waters), Water Industry Regulations 2006 (Vic) and other relevant statutory requirements.	Design and construction

Performance objective	Applicable legislation, policy and guidelines	Impact pathway	EPR code	Environmental Performance Requirement	Project phase
Noise and vibration To minimise the impacts of noise and vibration impacts to sensitive receptors	EPA Publication 1254 (Noise Control Guidelines) EPA Publication 480 (EPA Environmental Guidelines for Major Construction Sites) VicRoads Traffic Noise Reduction Policy 2005	Noise and/or vibration from construction activities potentially impacting on sensitive receptors	NV1	**Construction noise management** The CEMP must include measures to manage construction noise and vibration in accordance with EPA Publication 1254 (Noise Control Guidelines), EPA Publication 480 (EPA Environmental Guidelines for Major Construction Sites) and other relevant statutory requirements. The CEMP should include measures, such as (but not limited to): • Fit and maintain appropriate mufflers on earth-moving and other vehicles on the site • Enclose noisy equipment • Provide noise attenuation screens, where appropriate • Where an activity is likely to cause noise impacts to nearby residents, restrict operating hours to between 7 am and 6 pm weekdays and 7 am to 1 pm Saturday, except where, for practical reasons, the activity is unavoidable. All reasonable measures must be implemented to mitigate the impacts of such unavoidable works • Undertake targeted noise monitoring of construction activities that are expected to cause higher impacts (as appropriate) and modify management actions as necessary • Advise local residents when unavoidable out-of-hours work will occur	Design and construction

Performance objective	Applicable legislation, policy and guidelines	Impact pathway	EPR code	Environmental Performance Requirement	Project phase
Continued: Noise and vibration	**Continued:** As above	**Continued:** As above	**Cont:** As above	• Schedule deliveries to the site so that disruption to local amenity and traffic is minimised • A noise and vibration communications sub-plan, consistent with the Communications and Stakeholder Engagement Plan (see also EPR S2), for informing the community of work scheduling and working hours • Provide the opportunity for the community to raise issues / concerns through an attended 24-hour phone number (see also EPR S2).	**Continued:** As above
		Noise and/or vibration from operational road traffic noise potentially impacting on sensitive receptors	NV2	**Achieve traffic noise objectives** Design and construct the Project so that operational noise will be addressed in accordance with the VicRoads Traffic Noise Reduction Policy (2005).	Design and construction Operation and maintenance

Performance objective	Applicable legislation, policy and guidelines	Impact pathway	EPR code	Environmental Performance Requirement	Project phase
Surface water To maintain or improve existing surface water quality and protect beneficial uses.	State Environment Protection Policy (Waters) *Water Act 1989* Melbourne Water Performance Criteria EPA Publications 275, 480 and 960 MRPV Integrated Water Management Guideline (2019)	Potential changes to stormwater flows as a result of site works, and/or adverse impacts on water quality and beneficial uses including waterway health and listed Wetlands (if applicable)	SW1	**Surface water management** The CEMP must include processes and measures to manage surface water in accordance with the relevant water objectives set out in the State Environment Protection Policy (Waters), Melbourne Water Performance Criteria and other relevant statutory requirements. Mitigation and management measures would be informed by Melbourne Water and Council requirements, EPA Publications 275, 480 and 960 and include: • Best practice sediment and erosion control, including measures to prevent contamination of surface waters from contaminated soils if / when encountered and the management of dewatering of earthworks areas following storm events • Maintenance of existing flow paths, drainage lines and floodplain storage or, where modification of existing flow paths cannot be avoided, mitigating the effects of changes to flow to the extent practicable • Water quality monitoring during construction and management of drainage infrastructure to be carried out in accordance with MRPV's Integrated Water Management Guideline (2020) • Stormwater or flood modelling and implementation of mitigation solutions and management measures for temporary works as required • Flood emergency management including consideration of scheduling works • Maximising the visual and aesthetic amenity of waterways having regard to any relevant development plans in consultation with Melbourne Water • Refuelling in designated areas where hardstand is present and removal of impacted soils following minor spills.	Design and construction

Performance objective	Applicable legislation, policy and guidelines	Impact pathway	EPR code	Environmental Performance Requirement	Project phase
Continued: Surface water	**Continued:** As above	Potential changes to stormwater flows as a result of operation, and/or adverse impacts on water quality and beneficial uses including waterway health and listed Wetlands (if applicable) due to changes to ground levels, ground surface imperviousness or increases in stormwater pollutants	SW2	**Design to minimise surface water impacts** Design the Project to minimise impacts on the hydrologic and / or hydraulic regime of waterways and stormwater risks, including: • Develop a detailed drainage model based on the 3D road detailed design to comply with Austroads, Council and Melbourne Water guidelines. A spill risk assessment will be conducted for each outfall based on the likelihood of a spill, which is estimated based on the road characteristics (geometry) of the outfall catchment, and its proximity to the downstream water sensitive receptors (i.e. consequence of the spill). Outfalls with a high spill risk are to provide spill containment • Discharge and runoff to meet the relevant water objectives set out in the State Environment Protection Policy (Waters), Melbourne Water Performance Criteria and other relevant statutory requirements • For outfalls to major main drains or waterways, determine specific requirements in consultation with Melbourne Water • Minimise risk from changes to flood levels, flows and velocities. Permanent works must not increase overall flood risk at relevant locations or modify the flow regime of waterways without the acceptance of the relevant flood plain manager, drainage authority or asset owner • Minimise impacts on private, Council and Melbourne Water drainage assets • Comply with Melbourne Water Performance Criteria and MRPV's Integrated Water Management Guideline (2020).	Design, operation and maintenance

11.7 Conclusion

This chapter details the findings of the technical assessments that have been undertaken to determine the Project's impacts on the key aspects of the physical environment including noise and vibration, groundwater, contaminated land, surface water and air quality, and related sensitive receptors.

The impact assessments undertaken by technical specialists concluded that aspects of the physical environment typically resulting in high risk ratings on construction projects were limited to potential noise and vibration impacts during the construction phase. The Project's potential impacts from construction activities on air quality, contaminated land, groundwater and surface water are expected to be minimal.

Key impacts were associated with noise and vibration during the construction phase as, by its nature, construction can be a noisy activity, which can cause annoyance to neighbouring communities. Activities such as bulk earthworks, vegetation clearing and road paving can all generate noise. Additionally, there is potential for vibration impacts associated with driven piling works and the compaction of road surfaces.

Any potential impacts can be appropriately managed through the implementation of mitigation measures identified in the EPRs.

To minimise potential impacts arising from construction noise and vibration activities, the Project will be managed in accordance with a Construction Environmental Management Plan and Noise and Vibration Communications Sub-Plan. The community will also have the opportunity to raise any issues or concerns through a 24-hour phone number.

Therefore, the Project is considered to respond to the EES Scoping Requirements relevant to the physical environment by:

- Identifying the potential adverse environmental effects in all key aspects using a risk-based approach
- Proposing a comprehensive environmental management approach including appropriate performance measures to avoid, otherwise minimise and mitigate adverse environmental impacts.