**Avonbank Mineral Sands Project**

**Environment Effects Statement**

**Chapter 26 – Summary and ConclusionGraphical user interface, website

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# Summary and Conclusions

## Introduction

This Chapter presents a summary and the conclusions of the Environment Effects Statement (EES) for the Avonbank Mineral Sands Project (the Project). It summarises the environmental assessments undertaken during the preparation of the EES and presents conclusions regarding the significance of the Project’s environmental effects.

This Chapter summarises the assessed environmental effects and the key avoidance and mitigation measures relevant to each of the EES evaluation objectives, as detailed in the Avonbank Scoping Requirements (DELWP, 2020). It also outlines the environmental management framework to be implemented and details key procedural matters regarding the EES process.

## The Project

### Overview

The Project comprises the mining of mineral sands and processing works to produce a Heavy Mineral Concentrate (HMC), road haulage of HMC to the Port of Portland (PoP), and the temporary storage of HMC at the PoP prior to loading and shipping overseas. The Project will produce approximately 12.75 million tonnes (Mt) of HMC over the operational life of mine.

The HMC product consists of zircon, titanium-rich mineral concentrate and minor amounts of rare earth products. Zircon is used in the production of ceramics and other applications such as catalytic fuel converters and in water and air purification. Titanium minerals (ilmenite, leucoxene and rutile) are principal components for pigment production used in products such as protective house/car paints, paper, plastics, ink, rubber, textiles, cosmetics, sunscreens, leather and ceramics. Rare earth minerals are critical components for various applications, in particular electric vehicles and wind turbines.

Mining and processing activities will operate 24 hours a day, 365 days per year. The life of the Project (construction, operation and rehabilitation/closure) is expected to be 36 years, with the operational period of the Project being 30 years.

### Rationale

The objective of the Project is to establish a world-class mining operation and concentration plant which will safely and efficiently produce a premium-quality mineral concentrate for export overseas.

The Project aims to be able to supply approximately 5% of the global demand for zircon, 2% to 3% of the global demand for titanium, and approximately 5% of the global demand for rare earth minerals over the next 30 years. In doing so, the Project is in line with the Commonwealth’s 2022 ‘Critical Minerals Strategy’ (DISR, 2022) to promote Australia’s capacity to meet the increasing global demand for critical minerals such as zircon.

Through its activities, the Project aims to create and sustain significant long-term employment and economic activity in Victoria and the Wimmera Southern Mallee (WSM), the region in which the Project is located. These economic benefits for the WSM region and Victoria would not be realised if the Project did not proceed and the Commonwealth’s Critical Minerals Strategy would not be supported.

### Project Activities

The Project’s development extent totals 3,546 ha. Mining and related activities will occur within the 3,426 ha proposed mining licence area to be secured within the granted retention licence 2014 (RL2014) and processing in an adjacent area, referred to as the WIM Base Area (WBA). Minor utilities, including power and water infrastructure, will extend to the WBA from the respective terminal stations. The utilities infrastructure corridor will be located within areas of road reserve and private properties.

The WBA is primarily located within the Special Use Zone established over the Wimmera Freight Intermodal Terminal (WIFT) Precinct for industrial purposes, including the processing, storage and handling of mineral sands.

The mine will be an open-cut (‘moving hole’) operation with primary processing to occur within the mine void and the screen/trommel located within the proposed mining licence. The total mining footprint will cover an area of 2,215 ha. This area will be progressively mined over the life of the Project. Mining will progress sequentially across four mining blocks (Block A through to Block D). At any given time, the extent of Project disturbance will be typically (on average) less than 300 ha, with a maximum disturbance of 400 ha, as areas are progressively mined and rehabilitated.

Secondary processing to separate and concentrate the HMC will occur at the Wet Concentrator Plant (WCP) within the WBA.

At the WBA, the HMC will then be loaded by front-end loader into B-double articulated vehicles (haulage trucks) and transported to the PoP via the Henty Highway (26 return trips per day). The HMC product will be unloaded from the haulage trucks into a bunker/storage shed at the PoP. It is expected that every 2 to 3 weeks, a ship will be loaded with HMC for transport overseas. The HMC will be transferred directly from the storage shed to the ship’s bulk hold using a closed circuit bulk loading system.

## Evaluation Objectives

The EES Scoping Requirements (DELWP 2020) detail the specific matters to be investigated and the evaluation objectives against which the Project will be assessed by the Victorian Minister for Planning.

The evaluation objectives for the Project identify the desired Project related outcomes in the context of key legislative and statutory policies as well as the principles and objectives of ecologically sustainable development and environmental protection. The evaluation objectives provide a framework for an integrated assessment of environmental effects and for evaluating the overall implications of the Project.

The evaluation objectives for the Project, as presented in the Scoping Requirements (DELWP 2020), are listed in Table 26‑1, and the EES conclusions relating to each objective are summarised in Section 26.3.1 to Section 26.3.6.

Table 26‑1: Evaluation objectives

| **Environmental Value** | **Evaluation Objective** |
| --- | --- |
| Resource development | Achieve the best use of available mineral sands resources in an economically and environmentally sustainable way. |
| Social, land use and infrastructure | Minimise adverse social, land use and infrastructure effects. |
| Amenity and environmental quality | Protect the health and wellbeing of the community, and minimise effects on air quality, noise, visual and social amenity. |
| Cultural heritage | Avoid or minimise adverse effects on Aboriginal and historical cultural heritage. |
| Biodiversity and habitats | Avoid, minimise or offset adverse effects of the project on biodiversity values including native vegetation, listed threatened species and communities and habitat for these species consistent with State and Commonwealth policies. |
| Catchment values | Minimise effects on water resources and on existing and potential future beneficial and licensed uses of surface water, groundwater and related catchment values over the short and long-term. |

### Resource Development

The resource development evaluation objective is to *achieve the best use of available mineral sands resources in an economically and environmentally sustainable way*. Resource development is considered in the EES through an assessment of Project alternatives, Project economics, soils and landforms, and land rehabilitation.

The Project involves mining of the ore hosted within the Parilla Sands Unit. The average depth to the top of the ore-bearing layer is approximately 12–16 m below ground level and the thickness of the ore is between 8–15 m.

The global mineral resource is estimated at 490 Mt of ore with a grade of 4% Total Heavy Mineral (THM). Following the completion of feasibility studies, a JORC 2012 compliant Reserve was defined, comprising 311.8 Mt of ore with a grade of 4.3% THM (Proven and Probable).

It is expected the ore body will yield approximately 1,430 t of HMC per day over the operational life of the Project.

The Project’s performance against the evaluation objective for resource development is summarised below.

#### Project alternatives

The Project design was developed and refined over the course of the EES preparation period, with consideration to feasibility studies, technical impact assessments and stakeholder feedback.

Project design alternatives were identified and considered through an assessment of operational constraints and opportunities, environmental impacts, risks or opportunities, stakeholder feedback and cost implications and limitations.

The alternatives selected were the most practical option that maximised opportunities for efficient resource recovery and minimised adverse impacts.

#### Economic impacts

The WSM is predominantly an agricultural region with a focus on broadacre cropping. Horsham is the largest urban centre in the WSM region and the main administrative centre for the Horsham Rural City (HRC), supporting residents and businesses across the region. Smaller settlements in the region include Dooen, Jung, Murtoa, Rupanyup and Minyip.

The average annual unemployment rate for the HRC was 3.8% in June 2020, lower than the WSM region (4.1%) and the Victorian average (5.4%). The highest employing industries included health care and social assistance, retail trade and construction. Between 2015 and 2019, large declines occurred, with the largest loss of business in agriculture (number of businesses declined by 9%).

Potential Project economic impacts are associated with beneficial changes to the State, regional and economic profile resulting from labour market demand and direct flow-on supply chain and consumption effects.

Over the 30-year Project operational life, the royalties for the State of Victoria will be approximately $180 million, there will be an increase in the Gross State Product (GSP) for Victoria of $5,772 million and a gross revenue output of $335 million per annum in the WSM. The total economic impact of the loss of agricultural production due to the Project is estimated to be a fall in regional gross revenue of $465,450 per annum (inclusive of direct, flow-on supply chain and consumption effects). In comparison to the estimated return for the WSM economy, the benefit associated with the Project far outweighs the indicative costs associated with the loss of agriculture production.

During operation, the Project is projected to result in the creation of 588 jobs across the WSM and 967 in Victoria (direct and indirect full-time equivalent).

The Project will create and sustain significant long-term employment and economic activity in the region and the State of Victoria.

#### Soils and landform impacts

The development extent lies within the Parilla Sand geological unit. There are two dominant soil types associated with the area: sodosols (soils with strong texture contrast between A and B horizons which are not strongly acid) and vertosols (clay soils with shrink-swell properties exhibiting strong cracking when dry).

The regolith materials below the A and B horizons that sit above the ore are commonly referred to as overburden. Within the development extent, this typically occurs from around 1 m through to around 14 m. There are two main types of overburden in the development extent: upper clayey overburden (derived from the Shepparton Formation) and lower non-mineralised (barren) fine sand or clayey sand (Loxton Parilla Sands). The mineralised parts of the Loxton Parilla Sands represent the ore body targeted by mining.

The Geera Clay lies beneath the Loxton Parilla Sands. The Geera Clay is considered a Potential Acid Sulfate Soil (PASS) risk. This lithological layer is below the ore body and will not be disturbed during mining.

There are no recorded priority Environment Protection Authority (EPA) contaminated sites recorded within the development extent. The closest sites are the Dooen Landfill, approximately 2 km to the west and the Country Fire Authority training site situated around 1 km south of the proposed mining licence.

With respect to land use, the majority of the development extent is utilised for intensive cropping. Vertosols are typically seen as one of the most productive soil types as their cracking or self-mulching nature reduces the limitations associated with clay topsoils, such as poor water infiltration or potential hard setting. The calculated yield potential for wheat and canola ranges between 0–2.0 t/ha (low rainfall or drought conditions) to 2.0–5.0 t/ha (above average rainfall year).

The potential impacts relating to Project activities are associated with the rehabilitated soil profile capability and productivity, landform stability, surface erosion, contaminated lands and PASS. Avoidance and mitigation measures were identified to reduce the residual impacts so far as reasonably practicable.

The overarching rehabilitation strategy is to recover as much of the effective rooting zone as practicable and to separate the upper soil horizons from the lower, more hostile units. Topsoil and subsoils will be stripped from operational areas and stockpiled separately (topsoil, upper subsoil and lower subsoil and excavated overburden).

The total depth of ore excavation will allow a minimum 1.5 m buffer above the Geera Clay, such that this PASS material will not be disturbed during mining. With this avoidance measure in place, the residual impact of exposing/oxidising PASS material was assessed to be negligible.

Coarse sand tailings and fine tailings resulting from processing will be co-disposed back to the mining pit cell, and the in-pit tailings will be left to consolidate. Rocky overburden and residual low-grade ore will be placed on top of the tailings, followed by overburden from the Shepparton Formation. This will be followed by the placement of subsoil in two separate cuts, which will be ameliorated with gypsum and ripped. Topsoil will then be placed and seeded with a broadacre agricultural crop.

Residual impacts associated with landform settlement and consolidation were assessed as minor and the soil erosion potential following rehabilitation was expected to be comparable with unmined areas.

Rehabilitation is considered complete when all rehabilitation objectives/criteria have been met and verified. The final landform will be commensurate with the surrounding areas and the pre-mining landscape. The backfill material balance is neutral and there will be no stockpiles or voids left upon completion of mining.

The impact assessment and associated studies noted there were expected to be minor changes to the chemical and physical properties of the rehabilitated soil profiles compared to unmined areas. The soil agricultural capability and productivity were however expected to be in line with surrounding non-mined areas. This was demonstrated in the Avonbank Demonstration Trial, which resulted in the successful rehabilitation of the mined area and a crop yield commensurate with surrounding areas.

A risk-based management protocol will be implemented to ensure the risk of spreading weeds or pathogens is as low as reasonably practicable. The residual impacts were assessed to be minor and manageable with standard farming practices in place.

Implementation of the Rehabilitation Operations Management Plan (ROMP) will ensure adequate planning operational controls and monitoring requirements are established to manage the residual impacts and risks associated with rehabilitation and soil management.

In summary, the residual impacts were assessed to be minor or negligible. The proposed Project is unlikely to result in significant environmental effects and it is anticipated associated impacts can be managed with avoidance and mitigation measures in place to achieve the EES resource development evaluation objective.

### Social, Land Use and Infrastructure

The social, land use and infrastructure evaluation objective is to *minimise adverse social, land use and infrastructure effects*. Social conditions, land use and infrastructure are considered in the EES through an assessment of social conditions, land use and planning, and traffic and transport.

The Project’s performance against the evaluation objective for social, land use and infrastructure is summarised below.

#### Social impacts

There are 25 separate landholdings located either partly or wholly within the proposed mining licence/WBA and several rural dwellings located in close proximity and in the nearby townships of Dooen and Jung. The Longerenong College is an educational property that is partially located within the proposed mining licence.

The development extent is located within the HRC. In 2016, the population of this local government area was approximately 16,462, representing 30.7% of the population of the WSM region. The population has grown at a rate of 0.3% per annum since 2009 and is projected to reach 17,334 people by 2031.

Business count data from the Australian Bureau of Statistics estimates 2,130 businesses operate in the HRC, with 29% in the agriculture industry, followed by construction (13%), rental and real estate services (10%). Between 2015 and 2019, large declines occurred in industries with a small number of businesses, such as public administration and safety. However, the largest loss of business occurred in agriculture, with the number of businesses declining by 9%, which may be indicative of farm consolidation, poor seasonal conditions, and the ageing workforce.

Project haulage traffic will use the Henty Highway to transport HMC product to the PoP via Horsham, Cavendish, Hamilton, Branxholme, and Heywood. The Henty Highway is a key arterial route through the WSM region, providing north-south connectivity and access to the PoP for the import and export of bulk commodities.

Potential Project related social impacts are associated with land use, access and amenity changes resulting from mining and ancillary activities. Avoidance and minimisation measures were identified to reduce the residual impacts resulting from Project activities so far as reasonably practicable.

Within the proposed development extent, Project disturbance will on average be less than 300 ha, with a maximum disturbance of 400 ha, as areas are progressively mined and rehabilitated. There will be a temporary change of land use from broadacre farming to mining and ancillary uses as areas are progressively mined and rehabilitated. Landholders will be compensated for this temporary change in land use through the negotiation of Land Access and Compensation Agreements (LACAs) where relevant.

A small number of dwellings situated either within the mining footprint or in close proximity will be displaced by mining over the course of the Project. It is anticipated that several of these properties will be purchased prior to mining and for those properties not acquired, loss to individual landholders will be compensated through the establishment of LACAs. This was assessed to be a moderate residual impact, as it was expected that several landholders would have strong emotional ties to their properties that financial compensation may not address fully.

For residents located in proximity to the proposed mining licence and WBA that are not directly impacted (displaced), the presence of the Project may be perceived to detract from the area’s rural residential amenity. While impact assessments undertaken for noise, air emissions and road traffic found there to be negligible to minor impacts to landholders within the immediate vicinity of the mine, current owners/occupiers may be less satisfied with their residential amenity as a result of the Project. The residual impacts due to the loss of actual or perceived amenity were assessed to be minor to moderate, depending on the sensitivity of the landholder and the extent to which they feel emotionally connected to the landscape.

There is some limited potential for a short-term effect on the local housing market, which may limit choice for market participants with reduced purchasing power. A workforce accommodation strategy will be implemented to minimise the impact and the effect would be short-lived, as new residents integrate into the local community, market conditions would re-balance. The residual impact was assessed to be a minor, relatively short-term effect.

The Project has the potential to increase the demand for community facilities and services in Horsham due to new residents or temporary workers residing in the area. Demand for children’s services and schools will be relatively small and is set against a trend of declining demand for services targeted at a younger demographic. This demand is considered to result in a minor positive residual impact, as it will aid the sustainability of these services in the context of a projected decline in demand.

It was projected that the uplift in demand for medical services would not be sufficient to fundamentally alter the current balance between supply and demand, and the residual impact was assessed to be negligible to minor.

The Project will create and sustain significant long-term employment with operations projected to support 588 jobs across the WSM and 967 in Victoria (direct and indirect full-time equivalent).

A Community Engagement Plan (CEP) will be maintained throughout the Project’s life such that stakeholder feedback can be received, considered and responded to. The CEP will include measures through which the Project can make a practical contribution to the local community, such as by the provision of scholarships or funding for community programs.

In summary, the minor to moderate adverse social impacts can be managed with avoidance and mitigation measures in place. The Project is expected to create and sustain significant long-term employment and economic activity in the WSM region.

#### Land use and planning impact

The development extent is located within the HRC municipality, within which the Horsham Planning Scheme (HPS) applies. The HPS provides a framework for decisions regarding the use and development of land and applies zones, overlays and provisions relevant to the implementation of the Municipal Planning Strategy.

The Municipal Planning Strategy states that the strategic direction for earth and energy resources is to ‘Encourage the use and development of land in areas of abundant mineral sand deposits for the earth and energy resources industry and associated activity’.

The predominant land use within the development extent is broadacre farming, intersected by public minor roads and the Wimmera Highway. The Stawell-Horsham railway passes through the proposed mining licence area. The minor utilities corridor for power and water passes through areas used predominantly for broadacre farming and some road reserves. The development extent is mainly zoned for Farming (FZ) and the WBA is primarily within a zone for industrial use, Special Use Zone (SUZ9).

Crown land tenure and managed public lands associated with the proposed mining licence include government road reserves, an unused road reserve, the Stawell-Horsham Railway and Crown land under a grazing licence. The WBA and ground disturbing works associated with the minor utilities intercept various government road reserves. There is no Crown land associated with the facilities at the PoP.

The potential impacts assessed for the Project activities were associated with changes to existing land use, agglomeration effects and inconsistency between the proposed Project and existing planning policies.

Avoidance and mitigation measures were identified to reduce the residual impacts so far as reasonably practicable. The key measures to be implemented during mining will include negotiation of LACAs with landholders, purchase of landholdings prior to works commencing and the rehabilitation of land to establish a post-mining landform, commensurate with the agreed end land use.

Mining activity will result in a change of land use within the mining licence from what is primarily broadacre cropping to mining and ancillary uses. This will be a temporary land use change that is expected to extend up to 4 years within any one section of the mining footprint.

The Project represents a net positive regional economic effect with gross regional revenue from the Project of over $330 million per annum, inclusive of flow-on supply chain and consumption expenditure. There are 25 landholdings (excluding Crown land tenure and managed public land) that will be directly affected by the Project. Some of these properties will be acquired over the course of the Project and some will be retained as third-party private landholdings. For those properties not acquired, loss to individual landholders will be compensated through LACAs.

The secondary processing facilities are primarily situated within a Special Use Zone which has been established for industrial purposes, including the processing, storage and handling of mineral sands. There will be no loss of existing land use within the WBA.

There is anticipated to be only a temporary loss of land use (less than 3 months) associated with the installation and development of the minor utilities. There will be no change to the land use associated with the establishment and use of facilities at the PoP.

Industrial or commercial developments may be attracted to the area as a result of the Project. It is expected that the potential agglomeration effects that may be caused by the Project can be managed through the existing Planning Policy Framework and Municipal Planning Strategy.

There are three other proposed mineral sands projects within the region (~50 km). The cumulative impact of agricultural land temporarily removed from agricultural production is relatively minor in a regional context.

In summary, the proposed Project is unlikely to result in significant environmental effects and it is anticipated that the associated impacts can be managed with avoidance and mitigation measures in place to achieve the social, land use and infrastructure evaluation objective.

#### Traffic and transport impacts

The Henty Highway and the Wimmera Highway are key arterial roads in the WSM that form part of the region’s high-productivity freight network.

The Henty Highway is a north‐south arterial road extending north from Portland to the Sunraysia Highway south of Lascelles. It links the regional towns of Portland, Hamilton, Horsham and Warracknabeal. The Wimmera Highway extends east from Henty Highway near the development extent, through to the Calder Highway at Marong, west of Bendigo.

Road haulage of HMC product will be by B-double articulated vehicles utilising the Henty Highway from the WBA to PoP. Department of Transport (DoT) data indicates existing traffic volumes on the rural sections of Henty Highway north of Portland are low (maximum of 4,000 vehicles per day) compared to the capacity of a two‐lane, two‐way arterial road (18,000 vehicles per day). Urban and duplicated segments of Henty Highway carry higher traffic volumes of up to 12,000 vehicles per day.

Around the PoP, heavy vehicles typically represent in the order of 25–35% of all traffic. This is commensurate with the use of the road as the principal access to the Port.

Local roads are used to access private properties in the area of the development extent. The Horsham Rural City Council (HRCC) report that, with the exception of Freight Terminal Road (not relied on by the Project), traffic volumes on these local roads are very low, with not more than 50 vehicle movements per day on any one road. The local road network provides multiple access points to the arterial road network (Henty Highway and Wimmera Highway).

The DoT accident data shows the greatest number of accidents typically occur within township areas, with an exception being the Henty Highway between Horsham and Cavendish. Within township areas, accidents generally involve more than one vehicle at intersections, whereas in rural areas, most are single vehicle accidents away from intersections. Heavy vehicles are under‐represented across recorded accidents on the roads assessed.

Traffic impacts have been assessed against the current road network infrastructure and considered likely traffic growth across the operating life of the Project. The key potential impacts assessed relate to increased traffic volume, adequacy of road infrastructure and road closure requirements.

A Traffic Management Plan (TMP) will be implemented to manage Project related traffic movement and mitigate specific short and long-term traffic impacts.

Project traffic will result in a minor increase in local road usage but will not impact levels of congestion or compromise safety. Green Travel Plans will be established to encourage sustainable travel and to minimise Project traffic.

Project traffic will result in no change to the Level of Service (LOS) across all arterial roads during construction and operation and will have no material impact on road users. During rehabilitation/closure, all roads will operate with a stable uncongested flow.

Project heavy vehicles will rely on arterial roads which are of a suitable standard (at least gazette B‐double) for the proposed vehicle types and as such, there are expected to be no material impacts that would compromise the function or safety of the roads. Arterial roads relied upon are declared main roads managed by DoT.

Roadworks to construct the Wimmera Highway/WBA intersection will result in lane closures and cause temporary delays for road users.

Mining operations will require temporary closure and diversion of existing local roads, resulting in longer travel distances (up to ~5 km) for road users.

The establishment of local road diversions will allow access to all properties and maintain continuity of the local road network. There will be progressive rehabilitation and reinstatement of relevant local roads, through road maintenance and management agreements with HRCC.

Cumulative traffic impacts caused by other proposed projects were assessed as being unlikely to result in a material change to the LOS.

In summary, the assessed residual impacts were all considered to be minor or negligible. The proposed Project activities were not considered to result in a significant environmental effect, and the associated impacts can be managed with avoidance and mitigation measures in place to achieve the social, land use and infrastructure evaluation objective.

### Amenity and Environmental Quality

The amenity and environmental quality evaluation objective is to *protect the health and wellbeing of the community and minimise effects on air quality, noise, visual and social amenity*. Amenity and environmental quality are considered in the EES through an assessment of landscape and visual amenity, human health, wastes and emissions, air quality, noise and vibration, matters of national environmental significance (MNES) MNES and radiation.

The Project’s performance against the evaluation objective for amenity and environmental quality is summarised below.

#### Landscape and visual amenity impacts

The majority of the development extent is occupied by broadacre cropping and some low-level vegetation. Native and planted trees are largely restricted to property boundaries and road reserves. A high-voltage transmission line (220 kV) bisects the development extent, north to south. The elevated hills and topographical features of the Grampians (Gariwerd) are visible approximately 25 km to the south.

The agricultural land is subject to regular visual change through seasonal cropping activities. Dwellings and supporting agricultural infrastructure are present, including large sheds, tarpaulin-lined grain bunkers, grain elevators, silos, windbreaks and hedgerows. Seasonal lighting associated with plant and equipment used for larger-scale cropping and harvesting is a feature in cropping areas.

From the Henty Highway, stockpile mounds associated with the Dooen Landfill are visible in the distance to the west of the development extent. The WIFT Precinct accommodates shipping containers stacked to a height of around 8 m from ground level. Grain handling and storage facilities comprise on-ground bunkers and approximately 30 m high silos.

Townships within the area include Jung to the east and Dooen to the south-west. Jung is set back from the Wimmera Highway and freight line. The town mainly consists of dwellings, vegetation in private allotments and roadsides, and community facilities, including a sports field and hall. Dooen is west of the development extent, straddling the Henty Highway. Public locations include the Dooen Hotel. Lighting in these townships is contributed to by street lighting, dwellings, road users and elevated structures.

The Murra Warra Wind Farm is located north of the Project. Key visual features of the wind farm include the wind turbines, transmission lines and substations. Existing wind turbines and high-voltage transmission lines are visible from the Project area and surrounds.

Visual amenity impacts were assessed at 12 public viewpoints (located on roadways, at Jung/Dooen townships and Longerenong College) and seven private viewpoints (residences). The potential impact at these viewpoints pertained to the WBA, mining activity, overburden stockpiles and lighting.

There will be a minor residual impact associated with visually prominent plant within the WBA at one public viewpoint on the Wimmera Highway near the WBA. The WBA will be primarily situated within the WIFT Precinct which is an area zoned for industrial land use and therefore will not appear incongruent with the surrounding area. A negligible to minor residual visual impact was expected at two public viewpoints on Wimmera Highway and the Henty Highway. The planting of vegetation will filter and screen views of the lower-level infrastructure within the WBA. The remaining nine public viewpoints and four private viewpoints will experience negligible to no residual visual impacts relating to the WBA.

The residual visual impact for the four private viewpoints (residences) considered within the viewshed of the mining Blocks was assessed to be negligible. The residual visual impacts identified relating to public viewpoints during mining are considered negligible, with the exception of minor residual impacts at two public viewpoints, due to the overburden stockpile established at the commencement of mining in Block B. One of these viewpoints is located on the Wimmera Highway, and the other is on the Henty Highway. To reduce visual impact, the overburden stockpile footprint will be minimised so far as reasonably practicable and will be set back from road edges. The ‘moving hole’ mining method and progressive rehabilitation of operational areas minimise the extent and duration of the residual impacts identified.

Project light sources will contribute to the night-time lighting environment. Where practical, lighting at the WBA will be diverted away from roads and farming areas. Project related light emissions were considered to have a minor to negligible impact on the residents in Jung and Dooen, given existing and other background lighting in the area, including the WIFT Precinct and township lighting. The visual impact to dwellings in farming areas was assessed to be minor to negligible.

Cumulative impacts were assessed considering other activities in proximity to the Project that may contribute to visual impacts, including the Dooen Landfill, Ladlow’s Quarry and the concrete recycling facility. Dooen Landfill is the only similar use that was identified as being visible or potentially noticeable from the assessed viewpoints, although it is not a prominent feature in views from the Henty Highway when travelling north, north-west of Henty Highway. The limited visibility of this activity and its relative distance to the Project (2 km west) was considered to result in a negligible cumulative visual impact.

In summary, the residual visual impacts from the assessed viewpoints were all considered minor to negligible. Overall, the proposed Project activity was assessed as unlikely to result in significant visual impacts, and it is anticipated the associated residual impacts can be managed with avoidance and mitigation measures in place to achieve the amenity and environmental quality evaluation objective.

#### Wastes and emissions impacts

The existing conditions for greenhouse gas emissions (GHG) provide a base case against which emissions from the Project can be compared. The *Climate Change Act 2017* drives the State to achieve net-zero emissions by 2050. Victoria’s total GHG emissions for 2019 was 91.3 Mt CO2-e, which represents a reduction of 25% from 2005 levels.

For the construction phase, the Project’s contribution is 0.075% of Victoria’s total, and for operations, the annual contribution is 0.205% of Victoria’s total. The Project’s proportional contribution to Australia’s total is an order of magnitude less.

An Energy Efficiency Program will be maintained over the life of the Project to minimise GHG emissions so far as reasonably practicable. The increased GHG emissions due to construction and operational activities, including energy consumption, was assessed to result in a minor residual impact.

The main waste streams resulting from Project activities will include sand tailings, excavated regolith including overburden, subsoil and topsoil, and waste hydrocarbons from vehicle and equipment maintenance, generation of sewage from ablutions, contaminated stormwater run-off and other general municipal waste.

The potential Project related waste and emissions impacts were assessed and consideration given to impacts associated with changes to groundwater quality from tailings placement, stormwater contamination, GHG emissions, hydrocarbon spills and the uncontrolled disturbance of existing contaminated sites.

A Waste Management Plan (WMP) will be maintained over the life of the Project to provide a management framework to avoid and minimise risks/impacts so far as reasonably practicable. The WMP will address aspects relating to Project related waste, emissions and associated potential impacts on sensitive receptors.

Process water will be recovered and reused to minimise discharge and process water storage, transfer areas and sumps will be designed with a capacity to contain a significant rainfall event of at least a 1% annual exceedance probability (AEP). There will be no discharge of contact water from operational areas.

The proposed tailings strategy (placement in the mine void) was assessed as resulting in a minor or negligible impact on groundwater quality, and no change was expected to the existing environmental values.

Potentially contaminated materials and sites will be assessed in accordance with the National Environment Protection Measures (NEPM) prior to mining. Hydrocarbons and other chemicals will be stored and managed in line with relevant guidelines and industry best practice. Residual impacts associated with the uncontrolled disturbance of contaminated sites, chemical spills and stormwater run-off were assessed to be minor or negligible.

The residual impacts were all assessed to be minor or negligible. Overall, the impact assessment concluded the proposed Project activities were unlikely to result in significant effects as a result of waste generation or emissions. It is anticipated that the associated impacts can be managed with avoidance and mitigation measures in place to achieve the amenity and environmental quality evaluation objective.

#### Air quality impact

On-site air quality monitoring was undertaken over a 12 month period to assess the existing conditions in the development extent area for particulate matter (PM), respirable crystalline silica (RCS) and heavy metal content.

With the exception of PM10 measurements, all results were within the applicable criteria. The criterion for PM10 (24-hour average) was exceeded on five occasions, with the results indicative of windblown dust, harvesting or sowing of seed for grain crops.

Potential air quality impacts for the Project, including PM, RCS, heavy metals and depositional dust were assessed for all phases of the Project. Avoidance and mitigation measures were identified during the impact assessment to reduce the residual impacts so far as reasonably practicable.

Topsoil stripping and placement will be avoided during extreme weather conditions to reduce Project related dust generation, gravel and low silt content material will be used for internal haulage routes. Air emissions will be avoided at PoP as the storage and loading of HMC will be via a closed system.

Mining cells are expected to be disturbed and a potential source of Project related dust for a period of 1.5 to 4 years from initial disturbance through to mining and rehabilitation. The progressive mining and rehabilitation strategy minimises the area of active mining and means the worst-case impacts at each sensitive receptor will be temporary.

In the WBA, the HMC will be stockpiled wet, and sprinklers will be established to maintain moisture content and minimise surface creep during extremely dry conditions.

An Air Quality Management Plan (AQMP) will be established to provide a framework for the management of residual impacts and risks. The AQMP will employ an adaptive management strategy to ensure avoidance and mitigation measures can be applied in response to forecast weather conditions, monitoring results and community complaints to minimise residual impacts so far as reasonably practicable.

It is expected that avoidance and mitigation measures to minimise the area disturbed over the life of the Project, in combination with an adaptive management strategy that includes dust suppression watering on roads and disturbed areas, will reduce residual impacts. A mechanism for community feedback or complaints will be established through the CEP.

Modelling demonstrated the residual impacts associated with all phases of the Project were below the Air Pollution Assessment Criteria (APAC) for all indicators except for the 24-hour average PM10 cumulative concentration, which was exceeded due to elevated background conditions on several days for each scenario during the 2018–2019 modelling period. The Project contribution in these instances was very low.

Air emissions from nearby projects (existing and proposed) are unlikely to materially add to those generated by the Project.

In summary, the residual impacts were all assessed to be minor or negligible. Overall, proposed Project activities are unlikely to result in significant air quality environmental impacts due to PM10, PM2.5, RCS and depositional dust affecting the general public (including residential dwellings commercial buildings, community venues and representative agricultural areas). The associated impacts can be managed with avoidance and mitigation measures in place to achieve the amenity and environmental quality evaluation objective.

#### Noise impact

Baseline noise monitoring indicated a quiet noise environment typical of rural areas with negligible human activity. In general, the lowest ambient and background noise levels were recorded during the night period and the highest levels during the day. Monitoring data did not suggest any significant influence due to increased agricultural activities or noise-enhancing conditions.

Results of monitoring in the area of the WIFT Precinct are considered representative of a quiet noise environment (especially at night).

Potential noise and vibration impacts relate to construction and site establishment, operational activities and Project road traffic.

Noise generated as a result of Project activities will be reduced through the optimisation of the equipment, fleet size and noise minimisation measures, such as the establishment of earth bunds/stockpiles to mitigate noise emissions and the use of noise abatement kits on equipment and vehicles. A Noise and Vibration Management Plan (NVMP) and a TMP will be implemented to provide a framework for the management of residual impacts and risks.

Noise emissions associated with construction and establishment activities are expected to be experienced at sensitive receptors intermittently during the first 2 years of Project establishment. With avoidance and mitigation measures in place, residual impacts were assessed to be minor.

Noise emissions associated with operational activities over the life of mine are expected to be below the assessment criteria at all sensitive receptors. With avoidance and mitigation measures in place, residual impacts were assessed to be negligible.

The HMC haulage route comprises arterial roads gazetted to cater for the types of traffic generated by the Project. As such, impacts on lower-order local roads will be avoided. Noise emissions associated with road traffic are likely to result in a perceptible noise level change at dwellings fronting the Henty Highway in Cavendish, however, the magnitude is below the selected assessment criteria.

The magnitude of noise emissions at Dooen exceeds the selected criteria prior to and after Project implementation, however, the resulting change was assessed as unlikely to be perceptible. The residual impact from road traffic was expected to be minor.

Based on the equipment and activities identified for the Project, potential sources of vibration are limited. Vibration impacts are expected to dissipate rapidly with distance from the source, such impacts are not expected beyond a distance of around 100 m. Given the limited vibration sources, combined with the greater than 100 m distance offset to the closest sensitive receptors, impacts were assessed to be negligible, if any at all, for all activities and phases of the Project.

Noise emissions from nearby projects (existing and proposed) are unlikely to materially add to those generated by the Project, such that it would generate additional material impacts to those described.

In summary, Project related noise has been minimised so far as reasonably practicable, and the residual impacts were assessed as minor or negligible. Overall, the proposed Project activities are unlikely to result in significant noise and vibration environmental effects, and the associated impacts can be managed with avoidance and mitigation measures in place to achieve the amenity and environmental quality evaluation objective.

#### Human health risk

The age of the population in Horsham, Cavendish and Dooen is higher than the Victorian average. For Dooen, this is driven by a larger percentage of the population in the 15–64 year age group compared to the Victorian average. For Cavendish and Horsham, there is a much higher percentage of people greater than 65 years of age, a cohort that is known to be more vulnerable to the effects of air pollution and noise.

By comparison, the population of Jung is younger than that of the other towns and the Victorian average. This is driven by a much larger percentage of children in the population. Children also fall into a vulnerable group to the effects of air pollution and noise.

The baseline health profile of people in the HRC, which includes the towns of Dooen and Jung, is better than the Victorian average. The rates of admissions for respiratory and cardiovascular disease and asthma are lower than those for Victoria as a whole.

The potential hazards to sensitive receptors associated with the Project were assessed and consideration was given to the potential hazards to human health associated with changes to air quality, noise, groundwater and surface water. The avoidance and minimisation measures identified in the assessment studies of air quality, noise and vibration, traffic and transport, soils and landform, groundwater and surface water are applicable to mitigating potential impacts on human health.

The Project contribution to air emissions were assessed to be low and the residual human health risk associated with the inhalation of PM10, PM2.5, RCS and metals were assessed to be negligible.

The predicted level of metals deposited on crops were well below maximum residue levels for the safe consumption of food and was assessed to pose a negligible risk. The human health risk assessment assumed that residential properties have rainwater tanks that may be used for drinking water, and accordingly, an assessment of metal deposition and potential impacts on water quality was undertaken. All metals were well below the relevant Australian Drinking Water Guidelines (ADWG) benchmarks and were assessed to pose a negligible risk.

Predicted existing daytime and night-time road traffic noise levels were determined to exceed the World Health Organisation (WHO) benchmarks at most receptors in both Cavendish and Dooen, prior to Project commencement. There was one additional receptor predicted to be affected above those already affected, due to the existing traffic noise and the associated residual risks were assessed to be minor.

There were some perceptible increases in noise from the Project during construction at some receptors, however, these were assessed to pose a negligible risk to human health. Based on the findings of the groundwater and surface water investigations, the residual risk to human health was considered to be negligible.

In summary, the residual risks are all considered to be minor to negligible. Overall, the proposed Project is unlikely to result in significant risks to human health and it is anticipated that the associated risk can be managed with avoidance and mitigation measures in place to achieve the amenity and environmental quality evaluation objective.

#### Radiation risk

Project operations will produce HMC from ore, which will contain Naturally Occurring Radioactive Materials (NORMs) with elevated concentrations of radioactive uranium and thorium. The radioactivity levels are expected to be approximately 1.02 Bq g-1 for the ore, 0.99 Bq g-1 for the material within the rougher spiral feed, and 9.5 Bq g-1 for the HMC. Based on these estimated activity concentrations, the ore and final product for the Project will be classified as prescribed radioactive material.

Radionuclide concentrations of the tailings material are expected to be less than the in situ ore, at concentrations of approximately 0.53 Bq g-1 (260 Bq kg-1 U-238 and 270 Bq kg-1 Th-232). Tailings being returned to the mine void will not be classified as radioactive waste based on its proposed radioactive content.

Ambient gamma radiation dose levels and background radionuclide concentrations in soils and surface water were characterised across the development extent. The ambient gamma radiation doses were found to be consistently averaging between 0.070 and 0.078 μGy h-1 and radionuclide activity concentrations within farming topsoils were comparable to concentrations found naturally in soils worldwide. Similarly, radionuclide activity concentrations within surface water bodies of Wimmera River and Yarriambiack Creek, were within Australian Drinking Water Guidelines.

The potential impacts associated with Project activities that were assessed relate to radiation dose levels resulting from mining activities, transportation and rehabilitation. Exposure pathways considered in the impact assessment included inhalation of dust, exposure to radon gas, consumption of food and drinking water, as well as exposure during the transportation of HMC. This was considered to be a highly conservative assessment of exposure pathways.

A Radiation Management Plan (RMP) will be implemented to provide a framework for the management of risks associated with radiation. The RMP requires Victorian Department of Health approval prior to the commencement of mining activities.

The effective radiation dose to members of the public was conservatively assessed at the most sensitive receptor location to be very low. The calculated maximum annual doses from the combination of multiple exposure pathways from the Project was 40 microsievert (µSv) for an adult and 71 µSv for a child. Both doses are substantially below the Victorian regulatory annual dose limit for a member of the public of 1,000 µSv, and the annual dose limit for an occupational worker of 20,000 μSv.

Based on the processes proposed for the Project, the potential for seepage of radionuclides from the rehabilitated site into the existing groundwater system or surface waters will be commensurate with the pre-mining conditions. The post-mining surface gamma radiation dose rates and radon emanation rates will be comparable to the current natural pre-mining conditions.

Sprinklers will be established as a contingency to maintain moisture content across the HMC stockpile and minimise surface creep outside the stockpile domain. The HMC haulage trucks will be fully contained and the storage and loading of HMC at the PoP will be via a closed system.

Predictions of radiation doses to non-human biota from resuspended particulates settling on soils were also substantially below the screening value of 10 micrograys per hour (µGy/h). The radiological risk on non-human biota is considered negligible. The potential impacts are unlikely to represent a significant impact on MNES.

A cumulative assessment considered other projects (current and proposed) in the local and regional areas. This concluded that none of the projects would result in a cumulative risk, either because they are too distant for the zones of impact to overlap or because emissions would not occur concurrently.

In summary, the residual impacts relating to radiation were assessed to be negligible. The proposed Project activities are unlikely to result in significant radiation doses to members of the public or non-human biota, and it is anticipated that the associated impacts can be managed with avoidance and mitigation measures in place to achieve the amenity and environmental quality evaluation objective.

### Cultural Heritage

The cultural heritage evaluation objective is to *avoid or minimise adverse effects on Aboriginal and historical cultural heritage*. Cultural heritage is considered in the EES through an assessment of historic heritage and Aboriginal cultural heritage.

The Project’s performance against the evaluation objective for cultural heritage is summarised below.

#### Historical heritage

No heritage sites are formally listed within the development extent. The nearest statutory listed site is the Dooen Hotel, located approximately 2.5 km to the south-west and the nearest non-statutory listing is the Dooen North Brighton School Plantation, located approximately 1 km north of the development extent. The historic heritage impact assessment identified 10 sites of heritage interest within the development extent area, primarily comprising sheds and former dwellings.

Exclusion zones will be established within the development extent to avoid direct impacts on five sites (sheds, a derelict dwelling, a relocated homestead and two former homestead sites).

A Heritage Management Plan (HMP) will be prepared prior to Project commencement to provide a management framework to avoid and minimise impacts on historic heritage so far as reasonably practicable. The HMP will include a Chance Finds Procedure to minimise the impacts associated with unexpected discoveries.

An occupied mid-20th century brick and tile dwelling within the mine footprint has no formal standing as a heritage asset, although it most likely holds social and familial value for the current owners. The residual heritage impact associated with removal of the dwelling was assessed to be negligible, should this occur.

A corrugated iron shed is likely to be removed due to activities associated with the utilities corridor. The shed has no formal standing as a heritage asset, and the residual heritage impact associated with its removal was assessed as negligible. There may however be an opportunity to relocate the shed pending further assessment and consultation with the landholder.

A modern concrete culvert associated with the Dooen Main Irrigation Channel may be partially removed due to activities associated with the minor utilities corridor. The impact assessment ascribes no particular historic value to this site and as such, was assessed to be a negligible residual impact.

Two sites (a former school ground and former farm) have been cleared of above-ground structures that are of potential archaeological interest. These sites warrant further investigation once access to the land is granted and prior to ground disturbing work. The excavation of these sites was assessed as a minor residual impact which offers a research opportunity that can be managed within the existing framework established in the *Heritage Act 2017*.

Given the mining involves no blasting and all sites are located more than 20 m from the mine pit crest, the potential impacts associated with vibration are highly unlikely. The residual impacts associated with ground movement and vibration are negligible.

In summary, the proposed Project activity was assessed as being unlikely to result in significant heritage effects and it is anticipated that the associated impacts can be managed with avoidance and mitigation measures in place to achieve the cultural heritage evaluation objective.

#### Aboriginal cultural heritage

The WSM region has been extensively modified since the 1840s. No previously registered Aboriginal Places are listed on the Victorian Aboriginal Heritage Register (accessed 20 June 2022) for the proposed activity area, nor are any referenced in literature for the area.

No evidence of Aboriginal artefacts were observed during the site walk-over assessment and the subsurface assessment undertaken by the Heritage Advisor. The Aboriginal community representatives involved in the assessment identified the proposed activity area as a place that Aboriginal people had occupied in the past, however, the Traditional Owners were unaware of any specific Aboriginal cultural heritage places within the area.

Overall, assessment works concluded that the proposed Project activities are unlikely to result in significant Aboriginal cultural heritage impacts. Landforms that may contain archaeological material were not identified during assessment works.

Contingency measures, including a Chance Finds Procedure, will be implemented through the CHMP during all phases of the Project. As such, any residual impacts can be managed to achieve the cultural heritage evaluation objective.

### Biodiversity and Habitats

The biodiversity and habitats evaluation objective is to *avoid, minimise or offset adverse effects of the project on biodiversity values including native vegetation, listed threatened species and communities and habitat for these species consistent with state and commonwealth policies*. Biodiversity and habitats are considered in the EES through an assessment of ecological communities, flora and fauna and MNES.

The Project’s performance against the evaluation objective for biodiversity and habitats is summarised below.

#### Ecological communities, flora and fauna

The development extent and immediate surrounds occur within the Wimmera Bioregion. A large portion of the area is private land used for broadacre cropping and as a result, is dominated by exotic species with limited remnant vegetation.

Immediately outside the east boundary of the retention licence, there are several natural watercourses, including the Wimmera River, Yarriambiack Creek and Two Mile Creek. The Darlot Swamp Wildlife Reserve is linked to the Yarriambiack Creek, Darlot Channel and Two Mile Creek. Dooen Swamp Bushland Reserve is periodically linked to the Wimmera River. Existing ecological values within the area include native vegetation (patches and scattered trees), threatened ecological communities (TECs), threatened flora and fauna species and protected flora species.

**Ecological communities**

Four TECs listed under the FFG Act are represented in the development extent, with Northern Plains Grassland Community having the largest coverage (21.18 ha). The remaining TECs (Semi-arid Northwest Plains Buloke Woodlands Community, Victorian Temperate Woodland Bird Community (VTWBC), and Red Gum Swamp Community No. 1) range in area from 0.02 ha to 5.01 ha.

Four TECs listed under the EPBC Act were identified as having the potential to occur within the area: Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains, Natural Grasslands of the Murray Valley Plains, Buloke Woodlands of the Riverina and Murray Darling Depression (Buloke Woodlands) and Mallee Bird Community of the Murray Darling Depression Bioregion.

The Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains were confirmed to be absent from the development extent. No surveyed remnants of Plains Grassland (an ecological vegetation class (EVC) associated with Natural Grasslands of the Murray Valley Plains) within the development extent satisfied the condition thresholds for the EPBC Act-listed community. The EVCs recorded within the study area did not correspond with the major vegetation groups described for the Mallee Bird Community of the Murray Darling Depression Bioregion.

The Bioregional Conservation Status for the Wimmera region identifies six endangered EVCs, comprising a total extent of 40.51 ha. Five of these endangered EVCs were identified within the development extent with a combined total area of 27.73 ha, these being: Plains Grassland, Plains Savannah, Black Box Lignum Woodland, Floodplain Riparian Woodland and Riverine Chenopod Woodland.

**Flora**

Three flora species listed as Critically Endangered under the *Flora and Fauna Guarantee Act 1988* (FFG Act) were identified within the development extent and immediate surrounds, these being Buloke (*Allocasuarina luehmannii*), Buloke Mistletoe (*Amyema linophylla* subsp. *orientalis*), and Weeping Myall (*Acacia pendula*). There are 153 recorded individuals of Buloke and 10 Buloke Mistletoe within the development extent, and 6 Weeping Myall within the development extent and its immediate surrounds.

No EPBC Act listed flora species have been recorded within the development extent and its immediate surrounds.

**Fauna**

Existing fauna habitat features comprise small patches of native vegetation, scattered trees and amenity plantings, and farm dams within private property. Large trees provide nesting, shelter and foraging habitat for microbats and log piles and fallen timber provide nesting, shelter, foraging and breeding habitat for reptiles. Large trees in patches and scattered Buloke trees at the north-western portion of the development extent are known to be used by nesting birds.

There is considered to be a moderate or higher likelihood of occurrence of 12 fauna species in the development extent that are listed under the EPBC Act and FFG Act, or under the EPBC Act or FFG Act only.

The VTWBC (FFG Act) relates to a group of 24 key bird species considered in decline that are primarily associated with dry woodland environments located to the north of the Great Dividing Range.

Three threatened fauna species listed under the EPBC Act were investigated including the Golden Sun Moth (*Synemon plana*), Striped Legless Lizard (*Delma impar*) and the Growling Grass Frog (*Litoria raniformis*). Targeted surveys were undertaken for the Golden Sun Moth and Striped Legless Lizard and were not recorded within the study area. It was noted there was no permanent habitat for the Growling Grass Frog and the likelihood of its occurrence within the development extent was assessed to be low.

The White-throated Needletail (*Hirundapus caudacutus)*, listed as vulnerable under the EPBC Act, was considered to have a high likelihood of occurrence within the development extent. This migratory species is considered likely to utilise the development extent as part of a wide-ranging foraging area while in Australia between summer and early autumn. The White-throated Needletail will be affected by the Project related removal of woodland habitat, grassland habitat and scattered trees. The White-throated Needletail may utilise Plains Savannah, Riverine Chenopod Woodland and Black Box Lignum Woodland for aerial foraging.

**Residual Impacts**

A Flora and Fauna Management Plan (FFMP) will provide a framework through which impacts on ecological communities, flora and fauna are avoided or minimised. Other relevant Project management plans include the Rehabilitation Plan, Surface Water Management Plan (SWMP) and Groundwater Management Plan (GWMP).

Project design refinements have avoided impacting 16.70 ha of native vegetation and habitat within the development extent. Through exclusion zones, the largest stands of Plains Savannah representing a total of 4.78 ha and 111 trees have been avoided. Plains Savannah is associated with the Buloke Woodlands TEC and the exclusion zone protects the largest examples of the ecological community in the development extent.

The removal of 11.80 ha of native vegetation and 59 trees within the development extent will be unavoidable. The total area of TECs to be removed under the EPBC Act is 0.23 ha (Buloke Woodlands). The total area of TECs to be removed under the FFG Act is 11.63 ha, comprising Northern Plains Grassland (10.71 ha), Buloke Woodlands (0.23 ha) and VTWBC (0.69 ha).

Vegetation offsets will total 2.650 General Habitat Units and 45 large trees. The offsets are required to compensate for the residual impacts on native vegetation, threatened species and habitat for threatened species. The offsets will be sourced from areas under the jurisdiction of the Wimmera Catchment Management Authority or the HRCC.

Periodic survey work will be undertaken over the Project life to identify previously unsurveyed flora and capture any changes in vegetation.

No residual impacts on groundwater dependent ecosystems (GDEs) are expected due to the groundwater flux or migration of process water. Other potential indirect impacts and contributions to threatening processes will be minimised through the FFMP.

The analysis of potential impacts on EPBC Act listed TECs and fauna species against established significant impact criteria indicated that potential impacts were unlikely to represent a significant impact to MNES. It is expected that the Project can be implemented in accordance with the principles of ecologically sustainable development outlined in the EPBC Act.

In summary, the flora and fauna impact assessment concluded that the proposed Project activity would result in limited residual impacts on flora and fauna that can be managed with avoidance and mitigation measures in place to achieve the biodiversity and habitats evaluation objective. The avoidance measures have reduced impacts to EPBC Act listed species so far as reasonably practicable.

### Catchment Values

The catchment values evaluation objective is to *minimise effects on water resources and on existing and potential future beneficial and licensed uses of surface water, groundwater and related catchment values over the short and long-term*. Catchment values are considered in the EES through an assessment of surface water and groundwater.

The Project’s performance against the evaluation objective for catchment values is summarised below.

#### Surface water

The Project is situated within the Wimmera River catchment, located in the southwestern part of the Murray-Darling Basin. The Wimmera River System is a large and geographically diverse system that experiences great variability in rainfall, which in turn influences hydraulic regimes for creeks, rivers and wetlands.

There are three designated waterways within the vicinity of the development extent: the Yarriambiack Creek, Two Mile Creek and the Wimmera River. Parts of Dooen Swamp are classified as a designated waterway, despite it being more appropriately defined as a wetland.

The sources of surface water inflow into Dooen Swamp are rainfall run-off and out of bank flows from the Wimmera River. Hydrologic modelling of the wetland concluded that the swamp would have been dry 93% of the time under the climatic conditions that have occurred over the past 110 years.

Riverine hydraulic and inundation modelling found that under current conditions, the largest river flood event modelled, a 1% AEP event, does not produce material external catchment overland flow into the development extent area and most local rainfall inundation is caused by overland flow with inundated areas, in general, flooded to a depth of around 0.15 m during the 1% AEP event.

An SWMP will be implemented to reduce the residual impacts resulting from Project activities on sensitive receptors so far as reasonably practicable. The SWMP will include a site drainage strategy and water optimisation measures.

As the proposed development extent is not impacted by riverine flooding up to a 1% AEP, the risk of flooding was assessed as negligible, and the proposed Project activities in the area will not result in changes to riverine flood behaviour.

Process water storage and transfer areas will be designed with a capacity to contain a significant rainfall event of at least a 1% AEP and as such, there will be no discharge of contact water from operational areas.

Local inundation modelling showed minor changes to ponding water levels up to around 0.3m which would mostly be isolated to the areas immediately surrounding the overburden stockpiles and mining pits. The mining footprint will reduce the local catchment area available to Dooen Swamp, however, the progressive rehabilitation of mined areas will minimise the disturbance area. The change to water availability was not expected to be material and the residual impacts were assessed as negligible.

The Project will retain and store all surface water on-site. The surface water assessment concluded there would be no residual water quality impacts to offsite areas or receiving waterways outside the operational areas.

Cumulative surface water impacts from the nearby WIFT Precinct were considered unlikely to materially add to those generated by the Project and there is no other material interaction with other projects in the area.

In summary, the residual impacts relating to surface water were all assessed to be minor or negligible. Overall, the proposed Project activities were assessed as being unlikely to result in significant surface water effects and it is anticipated that the associated impacts can be managed with avoidance and mitigation measures in place to achieve the catchment values evaluation objective.

#### Groundwater

The hydrogeology of the area encompassing the development extent was identified as comprising discrete hydrostratigraphic units, including (from youngest to oldest); Quaternary aquifer (absent within the mine footprint), Shepparton Formation aquifer, Loxton Parilla Sands, Bookpurnong Formation and Geera Clay aquitard and Renmark Group aquifer. The Renmark Group aquifer is underlain by a low hydraulic conductivity basement, forming an effective hydraulic base of the regional groundwater system.

The depth to groundwater across the study area ranged from around 5 m to 10 m in the south to more than 30 m in the north-west corner. Areas of shallow groundwater (less than 5 m) are associated with the Wimmera River, Dooen Swamp and along Two Mile Creek. Potential GDEs in the area include the Two Mile Creek, Wimmera River, Yarriambiak Creek, Darlot Swamp and Dooen Swamp.

Records indicate 42 private bores are located within approximately 5 km of the proposed mine area, two of which are listed as stock and domestic bores.

The potential impacts on sensitive receptors associated with the Project activities were assessed. Consideration was given to potential impacts associated with groundwater levels flux resulting from mining activities and changes to hydrochemistry resulting from tailings disposal, mining, chemicals spills and mobilisation of existing contaminated sites.

Implementation of management plans, including a GWMP and a PASS Management Plan, will avoid and/or mitigate impacts so far as reasonably practicable.

Tailings management will include the recovery and re-use of approximately 62% of process water from tailings using flocculants and decant sumps.

The proposed tailings strategy will result in low levels of groundwater drawdown and/or mounding at identified sensitive receptors (less than ~0.5 m). It is anticipated that the residual impacts to sensitive receptors, including GDEs and existing bores, will be negligible to minor, and there will be no change to the existing environmental values.

Monitoring and management of a groundwater bore network will be undertaken over the life of mine to adequately characterise the potential risks and impacts to groundwater resources.

Groundwater within the vicinity of the mine will become less saline due to the use of fresh pipeline water in the process and will slowly migrate (~200–300 m over 62 years) to the north-west. There is expected to be no change to the environmental values associated with GDEs and existing bore users associated with the migration of tailings water.

The PASS material (Geera Clay) below the base of ore will be avoided during mining activities through an excavation buffer zone of at least 1.5 m and residual impacts were assessed to be minor. No change to the environmental values associated with mining the ore body above the Geera Clay was expected.

A contaminated site investigation will be undertaken prior to mining in accordance with the NEPM and storage and management of chemicals will be in line with relevant guidelines and industry best practice. Residual impacts associated with the mobilisation of existing contaminated sites, chemical spills and changes to soil salinity were assessed to be negligible with the avoidance and mitigation measures in place.

In summary, the residual impacts were all assessed to be minor or negligible. Overall, the proposed Project activities are unlikely to result in significant groundwater effects and it is anticipated that the associated impacts can be managed with avoidance and mitigation measures in place to achieve the catchment values evaluation objective.

## Environmental Management

An overview of the environmental management framework for the Project is presented in Chapter 24 (Environmental Management) of the EES, reflecting the requirements set out in the AS/NZS ISO 14001:2016 Standard ‘Environmental management systems – Requirements with guidance for use’.

The environmental management system (EMS) will communicate how the Project will achieve its predicted environmental outcomes, meet statutory requirements and maintain stakeholder relations. The EMS covers all Project work areas including the operational mining area, processing plant, road transport and activities at the PoP.

The EMS will provide a consistent management approach across the Project and will be integrated with other relevant business elements. The EMS will document management plans which will incorporate the avoidance and mitigation measures/controls and monitoring commitments described in the EES. Project compliance with the EMS will be assessed through both internal and external audits.

The Project Management team will be responsible for the establishment of an environmental policy that is compatible with the strategic direction and context of the organisation. The environmental policy will include commitments to comply with regulatory requirements, avoid or minimise adverse environmental impacts, protect sites of cultural heritage, conserve resources and minimise waste, progressively rehabilitate disturbed areas, respond quickly and effectively to stakeholder concerns and communicate openly with employees, the community and regulators.

The organisation will maintain a set of environmental objectives that aim to fulfil the commitments in the environmental policy and performance standards will be developed and maintained to provide a measurable benchmark against which an associated environmental objective can be assessed. The performance standards will be specific, measurable, achievable, realistic and time-bound. Each performance standard will have an associated monitoring, inspection or auditing program.

A register of environmental aspects and risks will be maintained to identify the Project related activities, conditions and products that can interact with the environment.

The organisation will implement and maintain procedures and processes to prepare for and respond to potential emergency situations. The procedures and plans will aim to prevent or mitigate adverse environmental impacts from emergency situations. They will define training requirements and response actions appropriate to the magnitude of the emergency and the potential environmental impact, including a periodic testing regime for the planned response actions, where practicable. Periodic review of the procedures and processes will be undertaken, particularly after the occurrence of an emergency situation.

Given the 36-year life cycle of the Project, it is recognised that opportunities for continual improvement through innovation and technical advancement will be available. A process of continual improvement will be established to enhance environmental performance over the life of the Project. This will be primarily achieved through the successful implementation of the EMS.

## Next Steps

### EES Exhibition and Public Submissions

The Avonbank Mineral Sands Project EES will be on public exhibition for 30 business days. During this time, members of the public can view the EES and make written submissions regarding the EES.

The EES (executive summary, main report, appendices (A–Q) and attachments, including a draft Planning Scheme Amendment) can be viewed and downloaded from the Project website: www.avonbankproject.com.au.

Hard copies of the EES can be viewed at the Project office in Horsham, the Horsham Rural City Council office, Horsham Public Library and the State Library of Victoria. The addresses of these locations are as follows:

WIM Project Office Horsham Rural City Council  
81 Hamilton Street Civic Centre, 18 Roberts Avenue   
Horsham VIC 3400 Horsham VIC 3402

Horsham Public Library State Library of Victoria   
Mibus Centre, 28 McLachlan Street 328 Swanston Street  
Horsham VIC 3400 Melbourne VIC 3000

To obtain a hard copy of the EES Summary Report a request can be made via the Project website or a copy collected from the Project office located at 81 Hamilton Street, Horsham.

More information on how to make a submission, the submission process and public hearings can be found on the Engage Victoria website or by contacting Planning Panels Victoria by email on or on 136 186.

Online submissions are preferred and can be lodged via the Victorian Government’s engagement website: ‘[Engage Victoria](https://engage.vic.gov.au/)’. Hard copy submissions must be accompanied by a coversheet obtained from Planning Panels Victoria. To request a coversheet, please call DELWP Customer Service Centre on 136 186. Each written submission must have a separate cover sheet.

### EES Approval Process

Following the public exhibition/submission period of the EES, it is expected that the Minister for Planning will appoint an inquiry under the *Environment Effects Act 1978* to consider and report on the environmental effects of the Project. The Minister for Planning may also appoint an advisory committee under the *Planning and Environment Act 1987* to consider the draft Planning Scheme Amendment. The inquiry will consider the EES documentation and public submissions received and will provide a report to the Minister.

The Minister for Planning will consider relevant information relating to the Avonbank Mineral Sands Project, including the EES documents, public submissions, the proponent's response and the Inquiry report. The Minister for Planning will then provide an assessment on the Project’s environmental effects, usually within 25 days of the receipt of the Inquiry report. No decisions can be made on the Project until the Minister for Planning has provided their assessment on the EES.

The Minister’s assessment may conclude that the Project:

* Will have an acceptable level of environmental effects.
* Will not have an acceptable level of environmental effects.
* Would need major modifications and/or further investigations to establish that acceptable outcomes would be achieved.

The Minister for Planning's assessment will also be provided to the Commonwealth Minister for the Environment and Water. The Commonwealth Minister for the Environment and Water will then consider the final EES document and the Victorian Minister for Planning’s assessment report to make an informed decision on the Project under the EPBC Act.

A decision under the EPBC Act is anticipated to be made within 40 business days from the submission of final documentation to the Commonwealth Minister for the Environment and Water, although there may be some delay if additional information is requested regarding specific aspects of the Project. Based on the assessment report, the Commonwealth Minister for the Environment and Water formalises the decision, determining whether the Project will be approved, approved with conditions, or not approved. If it is concluded that the Project would have an acceptable level of environmental effects, all required statutory approvals must be sought prior to Project commencement.