AGRICULTURAL IMPACT ASSESSMENT

Goschen Rare Earths and Mineral Sands Project

Prepared for:

VHM Limited

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BASIS OF REPORT

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
640.30299.003 AIA	July 2023	Murray Fraser	Rod Masters	Murray Fraser

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1 Introduction

This technical report is an attachment to VHM Limited's Goschen Rare Earths and Mineral Sands Project (the Project) Environment Effects Statement (EES). It has been used to inform the EES required for the Project.

1.1 Requirement for an EES

The Project was referred to the Minister for Planning (the Minister) to seek advice on the need for an EES under the Environment Effects Act 1978 (Vic) (EE Act).

On 10 October 2018, the Minister for Planning decided that an EES was required on the basis that the Project has the potential for a range of significant environmental effects.

On 19 December 2018 under delegated authority from the Minister for the Environment, the Department of the Environment and Energy (now referred to as the Department of Climate Change, Energy, the Environment and Water (DCCEEW)) made a decision that the Project is a controlled action under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and would require assessment and a decision about whether approval should be given under the EPBC Act. The EES for the Project is an accredited assessment process under the EPBC Act through a Bilateral Assessment Agreement that exists between the Commonwealth and State of Victoria.

The EES allows stakeholders to understand the likely environmental impacts of the Project and how they are proposed to be managed. The Minister's assessment of the EES will also inform statutory decisions that need to be made on the Project.

The EES was developed in consultation with the community and stakeholders.

2 Project Description

2.1 Project Overview

The Project is a rare earth and mineral sands mine and processing facility, proposed to be operational for approximately 20 years. VHM has been developing the Project in the context of a rapidly growing global demand for rare earths. One of the world's largest, highest grade zircon, rutile and rare earth mineral deposits is in the Loddon Mallee region of Victoria in Australia, beneath the Project area. VHM intends to establish the Project to mine and process these deposits beneath the Project area to produce and market a range of products to national and international consumers.

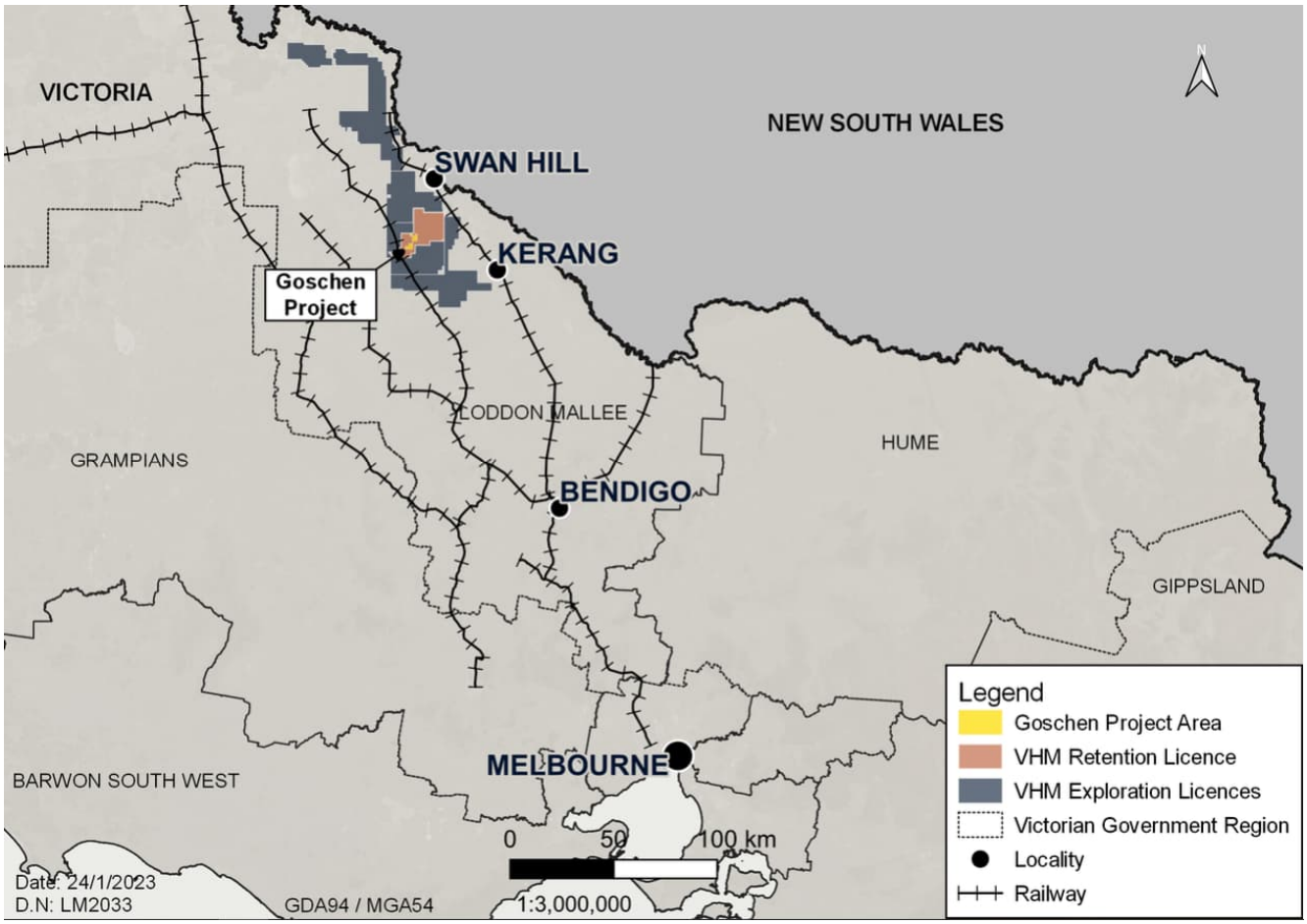
The mine footprint has been restricted to avoid intersection with groundwater and significant areas of remnant native vegetation. VHM will implement a staged development approach. Initially developing phase 1 consisting of a mining unit plant (MUP), wet concentrator plant (WCP), feed preparation plant (FPP) and a rare earth mineral concentrate (REMC) flotation plant. The product suite for Phase 1 consists of zircon. titania heavy mineral concentrate (HMC) and REMC products. Phase 1A would add a hydrometallurgical plant (HMP) downstream of the REMC flotation plant. The HMP would commence operations approximately 18 months post first production. The product suite for Phase 1A consists of mixed rare earth carbonate (MREC) products and zircon/ titania HMC.

Phase 2 will commence either at the same time as Phase 1 or some 24 months post-production depending on prevailing market circumstances and consist of an additional mineral separation plant (MSP), hot acid leach (HAL) and chrome removal circuit. The additional plant would allow for the production of premium zircon, zircon concentrate, high titanium (HiTi) rutile, HiTi leucoxene and low chromium ilmenite.

Mining will occur within two Project areas known as Area 1 and Area 3. Area 1 will be mined for eight to 10 years and Area 3 will be mined for a further 12 to 15 years once the mining of ore within Area 1 has ceased.

The Project is located approximately 4 hours' drive (275 kilometres; km) northwest of Melbourne and 30 minutes (35 km) south-southwest of Swan Hill within Gannawarra Shire (Figure 1).

Figure 1 Goschen Project Location

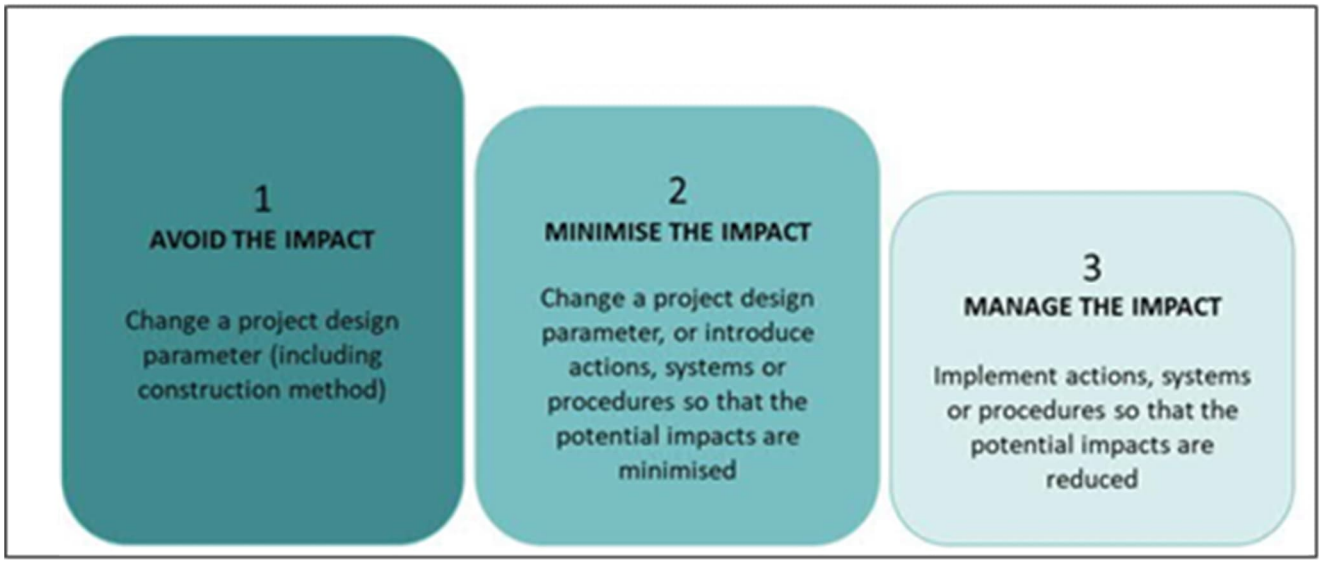


2.2 Project Development

It is recognised that there are opportunities to avoid and minimise environmental impacts during the many stages of Project development. During Project inception and early design development stages of the Project, decisions on the location of the Project, its design and construction techniques have enabled impacts to be significantly avoided and minimised in accordance with the hierarchy presented in Figure 2.

The Project specifically aims to minimise the long-term impacts on current land uses and landscape values of the site and surrounding areas, including the implications for agricultural productivity, through the reinstatement and amelioration of soil profiles suitable for the current winter cropping regime.

Figure 2 Mitigation Hierarchy



Avoidance or minimisation of social and environmental impacts is central to the Project's decision making and as such, the Project will continue to be refined in response to technical requirements and potential environmental and social impacts identified during the development phase. This was considered in the preparation of a project description which is found at Chapter 4: Project description.

Examples of this include the decision to create vegetation protection zones within the Project (mining area), restricting mining operations to daylight hours only to avoid noise related impacts to certain receptors, and restricting mining to depths above the water table to avoid impacts to the groundwater table.

After opportunities to avoid impact were incorporated into the Project, minimisation and rehabilitation measures were developed. These are described in the construction and operation impact assessment sections below.

2.3 Key Project Components

The Project site consists of a heavy mineral sand mining and processing operation that will produce several HMCs and a range of critical rare earth minerals across two defined mining areas known as Area 1 and Area 3 (Figure 3 and Figure 4).

2.3.1 Construction

Construction within Area 1 will include vegetation and topsoil stripping before establishment of hardstand areas, construction of the processing plant and MUP, and haul roads. Construction equipment will be as per typical industry usage, and may include cranes and mobile lifting plant, service vehicles, welding plant, lighting towers, assembly workshops, etc.

Construction of the pipeline will progress linearly and may include excavators, mobile lifting plant and flatbed truck delivery of pre-fabricated pipeline.

2.3.2 Operation

Conventional open pit mining equipment (truck and excavator) will be used for a strip-mining operation in Area 1 and Area 3. Mining will progress by blocks, each with a final floor footprint of approximately 500 m x 200 m. Topsoil and overburden will be stockpiled in waste dumps in the first instance. Ore will be transported by haul truck to the MUP where it will be turned into a slurry and piped to the processing plant. As the mining of the blocks continues, waste material (topsoil, overburden and tailings) from the initial mining voids will backfill the mined voids, reducing haulage and double handling. The stockpiled material on the surface will ultimately be rehandled to the final mine void. The land will then be rehabilitated to its original, or other approved, land use.

Figure 3 Project Area 1

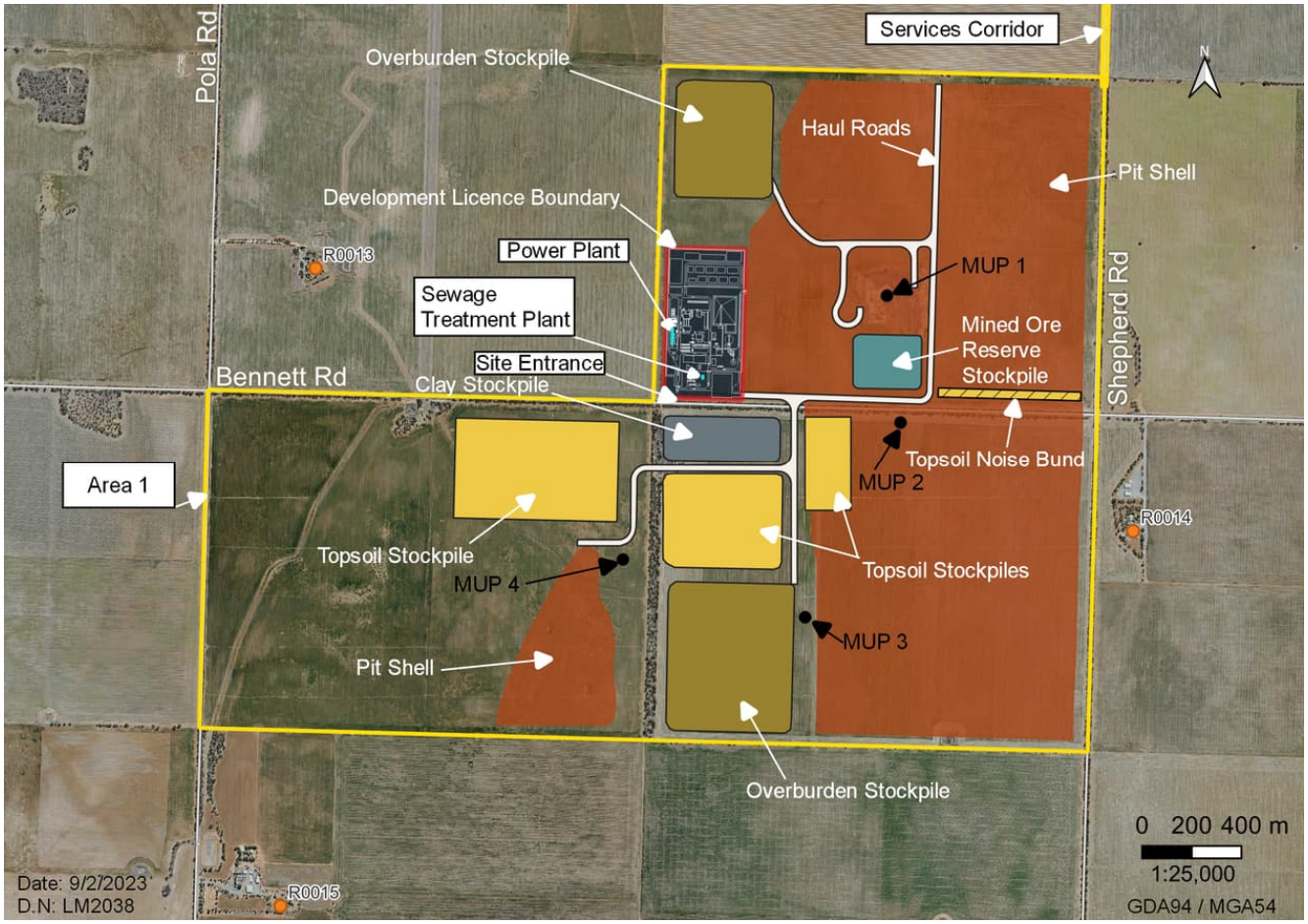
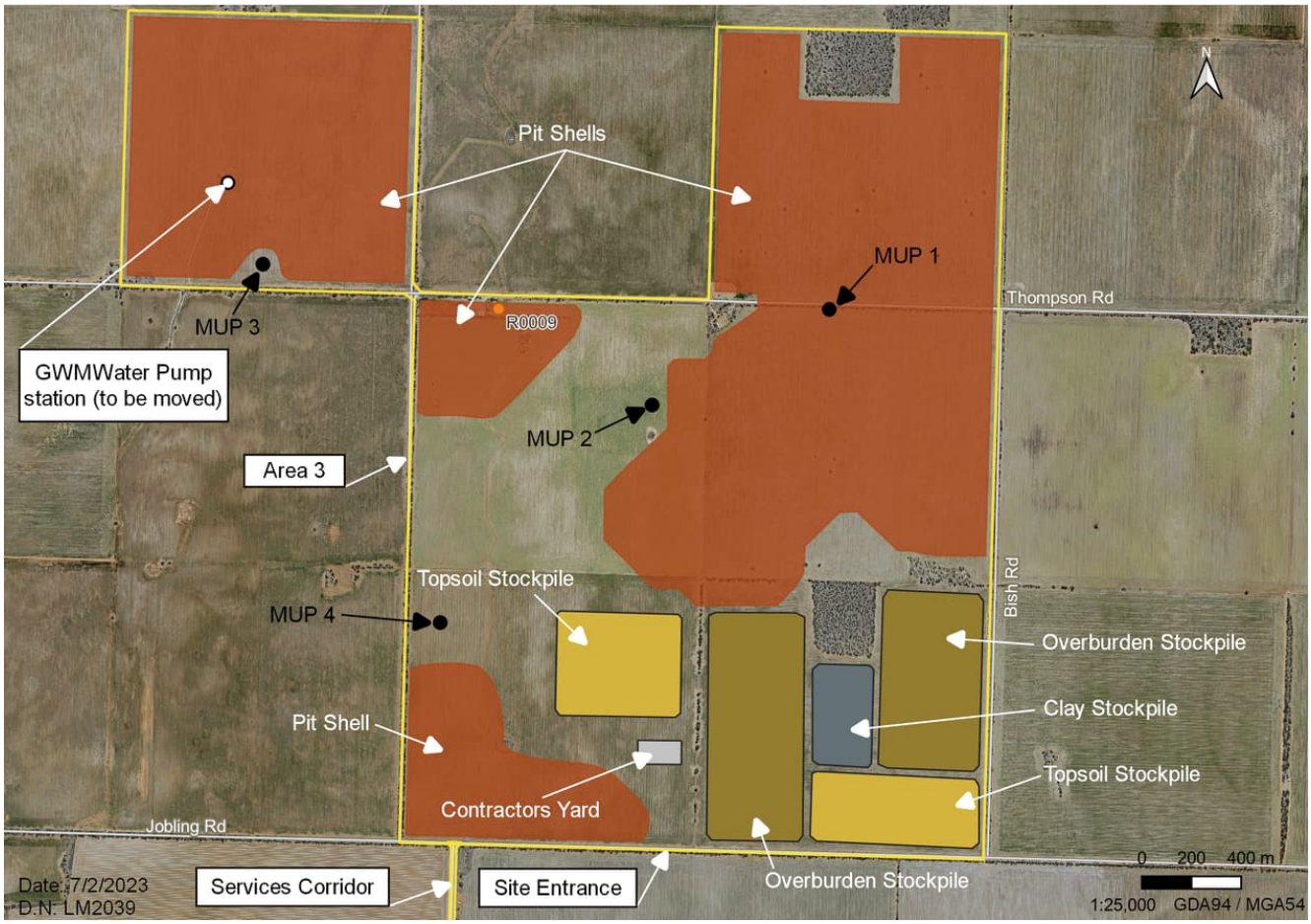


Figure 4 Project Area 3



The key components that make up the Project are described below.

Mining – Mining would operate 24hrs a day and would take 20 to 25 years at a throughput of 5 Mt per year and would occur above the groundwater table across approximately 1,479 hectares of farmland using conventional open cut mining methods of excavation, load and haul.

Processing – The processing would operate 24hrs a day with heavy mineral sands and rare earths ore separated via an on-site WCP and MSP to generate a rare earth mineral concentrate (REMC). Refining of the REMC on-site is limited to hydrometallurgical extraction to produce a mixed rare earth carbonate. Tailings from the various mineral processes would be homogenised and placed back into the ore zone earlier mined.

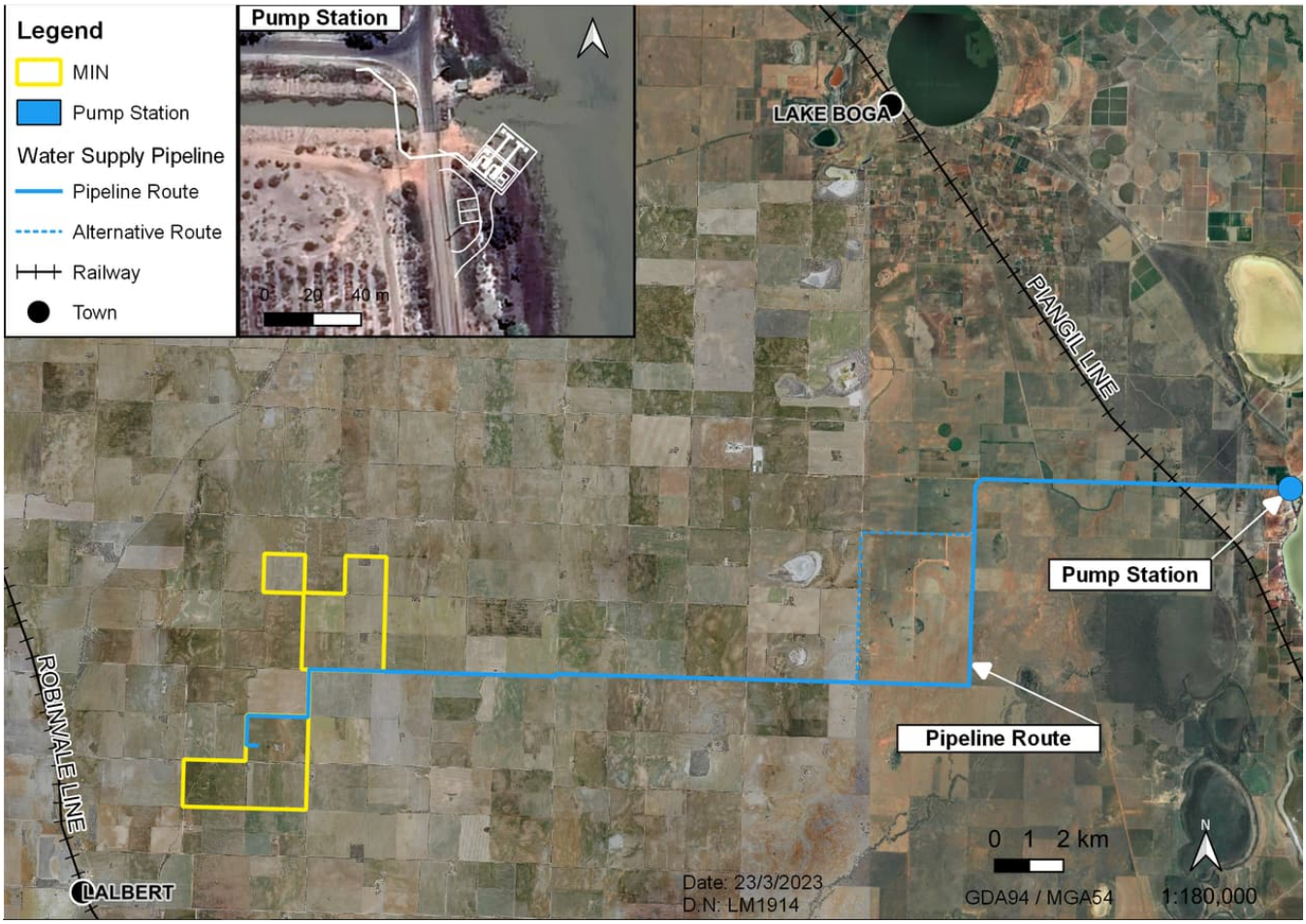
Rehabilitation – The mined areas (cells) would be progressively backfilled in a staged manner, with tailings dewatered in-pit to allow overburden and topsoil placement in a profile that reinstates the background soil structure. This would result in the ability for a return to the current agricultural land uses within three years.

Power – All electrical power needed for mining and processing would be produced from an on-site power plant able to be fuelled by diesel, LNG and/or LPG. A gradual evolution over the life of mine to renewables, hydrogen and/or battery will occur as technologies and commercial viability increase. Heat energy for the on-site gas fired appliances would be provided from an extension of the distribution network from the main LNG storage and regasification system.

Transport – Final products would be containerised in 20ft sealed sea containers on site and exported via road to an intermodal at Ultima and then rail to the Port of Melbourne.

Water – Water will be required for construction earthworks, processing, dust suppression and rehabilitation. Up to 4.5 GL a year will be needed for the Project. Water will be sourced from Goulburn Murray Water (GMW) from a new pumpstation at Kangaroo Lake via the open water market with no constraints put on existing or future agricultural availability. A 38 km underground pipeline is proposed beneath existing local road easements as shown in Figure 5.

Figure 5 Proposed Water Supply Pipeline Route



2.3.3 Closure & Rehabilitation

Closure/Rehabilitation would involve the dismantling and removal of above-ground infrastructure, with the following two aims.

- return the land to a condition that is as near as practicable to pre-existing environmental conditions
- decommission the infrastructure in a manner that minimises potential impacts to the environment, land use and third parties.

For the purposes of the EES, it is assumed that decommissioning would be undertaken in line with regulatory standards at time of decommissioning, involving the dismantling and removal of processing plant, equipment and ancillary facilities, including decommissioning of the water pipeline and removal of offtake pumping station unless it could be used by the local community.

3 Scope of Work

3.1 EES Evaluation Objectives and Scoping Requirements

The scoping requirements for the Goschen Rare Earths and Mineral Sands Project Environment Effects Statement ('scoping requirements') developed by the Minister for Planning, set out the specific environmental matters the Project must address in order to satisfy the Victorian assessment and approval requirements.

The scoping requirements include a set of evaluation objectives. These objectives identify the desired outcomes to be achieved in managing the potential impacts of constructing and operating the Project in accordance with the Ministerial guidelines for assessment of environmental effects under the EE Act.

The following evaluation objective is relevant to the Agricultural Impact Assessment and associated impacts on land stability and soil productivity:

- To minimise potential adverse social and land use effects, including on agriculture and transport infrastructure.

The aspects from the scoping requirements relevant to the Agricultural Impact Assessment are shown in Table 1 as well as the location where these items have been addressed in this report.

While not the primary evaluation objective, the objective '*to achieve the best use of available mineral sands resources, in an economic and environmentally sustainable way, including while maintaining viability of local industries*' is also considered to be relevant to this assessment considering its reference to maintaining viability of local industries.

Table 1 Scoping Requirements Relevant to Agricultural Impact

Aspect	Scoping Requirement	Section Addressed
Key Issues	Effects on the land uses and landscape values of the site and surrounding areas, including the implications for agricultural productivity	5.5, 5.6, 5.7 & 7
	Best use of land's resources considering environmental and agricultural values	5,6 & 7
	Potential impacts on the existing local industries, businesses and landholders	5, 6, 7.2 & 7.3
Existing environment	Describe local industries in the vicinity of the project which could be affected by the construction, operation, decommissioning and rehabilitation of the project	5, 6, 7.2 & 7.3
Environmental Management Framework	Environmental management measures proposed to address specific issues, including commitments to mitigate adverse effects and enhance environmental outcomes	7
	Potential acid sulphate soils (PASS) and risk associated with potential acid forming materials which may be disturbed or exposed by mining activities	5.3.1 & 5.3.3
Resource Development & Operation	Best use of lands resources considering environmental and agricultural values	5.7 & 7.2
	Describe the local industries in the vicinity of the project which could be affected by the construction, operation, decommissioning and rehabilitation of the project	5.2 & 5.5
	Likely effects and the temporary and permanent impacts on other industries	7.2 & 7.3
	Assess any effects of dust emissions on surrounding agricultural industry	7.9
	The potential for reduced access to farm land	7.6
	Potential for benefits and adverse effects on the existing and future land and beneficial uses, including agriculture	7
	Potential biosecurity effects associated with disturbance of land and movement of vehicles associated with the mine on agricultural operations within and in the vicinity of the mine	7.8
	Potential for benefits and adverse effects on socio-economics at local and regional scales	5.5, 5.6, 5.7, 5.8, 7.2 & 7.3
	The potential for changes to and interruption of the existing infrastructure in the project area and in its vicinity, including water supply infrastructure	7.4, 7.5 & 7.6
	Outline measures to minimise potential adverse effects to local businesses including agriculture	7.2 & 7.3

4 Evaluation Framework

The principal legislation governing the mining industry in Victoria is the Mineral Resources (Sustainable Development) Act 1990 (MRSDA) and the associated Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2019. The Minister for Resources (Victorian Government) and the Earth Resources Regulation (ERR) Branch of the Department of Jobs, Precincts and Regions (DJPR) are responsible for administering the MRSDA and Regulations.

The MRSDA establishes a legal framework aimed at ensuring that land which has been mined is rehabilitated. Before a proponent is granted consent to conduct mining activities it must submit a rehabilitation and closure plan (along with other required information, including – but not limited to – a work plan, a cultural heritage management plan, and a community engagement plan) to ERR for its review and approval. Section 79 of the MRSDA sets out the minimum requirements for rehabilitation and closure plans submitted to ERR.

The rehabilitation and closure plan must take into account:

- Any special characteristics of the land.
- The surrounding environment.
- The need to stabilise the land.
- The desirability or otherwise of returning agricultural land to a state that is as close as is reasonably possible to its state before the mining licence, prospecting licence or extractive industry work authority was granted.
- Any potential long term degradation of the environment.

In cases where mining activities are proposed on private land, the MRSDA requires that the mining proponent consult with affected private landholders as part of the development of the rehabilitation and closure plan.

The guideline applicable to this assessment is Managing Soil Disturbance, Publication 1894 (September 2020), Environment Protection Authority Victoria. This publication outlines how to eliminate or reduce the risk of harm from erosion, sediment and dust.

4.1 Methodology

This assessment has been undertaken through a review of available desktop information, field inspection of the Study Area and informal consultation with a selection of landholders during the original soil survey in 2019. The assessment provides a description of potential agricultural impacts at the regional (Gannawarra Shire) and local (Study Area) levels and proposed mitigation measures to reduce these identified impacts to as low as practicable.

4.1.1 Applicable Legislation, Policies and Strategies

Key Legislation, Policies and Strategies to be considered for the subject EES include:

- Environment Protection Act 2017
- Environment Effects Act 1978 (Vic)
- Environment and Protection Biodiversity Conservation Act 1999 (Cth)
- Environment Protection (Industrial Waste Resource) Regulations 2009

- Mineral Resources (Sustainable Development) Act 1990 (MRSD Act Vic) and associated regulations and guidelines
- Planning and Environment Act 1987 (P&E Act), and relevant provisions in the Gannawarra Planning Scheme.
- Water Act 1989
- Catchment and Land Protection Act 1994 (C&LP Act)
- Land Act 1958
- Radiation Act 2005 and relevant regulations
- Road Management Act 2004
- Conservation, Forests and Land Act 1987 (CF&L Act).

The above legislation, policies and strategies do not directly apply to this Agriculture Impact Assessment as agriculture is not a protected land use. However, landholders practicing agriculture have to adhere to the legislation, policies and strategies outlined above, apart from the Mineral Resources (Sustainable Development) Act 1990 (MRSD Act Vic) and associated regulations and guidelines, and the Radiation Act 2005.

4.1.2 Community and stakeholder consultation

Consultation and stakeholder engagement has been undertaken for the project with a broad range of community participants and stakeholders. Consultation is ongoing and has involved community information sessions at Lalbert, Kerang and Swan Hill on 27 and 28 July 2022, and 28 and 29 September 2022. Community information sessions were also held online on 15 November, 22 November and 30 November 2022.

With regard to agriculture, soils and land resources, community members raised concerns over the ability to successfully rehabilitate the land to restore productive agriculture. Community members also raised concerns about soil management and topsoil restoration, including legal obligations to rehabilitate the land for a return to agricultural use.

Both the Agricultural Impact Assessment and the Soil and Land Resource Impact Assessment prepared by SLR considers the matters raised by stakeholders and outlines the recommendations to return the land to its use for agriculture, including monitoring processes that will ensure the desired final land use is achieved.

5 Profile of Local Agriculture

5.1 Climate for Agriculture

Climate data was obtained from the Bureau of Meteorology Station at Lake Boga (Kunat), ID 77021, located approximately 10 kilometres north-east of the Study Area. Mean minimum and maximum temperatures range between 9.7°C to 23°C. Average annual rainfall from data collected between 1933 and 2022 is 327 millimetres (Table 2) and evaporation 1,620 millimetres. The area experiences a relatively dry climate where average monthly rates of rainfall are exceeded by evaporation in all months of the year.

The area is classed as a low rainfall cropping zone, being less than 350 millimetres per annum. The growing season rainfall for winter cropping in the area falls between April and October, with rainfall spread reasonably evenly across all months (GRDC, 2022).

Table 2 Annual Rainfall (1933 to 2022)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
23.9	21.0	20.4	21.4	31.3	26.9	33.8	33.2	31.0	34.9	27.8	20.7	327.3

5.2 Regional Land Use

Agriculture is the main employer and economic driver within the Gannawarra Shire (the Shire) with a direct value of around $284 million per annum, employing around 1,058 people directly in the agricultural industry (Gannawarra Shire Council, 2022). The Shire has a diverse agricultural economy comprised of dairy, cereal and legume cropping, livestock including beef, lamb and pork, viticulture and horticulture comprising walnuts, olives, tomatoes, apples, peaches and citrus along with small plantings of vegetables and herbs.

A variety of soil types combined with a suitable climate can support a range of enterprises across both irrigated and dryland properties. The Shire is split distinctively between the riverine plain to the east and the Mallee to the west. Soils in the Mallee are dominated by Calcarosols, Chromosols and Sodosols, which are suited to dryland winter cropping. Cropping comprises approximately 30% of agricultural land use in the Gannawarra Shire.

Irrigation plays an important role in agricultural production within the Shire. Water is supplied from the Murray River and Goulburn River systems via a network of automated channels and natural lakes and creeks. Lake Charm, Kangaroo Lake and the Gunbower Creek are natural assets that play a key role in the distribution of irrigation water from the Murray River.

Irrigation farms have undergone an efficiency transformation with laser grading and re use systems developed for flood irrigation farms. The implementation of subsurface irrigation, centre pivot irrigators, pipes and risers and automation has assisted in further efficiency gains for irrigation farmers.

Crops grown with irrigation include:

- Wheat, barley, canola, cotton, corn, peas, beans, sorghum, vetch and oats
- Tree crops including walnuts, olives, stonefruit, citrus and apples
- Tomatoes, onions, broccoli and pumpkin
- Wine grapes
- Hay including oaten, vetch, lucerne, clover and pasture

5.3 Study Area Land Use

The majority of the Study Area has been cleared of native vegetation, with only remnant areas left along road reserves and isolated patches within paddocks (Photo 1 & 2).

The predominant land use within and surrounding the Study Area is dryland winter cereal cropping, with wheat, barley, oats and canola the most commonly sown crops. Crops are sown using minimum or zero tillage techniques with an emphasis on minimal ground disturbance and stubble retention to protect the topsoil from wind and water erosion.

Grazing of sheep and cattle is undertaken opportunistically, however dryland winter cereal cropping is the predominant land use. There is no irrigation within or in the vicinity of the Study Area.

The Study Area represents 0.4% of the land area in the Gannawarra Shire (373,534 hectares).

5.3.1 Study Area Soil Types

The Project's Soil & Land Resource Assessment (SLR, 2022) identified one soil map unit (SMU), a Calcic Red-Brown Calcarosol, in the Study Area, having been mapped according to the dominant Australian Soil Classification (ASC) soil type (Table 3).

Table 3 ASC Soil Types within Study Area

SMU	ASC Soil Type	Soil Type Group	Hectares
1	Calcic Red Calcarosol	Dominant	1,479
	Calcic Brown Calcarosol		
	Eutrophic Red Chromosol	Sub-Dominant	
	Subnatric Brown Sodosol		

It is possible that the "original" soil type across the entire Study Area was a Calcarosol, with the actual physical textural characteristics of the topsoil (A horizon) having changed through loss of fine clay particles due to wind erosion, resulting from the rabbit plagues of the late 1880's and 150 years of cultivation in the Mallee region, with minimum and zero tillage methods only adopted in the early 1980's.

The characteristics of the three identified soil types are:

- Calcarosols are soils which are calcareous throughout the solum, or calcareous at least directly below the A1 horizon, or within a depth of 0.2 metres. Carbonate accumulations must be judged to be pedogenic. Calcarosols do not have a clear or abrupt texture contrast between the A and B horizons.
- Chromosols are soils with a strong texture contrast between the A and B horizons, where the B horizon is not strongly acidic or sodic.
- Sodosols are soils with a strong texture contrast between the A horizon and a sodic B horizon which is not strongly acidic.

Potential Acid Sulfate Soils

Given the soil types present (Calcarosols and Sodosols) in the Study Area do not have strongly acidic subsoils (pH is greater than 5.5), the potential for the presence of potential acid sulfate soils is negligible.

Photo 1 Area 1 Cropping Paddock

Photo 2 Area 3 Cropping Paddock

5.3.2 Topography

The topography within the Study Area ranges from approximately 75 to 125 metres AHD and is characterised by a north-south orientated ridge elevated around 100 to 125 metres AHD that transects the proposed pit areas.

5.3.3 Geology

The outcropping geology in the Study Area is comprised of a thin quaternary cover of sandy clay, and ranges in thickness from approximately 5 to 10 metres below ground surface. The quaternary material overlays the Loxton Parilla Sands, which hosts the target mineralisation zone. The Loxton Parilla Sands overlays the Geera Clay, which separates the Loxton Parilla Sands from the Renmark Group. (GeoScience Australia, 2022).

Drilling investigations undertaken by CDM Smith (2021) identified the Geera Clay to be prominent across the site with a thickness ranging from 32 to 46 metres. Field observations were typically consistent with VHM drillhole data, with depths ranging from 43 to 56 metres below ground level.

Acid Generation Potential

Sediments are slightly acidic after being subjected to oxidisation, this is due to very little carbonate material being present and only minor amounts of sulfide material. In addition the minor amount of acidity generated long term would be neutralised by alkalinity in the natural waters (VHM, 2021).

Sand tails have no detectable sulfide material or carbonate alkalinity and net acid generation is below the detection limit. Acid drainage is not considered to pose a significant risk (VHM, 2021).

In general the tailings have no risk of acid drainage.

5.3.4 Groundwater

Four regional hydrogeological units have been identified by CDM Smith (2022):

- Loxton Parilla Sands, which forms the main aquifer in the Study Area, with aquifer thickness ranging from 35 to 55 metres.
- Geera Clay, which acts as an aquitard in the region, separating the Loxton-Parilla Sands and the underlying Renmark Group aquifer, with aquitard thickness ranging from 32 to 46 metres.
- Renmark Group, consisting of the Olney Formation underlying the Geera Clay and the Warina Sand which forms an aquifer underlying the Olney Formation

There are no licenced or stock and domestic bores domestic within 10 kilometres of the Study Area. All monitoring bores have recorded EC of over 19,000 uS/cm (up to 44,100) and TDS of over 13,000 mg/L (up to 29,500) (CDM Smith, 2022), making the groundwater unsuitable for any agricultural or domestic use. Th Project will have no impact on groundwater resources relied upon by agriculture.

5.3.5 Surface Water

Surface water for stock and domestic use is supplied to the Study Area via the Northern Mallee Pipeline, managed by Grampians Wimmera Mallee Water (Water Technology, 2022), and is subsequently reticulated to storage tanks, dams and stock troughs for use on individual properties. The Project will not impact the landholders access to surface water for stock and domestic use.

5.4 Land Permanently Removed from Agriculture

At the conclusion of the Project, the land will be returned to its current agricultural use. Therefore, no land will be permanently removed.

5.5 Land Temporarily Removed from Agriculture

Over the proposed 20 year life of the Project, a total of 1,479 hectares will be unavailable for potential agricultural production. This area includes road reserves, easements and areas of agricultural infrastructure. For the purpose of this assessment the entire 1,479 hectares has been assumed as currently available for winter cereal cropping, which is the predominant land use within and surrounding the Study Area, and will remain unavailable for the life of the Project.

This approach was taken as a "worst case" scenario, even though only a portion of the Study Area will be disturbed at any one time, through the advancing mine pit and subsequent progressive rehabilitation following behind. For example, agricultural production will be available in Project Area 3 while Area 1 is being mined. The mine plan states there will never be more than 3 to 4 open mining cells at any one time during the life of the Project. Decommissioning of infrastructure and subsequent rehabilitation is scheduled to occur within 5 years of mining cessation.

Study Area and Value of Crop Production

Crop yield and crop values were sourced from the 2022 Farm Gross Margin and Enterprise Planning Guide (GRDC, 2022), with crop yields determined from the long term averages for the low rainfall cropping zone (less than 350 millimetres). Two scenarios for crop values are given, the 2022 GRDC price forecast (Table 4) and the most recent five year price average (Table 5).

Assuming the total cropping area is divided evenly between APW wheat, feed barley, canola (42% oil), red lentils and export oaten hay, as it would be in a "typical" cropping rotation for the area. The gross margin ranges between $164 (5 year average price) to $230 (2022 forecast price) per hectare, with a nominal variable cost of $422 per hectare (seed, fertiliser, chemical, freight, levies etc.). Giving a potential annual gross margin of $242,556 to $340,170 across the Study Area, with variable costs of $624,138 to sow, grow and harvest the crop. Fertiliser costs for all crops discussed comprises approximately 20% to 30% of the total variable costs.

Table 4 2022 Forecast Price Gross Margin

Crop	Grade	Yield	$ per tonne	Gross Income	Variable Costs	$ per Hectare
Wheat	APW	1.8	$350	$630	$300	$330
Barley	Feed	1.8	$260	$468	$361	$107
Canola	42% Oil	0.8	$750	$600	$495	$105
Lentils	Red	0.9	$700	$630	$357	$273
Oaten Hay	Export	3.2	$290	$928	$595	$333
Average per Hectare				$651	$422	$230

Table 5 5 Year Average Price Gross Margin

Crop	Grade	Yield	$ per tonne	Gross Income	Variable Costs	$ per Hectare
Wheat	APW	1.8	$330	$594	$300	$294
Barley	Feed	1.8	$271	$488	$361	$127
Canola	42% Oil	0.8	$622	$498	$495	$3
Lentils	Red	0.9	$650	$585	$357	$228
Oaten Hay	Export	3.2	$238	$762	$595	$167
Average per Hectare				$585	$422	$164

Given that the Study Area incorporates part of the Cannie Ridge, which is considered by local growers as one of the best cropping areas in the region, if the GRDC low rainfall cropping zone yields are increased by 25%, the average gross margin increases to $326 per hectare (5 year price average) with a total gross margin of $481,651 per annum (Table 6).

Table 6 25% Yield Increase

Crop	Grade	Yield	$ per tonne	Gross Income	Variable Costs	$ per Hectare
Wheat	APW	2.3	$330	$759	$300	$459
Barley	Feed	2.3	$271	$623	$361	$262
Canola	42% Oil	1.0	$622	$622	$495	$127
Lentils	Red	1.2	$650	$780	$357	$423
Oaten Hay	Export	4.0	$238	$952	$595	$357
Average per Hectare				$747	$422	$326

5.6 Project Employment

The Project is estimated to sustain an additional 478 full-time equivalent positions on average per annum over the evaluation period. This is relative to the current local labour force in the Loddon-Mallee region totalling 160,283 (Deloitte, 2022).

Study Area Employment

GRDC (2013) undertook a study to determine the number of full-time equivalent (FTE) labour units required to undertake activities on a typical 2,000 hectare southern region cropping farm. The Fair Work Act and Modern Pastoral Award define a full-time employee as working an average of 38 hours per week or 152 hours over a four-week period.

Table 7 shows a breakdown of activities required with the hours taken to complete the tasks allocated across the months when they occur. The total hours of work per month are assessed against the hours of an FTE labour unit. Peak labour demand occurs during sowing (April and May) and harvest (November and December). Given the Study Area is 1,479 hectares. Total FTEs to undertake cropping activities within the Study Area is an average of 1 per annum, and would not exceed 2.2 during the course of a calendar year.

Table 7 Cropping Activity Breakdown

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Management & planning	20	20	20	20	20	20	20	20	20	20	20	20
Spraying	70	-	70	50	50	35	35	35	35	-	-	-
Cultivation	-	-	-	30	-	-	-	-	-	-	-	-
Sowing/seeding	-	-	-	50	120	30	-	-	-	-	-	-
Crop inspections	5	5	5	5	5	10	10	10	10	10	10	5
Spreading/top dressing	-	-	-	-	-	-	60	60	-	-	-	-
Windrowing	-	-	-	-	-	-	-	-	-	50	-	-
Harvesting	-	-	-	-	-	-	-	-	-	-	100	150
Grain cartage &storage	-	-	10	10	10	-	-	-	-	-	100	150
Machinery maintenance	10	10	20	20	20	10	10	10	20	20	20	10
General farm maintenance	10	10	10	10	10	10	10	10	10	10	10	10
Purchasing supplies	10	10	10	10	10	10	10	10	10	10	10	10
Total hours per month	125	55	145	205	245	125	155	155	105	120	270	355
Number of FTE per month	0.8	0.3	0.9	1.2	1.5	0.8	0.9	0.9	0.6	0.7	1.6	2.2

The Pastoral Award for an adult farm and livestock hand ranges from $812.60 (grade FLH1) to $1,101.00 (grade FLH8) per week (Australian Government Fair Work Ombudsman, 2020).

5.7 Project Expenditure, Revenue and Benefits

The economy-wide modelling undertaken by Deloitte (2022) estimated the net impact of the additional investment in the local economy to develop and maintain the Project, and the resultant reallocation of labour and capital from other regions and sectors of the economy to the local area.

Estimates of the forecast capital and operating expenditure required to develop the Goschen mine and AREM facility have been provided by VHM and reflect the size and scale of the project at the detailed feasibility study stage. The total development capital expenditure is estimated at $626 million, while the on-going operational and sustaining capital expenditure is forecast to total $2.8 billion over the life of the Project (FY 2022 to FY 2044).

The Project is estimated to generate $2 billion in additional gross regional product for the Loddon-Mallee region which equates to an average impact to output of $206 million per annum, which is an average annual increase in economic activity for the Loddon-Mallee region of around 0.5%.

Due to the Projects size, relative to the local economy, development and operational activity is expected to draw labour and capital from other regions and sectors of the Victorian economy. These movements of labour and capital are termed ‘crowding-out effects’.

As a result of the movement of capital and labour to the region, the economic impact of the Project to the state of Victoria is expected to be lower than to the Study Area.

Across Victoria, the Project is estimated to deliver $1.3 billion in additional gross state product, which equates to an average output impact of $126 million per annum. The Project is estimated to sustain an additional 226 full time equivalent positions on average, per year in Victoria.

The Project is expected to create both positive and negative spillovers on the local economy. Positive economic spill-overs are generated across the broader economy, predominately in the service sector, which experiences an average uplift to economic output of $61 million per year. This is as a result of real incomes rising and leading to additional spending in service industries.

Negative spill-overs (i.e. crowding out) are expected to be most prominent in capital intensive industries that employ specialised labour such as heavy manufacturing, agriculture, and the mining industries. Overall however, while crowding out effects are expected, these are small in scale relative to the larger spillover benefits projected for other sectors as a result of the development of the Project.

Other benefits to the community and industry which may also be realised from the Project include planned upgrades to infrastructure such as roads, electricity connection, mobile phone coverage and water pipelines.

6 Preliminary Risk Assessment

A risk assessment has been adopted for the EES in accordance with the Department of Transport and Planning use of risk assessments advisory note. The purpose of the risk assessment is to identify and prioritise potential environmental effects so as to determine the level of effort applied to each aspect of the impact assessment. This risk assessment would also inform the risk register that ERR require as part of a Work Plan.

The identified risks and associated residual risk ratings are listed in Table 8. The likelihood and consequence ratings determined during the risk assessment process and the mitigation measures to be achieved are presented in Appendix A.

From agricultural perspective, the main risk for the Project is deficient rehabilitation of the disturbance areas to a condition which allows continued agricultural production, which could result in reduced production and economic loss if suitable mitigation measures, as outlined in Section 7, are not undertaken.

Table 8 Soil & Land Resource Risks

Risk ID	Potential threat and impact on the environment	Residual risk rating
1	Rehabilitation not satisfactory and agricultural production unable to be continued at conclusion of the Project	Low
2	Land temporarily removed from agricultural production and loss of agricultural revenue	High
3	A reduced employment pool being available for agricultural operations in the region during the life of the Project	Low
4	Restriction of the landholder to develop or sell the property during the life of the Project, with directly impacted land unable to be sold until it is fully rehabilitated	Low
5	Loss of existing agricultural infrastructure as a result of the Project.	Low
6	A restriction on access to farming areas for landholders resulting in decreased production	Low
7	Potential impacts to the local road network through road closures and increased vehicle movements during construction and operation of the Project	Low
8	Weed infestation during construction and operation resulting in the weed seed bank building up and being spread during rehabilitation activities	Low
9	Dust generated as a result of the project impacting agricultural production.	Low
10	Potential impact to agricultural resources and production during construction, operation and decommissioning of the water supply pipeline from Kangaroo Lake	Low

7 Construction, Operation & Closure Agricultural Impact Assessment

The following discusses the potential impacts of the project as a result of construction, operation and closure (including infrastructure decommissioning) of the Project and the associated mitigation measures to reduce impacts to as low a level as possible.

7.1 Final Land Use

Impacts

The proposed final land use of the Study Area is agriculture. The rehabilitation of disturbed land at conclusion of the Project is required to be undertaken satisfactorily to allow the resumption of agricultural production.

Mitigation

The Rehabilitation Strategy (Pitt & Sherry, 2022) and the Soil & Land Resource Assessment (SLR, 2022) proposes reinstatement of a soil profile to a depth of 1 metre, comprising 20 centimetres of topsoil and 80 centimetres of subsoil, which will provide the required rooting depth for growth of crops and pasture. Final landform will be designed to represent pre-disturbance gradients and flow paths. With all impacted soil profiles being greater than 1 metre in depth there is a substantial soil resource available for rehabilitation.

The post-mining landform is to be a gently undulating plain which is consistent with the existing landform. The goal is to restore final landform levels and local relief similar to current conditions, avoiding sharp relief between the existing and rehabilitated landscapes. As described by Pitt & Sherry (2022) key design criteria for the final landform are:

- Final levels are within +/- 0.5 m of existing levels when averaged across the mining blocks.
- Landform gradients will be typically less than 3% across agricultural areas and avoid sharp relief between rehabilitated landscapes and surrounding lands.
- Drainage will be predominantly as sheet flow mirroring present conditions.

This final landform is readily achievable and was comprehensively assessed in the Projects geotechnical assessment, including factors such as material balance, settleability of tailings and overburden, and provides a backfill sequence to achieve the desired final levels. Design of the mining methodology and sequencing of operations has been developed with a core focus on achieving a backfilled landform consistent with current conditions.

Topsoil and subsoil will be ameliorated as required during stripping and stockpiling activities to ensure pre-disturbance agricultural productivity is attained or improved. Gypsum will be spread prior to topsoil stripping to ensure thorough mixing prior to stockpiling (or respreading) to minimise the potential for dispersion. Topsoil will be tested prior to respreading to determine any further ameliorant requirements. Rehabilitation provides an opportunity to improve the agricultural productivity of the land through the addition of ameliorants and organic matter.

Wherever possible topsoil and subsoil will be respread directly onto active rehabilitation areas rather than stockpiling to minimise handling and possible structure decline.

Residual Impact

By implementing recommended mitigation measures, the residual impacts during the operation phase are expected to extend during the life of the mine but reduced in magnitude due to the mine plan working no more than 3 to 4 mining cells at any one time during the life of the Project. The residual impacts relating to the final landform will be confined in extent to only a portion of the total mining area. This is achieved through mining sequencing and progressive rehabilitation. Post operation, the final landform will be restored to pre-mining conditions.

7.2 Loss of Agricultural Revenue

Impacts

Land temporarily removed from agricultural production resulting in a loss of agricultural revenue within the local community.

Total potential revenue from growing winter cereal crops in the Study Area was calculated at $340,170 per annum (or $481,651 with a 25% assumed yield increase for the Cannie Ridge) with a variable cost of $624,138 to grow and harvest the crop. The potential revenue represents 0.12% of the $264 million agricultural production contributes to the Shire. A similar decrease in revenue earnt by local suppliers from cropping variable cost inputs would also be expected.

Given the Study Area has the potential to generate 0.12% of the agricultural production value within the Shire and comprises 0.4% of the total land area, impact of the Project to agricultural production within the Shire would be minimal. Whilst there is a potential loss of $624,138 in variable costs which would otherwise be spent with local rural suppliers, it should be noted that 20% to 30% of this value comprises fertiliser which is traditionally a low margin, high turnover product.

The loss of cropping area during the life of the Project will not impact upon the viability of winter cropping in the Shire, given the small area to be temporarily removed and its minor contribution to the overall revenue generated by agriculture.

This lost agricultural income is insignificant when compared to the projected revenue generated by the Project of $2 billion in additional gross regional product for the Loddon-Mallee region which equates to an average impact to output of $206 million per annum.

Mitigation

Whilst there will be a loss in farming generated revenue for local agricultural businesses such as rural suppliers, farm contractors, grain haulage etc. this will potentially be offset by increased service supply opportunities during construction, operation and closure of the Project. Operation of the Project is much more intensive and high input for rural commodities such as soil ameliorants, water infrastructure, fencing and product haulage when compared to a grain cropping operation. VHM proposes to engage with local suppliers during the life of the Project.

The Study Area will be returned to agricultural production at the completion of the Project, with progressive rehabilitation to be undertaken during the life of the project.

Residual Impact

While there will be loss of agricultural income for the duration of mining (approximately 20-25 years) , this loss is offset by the additional income streams and employment opportunities provided during the construction, operation and closure of the Project. The residual impact in terms of extent of loss of agricultural revenue must also be considered in the context of the mining sequencing. For example, in most of the mining area of Area 1 (excluding the processing plant area which will remain in situ during the mining of Area 3) the land would be rehabilitated and returned to agricultural use after the cessation of mining activities in that area. The residual impacts relating to the loss of agricultural revenue will be confined in extent to only a portion of the total mining area based on the sequencing of the mining operations – that is, the agricultural landholdings in Area 3 can continue whilst Area 1 is being mined, before the mining operations move to Area 3 following the completion of mining in Area 1.

7.3 Reduced Employment Pool

Impacts

A reduction in the locally available employment pool for seasonal agricultural operations and a reduction of available agricultural employment during the life of the Project.

Loss of FTEs required to undertake cropping operations within the Study Area would not exceed a maximum of 2.2 over a 12 month cropping cycle. Given that acquiring and maintaining quality, skilled farm labour is an increasing challenge, if these FTEs were sourced externally it would be reasonably expected alternate agricultural employment would be secured within the local area.

Over the evaluation period, the Project is estimated to sustain net employment gains of around 480 FTEs per annum. This estimate represents the average net number of jobs sustained each year as opposed to new, annual job creation. Peak employment is expected to be generated at the end of the evaluation period, with 640 additional FTEs per annum. This is relative to an estimated total workforce size in the Loddon-Mallee region of 160,283 (Deloitte, 2022)

Deloitte (2022) states that negative spill-overs (i.e. crowding out) are expected to be most prominent in capital intensive industries that employ specialised labour such as heavy manufacturing, agriculture, and the mining industries. This crowding out is observed in the agricultural sector within the Study Area of approximately $3 million per annum.

The services sector within the Study Area is estimated to experience positive spillovers worth $61 million in terms of an average annual net increase in sector output. This is followed by wholesale trade, and construction, which experience $19 million in additional average annual output, respectively. The dwellings sector experiences positive economic spillovers within the Study Area as well, with an estimated additional $18 million per annum in economic output relative to the base case.

In addition, if the Project creates more attractive employment opportunities which create a drain on agricultural employment that simply is the basis for a free market where individuals can choose what is best for them.

Mitigation

Whilst the potential loss of available employees for agriculture cannot be readily mitigated, the large increase in FTEs as a result of the Project will contribute significant economic benefit to the Shire.

Also, given that acquiring and maintaining quality, skilled farm labour is an increasing challenge, if the 2.2 FTEs that are accounted for within the Study Area were sourced externally it would be reasonably expected alternate agricultural employment could be secured within the local area.

Residual Impact

As a result of the project, 2.2 FTE's over a 12 month cropping cycle would be impacted during the life of the mining operations. While crowding out effects on the agricultural sector are expected, these are small in scale relative to the larger spillover benefits projected for other sectors as a result of the development of the Project.

7.4 Property Development

Impacts

Restriction of the landholder to develop or sell the property during the life of the Project, with directly impacted land unable to be sold until it is fully rehabilitated.

Mitigation

Consultation with landholders to determine whether lease, purchase or some other form of compensation is desired for areas directly impacted by the Project. All directly impacted landholders will be compensated in accordance with the Mineral Resources (Sustainable Development) Act 1990.

Residual Impact

Whilst compensation or other forms of agreements with the landholder will be achieved, restrictions of the landholder to develop or sell the property will be in place for the duration of the mining operations and until transfer of land back to agricultural use can occur..

7.5 Loss of Agricultural Infrastructure

Impacts

Loss of existing agricultural infrastructure as a result of the Project.

Mitigation

The agricultural infrastructure which may be impacted by the Project comprises of farm fences, gates, access roads, stock water points and storage facilities. A full inventory of these assets will be prepared by VHM in consultation with the impacted landholders. This will be considered in determining compensation amounts for each landholder, to ensure that full replacement or value of replacement is provided.

VHM will undertake consultation with impacted landholders to determine a compensation process and/or landholder lease agreements to ensure adequate compensation or replacement is determined.

Residual Impact

Whilst compensation or other forms of agreements with the landholder will be achieved, restrictions of the landholder to develop or sell the property will be in place for the duration of the mining operations and until transfer of land back to agricultural use can occur.

7.6 Property Access Restrictions

Impacts

A restriction on access to farming areas for landholders resulting in decreased production.

Mitigation

The proposed disturbance area for the Project is confined to 9 individual paddocks, within progressive pit development “up front” and rehabilitation occurring “behind” the extracted pit shell. As mining will be progressive, only a portion of the 1,429 hectare Study Area will be unavailable for agricultural production at any one time, with rehabilitation of mine pit areas proposed with 3 years of initial disturbance.

Access impacts to surrounding paddocks will be minimal as paddocks are laid out in a grid formation. Landholders will be consulted prior to, and during the development of each mining stage as to the requirement for alternative entry points and additional fencing, gates or grids to allow continued access to paddocks surrounding the Study Area.

Access impacts during construction of the water supply pipeline will also be minimal and will be managed through landholder consultation and measures outlined in a Traffic Management Plan, such as alternate access routes for temporary road closure and livestock/machinery entry points for paddocks.

Residual Impact

Whilst compensation or other forms of agreements with the landholder will be achieved, restrictions of the landholder to develop or sell the property will be in place for the duration of the mining operations and until transfer of land back to agricultural use can occur. Due to the sequencing of mining, the residual impact will mean that a portion of the 1,429 hectare will be unavailable for agricultural production at any one time, with rehabilitation of mine pit areas proposed with 3 years of initial disturbance.

7.7 Traffic Network

Impacts

Potential impacts to the local road network through road closures and increased vehicle movements during construction and operation of the Project.

Mitigation

AECOM (2022) states the road network within the Transport Assessment study area is comprised of declared and local roads. The major highway and arterial roads were observed within the study area to be relatively lightly trafficked and generally in good condition with adequate sealed road surface. Local roads in the vicinity of the project areas and the proposed water supply pipeline were found to be generally unsealed, narrower and with little to no traffic. Based on the predominant agricultural land use of the study area, traffic volumes would increase during harvest delivery.

Parts of Shepherd Road, Thompson Road and Bennett Road are expected to be closed for up to 12 years. Traffic controls and detour of local traffic which would be managed by the Traffic Management Plan with motorists expected to experience moderate delays. All road closures are anticipated to be managed as part of the Traffic Management Plan, including traffic detours and traffic management measures such as traffic controllers and signage. No delays to public transport services are expected to occur and local property access is expected to be maintained during the closures.

During development of the Traffic Management Plan consideration will be given to alternative access points and diversions during construction and operation, with scheduling taking into account livestock movement, vehicle and harvest machinery requirements.

Residual Impact

Access to agricultural land adjoining the Project will be impacted for up to 12 years while a combination of Shepherd Road, Thompson Road and Bennett Road are expected to be closed. Impacts to the transport network during construction and operation are expected to be managed through the Traffic Management Plan for the project. While the road network is found to be sufficient to accommodate anticipated traffic volumes, diversions of between 5-10 minutes may be required for existing agricultural landholders who require access to land via Shepherd Road, Thompson Road and Bennett Road.

Shepherd Road, Thompson Road and Bennett Road are expected to be fully reinstated upon completion of the Project. There are considerations for intersection and road section upgrades to ensure that safe vehicle movements can be facilitated, notably Donald-Swan Hill Road and Bennett Road priority intersection and Bennett Road, which would result in positive impacts for the local road network.

7.8 Weeds & Biosecurity

Impacts

The potential spread of agricultural weeds or pests during the life of the Project.

Mitigation

Continuation of weed control in areas that are yet to be mined if they are not under agricultural production to prevent seed set prior to topsoil stripping. Control of weeds biannually (both summer and winter weed species control) on stockpiles during autumn/winter and spring/summer, along with sowing suitable pasture species or cover crop to provide competition for weed species. Sow only grass species (monocotyledons) on stockpiles to allow use of selective herbicides for control of broadleaf weeds (dicotyledons). Continual weed control will prevent a build-up of weeds and reduce the weed seed bank in stockpiles prior to use in rehabilitation.

Disturbance areas, soil stockpiles and rehabilitation areas will be monitored for weed growth, with control measures undertaken as necessary.

The Invasive Plants and Animals Policy Framework is the Victorian Government's approach to the management of existing and potential invasive species, which will be incorporated into the Project's relevant Weed and Pest Management Plan.

Any import of equipment or machinery from interstate or overseas will follow the standard procurement safeguards and quarantine procedures as per Victorian and Australian requirements from the Biosecurity Act 2015. Once on site the vast majority of equipment to be used for the Project will site-dedicated and pose no biosecurity risk.

Residual Impact

Following the implementation of recommended mitigation measures impacts from the spread of weeds or pests are not expected for the duration of the project.

7.9 Dust

Impacts

Assess any effects of dust emissions on surrounding agricultural industry.

Dust or particles falling onto plants can physically smother the leaves affecting photosynthesis, respiration and transpiration. Literature suggests that the most sensitive species appear to be affected by dust deposition at levels above 1,000 mg/m²/day which is five times greater than the level at which most dust deposition may start to cause a perceptible nuisance to humans. Most species appear to be unaffected until dust deposition rates are at levels considerably higher than this. (Farmer, 1993).

Alternately in a grazing system, Connell Hatch (2008) concluded that cattle did not find feed unpalatable if coal mine dust was present at a level equivalent to a dust deposition rate of 4,000 mg/m²/day (which is a typical guideline used to protect against amenity impacts). At this level of dust cattle did not preferentially eat feed that did that did not contain coal mine dust and livestock production was not affected.

Mitigation

SLR (2022) found the Study Area and surrounds are already impacted by dust from agricultural activities, wind erosion during dry and windy conditions and long range transport of fine particulate matter from other regions. Elevated background concentrations of PM_{10} and $PM_{2.5}$ resulted in exceedances of the 24 hour criteria at all receptors before Project contribution is considered.

In accordance with the Air Guideline, dust deposition was not quantitatively assessed due to the great uncertainty in emission source estimations (SLR, 2022).

The mining schedule, which will generally include only 3-4 active blocks (each block being 6.25 hectares) at any one time will limit exposed areas subject to wind erosion, with surface consolidation, revegetation and rehabilitation occurring progressively throughout the Project life. With progressive rehabilitation being undertaken, the actual length of impact before being returned to agricultural production for any given area will generally by three to five years from initial disturbance.

Best practice dust emission mitigation measures will be employed for all aspects of the Project operations including use of water sprays, misting systems and water trucks. Wheel generated dust from haul roads has been identified as the primary potential source of dust emissions, therefore preparing and maintaining level and well finished haul road surfaces will be considered a priority.

Visual assessment of fugitive dust generation is recommended, especially that leaving the site boundary, and dust deposition on the vegetation surrounding the site, including use of remote close circuit television in areas where site activities are of regular concern with regard to dust emissions and impacts.

Residual Impact

The risk of impacts to health and the environment due to dust has been assessed as negligible to low with the application of the recommended dust management strategies. By implementing recommended mitigation measures, residual impacts are generally limited to within the Project area boundaries with little risk of dust deposition to impact surrounding vegetated areas and agricultural crops.

7.10 Water Pipeline

Impacts

Potential impact to agricultural resources and production during construction and decommissioning of the water supply pipeline from Kangaroo Lake, including reduction in available irrigation water for agricultural use.

Water licences will be purchased or leased for the required 4.5 gigalitres per annum, which represents less than1% of available surface water licenses in the Goulburn Murray Water system. Water not required during eachlicencing period could be made available for temporary transfer to other users. As only currently licenced surface water will be purchased or leased, no additional surface water which is currently available in the GoulburnMurray Water system will be removed as a result of the Project. No constraints will be placed on existing orfuture agricultural availability.

Mitigation

The underground water supply pipeline will be trenched (1 metre wide to a maximum depth of 1.5 metres), laid and backfilled with the proposed alignment traversing existing road easements wherever possible. The pipeline alignment has been designed to avoid direct impacts on surrounding agricultural land. The proposed pump station has been designed and sited on a section of the Kangaroo Lake bank that is characterised by agricultural infrastructure (AECOM, 2022).

VHM will have the option to utilise water sourced from the pipeline to aid in establishment of pasture and/or cover crops on soil stockpiles and rehabilitation areas.

VHM will consult with the responsible authority and other stakeholders as to the possibility of the pipeline remaining at completion of the Project, whereby surface water would be available for purchase by landholders along the pipeline route via Goulburn Murray Water.

The Traffic Management Plan will provide alternative access points during construction, with scheduling taking into consideration livestock movement, vehicle and harvest machinery requirements.

Residual Impact

Water will be sourced from Goulburn Murray Water via the open water market with no constraints put on existing or future agricultural availability. Full decommissioning of the water pipeline would occur unless otherwise agreed with the responsible authority.

There is potential for the beneficial use of irrigation water from Kangaroo Lake both during the life of the Project and also at completion, such as establishing cover crops on soil stockpiles, establishment of high value horticultural crops on rehabilitated areas, or for use in irrigated crop and fodder production.

8 Mitigation, Monitoring & Contingency Measures

A summary of mitigation measures for risks identified in Section 6 are shown in Table 9.

Table 9 Summary of Mitigation Measures

Mitigation ID	Mitigation Measure	Phase
MM-AG01	<u>Minimise potential adverse land rehabilitation effects:</u> • Reinstatement of a soil profile to a depth of 1 metre, comprising 20 centimetres of topsoil and 80 centimetres of subsoil. • Topsoil and subsoil will be ameliorated as required during stripping and stockpiling activities to ensure pre-disturbance agricultural productivity is attained or improved. • Wherever possible topsoil and subsoil will be respread directly onto active rehabilitation areas rather than stockpiling to minimise handling and possible structure decline.	Closure
MM-AG02	Minimise potential adverse land use effects: • Adjacent landholders must be consulted prior to, and during the development of each mining stage as to the requirement for alternative entry points and additional fencing, gates or grids. • Development of a Traffic Management Plan to allow continued access during temporary road closures and diversions.	All phases
MM-AG03	<u>Minimise potential adverse biosecurity effects:</u> • Weed control will be continued on areas which are not under current agricultural production. Disturbance areas, soil stockpiles and rehabilitation areas will be monitored for weed growth, with control measures undertaken as necessary. • Control of weeds must be undertaken biannually (both summer and winter weed species control) on stockpiles during autumn/winter and spring/summer. • Any import of equipment or machinery from interstate or overseas will follow the standard procurement safeguards and quarantine procedures as per Victorian and Australian requirements from the *Biosecurity Act 2015*.	All Phases

In addition to the above, visual monitoring of soil stockpiles and rehabilitation should be undertaken regularly, particularly after significant rainfall events. The following soil and stockpile characteristics forming part of the checklist:

- Integrity of sediment control.
- Effectiveness of drainage.
- Integrity of erosion and sediment control measures.
- Pasture or crop growth.
- Weed infestation.

With the mitigation measures to be adopted to minimise or negate the identified impacts there is no requirement for further contingency measures.

Should any of the above parameters not be satisfactory post inspection, the mitigation measures described in Section 8 are to be applied as appropriate. Sampling of topsoil stockpiles should occur prior to respreading with testing undertaken for agricultural nutrients to determine required amelioration when seeding is undertaken.

9 Conclusion

The purpose of this report is to assess the potential agricultural impacts associated with the Project to inform the preparation of the EES required for the Project. A summary of the key assets, values or uses potentially affected by the project, and an associated assessment of agricultural resource impacts and recommended mitigation measures, are summarised below.

Existing Environment

The existing environment comprises ASC soil type Calcic Red-Brown Calcarosol which is predominantly used by the landholders for winter cereal cropping. Soil depth exceeds 1 metre, with root growth from winter cereal crops having been observed at the base of sampling. Soils have good structure and could be classed as being in good condition for the current agricultural activities.

Agriculture is an important source of revenue and employment in the local region, contributing some $264 million per annum to the Gannawarra Shire.

Impact Assessment Findings

The Project will result in maximum reduced revenue from agricultural activities during the life of the Project, calculated at a potential maximum of $340,170 per annum across the entire Study Area using GRDC average yields for the low rainfall zone. If these yields are increased by 25%, considering the Study Area is located on the Cannie Ridge, this potential gross margin rises to $481,651 per annum.

The Project will also result in reduced revenue to agricultural support industries calculated at maximum of $624,138 as there will be reduced cropping inputs while the Project is undertaken.

The current good condition of the soil provides the proponent with an ample resource for rehabilitation activities during and post mining. With the implementation of the mitigation measures recommended throughout this assessment, potential adverse impacts on agricultural resources will be minimised.

Mitigation & Contingency Measures

Whilst there will be a definite reduction in agricultural revenues at a regional level as a result of the Project, this is more than offset by the predicted $2 billion of gross regional product for the Loddon-Mallee region over the life of the Project.

Other benefits to the community and industry which may also be realised from the Project include planned upgrades to infrastructure such as roads, electricity connection, and water pipelines.

There is considerable opportunity for advancement of agricultural production through the use surface water delivered from Kangaroo Lake via the pipeline, through purchase of surface water licences and the establishment of high value horticultural crops and/or irrigated crop and fodder production, including summer cropping.

The mitigation and contingency measures for progressive rehabilitation comprise stripping, stockpiling and maintenance of available topsoil and subsoil resources, application of gypsum to prevent erosion of dispersive subsoils and monitoring of stockpiles for weed infestation and erosion.

10 References

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Water Technology (2022) Goschen Rare Earths & Mineral Sands Project Surface Water Assessment

VHM (2021) Tailings Geochemical Characterisation

APPENDIX A

Risk Register

Risk ID	Risk pathway	Causes / Background	Initial risk level			Final mitigation	Residual risk level		
			Likelihood	Consequence	Risk		Likelihood	Consequence	Risk
1	Final land use	Rehabilitation not satisfactory and agricultural production unable to be continued at conclusion of the Project	Unlikely	Critical	High	Follow methodologies presented in the Project's Rehabilitation Strategy and Soil & Land Assessment	Unlikely	Minor	Low
2	Land temporarily removed from agricultural production and loss of revenue	Time between the pre-mining process and prior to final rehabilitation.	Almost certain	Moderate	Very High	Scheduling and operation to minimise disturbance. Progressive rehabilitation to reduce the time that disturbed areas are unavailable for agricultural production. Agreed compensation package with impacted landholders	Almost certain	Minor	High
3	Reduced employment pool for agricultural operations	More attractive wages generated by development of the Project	Almost certain	Moderate	Very High	While crowding out effects on the agricultural sector are expected, these are small in scale relative to the larger spillover benefits projected for other sectors	Possible	Minor	Medium
4	Restriction on property sale and/or development	If property is leased inability to sell prior to rehabilitation being completed	Possible	Major	High	Agreed compensation package with impacted landholders	Possible	Minor	Medium
5	Loss of agricultural infrastructure	Farm infrastructure being removed when within the development footprint	Almost certain	Moderate	Very High	Agreed compensation package with impacted landholders	Possible	Minor	Medium
6	Access restrictions or property severance	Development footprint enveloping	Almost certain	Moderate	Very High	Consultation with landholders for additional gates or grids to allow continued access to paddocks	Possible	Minor	Medium

Risk ID	Risk pathway	Causes / Background	Initial risk level			Final mitigation	Residual risk level		
			Likelihood	Consequence	Risk		Likelihood	Consequence	Risk
		traditional farming accesses							
7	Traffic network impact	Road closures and increased vehicle movements	Almost certain	Moderate	Very High	Upgrade of intersections and reinstatement of closed roads, taking into consideration accessibility during harvest	Possible	Minor	Medium
8	Weed infestation and biosecurity risks	Introduction of new weeds, pests or disease during the life of the Project	Possible	Moderate	Medium	Incorporation of a Weed & Pest Management Plan	Unlikely	Minor	Low
9	Dust impacts during construction and operation	Impact of dust on agricultural production	Unlikely	Moderate	Medium	Use of best practice dust emission mitigation measures and progressive rehabilitation	Rare	Minor	Low
10	Water pipeline construction & decommissioning	Impact on agricultural land	Unlikely	Moderate	Medium	Avoidance of construction on agricultural land with continued accessibility for livestock, vehicles and machinery	Rare	Minor	Low

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