

PART 1 PROPONENT DETAILS, PROJECT DESCRIPTION & LOCATION

1. Information on proponent and person making Referral

Authorised person for proponent	Marcus Little
Position	Principal Environmental Specialist & Radiation Safety Officer, Murray Basin
Postal address	Iluka Resources Limited (Iluka) Locked Bag 1001 Hamilton Vic 3300
Email address	Marcus.Little@iluka.com
Phone number	+61 3 5551 2360
Facsimile number	+ 61 3 5551 2417
Person who prepared referral	Philip Towler
Position	Associate Director
Organisation	EMM Consulting Pty Limited
Postal address	20 Chandos Street St Leonards NSW 2065
Email address	ptowler@emmconsulting.com.au
Phone number	+61 2 9493 9500
Facsimile number	NA
Available industry and environmental expertise	<p>Iluka Resources Limited (proponent)</p> <p>Iluka is an Australian-owned, international mineral sands company with expertise in exploration, development, mining, processing, marketing and rehabilitation. The company has over 60 years' experience in the mineral sands industry.</p> <p>Iluka's portfolio includes operations in Australia and Sierra Leone; projects in Australia, Sierra Leone and Sri Lanka; and a globally integrated marketing and distribution network.</p> <p>Iluka has invested over \$1 billion in Victoria since 2005.</p> <p>Consultants</p> <ul style="list-style-type: none">• Environmental approvals: EMM Consulting;• Heritage: GHD;• Biodiversity: Cardno;• Noise and vibration: GHD;• Meteorology: GHD;• Groundwater: Jacobs;• Surface water: Water Technology;• Radiation: Safe Radiation; and• Soil: Meridian Agriculture.

2. Project – brief outline

2.1 Project title

Wimmera Project.

2.2 Project location

The Project site is located at the locality of Jallumba, approximately 40 kilometres (km) south-west of Horsham, 35 km north-east of Balmoral in the Southern Wimmera Region in Western Victoria. It is approximately 325 km west of Melbourne Central Business District (Figure 1).

The Project site is located just to the north of the Toolondo Reservoir and the associated small settlement of Toolondo (Figure 2). Nearby towns and localities are shown in Figure 3.

The Iluka Echo and Douglas mines are approximately 5 km to the east and 20 km to the south-west of the Project site respectively (Figure 1).

The Echo mine development was undertaken in accordance with a Mining Licence (MIN5506) and Mine Work Plan approved under the *Mineral Resources (Sustainable Development) Act 1990*, Planning Permit 08-244 issued under the *Planning and Environment Act 1987*, and various other licences and permits. The Douglas mine development was assessed via an Environment Effects Statement under the *Environment Effects Act 1978* and was undertaken in accordance with a Mining Licence (MIN5367) and Mine Work Plan approved under the *Mineral Resources (Sustainable Development) Act 1990*, and various other licences and permits.

The Project coordinates are provided in Table 2.1.

Table 2.1 Project coordinates

Location point	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
1	36	59	20.26S	141	54	39.68E
2	36	52	24.59S	141	55	44.92E
3	36	52	58.23S	142	0	19.68E
4	36	58	29.02S	141	59	42.15E
5	36	59	15.61S	141	58	42.12E
6	36	59	29.64S	141	56	09.10E

2.3 Short project description

Iluka Resources Limited (Iluka) propose to develop the Wimmera Project, a mine and processing plant to extract mineral sands from the WIM100 deposit (Victorian Exploration Licence (EL) 4282) and refine them onsite to produce zircon, titanium dioxide and rare earth products.

Project activities include construction, mineral sand mining, processing, refining, decommissioning and rehabilitation of the mineral sands and rare earths mine and associated infrastructure.

The WIM100 deposit contains approximately 12 million tonnes of heavy mineral sands ore. From this it is estimated that the Project will produce 192 kilotonnes per annum (ktpa) of recoverable mineral product, comprising of the following:

- zircon product (approximately 60 ktpa);
- titanium dioxide mineral products (approximately 125 ktpa); and
- rare earth oxide equivalent as a mixed concentrate (approximately 7 ktpa).

The mine life is estimated at 25 years. The proposed mine and associated mineral processing and refining is a stand-alone Project.

2.4 Project area definitions

The Project area definitions used throughout this referral are outlined in Tables 2.2 and 2.3.

Note that since the location of the Project's offsite infrastructure has not been finalised (eg the pipelines, powerline and the temporary construction village). These footprints are not included in Tables 2.2 or 2.3.

The study area used for the surface water, ecological and cultural heritage aspects of the Project was defined to:

- use landmarks that were easily identifiable in the field as the Project area boundaries (such as road reserves or lot boundaries);
- be sufficiently large to incorporate the likely Project site; and
- enable assessment of existing environmental values on adjacent land.

Due to the lack of existing monitoring bores in the area local to the Project site, and the assessment of groundwater flow patterns requiring a more regional approach, the groundwater study area was defined to capture a sufficient number of existing groundwater bores that have associated monitoring data.

Study areas for baseline assessments such as social impact, landscape and visual, traffic and transport, or offsite infrastructure are yet to be defined.

Table 2.2 Project area definitions

Project area	Definition	Approximate footprint	Figure
Indicative mineralised extent	The area comprising the economically extractable mineralised resource. The extent of this area may change depending on the results of the 2019 drilling program.	1,509 hectares (ha)	2
Indicative mining extent	The extent of the economically extractable mineralised resource proposed to be mined. The final footprint may change depending on the results of the 2019 drilling program and on Iluka's decision to exclude additional areas due to environmental value or due to existing built assets (eg main transport routes).	1,308 ha	2
Plant area development envelope	The development envelope within which the mineral separation plant, zircon refinery, rare earth refinery and supporting infrastructure are expected be located. Final size, location and disturbance area within this envelope is yet to be determined, and may change depending on the results of the 2019 drilling program	455 ha	2
Project site	The mine layout development envelope. The area comprising the: <ul style="list-style-type: none"> • indicative mining extent; • plant area development envelope; and additional area associated with surface mining infrastructure and stockpiles. 	2,580 ha	2

Table 2.3 Project study area definitions

Project area	Definition	Approximate footprint	Figure
Environmental study area	The Project site and the immediate surrounds. Areas associated with offsite infrastructure is currently unknown.	9,780 ha	2
Groundwater study area	The groundwater baseline study area.	78,380 ha	8
Surface water study area	The surface water baseline study area.	5,600 ha	16
Ecological study area	The ecological baseline study area.	5,600 ha	14
Cultural heritage study area	The cultural heritage baseline study area.	5,600 ha	20

3. Project description

3.1 Aim/objectives of the project

The key objective of the Project is to extract mineral sands from the WIM100 deposit and refine them onsite to produce zircon, titanium dioxide and rare earth products in a manner that is safe, and economically and environmentally responsible.

Mined areas will be progressively restored and rehabilitated as the mine advances, with the aim of restoring land to be equivalent to its pre-mining capability, or to another end land-use as agreed with landholders and regulators.

The Project will also serve to progress the *Victorian Government's State of Discovery: Mineral Resources Strategy 2018 - 2023* and the *Wimmera Southern Mallee Regional Growth Plan (2014)*. Similarly, it will also serve to progress the Commonwealth's goal to enable the development of Australia's critical minerals sector, including downstream processing and manufacturing opportunities, by attracting investment, supporting innovation and connecting opportunities with infrastructure, as outlined in the *Australia's Critical Mineral Strategy 2019 (CMS)* document.

Extracting and refining the site's rare earths deposits will be a key enabler of the 2019 CMS goal of matching Australia's resource potential to international demand. In particular, it will enable Australia to action the commitments then-prime minister Turnbull made to the United States (US) on Australia's role diversifying critical minerals markets. It will also strengthen the mining links Australia has built with the US since the release of the US's CMS strategy. Rare earths are on the US' critical minerals list, and the country has looked to Australia to partner on meeting this demand and shifting the global rare earths market away from current Chinese dominance. Australian company Lynas' recent announcement of a joint-venture with a Texas-based rare earths company to localise processing is an example of the US strategy playing out.

Australia has some of the most valuable rare earth mineral deposits in the world that are not committed to (or controlled by) Chinese interests; this includes WIM100. The Project will help uphold the bilateral agreement made in February 2018 for Australia and the US to work together on strategic minerals exploration, extraction, processing and research, and development of rare earths and high-performance metals to ensure job growth and supply-chain protection, as part of Western governments' shift away from dependence on Chinese exports and supply chain monopoly.

3.2 Background/rationale of project

3.2.1 History of mining in Murray Basin

Iluka commenced mining mineral sands at the Douglas Mine, 70 km north of Hamilton, in November 2004. Ore mining at the Douglas mine concluded in early 2012. The majority of the site is now in the rehabilitation phase; however ongoing activity includes the use of the Pit 23 mine void for controlled disposal of non-saleable mineral waste streams from the Hamilton Mineral Separation Plant (MSP) which contain low level, residual radioactive material.

Between early 2010 and February 2012 Douglas also received ore from the Echo satellite mine for processing. The Echo mine site is located 35 km north-west of the Douglas Mine and 30 km south-west of Horsham. Mining at Echo concluded in late 2013, and processing of Douglas and Echo ore was completed in March 2012.

The Kulwin mine site is located approximately 28 km east of Ouyen and 30 km west of Manangatang. Iluka commenced mining mineral sands at Kulwin in late 2009 and completed mining and processing in February 2012. The site is now in the rehabilitation phase.

The Woornack, Rownack and Pirro (WRP) mine site is located 20 km south-east of Ouyen in north-west Victoria. Mining and ore processing commenced at WRP in early 2012 and concluded in March 2015. Following cessation of mining and ore processing stockpiled heavy mineral concentrate (HMC) was transported to the Hamilton MSP for processing into saleable and non-saleable products; this activity ceased following exhaustion of the HMC stockpiles in September 2017. Site operations are now limited to out-loading of in-pit Wet High Intensity Magnetic Separator (WHIMS) ilmenite for transport to the Port of Portland, demolition of the onsite mineral processing infrastructure, and rehabilitation of mine voids.

From early 2012 the HMC produced at the Kulwin and WRP mines was trucked to the Hopetoun rail loading facility, where it was stockpiled and then out-loaded onto a train for transport to the Hamilton MSP. Rail transport of HMC concluded in September 2017.

Until the cessation of HMC processing in October 2017 the Hamilton MSP received heavy mineral concentrate (HMC) produced from the Douglas, Echo, Kulwin and WRP mines located in Victoria, and the Jacinth-Ambrosia mine in South Australia.

3.2.2. Mineral deposit

The WIM100 deposit is located in the southern part of the Murray Basin in Western Victoria (Figure 1).

Drilling data and literature indicates that the regional geology comprises the following key units (from youngest to oldest) (Figure 4):

- Shepparton Formation (Late Tertiary to Quaternary);
- Loxton-Parilla Sands (LPS; Late Tertiary);
- Murray Group Limestone (MGL; Mid-Tertiary); and
- Geera Clay, Winnambool, and Ettrick Formations (Mid-Tertiary).

Further geological detail for each of these units is provided in Section 8.2.

The mineralisation is hosted within the Lower LPS unit, with heavy mineral grades ranging from 1 to 15%. The mineralisation in the Lower LPS is almost entirely beneath the water table, which is approximately 15-18 m below ground level (mBGL). Dewatering will therefore be required to allow mining.

The nature of the mineralisation makes it difficult to separate the heavy minerals from the ore using traditional, widely-applied mineral sands processing techniques. Therefore, recovery of the heavy minerals will require the application of froth flotation systems. The heavy mineral concentrate produced will be further refined to produce zircon and a rare earth concentrate. A flotation reagents impact assessment is planned for the second half of 2019 to identify and understand the implications of the proposed processing approach.

3.2.3 Employment

It is currently estimated that during the construction phase, the Project will directly employ approximately 300–350 people full time equivalent (FTE). During the operation phase, the Project will directly employ approximately 280–350 people FTE at the mine, processing plant and refinery. The majority of the jobs in the operations phase will relate to the refinery (refer Section 3.2.4).

The Project will also generate indirect engineering and technical services positions in the local region and Victoria.

It is anticipated that a purpose-built offsite temporary construction village will be required to house the construction workforce, many of whom will require specialist construction skills and who may be onsite for only part of the construction period.

It is anticipated that the majority of the operations workforce will be drawn from the region. Regional housing availability and requirements will be assessed as part of the preliminary design and assessment work.

The Wimmera Project offers the potential to generate a significant long-term employment opportunity in the region and to diversify and further develop the regional skillset.

The Project offers significant potential for the economic rejuvenation of Horsham and the surrounding region through the development of a large, highly skilled workforce; the creation of a hub for commercial investment to match the growing workforce; and improvements to local infrastructure, businesses and services. This is evident from data associated with Iluka's past operational activities; the 2013 economic contribution study found that Iluka's Victorian-based operations provided the following contributions to the regional economy:

- Total direct employment – 372 jobs
- Total direct value-add - \$124.6M
- Total indirect employment – 1,242 jobs
- Total indirect value-add - \$175.8M

The WIM100 deposit contains high-value rare earth elements that have highly sought-after application in the renewable energy market including application in electric cars and wind turbines. Of the global supply of rare earths, 80-90% is currently controlled by China. The Wimmera Project offers an opportunity for Victoria to source, process and refine rare earths locally and to thereby diversify the global supply of rare earths. This would put Victoria at the forefront of a new industry and for mineral products to be sourced and manufactured locally and used in Victoria's renewable energy and technology sectors.

Development of the WIM100 deposit, mineral processing plant and refinery is a stand-alone project and is not reliant on the future development of other deposits.

3.3 Main components of the project

3.3.1 Project components

The Project site will include:

- a conventional open pit mine and ore handling system (covering an area of approximately 1,308 hectares (ha));
- processing plants comprising:
 - mineral separation plant (MSP);
 - a zircon refinery; and
 - a rare earth refinery.
- supporting infrastructure.

Infrastructure in the mine area will include:

- an ore receipt and liquefaction system;
- water pipelines;
- pit dewatering infrastructure;
- mine by-products transport and containment infrastructure; and
- electricity supply infrastructure.

The process plant and infrastructure area will include:

- a mineral separation plant:
 - screening and clay separation;
 - froth flotation and physical separation equipment; and
 - water recovery (thickener and tails water recovery).
- refinery:
 - zircon refining;
 - rare earth refining;
 - product storage and out-loading;
 - refinery by-product disposal infrastructure;
 - reagent storage; and
 - residue treatment and water recovery plants.

Site infrastructure will include:

- administration buildings, meeting and training rooms;
- first aid facilities;
- ablutions block and crib rooms;
- workshop and plant maintenance areas;
- water storage dams;
- fuel storage areas;
- internal access and haul roads;
- laydown areas; and
- car parks.

Offsite components are outlined in Section 3.4.

3.3.2 Project footprint

The Project site (mine layout development envelope) encompasses the indicative mining extent, the plant area development envelope, and some additional area for surface infrastructure and stockpiles, as shown in Figure 2. The indicative mineralised extent defines the current spatial extent

of the economically extractable mineralised resource, based on resource drilling data. The indicative mineralised extent covers 1,392 ha and overlaps portions of the Jallumba Marsh Flora Reserve and Red Gum Swamp. The indicative mining extent covers 1,308 ha and excludes those portions of the indicative mineralised extent that overlap the Jallumba Marsh Flora Reserve and the Red Gum Swamp to avoid direct impacts to the ecological and cultural heritage values associated with these areas.

Iluka completed an infill resource drilling program in early 2019 to better define the edges and grade variability of the deposit and enable an Indicated resource to be declared in accordance with the *Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves* (the JORC Code). This will help with advancing the mine pit designs and overall mine layout footprint (expected to be finalised in Quarter 3, 2019). Another resource drilling program is planned for early 2020 in order to improve resource definition to a Measured ore reserve including sterilisation drilling of infrastructure areas. Mine layouts will be finalised following this 2020 drilling program.

The location of the stockpiles, haul roads, the processing plant and associated infrastructure are the subject of ongoing studies. While the exact locations are not yet known, it is anticipated they will likely be within a mine development envelope as shown in Figure 2.

The starter tailings storage facility (TSF), processing plant and associated infrastructure will likely be located within the 455 ha plant area development envelope; final locations and disturbance area within this envelope are yet to be determined. The area required for the plant and associated infrastructure is approximately 232 ha, and will comprise approximately:

- processing plant and associated areas (36 ha);
- refinery evaporation ponds and tailing storage facilities (TSFs) (96 ha), required for the on-going operation of the refinery throughout the life of the operation; and
- the starter TSF (100 ha), required for deposition and storage of tailings from the Mineral Separation Plan prior to mine void space becoming available.

Together, the indicative mining area, plant area development envelope and additional areas associated with soil stockpiles, haul roads and site drainage infrastructure are referred to as the 'Project site'. The Project site footprint will be approximately 2,580 ha.

Smaller areas outside of the Project site will also be disturbed as part of infrastructure development (eg for the temporary construction village, pipelines and power lines) (Section 3.4). The exact locations and footprint for these areas will be determined as investigations progress during the second half of 2019. In the interim, indicative alignments and locations were assessed via the on-line EPBC Protected Matters Search Tool (PMST). The PMST results are presented as Appendix A.

Iluka will progressively rehabilitate the open pit mine to minimise the amount of disturbed area at any given time.

In 2018 Iluka developed a test pit in the central part of the site, on the western side of the Natimuk-Hamilton Road, to extract ore for metallurgical testing. The recently completed test pit development, resource drilling, and transport of ore associated with the inter-state metallurgical testing is regulated under Victorian mineral and radiation legislation and is not part of the referred action. The test pit location is shown in Figure 2.

Likewise, other exploration activities such as resource drilling, hydrogeological investigation programs and environmental assessments currently underway or proposed are also regulated under Victorian mineral and water legislation and are not part of the referred action.

3.4 Ancillary components of the project

Offsite Project components will potentially include:

- a temporary construction accommodation village during the construction phase (location yet to be determined);
- a new water pipeline connected into the existing Rocklands-Douglas pipeline close to the Douglas mine and/or a borefield (Section 3.6.9);
- a new power line connected into the existing 66-kV line along the Wonwondah-Toolondo Road to the infrastructure area;
- new access roads;
- public road intersection upgrades if required; and
- a new gas pipeline (approximately 33–45 km long) connected to the existing pipeline at Horsham (subject to study outcomes in late 2019).

The disturbance footprint required for offsite infrastructure has not yet been determined. Once the preferred alignments for water pipelines, power lines, access roads and any required gas pipeline are known, baseline studies and technical impact studies will be undertaken for these areas, as applicable. Indicative alignments and locations were assessed via the on-line EPBC PMST as discussed in Section 8.1.1 (Appendix A).

3.5 Key construction activities

Key construction activities will include construction of:

- internal mine site access roads;
- administration buildings, meeting and training rooms;
- ablutions block and crib rooms;
- first aid facilities;
- warehouse, workshop and plant maintenance areas;
- fuel and reagent storage areas;
- laydown areas;
- car parks;
- water, slimes and waste storage dams;
- the mineral separation plant and refinery;
- site stormwater management systems including diversion drains;
- water supply pipeline and/or borefields;

- temporary construction village (offsite); and
- powerline/s.

Other key construction activities will include:

- transport of construction equipment and materials to the mine site;
- removal of agricultural infrastructure and vegetation;
- stripping and stockpiling of topsoil and subsoil; and
- relocation of telecommunications cables and infrastructure such as water supply pipelines.

3.6 Key operational activities

3.6.1 Operating hours

The mine, processing plant and refinery are expected to operate 24 hours a day, 365 days per year.

3.6.2 Key operational activities

The key operational activities will include:

- removal of vegetation;
- open pit mining including the removal of and stockpiling of topsoil, subsoil and overburden as well as mine pit dewatering;
- processing and refining of the ore;
- transport of product and by-product within the site;
- receipt of consumables into the site;
- backfilling the mine voids with overburden and tailings;
- packaging and transporting of product to port facilities;
- progressive rehabilitation;
- ongoing environmental management, monitoring and reporting; and
- transport of employees to and from the site.

3.6.3 Mining method

The mining method has not been finalised, however it is likely that the deposit will be progressively mined using mobile earthmoving equipment.

It is likely that scrapers will be used for the removal and replacement of topsoil, subsoil, and that bulldozers will be used for overburden removal and replacement, and for the extraction of ore. The mine will progress in strips approximately 75-m wide. The mining void will be approximately 28-m deep prior to the overburden replacement.

It is estimated that the mine advance rate will be approximately 20 m per day, resulting in an annual pit disturbance area of approximately 30–55 ha. It is anticipated that, on average, a total of approximately 17.0 million m³ of material will be mined annually. Further disturbance will be associated with haul roads, stockpiles, surface water management systems and other ancillary supporting infrastructure.

3.6.4 Mine production

Mine production rates are estimated to be as follows:

- overburden: an average of approximately 12 million bank cubic metres (bcm) per year;
- ore: an average of approximately 5 million bcm (approximately 10 million tonnes per annum (Mtpa)); and
- recoverable mineral product: an average of approximately 192 kilotonnes per annum (ktpa).

3.6.5 Stockpiles

Topsoil and subsoil will be stripped and stockpiled separately to facilitate future rehabilitation. Overburden will be mined and initially stockpiled, with direct return of overburden to the mined-out pit utilised wherever practicable. Stockpiled overburden will be progressively returned to the mine void to be progressively covered with subsoil and topsoil.

3.6.6 Mineral processing

Approximately 9–10 Mtpa of ore and its host material will undergo multiple stages of chemical and physical treatment in the ore processing and mineral separation plant to separate the ore from the non-valuable host material.

Treatments will include wet screening, clay separation and froth flotation to produce titanium dioxide mineral products and heavy mineral concentrate (HMC) (containing zircon and rare earth concentrates). The HMC will be further chemically refined to produce purified zircon and a mixed rare earth product.

The product will then be packaged and transported via road, rail and/or ship to customers.

The processing plant inputs and outputs are summarised in Figure 5 and Figure 6. Note that these are conceptual figures and final volumes and configurations may be subject to change.

A general arrangement plan and a plot plan of the processing plant are provided in Appendix B. Again, these are conceptual figures and the layouts may change.

3.6.7 Tailings and refining waste materials

Approximately 9.6 Mtpa of combined tailings (a mixture of sand and clay materials) will be generated as a by-product from the ore processing and mineral separation plant. Initially, some combined tailings will be placed into a surface tailing storage facility (or facilities) prior to the mine void space being available. Thereafter, the combined tailings will be placed within tailings cells within the mine void (and the tailing storage facility). Once each cell is complete it will be made geotechnically stable, and then will be capped with overburden, subsoil and topsoil.

The HMC will be further processed in the refinery to produce zircon and rare earth products. The refinery will generate approximately 260 ktpa of refinery waste materials, largely comprising:

- 100 ktpa of salt brine - the remnant salt (predominantly sodium sulphate) remaining after desalination water recovery and evaporation of the saline discharge; and
- 160 ktpa of gypsum residue - a precipitated solid predominately comprised of calcium sulfate dihydrate (gypsum), but also incorporating radionuclides and heavy metals. The gypsum residue will contain 300–500 becquerels per gram (Bq/g) total activity and is classified as low-level radioactive waste, as per the International Atomic Energy Agency's *Classification of Radioactive Waste General Safety Guide No. 1*.

The disposal method for the refinery waste streams is yet to be determined, pending the outcome of further hydrometallurgical studies and impact assessments which are expected to be completed during 2019. Conceptually, the two disposal options for the refinery by-product streams are:

- option A - placed in engineered, lined cells within the Project site for permanent storage; (Figure 5); or
- option B - placed into the mine voids with the combined ore processing/MSP tailings (Figure 6).

In option B, the refinery by-products will be mixed with the 9.6 Mtpa of combined ore processing and MSP tailings, thereby diluting the gypsum residue portion to approximately 1.6% of the overall by-product stream. This has the potential to dilute radioactivity levels to below the threshold for low-level radioactive waste, with the resultant combined tailing stream having a radioactivity lower than the ore prior to extraction.

Option B offers the benefit of no ongoing required maintenance of engineered structures after the rehabilitation phase.

The low-level radioactive waste will be permanently stored onsite in a manner that ensures exposure to people and the environment is as low as reasonably achievable (the ALARA principle), in accordance with Iluka's Radiation Management Licence.

Further detail about radiation management is provided in Sections 14.3 and 15.2.2.

3.6.8 Material transport

Processing plant/refinery chemicals, and potentially gas, will be sourced from a range of locations and transported to the site via road and/or rail. A gas pipeline to the site may be constructed.

Mine products will be transported via road and/or rail to port for export, most likely from Iluka's existing facilities at Portland.

The zircon and rare earth products are expected to have an activity content over 1 Bq/g and would therefore meet the definition of radioactive material in accordance with the *Radiation Act 2005* and associated *Radiation Regulations 2017*. These products will be temporarily stored at site prior to transport.

The likely transport routes and potential traffic impacts will be determined as part of Iluka's preliminary design and impact assessment.

3.6.9 Water supply

An overall process and site water balance is being developed. However, it is anticipated that the mine will require approximately 5.5 gegalitres (GL) per year of water, primarily for mineral processing, tailings disposal, dust suppression and rehabilitation with the bulk being required for processing.

Potential sources of water include:

- the Rocklands Reservoir (using the existing Douglas mine allocation of 5 GL per year, subject to an approved licence transfer);
- the existing Strathlynn Borefield (using the existing Douglas mine allocation of 3 GL per year, subject to an approved licence transfer); and
- a new borefield closer to the Project mine site.

Discussions with Grampians Wimmera Mallee Water have commenced regarding the infrastructure required to deliver water to the Project site. The preferred option includes a new pipeline connected into the existing Rocklands-Douglas pipeline close to the Douglas mine to utilise the existing Rocklands Reservoir and Strathlynn Borefield allocations. GMMWater are currently undertaking a reliability study to determine the required size of allocation to guarantee the water supply for the Project.

Dewatering of the mine pits will be required to allow mining of ore below the groundwater table. Any excess groundwater not utilised for processing or dust suppression will be returned to the aquifer via infiltration or, if the need is determined, via re-injection, and will offset total water demand.

Water will be stored in a series of dams across the Project site that will segregate water of varying quality.

3.7 Key rehabilitation and decommissioning activities

Mined areas will be progressively restored and rehabilitated as the mine advances, as agreed with the regulator and with a view to achieving the desired final land use.

Where practicable, overburden will be returned directly to the mine void to minimise the requirement for overburden stockpiles outside of the void. The progressive return of overburden to the void will allow subsoil and topsoil replacement and rehabilitation to commence as soon as possible and will minimise the area disturbed at any given time.

Vegetation will be reinstated following placement of mining by-products, overburden, subsoil and topsoil.

At the end of mining activities, infrastructure will be removed and the area rehabilitated so that it is safe and stable, except where such infrastructure supports the approved post-mining land use, or regulators request or agree that some infrastructure components are retained.

3.8 Is the project an element or stage in a larger project?
<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
No, this Project is not part of a staged development.
3.9 Is the project related to any other past, current or mooted proposals in the region?
<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
Although Iluka has operated in western Victoria since 2002 in relation to the Douglas and Echo mines, the Wimmera Project is not related to these past operations. The Wimmera mineral sand deposit is of a different type to those previously extracted in Victoria, including those operated by Iluka. The Project ore will be processed in a different manner than previously used in Victoria, predominantly due to the froth flotation, and zircon and rare earth refining processes.

4. Project alternatives

4.1 Brief description of key alternatives considered to date

Iluka holds tenements over three fine grained mineral sand deposits in the Murray Basin, namely the adjacent WIM50, WIM50 North and WIM100 deposits located within tenement EL4282 south of Horsham, and the Goschen South deposit located within tenement EL4191 just north of Wycheproof (Figure 7). Development of each of these deposits was considered, with the WIM100 deposit selected to progress into preliminary design and assessment because of its relative size and value and because it had fewer potential social, environmental and technical constraints.

Development of the WIM100 deposit, mineral processing plant and refinery is a stand-alone project. Final investment decision for the development of WIM100 will be based on a standalone WIM100 development and not include the value of any future development of the other two deposits.

Various high level mine layouts were considered including positioning of the process plant and refinery, including either north and north-east, north and north-west, or south-west of the deposit. The south-west option was discounted primarily due to the close proximity of the mineral processing and refining facilities to Lake Toolondo, and the associated environmental and recreational sensitivities. A northern location for the process plant and refinery (extending eastwards) appears to be the most efficient arrangement, as indicated by the development envelope in Figure 2.

The option to process the Wimmera HMC offsite at the Hamilton MSP was considered, however this option was considered to be commercially sub-optimal as the Hamilton MSP was designed to separate mineral sand feedstock of coarser grain size and uses fundamentally different separation processes and technologies.

The option to establish the processing plant and refinery at another offsite location was assessed, however this option was not considered to be currently commercially feasible due to the cost involved in trucking the material from the mine site to the processing site.

Disposal of Wimmera waste material into the Douglas mine Pit 23 approximately 23 km to the south-west of the Project site was considered. This option is not being considered further as Pit 23 was not designed to receive the types and quantities of material that will be produced by the Wimmera Project refinery plant. Similarly, Pit 23 is required to provide a mineral sands by-products disposal location should the Hamilton MSP operations recommence.

While drilling results indicate that mineralisation occurs under portions of the Jallumba Marsh Flora Reserve and the Red Gum Swamp, due to the high ecological and Aboriginal cultural heritage values Iluka has chosen to exclude these areas from the proposed mining footprint (Figure 2).

4.2 Brief description of key alternatives to be further investigated (if known):

A number of key Project aspects are still being investigated and are not yet determined, including:

- mining method;
- mine pit footprint;
- processing plant footprint;
- power supply;
- gas supply;
- various processing plant configurations and final equipment selection;
- by-product disposal options;
- water supply options and associated infrastructure footprint;
- routes and modes for transport of material;
- location of temporary construction village; and
- road upgrades and site access points.

As the operations workforce will be largely sourced from the region, the Project will not require an onsite airstrip or an onsite construction village during operations.

5. Proposed exclusions

No parts of the Project are proposed to be excluded from this referral.

6. Project implementation

6.1 Implementing organisation (ultimately responsible for project, ie. not contractor):

Iluka Resources Limited (Iluka)
Locked Bag 1001
Hamilton Victoria 3300
Australia
ABN 34 008 675 018
Entity name: Iluka Resource Limited

6.2 Implementation timeframe:

The expected duration of mining activities is 25 years, including initial pre-strip, ore mining, processing and refining, return of all stockpiled overburden and revegetation.

Iluka is currently undertaking a wide range of investigations and assessments on the geological, mining, processing, marketing, environmental and socio-political aspects of the Project. This preliminary design and assessment work will select the most appropriate mining and processing methods and estimate the cost of the Project with a precision of $\pm 30\%$ and is scheduled to be completed by the end of 2019.

The preliminary design and assessment work will be followed by a detailed design and impact assessment that will confirm and advance the Project design and estimate the cost of the Project with an accuracy of $\pm 15\%$. This work is scheduled to be completed by mid-2021 and will be followed by a decision by the Iluka Board whether to proceed with development of the Project. The process to obtain the required government environmental and planning approvals for the Project will proceed in parallel with the preliminary and detailed design and assessment phases of the Project.

Subject to receipt of governmental approvals and obtaining Board approval, the stripping of soil, construction activities, overburden mining and dewatering are scheduled to commence in mid-2021.

The mining activities are expected to continue for 25 years. Site rehabilitation and monitoring activities are expected to continue for approximately 15 years following the completion of mining.

The key stages of the Project are summarised in Table 6.1.

Table 6.1 Key stages

Stage	Timing
Approval	2019–2021
Construction	Mid 2021–mid 2023
Operation	Mid 2023–2048 (25 years)
Closure and rehabilitation	Progressive rehabilitation during operations
Post closure rehabilitation	2048–2062

6.3 Proposed staging

Not applicable.

7. Description of proposed site or area of investigation

7.1 Has a preferred site for the project been selected?

No Yes

The Project site is shown in Figure 2. The final siting of infrastructure within the Project site and the footprint of the offsite Project infrastructure are yet to be determined, as outlined in Sections 3.3.2 and 3.4.

7.2 General description of preferred site

7.2.1 Project assessment area

The Project site is within the Horsham Rural City Local Government area, which has a population of approximately 19,800, with three-quarters of the population living in the city of Horsham.

The environmental study area comprises the Project site and immediate surrounds, and totals 9,780 ha. This area is bound by:

- Cooks Lane to the north;
- McDonalds Road – Wonwondah-Toolondo Road to the east;
- Peppertree Lane to the south; and
- Jenzs Lane – Clarkes Lane to the west.

As discussed in Table 2.3, preliminary environmental studies have predominately been conducted across an area that is approximately 5,600 ha. The baseline groundwater assessment was undertaken across a larger study area of 78,380 ha to enable inclusion of existing monitoring bores and assessment of groundwater flow patterns at a regional scale (Figure 8).

The Project site and surrounding land is predominantly zoned as 'Farming' under the Horsham Planning Scheme (2018). Dry-land agriculture (mixed broad-acre cereal, pulse and oilseed cropping, with some grazing) is the predominant land use. The population in the vicinity of the Project site is a low-density agricultural community.

The Project site is currently used for agricultural activities and comprises farming infrastructure.

There are six residences, associated sheds and a derelict holiday shack located within the mine layout development envelope. In addition, there are a scattering of rural residences within approximately 5 km of the mine layout development envelope, including four residences located within 2 km and a settlement of approximately 10–20 residences located approximately 4 km south of the mine layout development envelope, just north of the Toolondo Reservoir (Figure 2).

Some Crown land is also present on the Project site, associated with roads, roadside reserves, the Red Gum Swamp and the Jallumba Marsh Flora Reserve (Figure 9). There is also some Crown land associated with easements for some of the now decommissioned water distribution channels.

7.2.2 Roads

A number of minor roads traverse the Environmental study area (Figure 2), including:

- Peaches Flat Lane – Nurrabiel Church Road (running east-west);
- Jallumba-Clear Lake Road – Jallumba-Mockinya Road (running east-west);
- Carchap Land – Toolondo Gun Club Road (running east-west);

- Quick Sinclair Russells Road (running north-south);
- Natimuk-Hamilton Road (a main transport route, managed by VicRoads, running north-south); and
- Jallumba-Douglas Road (running west from Natimuk-Hamilton Road).

7.2.3 Nearby infrastructure

Key infrastructure near the Project site includes:

- a gas pipeline at Horsham, approximately 33–45 km to the north-east of the Project site;
- an overhead 66-kv electricity powerline along the Wonwondah-Toolondo Road, approximately 5 km to the east of the Project site;
- the Rocklands-Douglas water supply pipeline close to the Douglas mine, approximately 23 km to the south-west of the Project site;
- an underground telecommunication cable located within the Hamilton-Natimuk Road reserve that runs north-south through the western portion of the Project site;
- Port of Portland, a deep-water bulk port, approximately 200 km to the south of the Project site;
- an operational (standard gauge) rail line runs from Hamilton (approximately 100 km to the south of the Project site) to Portland (approximately 200 km to the south of the Project site);
- a disused and decommissioned rail line runs from Jallumba to Hamilton;
- Horsham airport, approximately 41 km to the north-east of the Project site;
- Wimmera Base Hospital in Horsham, approximately 40 km to the north-east of the Project site;
- Hamilton Base Hospital, approximately 100 km to the south of the Project site; and
- Toolondo reservoir, approximately 4 km to the south of the Project site.

7.2.4 Topography

The Project site is relatively flat and consists of low-level plains above flood level (GHD 2018), ranging from 150 m Australian height datum (AHD) and 200 m AHD. The high point is a slight sandy ridge running north to south along the western boundary and the low points comprise the Jallumba Marsh Flora Reserve and the Red Gum Swamp.

Regionally, the Black Range is a topographic high point of greater than 400 m AHD to the south-east of the Project site, and the northern trending Douglas Depression forms a topographic low along the western boundary of the study area (GHD 2018).

7.2.5 Current condition

The predominant land use in and around the Project site is agriculture (mixed broad-acre cereal, pulse and oilseed cropping, with some grazing).

The Project site is dissected by a series of road networks and constructed open channels including the Natimuk Channel (decommissioned), Arapiles Channel (decommissioned), Toolondo Channel and the Rocklands Toolondo Channel (Figure 2).

Remnant native vegetation exists mainly as scattered trees within paddocks and along road reserves; however, there are some larger patches on private and Crown land. The ecological study area contains a number of perennial or ephemeral wetlands including those present at Jallumba Marsh Flora Reserve and the Red Gum Swamp (Jallumba Wildlife Reserve) (Figure 3).

However, due to the considerable long-term disturbance of the Project site through agricultural activity, the predominant form of vegetation within the Project site is exotic vegetation such as introduced economic crops, grasses, weeds, and some patches of degraded native vegetation, as well as two conservation reserves, (Figure 2).

7.2.6 Other

Biodiversity, groundwater and surface water are described in Section 8.

7.3 Site area

The Project site (mine layout development envelope) is expected to be approximately 2,580 ha, as described in Section 3.3.2. As previously noted, the mine layout will be finalised using the results of the 2019 and 2020 resource drilling programs. The areas associated with offsite infrastructure such as the temporary construction camp, water and energy supply infrastructure are yet to be determined.

7.4 Route length

Not applicable.

7.5 Current land use and development

The Project site is largely used for mixed cropping and sheep grazing.

Typical developments within the Project site and surrounding area include low density rural dwellings and ancillary farming related infrastructure.

There are six residences, associated sheds and a derelict holiday shack located within the mine layout development envelope. In addition, there are a scattering of rural residences within approximately 5 km of the mine layout development envelope, including four residences located within 2 km and a settlement of approximately 10-20 residences located approximately 4 km south of the mine layout development envelope, just north of the Toolondo Reservoir (Figure 2).

7.6 Description of local setting

The majority of rural dwellings within the region are associated with the farming properties.

Two conservation/recreation reserves are partially located within the Project site:

- the Jallumba Marsh Flora Reserve (a 79 ha nature conservation reserve); and
- the northern end of the Red Gum Swamp Jallumba Wildlife Reserve (a 177 ha wildlife hunting reserve) (Figure 2).

There are two former Iluka mines located within the region, namely Echo mine approximately 7 km to the east of the Project site and Douglas mine approximately 20 km to the south-east of the Project site (Figure 1). Extraction at both mine sites has ceased and the sites are in rehabilitation and/or closure monitoring phase.

There are several small settlements within the region including Toolondo, located approximately 4 km to the south of the Project site and Noradjuha approximately 11 km to the north of the Project site (Figure 3). Horsham is the largest regional centre, located approximately 30 km to the north-east of the Project site.

Nearby infrastructure is outlined in Section 7.2.3.

7.7 Planning context

7.7.1 Zoning

The Project site and surrounding land is predominantly zoned as Farming Zone (FZ) under the Horsham Planning Scheme (2018). Smaller portions of the Project site are zoned Public Conservation and Resource Zones (PCRZ) (in relation to the Jallumba Marsh Nature Conservation Reserve and the Red Gum Swamp, Jallumba Wildlife Reserve), and Road Zone Category 1 (RDZ1) (in relation to roads) (Figure 10).

7.7.2 Overlays

The following planning overlays, identified in the Horsham Planning Scheme, occur across the Project site:

- ESO4 Environmental significance 4 - Water catchment protection (Figure 11);
- ESO5 Environmental significance 5 - Channel and reservoir protection (Figure 12); and
- LSIO-FO Land Subject to Inundation (Red Gum Swamp) (Figure 13).

The following overlays have been identified within the region of the Project site but will not be affected by the proposed Project:

- ESO2 Environmental significance - Natimuk Douglas wetlands;
- ESO3 Environmental significance - Watercourse protection; and
- BMO Bushfire management overlay.
- The regional BMOs identified within the Horsham Planning Scheme will be identified in the Bushfire Management Plan developed for the overall Project.

7.7.3 State planning policy framework

The following Victorian Planning Provisions of the Horsham Planning Scheme clauses apply to the Project site:

- 11.03-5S Distinctive areas and landscapes;
- 12.01-1S Protection of biodiversity;
- 12.01-1R Protection of biodiversity - Wimmera Southern Mallee;
- 12.01-2S Native vegetation management;
- 12.03-1S River corridors, waterways, lakes and wetlands;
- 12.05-1S Environmentally sensitive areas;
- 12.05-2S Landscapes;
- 13.01-1S Natural hazards and climate change;
- 13.02-1S Bushfire planning;
- 13.03-1S Floodplain management;

- 13.04-1S Contaminated and potentially contaminated land;
- 13.04-2S Erosion and landslip;
- 13.04-3S Salinity;
- 13.05-1S Noise abatement;
- 13.06-1S Air quality management;
- 14.03-1S Resource exploration and extraction;
- 15.03-2S Aboriginal cultural heritage; and
- 17.01-1R Diversified economy - Wimmera Southern Mallee.

Resource exploration and extraction (Clause 14.03-1S) of the State Planning Policy Framework is identified as a relevant clause in this section of the Horsham Planning Scheme. Specifically, this clause provides an objective for the encouragement of exploration and extraction of natural resources in accordance with acceptable environmental standards. Strategies for achieving such a balance include protection of natural resource exploration and extraction opportunities where consistent with overall planning considerations and acceptable environmental practice. Provisions are also made for the determination of buffer areas between mining activities and sensitive land uses. It is considered this clause provides the relevant authority the ability to approve resource extraction activities with appropriate buffers to minimise potential impacts on adjacent sensitive land uses.

The Wimmera Southern Mallee is specifically identified in Clause 17.01-1R to capitalise on the economic development opportunities through mining activities identified as a regional asset.

7.7.4 Local planning policy framework

The following Local Planning Provisions of Horsham Planning Scheme clauses apply to the Project site:

- 21.03-1 Biodiversity conservation and habitat protection;
- 21.03-4 Ecological sustainable development;
- 21.05-4 Mining and extractive industry; and
- 22.02 Resource protection policy.

Mineral sands resources are identified by Clause 21.05-4 as being a resource of abundance within greater Horsham region and provides the potential for regional growth in employment and other major economic benefits.

7.7.5 Wimmera Southern Mallee Regional Growth Plan

The Wimmera Southern Mallee Regional Growth Plan (Victorian Government 2014) (the Plan) provides a regional approach to land use planning in the Wimmera Southern Mallee Region. This region includes the municipalities of Hindmarsh, Horsham, Northern Grampians, West Wimmera and Yarriambiack and as such is applicable to the Project site.

The Plan has been incorporated into the Victoria Planning Provisions. It identifies opportunities for accommodating growth and managing change over the next 30 years with a specific focus on using regional assets to facilitate economic diversification (to complement the agricultural sector) and build community resilience.

The Plan recognises that resource projects (such as the Wimmera Project) can contribute significantly to economic development and help to diversify the economy of the region, with mining

including mineral sand mining, among the largest potential sectors of the regional economy by 2031.

The Plan proposes the following actions:

- identify, manage and facilitate access to locally sourced natural resources where appropriate, including sand, stone and minerals;
- avoid urban growth and rural living in areas of valuable earth resources; and
- identify housing, transport and infrastructure needs associated with mining at mineral sand deposits near Horsham and Donald and plan to manage any impacts in advance of the commencement of mining.

The Plan recognises that mining will assist in regional employment diversification, increase local employment and attract new people to the region.

7.8 Local government area(s)

The entire Project site, and all offsite infrastructure corridors and areas, are within the Horsham Rural City Council local government area.

8. Existing environment

Overview of key environmental assets/sensitivities in project area and vicinity

8.1. Biodiversity

A baseline ecological assessment has been undertaken by Cardno (2019a, Appendix C) to inform design of the Project and future detailed surveys. The ecological study area is shown in Figure 14. The assessment was based on a review of biodiversity databases and spatial datasets, preliminary vegetation mapping and field-based habitat assessments to identify threatened species and communities that may occur in the Project site.

As part of the desktop assessment a likelihood of presence assessment was undertaken for all 97 threatened species identified via the Victorian Biodiversity Atlas (VBA) and EPBC Protected Matters Search Tool (PMST) search. Each species was assigned one of the following likelihood of presence ratings, based on the location, date and number of records, as well as modelled EVC data:

- **known:** species has been recorded in the study area by a qualified ecologist in the past 20 years;
- **likely:** suitable habitat for the species occurs in the study area and species has been recorded proximate to the study area;
- **possible:** suitable habitat for the species occurs in the study area but no recent records from the study area or proximate areas, OR, suitable habitat for the species may occur in the study area and there are recent records for the species proximate to the study area; and
- **unlikely:** suitable habitat for the species does not occur in the study area and no recent records from the study area or proximate areas.

Baseline surveys were conducted across multiple sites within the ecological study in November 2018. The surveys confirmed the presence of one ecological community listed under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), namely Victorian Temperate Woodland Bird Community and likely presence of two further ecological communities, namely Semi-arid Northwest Plains Buloke Grassy Woodland Community and Red Gum Swamp Community No. 1 (Figure 8).

Five species listed under the FFG Act were also recorded: Buloke (*Allocasuarina luehmannii*), Magpie Goose (*Anseranus semipalmata*), Diamond Firetail (*Stagnopleura guttata*), Whiskered Tern (*Chlidonyas hybrida*) and Brown Toadlet (*Pseudophryne bibronii*).

Three threatened ecological communities listed under the EPBC Act, namely Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions, Grey Box (*Eucalyptus microcarpa*) Woodlands and Derived Native Grasslands of South Eastern Australia and Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains, were potentially recorded during baseline surveys. Detailed field surveys and data analysis are required to confirm the presence and extent of these listed communities.

The likelihood of presence ratings for threatened flora and fauna species identified during the desktop assessment were revised after the field assessment. Twelve species were assessed as 'known' in the study area, four species were assessed as 'likely' to occur, 33 as 'possible' and 48 as 'unlikely'. The likelihood of presence assessment is presented as Appendix A of the Cardno baseline ecological assessment report (Appendix C).

Targeted surveys for species listed under the EPBC Act have not yet been conducted. However, the Red-tailed Black Cockatoo (*Calyptorhynchus banksii graptogyne*), Growling Grass Frog (*Litoria raniformis*) and Australasian Bittern (*Botaurus poiciloptilus*) have been previously recorded in the locality and are considered likely to occur given the presence of suitable habitat including woodlands and wetlands (Figure 15).

Detailed targeted surveys will be undertaken during optimal seasonal conditions in 2019 to verify the presence of the potentially occurring listed species and ecological communities.

Biodiversity is discussed further in Section 11.

8.1.1 Biodiversity associated with offsite infrastructure

Engineering options studies to identify the requirement, preferred location and location/alignment of offsite infrastructure are underway, and hence potential impacts associated with such works are unknown.

Indicative alignments for the following offsite infrastructure were used within the Department of the Environment and Energy's on-line PMST to identify species that may be, are likely, or are known to be present within an associated infrastructure corridor:

- Water pipeline of approximate length 30 km from the existing Rocklands Douglas pipeline to the Project site. Assuming an infrastructure corridor disturbance width of 40 m the total disturbance area is approximately 120 ha.
- Power line extension from the Toolondo-Wonwondah Road to the Project site, using one of the following alignment options:
 - along Nurrabel Church Road (5,400 m).
 - along Jallumba-Mockinya Road (4,900 m).
- Gas pipeline of approximate length 37 km from the Western Highway letdown point to the Project site. Assuming an infrastructure corridor disturbance width of 40 m the total disturbance area is approximately 149 ha.

The infrastructure corridors were defined as a line with a 1 km buffer within the PMST. The PMST reports are attached as Appendix A.

The PMST reports for the offsite infrastructure (pipelines, power line extension and construction camp) indicate that up to 11 migratory species, 26 listed threatened species and 3 listed ecological communities may occur in or relate to these corridors and footprints. However, as specific alignment locations are yet to be determined the likelihood of significant impacts is not known.

Following consultation with Horsham Rural City Council, options for the location of the construction camp on the southern fringes of Horsham are being investigated. As the specific location of the proposed construction camp has not yet been confirmed, a polygon with a 1 km buffer was delineated over the southern half of Horsham within the PMST, and the resulting PMST report attached is as Appendix A.

Iluka will apply the 'avoid, minimise and offset' principle to identify the preferred locations and routes for both onsite and offsite infrastructure.

8.2 Geology

The Project site is located near the south-western edge of the Murray Basin, which at its widest, extends 1,200 km from near Cooma in New South Wales (NSW) where it is bounded by the Great Dividing Range to the east, to the Murray mouth in South Australia to the west. In the north, the basin extends from Broken Hill in NSW to the south of Horsham and just north of Melbourne, Victoria.

The formation of the Murray Basin is the result of basement subsidence following the break-up of Gondwana, and the subsequent periods of marine transgression and regression during the Tertiary period. The Murray Basin comprises a thickness of up to about 600 m of marine, coastal and continental sediments that is underlain by Palaeozoic basement rocks and surrounded by low mountain ranges of the same age.

The WIM100 deposit falls within the Mallee-Limestone Province of the Murray Basin, which lies to the west of the Neckarboo Ridge in western Victoria and South Australia.

Drilling data and literature suggest the regional geology comprises the following key units (from youngest to oldest; Figure 4):

- Shepparton Formation (Late Tertiary to Quaternary) – The formation comprises poorly-consolidated, grey-brown and red-brown sandy clays (approximately 5 m thick);
- Loxton-Parilla Sands (LPS; Late Tertiary) – The LPS comprises grey-brown sand with some minor clays, these representing a depositional sequence of foreshore, surf-zone and offshore sediments (approximately 20 to 25 m thick). The mineralisation is hosted within the Lower LPS unit and is characterised by extensive sheets of very fine-grained sediments within well sorted clayey sand. The Lower LPS Unit is approximately 10 metres (m) thick and covers an area of about 25 square kilometres (km²). Heavy mineral grades in the Lower LPS range from 1 to 15%. The LPS unit is considered a regionally-significant, unconfined aquifer that receives rainfall-derived recharge. The mineralisation in the Lower LPS is almost entirely beneath the water table, which is approximately 15-18 m below ground level (mBGL). Dewatering will therefore be required to allow mining;
- Murray Group Limestone (MGL; Mid-Tertiary) – The unit comprises highly fossiliferous limestones and calcareous sandstones, and may be present to the southwest of the study area (to be verified during a groundwater well drilling program in mid-2019);
- Geera Clay, Winnambool, and Ettrick Formations (Mid-Tertiary) – All of these units may be represented at depth, potentially dependent on location. The Geera Clay comprises carbonaceous dark grey-black silts and plastic clays with an estimated clay content of 75% (approximately 20 m thick). The Geera Clay is associated with the Winnambool and Ettrick Formations, all of which were deposited during marine transgressions (Jacobs, 2018b). All these units overlie Palaeozoic basement.

Acid generation resulting from pit dewatering is not expected to occur. The occurrence of Acid sulfate soil (ASS)/acid sulfate rock (ASR) has been assessed via the sampling and geochemical analysis of samples collected during an exploration drilling program undertaken in March 2018. A total of four samples were collected from the southern half of the deposit (approximately 2 km south of the test pit site) for analysis via the chromium reducible sulfur suite and net acid generation (NAG) NAGpH. The results of the analysis were compared to the criteria in Publication 655.1 (EPA 2009) and the classification criteria set out in the *Acid Rock Drainage Test Handbook* (AMIRA 2002).

The analysis results provide no indication of the presence of acid sulfate soils or acid sulfate rock. The analysis results and assessment are described in the report *WIM100 Test Pit – Preliminary Dewatering Assessment* (Jacobs 2018b). Furthermore, no evidence of acid generation has been observed in the groundwater monitoring results for samples obtained during and following dewatering activities at the test pit site.

8.3 Groundwater

The regional water table in the LPS is around 15–18 m below ground level (mBGL). The mineralised zone within the LPS tends to occur below the regional water table (Figure 4).

The majority of surface water features throughout the region occur in depressions that overlay impermeable clays of the Shepparton Formation. It is conceptualised that surface water pooled in these depressions slowly infiltrates into the Shepparton Formation and subsequently, into the underlying LPS (Jacobs 2018a). As a result, groundwater dependent ecosystems (GDEs) in the proximity of these surface water features are likely to rely on perched or local groundwater, rather than the underlying regional groundwater.

Hydraulic testing of the Shepparton Formation, LPS or Geera Clay has yet to be undertaken at the Project site, with the exception of slug testing undertaken on the two monitoring wells installed at the test pit. Hydraulic testing will be part of ongoing detailed hydrogeological investigations. Available and inferred hydraulic head data suggests the LPS aquifer is unconfined at the Project site.

Groundwater levels and flow directions at the Project site have been estimated as part of initial baseline assessment across a broader study area (Jacobs 2018a), and groundwater modelling associated with the test pit site (Jacobs 2018b). The prevailing groundwater flow direction is interpreted to be north to north-west, declining from greater than 150 m AHD near the Red Gum Swamp (near the southern boundary of the Project site), to less than 135 m AHD near Cooks Lane (the northern boundary of the Project site).

In 2018, a test pit was constructed on the Project site. The test pit has a maximum depth of 26 mBGL. Initial groundwater modelling for the test pit predicted that the maximum groundwater inflow rates to the test pit was likely to range between 0.2 and 11 L/s, resulting in a maximum drawdown distance of approximately 550 m (for the scenarios considered) (Jacobs 2018b). However, slug tests performed on monitoring wells constructed at the test pit site, and site observations during the test pit excavation, suggested that the maximum groundwater inflow rate to the test pit was at the lower end of the predicted range (modelling Scenario 3), with a corresponding drawdown distance of approximately 180 m. Pump testing of the production well that was constructed at the test pit site in late 2018 is proposed during 2019 to obtain more aquifer hydrogeological data at the site.

Groundwater drawdown is not anticipated to affect any groundwater dependent ecosystems (GDEs) that support EPBC Act listed species or threatened ecological communities; this will be verified by the groundwater impact assessment to be undertaken during late 2019/early 2020.

Regional groundwater salinity mapping of the area (DELWP 2014a) indicates groundwater salinity ranges between 3,500 mg/L and 13,000 mg/L total dissolved solids (TDS). However, site-specific results obtained during exploration drilling activities indicate TDS ranges between 2,300 and 4,500 mg/L at the site. As such, groundwater at the Project site is likely to require management under segments B and C of the State Environment Protection Policy (SEPP) Waters of Victoria (EPA 2018) and would need to be protected against the beneficial uses listed under those segments, as outlined in Table 8.1.

Table 8.1 SEPP Waters of Victoria (2018) - groundwater segment classification and beneficial uses

Beneficial use	Segment B	Segment C
	(1,201–3,100 mg/L TDS)	(3,101–5,400 mg/L TDS)
Water dependent ecosystems	✓	✓
Potable water supply	-	-
Potable mineral water supply	✓	✓
Agriculture and irrigation (irrigation)	✓	-
Agriculture and irrigation (stock watering)	✓	✓
Industrial and commercial	✓	✓

Primary contact recreation	✓	✓
Traditional owner cultural values	✓	✓
Cultural and spiritual values	✓	✓
Buildings and structure	✓	✓
Geothermal properties		

To date, no active groundwater users have been identified within a 5 km radius of the test pit site (the test pit location is shown in Figure 2).

The Victorian Aquifer Framework identifies the Murray Group Limestone or equivalent units in the general site area. The aquifer within the Murray Group Limestone is used for irrigation in the western Murray Basin. However, bore logs in the vicinity of the ore body and observations during construction of the test pit do not show a distinct limestone unit. Further investigation will be undertaken to determine the degree of connection between the units in the vicinity of the ore and the regional limestone resource (Jacobs 2018a).

Bureau of Meteorology mapping suggests there are a number of terrestrial and aquatic ecosystems in the Project site with potential to be groundwater dependant ecosystems (Jacobs 2018a and 2018b). However, while these ecosystems have a potential to be groundwater dependant, the regional water table is expected to be greater than 15 mBGL, ie below the root depth of vegetation. Therefore, these ecosystems are unlikely to be reliant on the regional groundwater and are not expected to be affected by any local changes in groundwater levels.

Further detailed hydrogeological investigations for the Project site and surrounding area will be undertaken during the next phase of study to confirm site hydrostratigraphy, aquifer properties, groundwater levels, flow, quality and receptors. These investigations will include assessment of the likelihood of a useable groundwater supply option being present to the west of the Project area, and, if the presence of such a groundwater source is confirmed, the potential environmental impacts should that source be incorporated into the proposed water supply for the Project.

As noted in section 3.6.9, the Strathlynn Borefield may be used as part of the water supply for the Project. The hydrogeological properties of the Strathlynn borefield have previously been established and informed the licence conditions relating to abstraction of groundwater including annual abstraction volumes and triggers levels to cease pumping. Variation of the conditions of licence is not required or proposed, and hence no further hydrogeological assessment for the Strathlynn Borefield is proposed as part of this Project.

A copy of the groundwater baseline assessment is provided as Appendix D and a copy of the test pit dewatering assessment is provided as Appendix E.

8.4 Surface water

8.4.1 Around Project site

There is a chain of lakes and swamps through the Douglas Depression, located 10 km to the west of the Project site, most of which are saline (Jacobs 2018a), including White Lake, Brooskby Swamp, Centre and North Lake, Lake Bow, Clear Lake and Boundary Swamp (Figure 2).

There are a number of creeks to the north of the Project site, including Noradjuha Creek, Natimuk Creek and Darragan Creek. These drain to the north, forming series of minor tributaries to the Wimmera River (Jacobs 2018a).

The Toolondo Reservoir (also known as Lake Toolondo) is located less than 1 km from the southern boundary of the Project site. This off-stream reservoir and trout fishery receives inflows from a small catchment to the west of the Black Ranges via Mt Talbot Creek. The reservoir is the terminal discharge point of Mt Talbot Creek and its only discharge is via the Rockland Channel to the north (Jacobs 2018a).

The Glenelg River is located approximately 15 km to the south of the Project site.

Rainfall in the area is typically 497 mm per annum. Evapotranspiration monitors at Horsham (approximately 40 km to the north-east of the Project site) indicate average evapotranspiration

rates of less than 40 mm per month in June to over 200 mm per month between December and February (Jacobs 2018a).

The surface water study area is shown as Figure 16.

8.4.2 Within Project site

The Project site is characterised by a relatively flat and open topography with a lack of well-defined surface water channels (Water Technology 2018). The Project site is mostly cleared and cultivated. It features scattered paddock trees, some patches of remnant native vegetation and several wetlands.

Site topography ranges from 150 m AHD and 200 m AHD. The high point is a slight ridge along the western boundary and the low points comprise the Jallumba Marsh Flora Reserve and the Red Gum Swamp.

The major barriers to overland water flow include the north-south trending western ridge, the road network (predominantly the Jallumba-Mockinya Road, Natimuk Hamilton Road and Jallumba-Douglas Road) and the transfer channels network comprising the Natimuk Channel (decommissioned), Arapiles Channel (decommissioned), Toolondo Channel and the Rocklands Toolondo Channel (Figure 2).

Three sub-catchments have been identified at the Project site (Water Technology 2018):

- approximately 80% of the Project site is comprised of the northern sub-catchment. The western ridge forms the western catchment divide, while the fringing lunette dune on the north and north-east side of the Red Gum Swamp forms the southern catchment boundary. Surface water flows leave the catchment to the north and east, contributing to various downstream wetlands;
- approximately 10% of the Project site is comprised of the southern sub-catchment where surface water flows into the site from the south and flows toward the Red Gum Swamp; and
- the remaining 10% of the Project site is comprised of the western sub-catchment. The western ridge forms the eastern catchment divide, which prevents overland flow to the east. Surface water flows leave the catchment towards north-west.

The baseline surface water assessment considered water quality results for two samples obtained from the Red Gum Swamp and a small dam within the Jallumba Marsh Flora Reserve. A single sample was taken at each site and both samples were taken from standing water as no actively flowing water was available.

The following exceedances were recorded against water quality indicator limits set out in SEPP Waters of Victoria (EPA 2018):

- pH and total phosphorous for both sites; and
- total nitrogen for the Jallumba Marsh Flora Reserve site.

For the larger dataset the following exceedances were recorded against the water quality indicator limits set out in the Australian and New Zealand Environment *Guidelines for Fresh and Marine Water Quality* (2018) (toxicant default guideline values for protecting aquatic ecosystems):

- aluminium, arsenic, boron, chromium, copper, lead and zinc at both sites (total concentrations);
- ammonia for the Jallumba Marsh Flora Reserve site; and
- nickel for the Red Gum Swamp site.

A copy of the surface water baseline assessment is provided as Appendix F.

Since the baseline surface water assessment was completed water quality results have become available for a further six samples obtained from the Jallumba Marsh Flora Reserve dam, and a

further three samples obtained from the Red Gum Swamp. For this larger dataset the following exceedances were recorded against water quality indicator limits set out in SEPP Waters of Victoria (EPA 2018):

- pH (both above the upper limit and below the lower limit) and total phosphorous for both sites; and
- total nitrogen for the Jallumba Marsh Flora Reserve site.

For the larger dataset the following exceedances were recorded against the water quality indicator limits set out in the Australian and New Zealand Environment Conservation Council (ANZECC) guidelines (toxicant default guideline values for protecting aquatic ecosystems 2018):

- aluminium, arsenic, boron, chromium, copper, lead, nickel, silver, uranium and zinc at both sites (total concentrations);
- ammonia for the Jallumba Marsh Flora Reserve site; and
- nickel and selenium for the Red Gum Swamp site.

Further surface water monitoring and baseline assessment of surface water chemistry will be undertaken as part of ongoing investigations.

8.5 Noise

Continuous background noise monitoring was undertaken at six locations in and near the Project site (Figure 17 of Appendix G) from 1 February 2019 to 1 March 2019. Measurements were recorded at 15-minute intervals over this four-week period.

The results showed that ambient noise is currently generated from local traffic, breeze through trees, birds, insects and aircraft. Although there was no significant agricultural activity during the baseline noise assessment, it is expected that agricultural equipment would also be a source of ambient noise during certain times of the year.

The results of the background noise monitoring was used to establish relevant environmental noise emission criteria based on the requirements of the guideline *Noise from Industry in Regional Victoria (NIRV): Recommended maximum noise levels from commerce, industry and trade premises in regional Victoria*.

The baseline ambient noise levels varied significantly between monitoring locations and changed significantly during different times of the day. Ambient noise levels are outlined in Table 8.2.

Table 8.2 Average ambient noise levels

Period	L _{A90} DB
Day (7 am-6 pm)	28-34
Evening (6 pm-10 pm)	28-32
Night (10 pm-7 am)	23-25

The baseline noise report is provided as Appendix G.

8.6 Vibration

Continuous background vibration level monitoring was undertaken at two locations within the Project site (Figure 17). Each location was monitored for a period of approximately three weeks - location 1 was monitored between 1 February 2019 to 23 February 2019, whilst location 2 was monitored between 1 February 2019 and 21 February 2019. Measurements were taken at 10-second intervals over the monitoring period.

The monitoring sites were selected based on the following criteria:

- within and/or close to the mine layout development envelope; and
- close to existing and potential future transportation routes.

The results indicated that the typical baseline vibration level ranged from 0.06 to 0.15 millimeters per second (mm/s) across both monitoring sites. This range is below the recommended human comfort vibration targets at residential premises and below the typical threshold of human perception.

A copy of the baseline vibration report is provided as Appendix H.

8.7 Air quality

Existing key sources of air emissions are expected to include agricultural activities (including use of equipment, fertilisers and pesticides), local traffic, dust storms, controlled burning and domestic wood heating.

Sensitive air quality receivers include residents in the immediate and local vicinity – residential properties are shown in Figure 18, as are the air quality monitoring locations.

Monthly depositional dust monitoring at four locations at the Project site commenced in December 2018. The depositional dust data will establish a background for future assessment of any nuisance dust deposition events.

Monitoring of airborne PM₁₀ and associated gross alpha activity in air using high volume air samplers at two locations commenced in April and May 2019. Monitoring will be undertaken for up to three days per quarter, with the data used to establish background for radiological assessments.

Air quality monitoring equipment suitable for a level 1 background air quality monitoring program in accordance with the Protocol for Environmental Management: Mining and Extractive Industries (Mining PEM) has recently been installed. Monitoring includes:

- continuous PM₁₀;
- continuous PM_{2.5};
- heavy metals (PM₁₀) for a period of up to one week, once a month for 12 months; and
- respirable crystalline silica (PM_{2.5}) for a period of up to one week, once a month for 12 months.

8.8 Cultural heritage

Aboriginal and historic heritage are discussed in Section 14.9.

8.9 Visual amenity

The site and adjacent areas are relatively flat and typically consist of farming land with little vertical relief. Significant topographical and land use features are:

- Red Gum Swamp, Jallumba Wildlife Reserve (partially in the Project site);
- Jallumba Marsh Nature Conservation Reserve (partially in the Project site); and
- Darragan Swamp Wildlife Reserve (located north-east of the Project site) (Figure 3).

Due to the relatively flat nature of the Project area and local surrounds it is possible that the following areas in the broader region may have views to the site:

- Mount Arapiles-Tooan State Park, located approximately 15 km to the north/north-west of the site, with an elevation of 388 m AHD; 140m above Wimmera Plains;

- Black Range State Park (unnamed peak), located approximately 17 km to the south-east of the site, with an elevation of 490 m AHD; and
- Black Range State Park (unnamed peak), located approximately 20 km to the south/south-east of the site, with an elevation of 548 m AHD.

While the following elevated areas occur in the local region, viewshed analysis will be required to determine whether the intervening Grampians mountain range disrupts views to the site:

- The Grampians (Roses Gap), located approximately 35 km to the east of the site, with an elevation of 613 m AHD;
- The Grampians (Halls Gap), located approximately 47 km to the east/south-east of the site, with an elevation of 858 m AHD;
- The Grampians (Victoria Range), located approximately 45 km to the south-east of the site, with an elevation of 971 m AHD; and
- The Grampians (Mt William), located approximately 64 km to the east/south-east of the site, with an elevation of 1,160 m AHD.

Existing sources of night-time light in and around the Project site are expected to include lighting associated with residential properties, traffic and agricultural plant. Existing night-time light levels have not yet been measured but are expected to be negligible.

The presence of roadside and scattered trees in and around the Project site will provide some visual screening for views in the surrounding area at a similar elevation.

9. Land availability and control

9.1 Is the proposal on, or partly on, Crown land?

No Yes

There is some Crown land present on the Project site, and is associated with roads, roadside reserves, the Red Gum Swamp and the Jallumba Marsh Flora Reserve (Figure 9). There is also some Crown land associated with easements for some of the now decommissioned water distribution channels.

The surrounding area is similar.

9.2 Current land tenure

The land tenure in the Project site is largely freehold properties used for mixed cropping and grazing. There are six residences, associated sheds and a derelict holiday shack located within the mine layout development envelope. In addition, there are a scattering of residences within approximately 5 km of the mine layout development envelope, including four residences located within 2 km and a settlement of approximately 10-20 residences located approximately 4 km south of the mine layout development envelope, just north of the Toolondo Reservoir (Figure 2).

As discussed in Section 8.1, Crown land within the Project site is associated with the Jallumba Marsh Flora Reserve, the Red Gum Swamp Reserve, roads and roadside reserves. The surrounding area is similar.

The Project site is entirely within Iluka's Exploration Licence (EL4282) area with the exception of a small portion at the eastern side which is no longer within EL4282. Iluka has lodged applications for EL006966 over this eastern area, and RL006904 over the Wimmera Project area.

The offsite infrastructure footprint is not yet known, so the land tenures associated with these areas are currently unknown.

The Project site covers multiple lots, as outlined in Table 9.1.

Table 9.1 Land title details

Volume	Folio	Title plan number	Plan of subdivision	Lot plan number
4051	146	792081N		
4489	670	680008Y		
8104	144	334741E		
9474 (Part)	254 (Part)		444334S	
3006	027		444334S	
4344	773	391533P		
4133	509	411917P		
7070	881			136566

9.3 Intended land tenure

Iluka intends to purchase or lease the freehold land within the Project site in consultation with the landowners and via registered compensation agreements in accordance with the *Mineral Resources (Sustainable Development) Act 1990*.

Iluka intends to lease any Crown land that is included within the final development footprint.

9.4 Other interests in affected land

It has been determined that Native title does not apply to any part of the Project area (refer Federal Court Number VID6002/1998 and NNTT Number VCD2005/001 determined 13/12/2005). While the Jallumba Marsh Flora Reserve and the eastern half of the Red Gum Swamp were considered in the case, they were considered to fall into Determination Area B where Native title does not exist.

10. Required approvals

10.1 State and Commonwealth approvals required for project components

An *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral will be submitted to the Commonwealth Department for the Environment and Energy to determine whether the Project is a controlled action. Iluka anticipates that the Project will be declared a controlled action, requiring assessment and approval under the EPBC Act.

The purpose of this Environment Effects Statement (EES) referral is to determine whether the Project will need to be assessed under the Victorian EES system under the *Environment Effects Act 1978*. In the event the Project is determined to be a controlled action that requires assessment and approval under the EPBC Act, it is anticipated that the Project will be assessed under the bilateral agreement between the Commonwealth and Victorian governments in accordance with Part 5 of the EPBC Act.

In addition to the EES process, Iluka will require the following secondary approvals to construct and operate the Project:

- Under the Mineral Resources (Sustainable Development) Act 1990, Iluka will require:
 - a Mining Licence;
 - an Approved Work Plan, which must also include a rehabilitation plan;
 - a rehabilitation bond;
 - an approved environmental offset plan;

- public liability insurance; and
- owners/occupiers written consent or a registered compensation agreement.
- Under the *Crown Land (Reserves) Act 1978*, Iluka will require a Crown land licence to use any Crown land reserved.
- Under the *Aboriginal Heritage Act 2006*, Iluka will require an approved cultural heritage management plan (CHMP).
- Under the *Water Act 1989*, Iluka will require the following licences:
 - to install bores Iluka will require a licence to construct, decommission or alter a bore;
 - to extract water as part of pit dewatering or for water supply a groundwater take and use licence will be required;
 - to harvest and use surface water, Iluka will require a licence to use surface water and to operate works (also referred to as a 'take and use licence');
 - to construct and operate a dam, Iluka will require a Works licence; and
 - drainage works to be connected (directly or indirectly) to a designated waterway must not occur without the permission of Wimmera Catchment Management Authority through a Works on Waterways Licence. Furthermore, drainage works that are connected to designated waterways cannot be altered or removed without the permission of the Wimmera Catchment Management Authority.
- Under the *Radiation Act 2005*, Iluka will require a variation to its existing Radiation Management Licence. An approved Radiation Management Plan and an approved Radioactive Waste Management Plan are required as conditions of the Radiation Management Licence.
- Under the *Environment Protection Act 1970*, Iluka will require an Environment Protection Authority (EPA) licence if it is decided to discharge excess groundwater from pit dewatering into an aquifer via re-injection. It is noted that the *Environment Protection Act 1970* will be replaced on 1 July 2020 by the *Environment Protection Act 2017*. If the new Act is in operation, Iluka may require a development licence and operational licence under the new Act.

Various additional approvals may also be required:

- Under the *Planning and Environment Act 1987*, if any remnant of an Ecological Vegetation Class (EVC) of 'very high conservation significance' needs to be cleared, approval will be required from the Minister for Environment and Climate Change under Victoria's Native Vegetation Management Framework - A Framework for Action (NVMF).
- Mine works that have been assessed in an EES and by the Minister for Planning do not require a planning permit under the *Planning and Environment Act 1987*. However, works outside the mining licence area, such as the development of water and electricity supply infrastructure or road upgrades, will be subject to the Horsham Planning Scheme. Iluka will either seek planning permits for these works or request an amendment to the Horsham Planning Scheme to provide a "one stop shop" planning control for works undertaken outside the mine licence area, as is typical for mining projects in Victoria.
- VicRoads may require a cost recovery condition be applied to the EES approval under the *Road Management Act 2004*. Iluka may be required to contribute to road maintenance based on a \$/km/tonne basis, and/or the upgrade of intersections or bridges. If so, Iluka would be required to complete a 'Works within road reserves' application form and sign a

road maintenance agreement. If works are proposed within a road reserve, consent will be required from the relevant road authority under this Act.

- Horsham Rural City Council may require Iluka to contribute to the maintenance of Council owned roads, via a road maintenance agreement under the *Local Government Act 1989*.
- Iluka will require a Works Approval and an EPA Licence under the *Environment Protection Act 1970* if Iluka proposes to extract material for the construction of access roads and hardstand areas and if the extraction location is not assessed within the approved EES and within the Mine Licence Area. It is possible that a Works Approval and EPA Licence will also be required in relation to stack emissions from the refinery.
- Iluka may require a dangerous goods licence under the *Dangerous Goods Act 1985*, depending on the quantity of gas, diesel or other dangerous goods stored.
- Iluka will require a permit under the *Flora and Fauna Guarantee Act 1988* (FFG Act) to remove fauna species that are protected under the FFG Act. A licence may also be required under the FFG Act to remove or destroy flora species located on public land.
- Iluka would be required to obtain a licence to construct and operate a pipeline under the *Pipelines Act 2005*, if it plans to construct and operate a 'high transmission' pipeline that has a maximum design pressure exceeding 1,050 kilopascals (kPa) (gaseous hydrocarbons).

10.2 Have any applications for approval been lodged?

No Yes

No applications for any of the above approvals have been lodged. Applicable approvals had been previously obtained in relation to:

- the test pit bulk sampling works, undertaken in accordance with an approved Exploration Work Plan (PLN00864);
- Low Impact Exploration (LIE) works undertaken across the Project area within EL4282, including resource drilling and geotechnical drilling; and
- construction of groundwater monitoring wells.

These approvals do not constitute applications for approval for the Wimmera Project.

10.3 Approval agency consultation

Iluka has engaged with the local community, councils and government agencies since 2003 in relation to the nearby Douglas and Echo mines and the Hamilton Mineral Separation Plant.

Iluka commenced consultation on the Wimmera Project (formerly called the 'Fine Minerals Project') in 2018. This has included:

- circulation of the quarterly Murray Basin Newsletter – including articles introducing the Project in the May 2018 and the November 2018 editions – to local members of parliament, Horsham Rural City Council, Buloke Shire Council, Shire of Yarriambiack, Shire of Southern Grampians, Barenji Gadjin Landcare Council, Wimmera Development Association, Cavendish Police Station, various Douglas Environment Representative Committee members, Regional Development Victoria, Douglas Land Access Compensation Agreement (LACA), various local landholders and lessees, media, Department of Economic Development, Jobs, Transport and Resources (DEDJTR), Wimmera Catchment Management Authority and other interested stakeholders;
- circulation of the quarterly Wimmera Project Update No. 1 (February 2019) to local members of parliament, Horsham Rural City Council, Buloke Shire Council, Shire of Yarriambiack, Shire of Southern Grampians, Barenji Gadjin Landcare Council, Wimmera Development Association, Cavendish Police Station, Douglas Environment Representative Committee members, Regional Development Victoria, Douglas LACA,

local landholders and lessees, media, DEDJTR, Wimmera Catchment Management Authority and other interested stakeholders;

- presentation to a State government interagency workshop in April 2019;
- participation in a State Government working group, commencing May 2019;
- presentation to the Horsham Rural City Council in June 2019;
- targeted consultation (emails, meetings and phone calls) with affected landowners, ongoing since November 2018 regarding land access to conduct baseline study assessments and drilling (ecology, noise, groundwater, surface water and Aboriginal heritage);
- project updates at the quarterly Douglas Environmental Review Committee meetings in May, August and November 2018 and in February 2019;
- tours of the test pit;
- media releases;
- establishment of a staffed drop-in information centre at Horsham Real Estate (13-17 Firebrace Street Horsham). This centre opened in February 2019 and is open Tuesdays and Fridays 9.30 am - 2.30 pm or by appointment;
- establishment of a staffed drop-in information centre at Natimuk (details to be confirmed but likely to be one day a week, commencing in July 2019);
- the community information line (telephone 1800 201 113) which is available for members of the community to discuss the Project with Iluka;
- implementation of the *WIM100 Test Pit Community Engagement Plan* (August 2018) which outlines Iluka's consultation program for the test pit. The plan outlines the key stakeholders identified, their potential concerns, the proposed communications strategy and the proposed schedule. A copy of the test pit consultation plan is included as Appendix I;
- a stakeholder perception survey in 2018 of Iluka's Australian operations, including those in the Murray Basin; and
- discussions with Government agencies, as summarised in Table 10.1.

Table 10.1 Consultation with government agencies

Agency	Date	Regarding
Department of Economic Development, Jobs, Transport and Resources (DEDJTR)	February 2018	Preparation of an Exploration Work Plan in relation to the test pit.
VicTrack and DEDJTR	May 2018	Permission to construct a temporary access road for the test pit across decommissioned Balmoral rail corridor in relation to the test pit.
Environment Protection Authority Victoria (EPA)	July 2018	Permits for the disposal of water associated with the test pit.
Horsham City Rural Council planning department and VicRoads	August 2018	Permission to construct a temporary access road in relation to the test pit.
Grampians Wimmera Mallee Water (GWM Water)	October 2018	Application for a water carting permit in relation to the test pit dewatering and also the construction of groundwater bores.
EPA	November 2018	Air quality monitoring requirements.
Department of Health and Human Services	November 2018	Introduction to the Project

Wimmera Catchment Management Authority	November 2018	Potential surface water impacts associated with the test pit.
Regional Development Victoria	February 2019	Introduction to the Project.
Horsham City Rural Council, Mayor and Chief Executive Officer	March 2019	Introduction to the Project
Regional Development Victoria, Department of Jobs, Precincts and Regions, Department of Premier and Cabinet, Energy Earth Resources, Environment Protection Authority Victoria, Horsham Rural City Council, Transport for Victoria and Resources Economic Development, Department of Environment, Land, Water and Planning, Department of Health and Human Services Invest Victoria	April 2019	Introduction to the Project
Regional Development Victoria, Department of Jobs, Precincts and Regions, Environment Protection Authority Victoria, Department of Environment, Land, Water and Planning Department of Health and Human Services Invest Assist.	May and July 2019	Project update
Department of Environment, Land, Water and Planning Department of Energy and Environment	May 2019	Provision of draft EES and EPBC referral documents for review and comment

Iluka is committed to high levels of community engagement. A community consultation plan is being prepared for the Wimmera Project to ensure that stakeholder interests are heard and actioned where reasonable.

Iluka will work in partnership with State Government, Horsham Rural City Council and the local community to develop a long-term, inclusive growth plan for Horsham with a view to maximise benefits for local communities.

Aboriginal stakeholder consultation related to the Project so far is summarised in Table 10.2.

Table 10.2 Consultation with Aboriginal stakeholders

Agency	Date	Regarding
Barengi Gadjin Land Council (BGLC) Chief Executive Officer, Michael Stewart	September 2018	Initial meeting to discuss the cultural heritage aspects of the proposed test pit and broader Project.
BGLC Registered Aboriginal Party (RAP)	October 2018	Initial meeting to discuss the desktop cultural heritage assessment (cultural heritage predictive modelling) undertaken

Manager, Darren Griffin		by Iluka's Aboriginal cultural heritage consultants, GHD, including: the test pit works, the desktop cultural heritage assessment, proposed protocols to implement if cultural heritage material was found during the test pit works. The proposed approach regarding the cultural heritage management plan (CHMP) for the broader Project was also discussed.
BGLC	December 2018	A meeting to discuss the deliverables from the desktop cultural heritage assessment.
BGLC	February 2019	The first day of a two-day standard assessment (non-ground intrusive field survey) was undertaken. The survey was undertaken by two Registered Aboriginal Party (RAP) representatives. An Iluka representative and two GHD cultural heritage experts were also in attendance.
BGLC	April 2019	The second day of the two-day standard assessment survey was undertaken.

10.4 Other agencies consulted:

Not applicable.

PART 2 POTENTIAL ENVIRONMENTAL EFFECTS

11. Potentially significant environmental effects

Overview of potentially significant environmental effects

11.1 Biodiversity

A baseline terrestrial ecological study was undertaken by Cardno (2018) to identify species and ecological communities likely to occur in the biodiversity study area and/or with potential to be impacted by the Project, with a particular focus on those listed under the *Flora and Fauna Guarantee Act 1988* (FFG Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The baseline ecological assessment did not include an assessment of the offsite infrastructure areas as these areas are yet to be determined. Similarly, no aquatic biodiversity assessments have been undertaken at this time.

The ecological study area (Figure 14) was found to predominantly contain exotic vegetation, with native vegetation remaining in isolated patches. A number of native ecological vegetation classes and flora and fauna species were recorded. These are discussed further in Tables 11.1 and 11.2.

Targeted surveys will be undertaken to determine the presence and extent of significant flora, fauna and ecological communities, along with an ecological impact assessment once the site layout and offsite infrastructure requirements are determined to assess the potential impacts.

Given the early stage of the biodiversity assessment and mine planning, the potential for biodiversity impacts was assessed using the following EES referral criteria for individual effects that may be of State or regional significance:

- Potential clearing of 10 ha or more of native vegetation from an area that:
 - is of an ecological vegetation class (EVC) identified as endangered by the Department of Sustainability and Environment (DSE) in accordance with Appendix 2 of Victoria's Native Vegetation Management Framework (VNVMF); or

- is, or is likely to be, of very high conservation significance as defined by Appendix 3 of VNVMF; and
- is not authorised under an approved Forest Management Plan or Fire Protection Plan.
- Potential long-term loss of a significant proportion (eg 1 to 5% depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria.
- Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'.
- Potential extensive or major effects on the health of biodiversity of aquatic, estuarine or marine ecosystems over the long-term.

Potential individual impacts of the Project as assessed against these EES referral criteria are outlined in Table 11.1.

Table 11.1 Potential individual impacts against EES referral criteria

Criterion	Potential impact
Potential clearing of 10 ha or more of native vegetation that is an endangered EVC.	<p>The Environmental study area potentially contains:</p> <ul style="list-style-type: none"> • 137 ha of endangered EVCs, comprising Plains Grassy Woodland (EVC 125) and Plains Grassy Wetland (EVC 125) (Figure 19); and • two ecological communities listed under the EPBC Act (Figure 21). <p>Targeted surveys will be undertaken to confirm their presence and extent.</p>
Potential long-term loss of a significant proportion of known remaining habitat or populations of a threatened species within Victoria.	<p>Baseline surveys confirmed the presence of the following in the Biodiversity study area:</p> <ul style="list-style-type: none"> • six threatened flora species listed under the FFG Act; • seven threatened fauna species listed under the FFG Act (Figure 22); • two EPBC listed species (Red-tailed Black Cockatoo and Growling Grass Frog) have previously been recorded in the locality and are considered likely to occur given the presence of suitable habitat including woodlands and wetlands; • other listed species with potential to occur include: <ul style="list-style-type: none"> – Swamp Everlasting; – Downy Starbush; – Red-lored Whistler; – Painted Honeyeater; – Curlew Sandpiper; – Australasian Bittern; and – Swift Parrot.
Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'.	<p>The nearest wetlands listed in the 'Directory of Important Wetlands in Australia' are White Lake and Heards Lake, approximately 20 km south and 10 km north-west of the Project, respectively.</p> <p>The nearest Ramsar wetland, Lake Abacutya is 100–150 km downstream (north) of the Project and therefore would not be impacted.</p>
Potential extensive or major effects on aquatic, estuarine or marine ecosystems over the long term.	<p>Several permanent and ephemeral wetlands occur in the Environment study area, the largest being Red Gum Swamp (Figures 23 and 3).</p> <p>Darragan Swamp Nature Reserve is located north-east of the Project site (Figures 23 and 3).</p>

The potential for biodiversity impacts has been identified using the following EES referral criteria for two or more potential impacts combined on the environment that may be of State or regional significance:

- Potential clearing of 10 ha or more of native vegetation, unless authorised under an approved Forest Management Plan or Fire Protection Plan.
- Matters listed under the FFG Act:
 - potential loss of a significant area of a listed ecological community; or

- potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including as a result of loss or fragmentation of habitats; or
- potential loss of critical habitat; or
- potential significant effects on habitat values of a wetlands supporting migratory bird species.
- Potentially extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the *National Parks Act 1975*.

Potential individual impacts of the Project as assessed against these EES referral criteria are outlined in Table 11.2.

Table 11.2 Potential combined impacts against EES referral criteria

Criterion	Potential impacts
Potential clearing of 10 ha or more of native vegetation.	The ecology study area is predicted to contain 461 ha of native EVCs (Figure 19) and scattered trees that may be impacted. Targeted surveys will be completed to verify their presence and extent. Project design will consider measures to avoid and/or minimise their clearing.
Matters listed under the FFG Act including potential loss of a significant area of a listed community, potential loss of a genetically important population of an endangered or threatened species, potential loss of critical habitat or potentially significant effects on habitat values of a wetland supporting migratory bird species.	Woodlands in the ecology study area represent Victorian Temperate Woodland Bird Community. The Project area is also likely to support Semi-arid Northwest Plains Buloke Grassy woodland Community and Red Gum Swamp Community No 1 (Figure 19). Five FFG Act listed species comprising Buloke, Magpie Goose, Diamond Firetail, Whiskered Tern and Brown Toadlet were recorded during baseline surveys. A number of wetlands occur in the Environmental study area that are likely to support migratory species (Figure 23). Detailed and targeted surveys will be completed for the above listed species and communities. The design will consider measures to avoid and/or minimise impacts on these communities or species.
Potential extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the National Parks Act.	No parks or reserves listed under the National Parks Act occur in the ecology study area. The south-west part of the Project site is covered by Environmental Significance Overlay – Schedule 4 (Figure 11) under the Horsham Rural City Planning Scheme. Most of the wetlands in the biodiversity study area are covered by Environmental Significance Overlay – Schedule 2 which protect the Natimuk Douglas Wetlands.
Four declared weeds (Bridal Creeper, Slender Thistle, Spear Thistle and African Boxthorn) and one declared pest (Red Fox) were recorded during baseline surveys.	

11.2 Radioactivity

All heavy mineral sand deposits contain traces of naturally occurring uranium (U_{nat}) and thorium (Th_{nat}), also known as naturally occurring radioactive material, or NORM. NORM in mineral sands primarily comprises of Thorium-232 (Th^{232}) and its decay chain progeny, and Uranium-238 (U^{238}) and its decay chain progeny; Uranium-235 (U^{235}) and its decay chain progeny typically comprises approximately 0.72% of U_{nat} . As the head of chain radioisotopes, U^{238} and Th^{232} have the longest half-lives in their respective decay chains at 4.5 billion years and 14 billion years respectively.

The U_{nat} and Th_{nat} is contained within the solid mineral grains of the mineral monazite, xenotime, zircon and some ilmenites. Radioactivity is predominately associated with the rare earth phosphate mineral monazite, which typically contains 0.1 to 0.3% uranium and 5 to 7% and thorium. Flowcharts that provide an overview of the mineral streams and associated distribution of radioactivity throughout the proposed mineral sands mining, processing and refining stages are presented as Figures 5 and 6.

The mineral separation plant will physically separate the ore ore (~25ppm U_{nat} , ~250ppm Th_{nat} , head of chain activity of ~1.34 Bq/g) from the host material to form heavy mineral concentrate (HMC) and about 9 Mtpa MSP tailings (Figure 5). There will be no chemical changes to the minerals within the mineral separation plant. The HMC will contain the vast majority of the monazite originally present in the ore. Therefore, the MSP tailings will have lower radioactivity than the host material prior to extraction. After initial out-of-pit storage, this material will be returned to the mine void.

The HMC will be further processed within the rare earth and zircon refinery. This will involve chemical processing which will generate about 260 ktpa of salt and gypsum residue that will include elevated uranium and thorium concentrations. The gypsum residue will contain 300 - 400 Bq/g total activity so will be classified as low-level radioactive waste.

As stated previously, by-products may be diluted to the extent they are not classified as low-level radioactive waste, or they may be stored separately in lined engineered facilities onsite. In either case, by-products will be permanently stored onsite to ensure radiation exposure to people and the environment is As Low As Reasonably Achievable (the ALARA principle), in accordance with Iluka's Radiation Management Licence issued under the *Radiation Act 2005*, radiation management plans required as a condition of that licence.

A radiation baseline assessment is currently underway to characterise the background radiation environment at the Project site. A radiological impact assessment is planned to assess the potential radiological impacts to workers, the public and the environment due to the Project operations.

Radiation will be managed in accordance with Iluka's approved Murray Basin Operations Radiation Management Plan. Management measures such as minimising exposure time, increasing distance from exposure sources, and shielding of sources will be used to ensure that radiation exposure to people and the environment meets prescribed statutory limits and is ALARA. A site-specific addendum to the Radiation Management Plan will be prepared that describes the combination of measures to be implemented for the Project as informed by the radiological impact assessment.

11.3 Groundwater

In the absence of appropriate management measures there is potential for the Project to impact groundwater quality, drawdown distances, inflow rates and groundwater dependent ecosystems.

Detailed hydrogeological investigations will be undertaken to develop and calibrate a hydrogeological model for the Project site, and assess potential impacts on regional groundwater resources, receptors and users.

11.4 Surface water

A baseline surface water assessment has been undertaken to identify the surface hydrology features of the Project site, including identification of site sub-catchments, flow paths, and onsite and offsite receptors. As detailed site layout plans are developed a surface water impact assessment will be undertaken to assess the potential disturbance to existing flow paths, and whether the Project has the potential to change the hydrological regime or impact receptor waterbodies within the Project site or downstream.

Due to the relatively flat topography, the majority of the Project site falls within flood hazard vulnerability class 'H1', meaning it is generally safe for people, buildings and vehicles (Water Technology 2018). There is potential for flood hazard to be increased in some areas by the Project due to the diversion or capture of water.

Surface water modelling undertaken as part of the impact assessment will be used to assess changes to flood hazard across the Project site. The modelling will also be used to inform site surface water management infrastructure such as sizing and location of drains, sumps, pumps, pipelines and dams to prevent offsite discharge of surface water having water quality indicators that exceed the objectives as determined in accordance with the *State Environment Protection Policy (Waters)*, or SEPP (Waters), is prevented.

11.5 Air quality

In the absence of appropriate management measures, air emissions from the construction, mining, and the operation of the processing plant (mineral separation plant and refinery), and Project-related traffic have potential to:

- increase gases and particulate matter concentrations in the air;
- increase radiation exposure due to inhalation of airborne radioactive dust, or atmospheric radon and thoron;
- reduce local amenity; and/or
- reduce crop quality.

The most significant air pollutant is expected to be dust generated from land clearing, mining and the operation of traffic on unsealed roads. The extent of the impacts will depend on prevailing weather conditions, the proximity of the receiver to the Project site and the effectiveness of the mitigation measures implemented.

The air quality impact assessment will quantify the potential impacts and will inform Project design and operations to ensure air quality impacts are minimised and comply with relevant air quality criteria in the *State Environment Protection Policy (Air Quality Management)* (SEPP AQM) and the *Protocol for Environmental Management for Mining and Extractive Industries* (the Mining PEM).

Identification and assessment of air emissions from the proposed mineral processing and refining is occurring as part of current pilot-plant scale metallurgical investigations.

Radiation exposure due to inhalation of radioactive dust, or atmospheric radon and thoron, will be considered as part of the radiological impact assessment for the Project.

11.6 Soils and rehabilitation

In the absence of appropriate management measures, there is potential for Project-related activities to result in a reduction in topsoil/subsoil quantity and/or quality which may in turn impact the eventual rehabilitation success.

These potential impacts can be mitigated through the careful management of stockpiles, by-product disposal and ongoing monitoring of soil and groundwater characteristics.

The soil and landscape impact assessment will quantify the potential impacts and will inform Project design and operations to ensure soil and landscape impacts are minimised during construction, operation, closure and rehabilitation.

Acid generation resulting from pit dewatering is not expected to occur. The occurrence of Acid Sulphate Soils (ASS) and Acid Sulphate Rock (ASR) have been assessed via the sampling and geochemical analysis of samples collected during an exploration drilling program undertaken in March 2018. A total of four samples were collected from the southern half of the deposit (approximately 2 km south of the test pit site) for analysis via the chromium reducible sulfur suite and net acid generating (NAG) NAGpH. The results of the analysis were compared to the criteria in Publication 655.1 (EPA 2009) and the classification criteria set out in the *Acid Rock Drainage Test Handbook* (AMIRA 2002). The results provide no indication of the presence of acid sulfate soils or acid sulfate rock. The analysis results and assessment are described in the report *WIM100 Test Pit – Preliminary Dewatering Assessment* (Jacobs 2018b). Furthermore, no evidence of acid generation has been observed in the groundwater monitoring results for samples obtained during and following dewatering activities at the test pit site.

11.7 Visual impact

Stockpiles, the processing plant and Project infrastructure have the potential to impact the rural character of the area. As the site is relatively flat, it is anticipated that the Project infrastructure will be visible from a considerable distance. As previously noted it is possible that the following areas in the broader region may have views to the site:

- Mount Arapiles-Toosan State Park, located approximately 15 km to the north/north-west of the site, with an elevation of 388 m AHD; 140m above Wimmera Plains;
- Black Range State Park (unnamed peak), located approximately 17 km to the south-east of the site, with an elevation of 490 m AHD; and
- Black Range State Park (unnamed peak), located approximately 20 km to the south/south-east of the site, with an elevation of 548 m AHD.

While the following elevated areas occur in the local region, viewshed analysis will be required to determine whether the intervening Grampians mountain range disrupts views to the site:

- the Grampians (Roses Gap), located approximately 35 km to the east of the site, with an elevation of 613 m AHD;
- the Grampians (Halls Gap), located approximately 47 km to the east/south-east of the site, with an elevation of 858 m AHD;
- the Grampians (Victoria Range), located approximately 45 km to the south-east of the site, with an elevation of 971 m AHD; and
- the Grampians (Mt William), located approximately 64 km to the east/south-east of the site, with an elevation of 1160 m AHD.

The presence of roadside and scattered trees in and around the Project site will provide some visual screening for views in the surrounding area at a similar elevation.

In the absence of appropriate design measures, operations at night may result in light-spill impacting nearby residents or indicate the Project's location from more distant viewpoints.

The landscape, visual and lighting impact assessment will quantify the potential impacts and will inform Project design to ensure visual impacts are minimised.

11.8 Noise and vibration

Operation of plant, equipment and machinery during construction and operations will increase noise (and potentially also vibration levels) above background levels, in and around the Project site. The impacts to sensitive receivers will depend on the emitted noise levels and frequencies, weather conditions, locations of the sources and receivers, and the effectiveness of mitigation measures.

Similarly, the increase in vehicle movements travelling to, from and within the site will also increase noise levels along roads, potentially impacting the amenity of residents along these routes.

The noise and vibration impact assessments will quantify the potential impacts and will inform Project design and operations to ensure noise and vibration impacts are minimised, and that noise emissions comply with the recommended maximum noise levels determined in accordance with *Noise from Industry in Regional Victoria (NIRV): Recommended Maximum Noise Levels from Commerce, Industry and Trade Premises in Regional Victoria* (EPA publication 1411).

11.9 Traffic and transport

Traffic volumes in the general area will increase as a result of Project-related traffic. This may result in safety and amenity impacts including:

- increased travel times;
- increased crash risk;
- increased volumes of light, heavy, oversized and over mass vehicles;
- increased road maintenance requirements;
- increased vehicle exhaust emissions; and
- road detours and/or closures.

The traffic and transport impact assessment will quantify the potential impacts and will inform Project design and operations to ensure traffic and transport impacts are minimised. See also Section 14.1.

12 Native vegetation, flora and fauna

12.1 Native vegetation

12.1.1 Is any native vegetation likely to be cleared or otherwise affected by the Project?

Yes, native vegetation will need to be cleared as a result of the Project. The extent of clearing is currently unknown as the Project layout has not been finalised, the total area of native vegetation and the total number of scattered trees within the mine layout development envelope has not been confirmed and is not currently known for the offsite infrastructure areas. Targeted surveys will be undertaken to determine the presence and extent of significant flora, fauna and ecological communities, along with an ecological impact assessment once the site layout and offsite infrastructure requirements are determined to assess the potential impacts.

12.1.2 What investigation of native vegetation in the Project area has been done?

A baseline terrestrial ecology assessment was undertaken by Cardno (2018) to identify potentially occurring listed species and ecological communities within the Project site, such that these could be considered during Project design. The baseline terrestrial ecology assessment included:

- a review of available biodiversity databases, planning scheme information, GIS mapping datasets and other relevant and available information;
- identification of vascular flora, terrestrial vertebrate fauna and habitat values in the biodiversity study area;
- mapping any remnant and ecologically significant flora and terrestrial fauna habitats;
- identification of flora and fauna of national, State and regional significance present or likely to occur in the biodiversity study area;
- habitat quality assessments of woodland and habitat patches in accordance with the relevant State and national native vegetation assessment frameworks; and
- recommendations for further required assessments.

The ecology baseline report is attached at Appendix C.

12.1.3 What is the maximum area of native vegetation that may need to be cleared?

The baseline ecological assessment identified approximately 461 ha of native vegetation within the 5,600 ha ecology study area, including the vegetation associated with the Jallumba Marsh Flora Reserve and the Red Gum Swamp.

The mine layout development envelope, which encompasses the indicative mining area, processing and refining plant and associated infrastructure areas, evaporation ponds and TSFs will total approximately 2,580 ha. Iluka has chosen to exclude the Jallumba Marsh Flora Reserve and Red Gum Swamp from the mine layout development envelope (Figure 2).

Targeted surveys will be undertaken to determine the presence and extent of significant flora, fauna and ecological communities, along with an ecological impact assessment once the site layout and offsite infrastructure requirements are determined to assess the potential impacts. The detailed design will seek to minimise the area of native vegetation clearing.

The potential habitat extents for listed species or threatened ecological communities within the baseline ecological study area (Cardno 2019a), which is of larger extent than the likely final mine layout and disturbance footprint is outlined in Table 12.1. The mine layout plan will be developed in the second half of 2019.

Table 12.2 Habitat extents for listed species or threatened ecological communities within the baseline ecological study area

Protected matter	Potential area of habitat impact
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Up to 55.3 ha of potential habitat
Grey Box (<i>Eucalyptus microcarpa</i>) Woodlands and Derived Native Grasslands of South Eastern Australia	Up to 55.4 ha of potential habitat
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	Up to 56.5 ha of potential habitat
Growling Grass Frog (<i>Litoria raniformis</i>)	Up to 346.3 ha of potential habitat (foraging) and 59.9 km of drainage lines (breeding and dispersal habitat)
Red-tailed Black Cockatoo (south-eastern form) (<i>Calyptorhynchus lathami graptogyne</i>)	Up to 529.9 ha of potential habitat
Swamp Everlasting (<i>Xerochrysum palustre</i>)	Up to 245.9 ha of potential habitat
Red-lored Whistler (<i>Pachycephala rufogularis</i>)	Up to 272.1 ha of potential habitat
Painted Honeyeater (<i>Grantiella picta</i>)	Up to 529.9 ha of potential habitat
Curlew Sandpiper (<i>Callidris ferruginea</i>)	Up to 334.4 ha of potential habitat
Australasian Bittern (<i>Botaurus poiciloptilus</i>)	Up to 334.4 ha of potential habitat
Swift Parrot (<i>Lathamus discolor</i>)	Up to 272.1 ha of potential habitat

The ecological impacts associated with the indicative mineralised extent versus an indicative mining extent that excludes the Jallumba Marsh Flora Reserve and Red Gum Swamp areas were assessed by Cardno in a letter dated 21/07/2019 (Appendix J). Ecological values present or likely to be present were identified for the following areas:

- baseline ecological assessment study area (an upper limit, assumes the entire 5,600 ha ecological study area is disturbed);
- indicative mineralised extent (totalling 1,509 ha, including the overlap areas with Jallumba Marsh Flora Reserve and Red Gum Swamp); and
- indicative mining extent (ie the indicative mineralised extent with the overlap areas of Jallumba Marsh Flora Reserve and Red Gum Swamp excluded, totalling 1,308 ha. This is referred to as the revised mineralised extent in the Letter of Advice (Cardno 2019b).

Ecological values considered in the assessment related to threatened species, threatened ecological communities, and native vegetation (Appendix J), and the associated scenario testing offset requirements report (Ensym) sourced from DELWP (also in Appendix J).

Threatened species (classed either as endangered or vulnerable) are more likely to be impacted by the potential development footprint than the modified footprint (with the Jallumba Marsh Flora Reserve and Red Gum Swamp areas excluded), and that differences in habitat impacts are largely attributed to the exclusion of Jallumba Marsh Flora Reserve. There was little difference in impact relating to Red Gum Swamp between the two footprints (Appendix J).

By excluding the Red Gum Swamp and the Jallumba Marsh Flora Reserve from the potential development footprint, the total area with potential for TECs to occur is reduced from approximately 99 ha to less than 1 ha (Table 12.2).

Table 12.3 Area of EPBC threatened ecological community potentially impacted by the three disturbance options

Community	Baseline study area (ha)	Indicative mineralisation extent (ha)	Indicative mining extent (ha)
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	56.67	39.91	<0.01
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	56.61	40.18	0.11
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	57.85	19.37	0.00
Total	171.13	99.46	0.11

The report also showed that by excluding Red Gum Swamp and the Jallumba Marsh Flora Reserve from the potential development footprint, the total area with potential for native vegetation to be impacted is reduced from approximately 93 ha to less than 1 ha (Table 12.3). It should be noted that for the purposes of the exclusion area assessment native vegetation removed is based on native patches and did not include scattered trees, which have not yet been fully assessed in the field. Field assessment of scattered trees will be undertaken as part of the targeted ecological assessment works scheduled for the second half of 2019.

Table 12.4 Area of EVC potentially impacted by the three disturbance options

Ecological vegetation classes	Bioregional conservation status	Baseline study area (ha)	Indicative mineralisation extent (ha)	Indicative mining extent (ha)
WIM_0125	Endangered	56.50	19.37	0.00
WIM_0292	Vulnerable	280.40	33.38	0.06
WIM_0653	Endangered	23.40	0.00	0.00
WIM_0803	Endangered	88.00	40.51	0.17
Total		448.30	93.26	0.23

Further advice was sought from Cardno (Appendix K) to understand the ecological impacts and offset implications associated with the larger mine layout development envelope (Figure 2); this development envelope totals 2,580 ha and comprises the indicative mining extent, the plant development envelope,

and additional area associated with haul roads, soil stockpiles, surface drainage and other supporting infrastructure.

The offset requirements within the mine layout development envelope were calculated by DELWP using the following information as Scenario 1:

- the extents of native vegetation patches as mapped by Cardno (2019a), and their associated habitat hectare condition scores as modelled by Cardno; and
- current wetlands as mapped by DELWP (all assumed to comprise Red Gum Swamp EVC 292), and their associated condition scores as modelled by DELWP.

While field verification of individual scattered trees has not yet been undertaken, it was estimated from aerial photography that approximately 836 large scattered trees are located within the mine layout development envelope and were included in the offset calculations as Scenario 2.

The resulting offset requirements for Scenarios 1 and 2 were reported in Cardno's letter dated 26/06/2019 regarding offset implications for the development footprint (Cardno 2019b) (Appendix K) and the associated DELWP Ensym reports attached as Appendices A and B respectively of Appendix K.

The total area of each EVC located within the mine layout development envelope as determined in the DELWP Ensym report is summarised in Table 12.4.

Table 12.5 Area of EVC potentially impacted within the mine layout development envelope

Ecological vegetation classes	Bioregional conservation status	Area of EVC (ha)
WIM_0125	Endangered	0.00
WIM_0292	Vulnerable	27.09
WIM_0653	Endangered	0.00
WIM_0803	Endangered	11.92
Total		39.01

The resulting offset requirements as determined by the DELWP Ensym report are summarised in Table 12.5.

Table 12.5 Summary of offset requirements for removal of patches within the mine layout development envelope

	Scenario 1 (patches and current wetlands)	Scenario 2 (patches, current wetlands and scattered trees)
General offset amount	0.155 general habitat units	1.003 general habitat units
Vicinity	Wimmera Catchment Management Authority (CMA) or Horsham Rural City Council	
Minimum strategic biodiversity value score	0.094	0.124
Large trees	0 large trees	836 large trees
Species offset amount	16.952 species units of habitat for Erect Peppercreess, <i>Lepidium pseudopapillosum</i> 19.579 species units of habitat for Inland Pomaderris, <i>Pomaderris paniculosa</i> subsp. <i>paniculosa</i>	30.030 species units of habitat for Hairy-pod Wattle <i>Acacia glandulicarpa</i> 26.120 species units of habitat for Erect Peppercreess, <i>Lepidium pseudopapillosum</i> 29.919 species units of habitat for Inland Pomaderris, <i>Pomaderris paniculosa</i> subsp. <i>paniculosa</i>



12.1.4 How much of this clearing would be authorised under a Forest Management Plan or Fire Protection Plan?

Not applicable.

12.1.5 Which Ecological Vegetation Classes may be affected?

The following Ecological Vegetation Classes (EVCs) may be affected by the Project (Figure 19):

- EVC 125 Plains Grassy Wetland;
- EVC 292 Red Gum Swamp;
- EVC 803 Plains Woodland;
- EVC 653 Aquatic Herbland; and
- EVC 682 Permanent Open Freshwater.

Detailed surveys will be undertaken to accurately map the extent of these EVCs in the Project site.

12.1.6 Have potential vegetation offsets been identified as yet?

No.

12.1.7 Other information/comments?

Data collected during the baseline study is preliminary and relates only to terrestrial ecology. Detailed and targeted terrestrial and aquatic field survey and assessment is planned for Spring 2019. Ecological impact assessments will also be undertaken.

12.2 Flora and fauna

12.2.1 What investigations of flora and fauna in the Project area have been done?

See Section 12.1.2.

12.2.2 Have any threatened or migratory species or listed communities been recorded from the local area?

Yes, baseline surveys confirmed the presence of one ecological community listed under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), namely Victorian Temperate Woodland Bird Community and likely presence of two further ecological communities, namely Semi-arid Northwest Plains Buloke Grassy Woodland Community and Red Gum Swamp Community No. 1 (in the biodiversity study area). Five species listed under the FFG Act were recorded:

- Buloke (*Allocasuarina luehmannii*);
- Magpie Goose (*Anseranus semipalmata*);
- Diamond Firetail (*Stagnopleura guttata*);
- Whiskered Tern (*Chlidonyas hybrida*); and
- Brown Toadlet (*Pseudophryne bibronii*).

Migratory species were not recorded during baseline surveys. Species that may occur in the biodiversity study area on an occasional basis are:

- Common Sandpiper (*Actitus hypoleucos*);
- Sharp-tailed Sandpiper (*Calidris acuminata*);
- Pectoral Sandpiper (*Calidris melanotos*);
- Latham's Snipe (*Gallinago hardwickii*); and
- Common Greenshank (*Tringa nebularia*).

As detailed in Section 8.1.1 the PMST reports for the offsite infrastructure indicated that 11 migratory species and 3 listed ecological communities may occur in or relate to these corridors and footprints (Appendix J).

12.2.3 If known, what threatening processes affecting these species or communities may be exacerbated by the Project?

The following threatening processes have potential to be exacerbated by the Project:

- alteration to the natural flow regimes of rivers and streams;
- habitat fragmentation as a threatening process for fauna in Victoria;
- increase in sediment input into Victorian rivers and streams due to human activities; and
- wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing.
- The potential for the Project to result in these processes will be assessed in the biodiversity impact assessment and strategies will be developed to avoid, minimise and/or mitigate these threatening processes, as applicable.

12.2.4 Are any threatened or migratory species, other species of conservation significance or listed communities potentially affected by the Project?

The species, communities and migratory species listed in Section 11 may be impacted by the Project if they are confirmed to be present during detailed and targeted surveys. However, as the Project design has not been completed and the presence of the species and communities has not been confirmed, the extent of impacts is currently unknown. The results of the detailed and targeted surveys will inform the Project design such that impacts on listed species and communities are avoided and/or minimised.

12.2.5 Is mitigation of potential effects on indigenous flora and fauna proposed?

Yes. In addition to the field surveys undertaken in 2018, field surveys and data analysis will be undertaken in Spring 2019 to further define the extent of listed ecological communities in the Project site and biodiversity study area to confirm the presence (or otherwise) of listed species and their habitats. The results of these detailed surveys will inform the Project design.

Iluka will implement the following measures to minimise the potential for unacceptable mine development-related impacts on biodiversity:

- as far as practicable, avoid impacts on native vegetation, prioritising retention of the largest patches, listed communities and species habitats;
- as far as practicable, avoid impacts on wetlands;
- consider the connectivity of native vegetation and waterways during mine planning, to reduce impacts related to altered hydrological regimes and impacts beyond the biodiversity study area;
- undertake hydrological studies to determine potential impacts on surface flow to wetlands and groundwater dependent ecosystems and design appropriate mitigation strategies;
- develop detailed environmental safeguards for listed species and communities once their extent and presence has been better defined (ie following detailed surveys);
- clearly identify the limit of approved disturbance areas on the ground using markers and ensure that all ground disturbing activities are only undertaken within approved areas;
- ensure that vegetation is removed in such a way to avoid damage to surrounding vegetation;
- undertake a pre-clearing inspection to identify and, where practicable, remove nesting or roosting fauna;
- stockpile vegetation onsite where practicable for use during rehabilitation operations. Larger vegetation may be retained whole for use in rehabilitation operations on site or for regional biodiversity enhancement programs such as re-snagging of rivers;
- undertake weed management and pest control programs in consultation with surrounding landholders; and
- undertake progressive rehabilitation.

Biodiversity offsets will be provided to compensate for vegetation clearance that cannot be avoided. Iluka will also implement appropriate mitigation strategies for indirect biodiversity impacts.

In addition, Iluka will implement a biodiversity offset strategy to compensate for any potential unavoidable biodiversity impacts.

12.2.6 Other information/comments?

Since only limited biodiversity baseline studies have been undertaken to date, and targeted surveys are yet to be completed, there are information gaps regarding the presence of various species.

12.3 Water environments

12.3.1 Will the Project require significant volumes of fresh water (eg. > 1 GL/yr)?

Yes, as discussed in Section 3.6.9, the overall process and site water balance is currently under development however, it is anticipated that the mine will require approximately 5.5 GL/year of water, primarily for mineral processing, tailing disposal, dust suppression and rehabilitation with the bulk being required for processing. Potential sources of water include:

- the Rocklands Reservoir (using the existing Douglas mine allocation of 5 GL/year - subject to an approved transfer);
- the Strathlynn Borefield (using the existing Douglas mine allocation of 3 GL/year - subject to an approved transfer); and
- a new borefield closer to the mine site.

Discussions with GWM Water have commenced regarding the infrastructure required to deliver water to the Project site. The preferred option includes a new pipeline connected into the existing Rocklands-Douglas pipeline close to the Douglas mine to utilise the existing Rocklands Reservoir and Strathlynn Borefield allocations. GWM Water are currently undertaking a reliability study to determine the required size of allocation to guarantee the water supply for the Project.

Dewatering of the mine pits will be required to allow mining of ore below the groundwater table. Any excess groundwater not utilised for processing or dust suppression will be returned to the aquifer via infiltration or, if the need is determined, via re-injection, and will offset total water demand.

Water will be stored in a series of dams across the Project site that will segregate water of varying quality.

12.3.2 Will the Project discharge wastewater or runoff to water environments?

The Project has the potential to discharge water to surface water and groundwater environments, however the likelihood and potential impact has not yet been determined.

Additional site-based hydrological investigations will be undertaken to assess likely surface water volumes, quality, flow paths (including run-off to downstream environments) and flood risks. The studies will also assess the potential impacts on ecological receptors as a result of changes in hydrological regime.

Mine affected surface water runoff will be captured within a system of drains, sumps, pumps, pipes and dams, and stored onsite to prevent offsite discharge of surface water having water quality indicators that exceed the objectives determined in accordance with the *State Environment Protection Policy (Waters)*, or SEPP (Waters).

To minimise water demand, process water within the Mineral Separation Plan (MSP) and refinery circuits will be treated and recirculated. Any waste process water from the MSP circuits will be disposed as part of the tailings stream into the starter TSF or in-pit tailings cells. Disposal of waste process water from the refinery circuits will occur as part of the saline brine by-product, with the disposal methodology to be informed by impact assessments undertaken during the second half of 2019.

Dewatering of the mine pits will be required to allow mining of ore below the groundwater table. Any excess groundwater not utilised for processing or dust suppression will be returned to the aquifer via infiltration or, if the need is determined, via re-injection, and will offset total water demand.

12.3.3 Are any waterways, wetlands, estuaries or marine environments likely to be affected?

The Project will impact the flow of surface water across the site and has the potential to impact the hydrological regime of downstream waterbodies and receptors. The likelihood and extent of impact has not yet been determined.

A surface water impact assessment will be undertaken to assess impact to surface water volumes, quality, flow paths (including run-off to downstream environments) and flood risks arising from the Project, and potential impacts to ecological receptors resulting from changes in the hydrological regime.

No estuarine or marine ecosystems will be affected.

12.3.4 Are any of these water environments likely to support threatened or migratory species?

Waterways and wetlands in the vicinity of the Project have the potential to support threatened and migratory species. Further ecology surveys will be undertaken to determine the existing condition of nearby wetlands, and to assess for the presence of threatened or migratory species to determine the potential for Project-related impacts.

12.3.5 Are any potentially affected wetlands listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia'?

No. The nearest Ramsar wetland, Lake Albacutya is 100–150 km downstream (north) of the Project site.

As detailed in Section 8.1.1, the PMST reports for the offsite infrastructure (pipelines, power line extension and construction accommodation village) indicate that up to two Wetlands of International Importance may occur in or relate to the nominated corridors and footprints, being:

- the Glenelg River estuary and Discovery Bay wetlands (for the potential water pipeline); and
- Lake Albacutya.

In both cases the PMST reports note that these wetland complexes are located more than 100 km away from the offsite infrastructure corridors or footprints.

The nearest wetlands listed in the 'Directory of Important Wetlands in Australia' are White Lake and Heards Lake, approximately 20 km south and 10 km north-west of the Project site, respectively. The north-south trending ridge located on the western side of the Project area physically separates the Project site from the catchments for these two lakes, and therefore impact to these lakes due to the Project will not arise.

The PMST reports are attached as Appendix J.

12.3.6 Could the Project affect streamflows?

Yes, it is likely that the Project will affect streamflows in downstream catchments. The surface water impact assessment will assess potential impacts on streamflows.

12.3.7 Could regional groundwater resources be affected by the Project?

Yes, the Project could affect regional groundwater resources.

Initial groundwater modelling for the 26-m deep test pit (based on regional data) predicted that the maximum groundwater inflow rates to the test pit was likely to range between 0.2 and 11 L/s, resulting in a maximum drawdown distance of approximately 550 m (Jacobs 2018b). However slug tests performed on monitoring wells constructed at the test pit site, and site observations during the test pit excavation, suggested that the maximum groundwater inflow rate to the test pit was at the lower end of the predicted range, with a corresponding drawdown extending approximately 180 m horizontally from the test pit.

Test pumping of the production well that was constructed at the test pit site in late 2018 is proposed during 2019 to obtain additional aquifer hydrogeological data at the site.

A number of additional groundwater wells are also proposed for installation during 2019 to improve the understanding of spatial variations in groundwater level and quality over the local region. Where possible, test pumping of these wells is also proposed.

Detailed hydrogeological investigation will be undertaken to develop and calibrate a hydrogeological model for the region local to the Project site, with the calibrated model then used to assess potential impacts on regional groundwater resources.

12.3.8 Could environmental values (beneficial uses) of water environments be affected?

The Project has the potential to affect environmental values (beneficial uses) of the local water environment.

Investigation and assessment of the regional groundwater resource has been undertaken as part of the *WIM100 East Baseline Groundwater Assessment* (Jacobs 2018a), and *WIM100 Test Pit Phase 2 Dewatering Assessment* (Jacobs 2018b).

Regional groundwater salinity mapping of the area (DELWP 2014a) indicates groundwater salinity ranges between 3,500 mg/L and 13,000 mg/L total dissolved solids (TDS). However, site-specific results obtained during exploration drilling activities indicate TDS ranges between 2,300 and 3,400 mg/L at the site. As such, groundwater at the Project site is likely to require management under segments B and C of the State Environment Protection Policy (Waters) (EPA 2018) and would need to be protected against the beneficial uses listed under those segments, as outlined in Table 8.1.

As part of the test pit dewatering assessment no active groundwater users were identified within a 5 km radius of the test pit site (the test pit location is shown in Figure 2).

The Victorian Aquifer Framework identifies the Murray Group Limestone or equivalent units in the general site area. The aquifer within the Murray Group Limestone is used for irrigation in the western Murray Basin. However, bore logs in the vicinity of the ore body and observations during construction of the test pit do not show a distinct limestone unit. Further investigation will be undertaken to determine the degree of connection between the units in the vicinity of the ore and the regional limestone resource (Jacobs 2018a).

Bureau of Meteorology mapping suggests there are a number of terrestrial and aquatic ecosystems in the Project site with potential to be groundwater dependant ecosystems (Jacobs 2018a and 2018b). However, while these ecosystems have a potential to be groundwater dependant, the regional water table is expected to be greater than 15 mBGL ie below the root depth of vegetation. Therefore, these ecosystems are unlikely to be reliant on the regional groundwater and are not expected to be affected by any local changes in groundwater levels.

Further detailed hydrogeological investigations will be undertaken to confirm site hydrostratigraphy, aquifer properties, groundwater levels, flow, quality, receptors and beneficial uses.

12.3.9 Could aquatic, estuarine or marine ecosystems be affected by the Project?

The Project will impact surface water flows across the Project site and has the potential to impact hydrological regimes downstream of the site. The level and location of impact will be dependent on the final site design and layout. The Project therefore has the potential to affect aquatic ecosystems. Assessment of impacts to surface water hydrology from the Project, and the resulting potential to affect aquatic ecosystems, is proposed during the second half of 2019 following the development of the site layout plan.

No estuarine or marine ecosystems will be affected.

12.3.10 Is there a potential for extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems over the long-term?

As noted above the Project has potential to impact hydrological regimes and aquatic ecosystems downstream of the site, and assessment is proposed during the second half of 2019 following the development of the site layout plan.

No estuarine or marine ecosystems will be affected.

12.3.11 Is mitigation of potential effects on water environments proposed?

Yes, all Iluka sites operate under an environmental management plan (EMP), which is a key component of an approved Mine Work Plan required under the *Mineral Resources (Sustainable Development) Act 1990*.

A site-specific EMP will be prepared for the Wimmera Project covering the construction, operational, closure, rehabilitation and post-closure phases. The EMP will outline mitigation measures and environmental performance criteria (where relevant) for biodiversity, groundwater and surface water.

The Project will be designed (eg stockpile locations etc) to minimise potential effects on water environments.

12.3.12 Other information/comments?

Only baseline groundwater studies have been undertaken to date. Assessment of hydrochemistry, groundwater dependent ecosystems (GDEs), groundwater levels, flowrates, presence of the Murray Group Limestone near the ore and the presence of beneficial users are underway.

Only baseline surface water studies have been undertaken to date. Assessment of seasonal flow patterns, surface water users and receptors, water quality, location and extent of hydrological features, surface water catchments and flow pathways across the Project site are underway.

Aquatic ecosystem baseline studies are planned.

The Project layout design is not yet finalised (onsite and offsite infrastructure).

Impact assessments will be undertaken based on the completed characterisation of the existing environment and on the Project design.

13 Landscape and soils

13.1 Landscape

13.1.1 Has a preliminary landscape assessment been prepared?

No.

13.1.2 Is the Project to be located either within or near an area that is subject to a Landscape Significance Overlay or Environmental Significance Overlay?

Yes, the Project site is located within the following Environmental Significance Overlays:

- ESO4 Environmental Significance 4 - Water catchment protection (Figure 11); and
- ESO5 Environmental Significance 5 - Channel and reservoir protection (Figure 12).

The Project site is located in the region of the following Environmental Significance Overlays:

- ESO2 Environmental Significance 2 - Natimuk Douglas wetlands (approximately 3 km to the north-west of the Project site); and
- ESO3 Environmental Significance 3 - Watercourse protection (approximately 9 km to the north-west of the Project site).

No Landscape Significance Overlays apply in or near the Project.

13.1.3 Is the Project to be located either within or near an area that is identified as of regional or State significance in a reputable study of landscape values?

No - the Project site is not located near the Grampians Ranges or Mount Arapiles (State level significance) or the Black Ranges and the Natimuk-Douglas Saline Wetland Depression (regional level significance).

A landscape, visual and lighting impact assessment will be undertaken to identify potential impacts, avoidance, mitigation in relation to any local landscape values within the region.

13.1.4 Is the Project to be located either within or near an area that is within or adjoining land reserved under the National Parks Act 1975?

No.

13.1.5 Is the Project to be located either within or near an area that is within or adjoining other public land used for conservation or recreational purposes?

Yes, two conservation/recreation reserves are partially located within the Project site, comprising:

- the Jallumba Marsh Flora Reserve (a 79 ha nature conservation reserve) (refer Figure 2); and
- the Red Gum Swamp Jallumba Wildlife Reserve (a 177 ha wildlife hunting reserve) (refer Figure 2).

The Darragan Swamp Wildlife Reserve (a 67 ha wildlife hunting reserve) and Cookes Wildlife Reserve (a 14 ha wildlife hunting reserve) are located downstream of the Project site to the east and north respectively.

According to the Victorian Government's *Conservation Action Plan for Parks and Reserves Managed by Parks Victoria – Wimmera* (2018) the Jallumba Marsh Flora Reserve is classified as category E1 for its level of protection i.e. 'generally have very low or nil recorded values of low biodiversity conservation significance'. Classified as E2 the Cookes Wildlife Reserve is regarded as having the same level of biodiversity conservation significance.

The Red Gum Swamp Jallumba Wildlife Reserve and Darragan Swamp Wildlife Reserve are classified as D for its level of protection, i.e. 'Park sizes range from 10 ha to 15 000 ha and are conservation reserves. Parks have relatively lower species diversity, representing a moderate proportion of the bioregions species diversity (about 2 - 15%). Relatively small number of threatened species present.'

As previously noted, while drilling results indicate that mineralisation occurs under portions of the Jallumba Marsh Flora Reserve and the Red Gum Swamp, due to the high ecological and Aboriginal cultural heritage values Iluka has chosen to exclude these areas from the proposed mining footprint.

Other reserves and State parks located in the broader area are as follows, measured from the nearest applicable boundary of the EES study area (Figure 1):

- Lake Carchap Wildlife Reserve: 8 km to the west;
- John Smith Memorial Fauna Reserve: 10 km to the north-east;
- Jilpanger Nature Conservation Reserve: 10 km to the west;
- Mount Arapiles-Tooan State Park: 12 km to the north-west;
- Black Range State Park: 15 km to the south-east;
- Ti Tree Swam Wildlife Reserve: 20 km to the south-west;
- Grassflat Swamp Flora and Fauna Reserve: 23 km to the north-west;
- Mitre Lake Flora and Fauna Reserve: 23 km to the north-west; and
- Oliver's Lake Fauna Reserve: 25 km to the north.

It is not anticipated that the above locations will be impacted by the Project.

13.1.6 Is any clearing vegetation or alteration of landforms likely to affect landscape values?

Yes, whilst the existing landscape to be altered is agricultural land that has already been disturbed, the Project will involve clearing of vegetation and alteration of landforms which in turn will affect the visual impacts of the area, particularly in relation to the presence of the mine pit, stockpiles, processing plant and refinery during operations.

A visual impact assessment will be undertaken to confirm the sensitivity of the existing landscape to accommodate change, assess the likely visual impact of the Project on the specific and wider landscape and provision of recommendations to mitigate visual impacts.

13.1.7 Is there a potential for effects on landscape values of regional or State importance?

No - the Project site is not located near the Grampians Ranges or Mount Arapiles (State level significance) or the Black Ranges and the Natimuk-Douglas Saline Wetland Depression (regional level significance).

A landscape and visual impact assessment will be undertaken to determine whether the Project will impact any values of regional or State importance.

13.1.8 Is mitigation of potential landscape effects proposed?

Mitigation of potential landscape effects is intended as part of Project layout design, however the feasibility and practicality of required mitigation approaches is unknown until potential effects are determined.

A landscape and visual impact assessment will be undertaken to determine potential effects on the landscape values and provide recommendations to mitigate visual impacts.

13.1.9 Other information/comments?

No.

13.2 Soils

13.2.1 Is there a potential for effects on land stability, acid sulphate soils or highly erodible soils?

Yes. Operations will involve the removal and stockpiling of topsoil, subsoil and overburden, placement of tailings into the starter TSF and in-pit voids, and the subsequent progressive replacement of overburden, subsoil and topsoil as the mine advances. Un-planned and un-controlled consolidation of tailings and replaced material in pits under rehabilitation has the potential to cause land stability issues.

Analysis of lithological samples undertaken for the test pit provided no indication that acid sulfate soils or acid sulfate rock occur (Jacobs 2018b). Groundwater samples undertaken during and following test pit dewatering also show no indication of acid sulphate soils being present. Further geochemical assessments are proposed during 2019.

The Project site is characterised by gentle slopes, and no significant erosional features are evident. Open disturbed areas associated with the operational site, including mine pits, ramps, stockpiles and roads, will be designed to minimise the potential for erosion, and accommodate predicted climate change rainfall patterns. Mined areas will be progressively restored and rehabilitated as the mine advances, with the aim of restoring the land capability to be equivalent to the pre-mining capability, or other end use as agreed with the landowner and regulator. Vegetation will be reinstated following placement of mining by-products, overburden, subsoil and topsoil.

A baseline soil assessment is currently in progress and a soil and landscape impact assessment will also be undertaken including an assessment on land stability, erosion and potential rehabilitation issues.

13.2.2 Are there geotechnical hazards that may either affect the Project or be affected by it?

No geotechnical hazards have been identified to date.

The program of geotechnical investigations for the project seeks to identify and quantify the geotechnical properties of soil and lithological materials at the project site, and includes:

- PQ3 diamond core drilling to obtain sample material for laboratory testing (drilling completed April 2019);
- electric Cone Penetrometer Test (CPT) to determine cone tip resistance, sleeve resistance and pore pressure (completed April 2019); and
- geotechnical test pits to obtain samples for laboratory testing (proposed in the second half of 2019).

The design of mine pits and infrastructure foundations will be informed by the results of the geotechnical investigations, and a geotechnical impact assessment that will be undertaken for the Project.

13.2.3 Other information/comments?

Not applicable.

14 Social environments

14.1 Is the Project likely to generate significant volumes of road traffic, during construction or operation?

Yes, the Project will generate significant volumes of road traffic during its construction and operation, including light, heavy and oversize and over mass vehicles. The majority of oversized and over mass vehicle movements will occur during the construction phase and will largely comprise delivery of construction materials, large tyres, plant and parts for the mining fleet. Delivery of large tyres and other parts will also be required during the operations phase, to a lesser extent.

All material extracted from the Project site will be processed onsite and as a result, there will be no heavy vehicle haulage of ore from the Project site. During the operation phase the only heavy vehicle movements to and from the Project site will be for delivery of goods such as chemicals, gas bullets, plant and equipment, and transport of product from the site.

Other Project-related traffic will comprise employees and visitors, typically travelling in private vehicles.

Baseline traffic assessments are planned during 2019 and will consider existing traffic volumes and existing road conditions. A traffic impact assessment will be undertaken to identify potential traffic impacts during the construction phase and the operation phase, including increases in traffic volumes (by vehicle type, travel route, travel purpose and movement type). The impact assessment will identify required road upgrades and/or traffic mitigation measures such as the provision of a bus service for Project employees.

The traffic impact assessment will be supported by the socioeconomic impact assessment, which will consider where employees are likely to live during construction and operations.

14.2 Is there a potential for significant effects on the amenity of residents, due to emissions of dust or odours or changes in visual, noise or traffic conditions?

Yes, there are number of residences on and within close proximity to the Project site (Figure 2) that may be impacted due to Project-related emissions of dust or odours or Project-related changes in visual, noise or traffic conditions:

- there are six residences and a derelict holiday shack located within the mine layout development envelope; and
- there are a scattering of residences within approximately 5 km of the mine layout development envelope, including four residences located within 2 km and a settlement of approximately 10-20 residences located approximately 4 km south of the mine layout development envelope, just north of the Toolondo Reservoir (Figure 2).

The extent of the impacts will depend on noise levels and frequencies, timing, prevailing weather conditions, the residence's proximity to the Project site and the effectiveness of mitigation measures.

The nearest township to the Project site is Toolondo, located approximately 4 km to the south of the Project site's southernmost boundary (Figure 1). This is considered a sufficient distance to not cause excessive disturbance to the amenity of Toolondo residents, although this will be considered as part of the assessments listed below.

The potential impacts on residents as the result of the construction and operation of the Project will be assessed through:

- noise and vibration impact assessment;
- air quality impact assessment;
- landscape, visual and lighting impact assessment;
- socioeconomic impact assessment; and
- traffic impact assessment.

14.3 Is there a potential for exposure of a human community to health or safety hazards, due to emissions to air or water or noise or chemical hazards or associated transport?

Yes, in the absence of appropriate management measures there is the potential for exposure of a human community to health or safety hazards, due to emissions to air, water, noise, chemical hazards or associated transport. A hazard assessment will be undertaken to identify potential Project-related hazards related to materials handling and transport, waste management (including low level radioactive waste), noise, traffic, air, soil and water emissions. Mitigation strategies will be implemented for each hazard identified.

Further detail on radioactivity is provided in Section 3.6.7 and 15.2.2.

14.4 Is there a potential for displacement of residences or severance of residential access to community resources due to the proposed development?

Yes, four farming residences (Figure 2) in the Project site will be displaced for some or all of the Project life.

Depending on the final mine layout, the Project may require the diversion of removal of portions of local roads within the Project site, namely the Jallumba Mockinya Road, the Natimuk-Hamilton Roads and/or the Toolondo Gun Club Road. However, the layout will seek to minimise interaction with local roads.

Access between and within properties will be maintained through the construction of diversions, detours and/or road upgrades.

14.5 Are non-residential land use activities likely to be displaced as a result of the Project?

Yes, some existing farming activities in the Project site will be temporarily displaced, however farming is likely to continue within the Project site prior to physical disturbance and following progressive rehabilitation.

No other non-residential land use activities are expected to be displaced as a result of the Project.

The Project will not impact public access to the Jallumba Marsh Flora Reserve or the Red Gum Swamp. While the indicative mineralised extent and mine layout development envelope indicate that public access to Red Gum Swamp will be impacted by the Project, these extents may change as a result of the 2019 and 2020 drilling programs. Regardless, Iluka will ensure that safe public access to the Red Gum Swamp is maintained during the life of the Project.

14.6 Do any expected changes in non-residential land use activities have a potential to cause adverse effects on local residents/communities, social groups or industries?

Yes, the Project will necessitate the temporary displacement of some localised agricultural activities, thereby temporarily reducing available agricultural land in the local area. The Project may also impact the rural character of the local area. However, the Project offers the potential to generate a significant long-term employment opportunity in the region and for opportunity for skills development and diversification. It offers the potential for the region and Victoria to be at the forefront of a new industry and for mineral products to be sourced and manufactured locally and used in Victoria's renewable energy and technology sectors.

The Project will generate local and regional business in relation to the supply of products and services required by the Project in the construction, operation, rehabilitation, closure and post-closure phases.

14.7 Is mitigation of potential social effects proposed?

Yes. A socioeconomic impact assessment and stakeholder consultation will be undertaken to identify potential impacts on residents, community, social groups and industry with ongoing consultation to address the concerns raised.

14.8 Other information/comments?

Iluka recognises that effective management of consultation can improve its understanding of the community's needs and social licence to operate.

The following principles form the foundation of Iluka's approach to community consultation:

- take a proactive and systematic approach to community consultation;
- recognise the rights, cultural beliefs, values and interests of the community;
- respond to community concerns in a timely, open and effective manner;
- explore community values and interests with a view to finding common ground;
- use clear, concise and balanced language;
- make scientific and technical information accessible; and
- ensure that the purpose of each consultation activity is made clear to avoid creating expectations around a level of interaction that is not intended, or is able, to be satisfied.

Iluka is committed to high levels of community engagement. A community consultation plan is being prepared for the Wimmera Project to ensure that stakeholder interests are heard and actioned where reasonable.

14.9 Cultural heritage

14.9.1 Have relevant Indigenous organisations been consulted on the occurrence of Aboriginal cultural heritage within the Project area?

Yes. Prior to European settlement the region was occupied by Wotjobaluk, Jaadwa, Jadawadjali, Wergaia and Jupagulk Traditional Owner groups. These groups are represented by the Barengi Gadjin Land Council Aboriginal Corporation (BGLCAC), the Registered Aboriginal Party (RAP) under the *Victorian Aboriginal Heritage Act 2006*.

Aboriginal stakeholder consultation related to the Project to date is outlined in Table 10.2.

14.9.2 What investigations of cultural heritage in the Project area have been done?

The Registered Aboriginal Party (RAP) for the Project site is the Barengi Gadjin Land Council Aboriginal Corporation (Barengi Gadjin).

A desktop assessment of the potential Aboriginal heritage values associated with the Project was undertaken in 2018. The cultural heritage study area included the Project site and surrounds (approximately 5,600 ha), as shown in Figure 20. The desktop assessment used available archaeological, geological, topographic and waterway mapping data to undertake archaeological predictive modelling across the cultural heritage study area. The predictive modelling indicated that there is:

- an area of high Aboriginal archaeological potential corresponding to the lunette dune fringing the northern and eastern flanks of the Red Gum Swamp (ancestral human remains are known to be present at this site). This area may be a potential 'no-go' area;
- an area of high Aboriginal archaeological potential corresponding to the source bordering dunes to the north of the former Jallumba Marsh Flora Reserve (ancestral human remains are potentially present at this site); and
- other areas of low to moderate Aboriginal archaeological potential across large portions of the optimised resource area that are likely to contain Aboriginal cultural material in low densities.

Day one of a two-day standard assessment (non-ground-intrusive field survey) was undertaken in February 2019 across selected portions of the Project site, including the western portion of the land bounded by Nurrabel Church Road (north), Quick Sinclair Russells Road (east), Jallumba-Mockinya Road (south), and Natimuk-Hamilton Road (west). Survey was also conducted in selected areas south of the Jallumba-Mockinya Road including immediately east of the Jallumba Marsh Flora Reserve, and on the Red Gum Swamp fringing lunette dune. The survey comprised a visual assessment to determine the presence of scar trees and/or surface artefacts and scatters. The survey identified a surface scatter of stone tools along the Red Gum Swamp fringing lunette and no scar trees. The results of the survey indicated that the areas that had been modelled to be of low to moderate Aboriginal archaeological potential are likely to be designated as low potential in the survey area and will therefore not require further investigation (ie complex assessment), however this is yet to be confirmed by the RAP.

In April 2019, the second day of the two-day standard assessment was undertaken across the remaining area north of the Jallumba-Mockinya Road and west of Quick Sinclair Russells Road. Level survey of a drain historically constructed through the Red Gum Swamp fringing lunette dune and recording of surface artefacts was also undertaken. The results of the survey indicated that the areas that had been modelled to be of low to moderate Aboriginal archaeological potential in the survey area are likely to be designated as low potential and will therefore not require further investigation (complex assessment), however this is yet to be confirmed by the RAP. The survey also confirmed that the potentially potential area associated with the source bordering dune to the north of the former Jallumba Marsh Flora Reserve will require complex assessment to confirm the heritage values and whether or not these will be designated as 'no go' areas.

Complex assessment generally involves ground-intrusive survey, however the use of geophysical survey has been discussed with the RAP as a potential alternative, with a trial proposed during 2019.

The EPBC Protected Matters Search Tool showed no heritage values registered on the World Heritage List, National Heritage List or the Commonwealth Heritage List within the cultural heritage study area.

There are no items on the Horsham Planning Scheme heritage overlays within the cultural heritage study area.

A copy of the desktop cultural heritage baseline report is provided as Appendix L.

14.9.3 Is any Aboriginal cultural heritage known from the Project area?

Yes. The Aboriginal Cultural Heritage Register and Information System (ACHRIS) was accessed on 16 April 2018. There are three Aboriginal cultural heritage places registered on the Victoria Aboriginal Heritage Register (VAHR) within the cultural heritage study area. These places were recorded by the Victorian Archaeological Survey in 1976 and are summarised as follows:

- **Jallumba Swamp 1** (VAHR 7224-0001): recorded by Hutchison and Cochrane in 1976 on a source bordering dune to the north of the Red Gum Swamp. Notes on the site card record the place as a lithic artefact scatter 170 m by 70 m, located across a blowout on top of the dune. Raw material types include quartz, 'flint', greenstone, granite, ferriarrette, rhyolite, quartzite and laterite, suggesting both flaked and ground stone tools are present. Although no location is given, the recording documents that a skeleton was reported to have been exposed at the place 'several years ago', with no details of potential location. Photographs of the place were noted as being taken in 1977 by D. Byne but subsequently went missing from the file.
- **McKendrick1 Toolondo** (VAHR 7224-0002): recorded by Frank in 1976 as "an outstanding mound at the site of excavation MK-1". The place is located approximately 200 m west of the Red Gum Swamp and two 1-m by 1-m trenches were excavated in the mound by the Victorian Archaeological Survey. Excavation revealed baked clay balls within blackened soil above clays. Radiocarbon dates for VAHR 7224-0002 were published in 1977 as SUA 583 (Radiocarbon Laboratory, University of Sydney, Australia) 820 ± 95 BP (before present) but were documented as unreliable.
- **McKendrick1 Toolondo** (VAHR 7224-0003): recorded by Frank in 1976 and was recorded as a mound site approximately 9 m by 7 m, 28-cm high. Located approximately 200 m west of the Red Gum Swamp and 200 m south of VAHR 7224-0002, it was noted that mound consisted of black sandy soil.

The cultural heritage study area also includes areas of cultural heritage sensitivity associated with the waterways, registered Aboriginal cultural heritage places and former waterways (Figure 5 in GHD 2018).

14.9.4 Are there any cultural heritage places listed on the Heritage Register or the Archaeological Inventory under the Heritage Act 1995 within the Project area?

No.

14.9.5 Is mitigation of potential cultural heritage effects proposed?

Yes, Iluka is continuing discussions and investigations with GHD and the RAP as part of the development of a cultural heritage management plan (CHMP) for the Project. The CHMP will be prepared and implemented to manage issues relating to Aboriginal cultural heritage in the Project site. The CHMP will determine the extent (if any), nature and significance of Aboriginal heritage values in the Project area and provide conditions to avoid and/or mitigate harm to those values. The CHMP will need to be developed in consultation with and approved by Barengi Gadjin as the RAP for the region.

14.9.6 Other information/comments

No.

15 Energy, wastes and greenhouse gas emissions

15.1 What are the main sources of energy that the Project facility would consume/generate?

15.1.1 Electricity

Electricity requirements are estimated at 20-25 megawatts (MW). However, this is subject to further study and definition.

Electricity is proposed to be sourced from the grid. This may include the construction of a dedicated 66 kV line along Jallumba-Mockinya Road from the existing 66-kV line along the Wonwondah-Toolondo Road to the infrastructure area, depending on the final refinery location. An engineering options study for the location of the refinery and alignment of associated offsite services such as electricity supply is currently underway.

The Project will not include any generation of electricity.

15.1.2 Natural gas

Natural gas requirements are estimated at 50 gigajoules per hour (GJ/h). Subject to study outcomes, the Project may require construction of a new gas pipeline (approximately 33-45 km long) connected to the existing pipeline at Horsham.

15.1.3 Other

Diesel will be used to fuel Project vehicles. Upon finalisation of the mine layout design and the mining method a list of all required mining and supporting plant will be developed and estimates of annual diesel usage will be prepared.

15.2 What are the main forms of waste that would be generated by the Project facility?

15.2.1 Wastewater

Project-related domestic sewage will be treated using a small onsite wastewater treatment plant.

Mine affected surface water runoff will be captured within a system of drains, sumps, pumps, pipes and dams, and stored onsite to prevent offsite discharge.

To minimise water demand, processing plant wastewater will be treated and recirculated before it is eventually disposed as part of the saline brine by-product. The disposal methodology will be informed by impact assessments to be undertaken during the second half of 2019.

Dewatering of the mine pits will be required to allow mining of ore below the groundwater table. Any excess groundwater not utilised for processing or dust suppression will be returned to the aquifer via infiltration or, if the need is determined, via re-injection, and will offset total water demand.

15.2.2 Solid wastes

Approximately 9.6 Mtpa of combined tailings will be generated as a by-product from ore processing and mineral separation plant. Initially, some combined tailings will be placed into a surface tailing storage facility (or facilities) prior to the mine void space being available. Thereafter, the combined tailings will be placed within tailings cells within the mine void (and the tailing storage facility). Once each cell is complete it will be made geotechnically stable, and then will be capped with overburden, subsoil and topsoil.

The HMC will be treated in the refinery to produce zircon product and rare earth product. The refinery will generate approximately 260 ktpa of refinery waste material, largely comprising:

- 100 ktpa of salt brine - the remnant salt (predominantly sodium sulphate) remaining after desalination water recovery and evaporation of the saline discharge; and
- 160 ktpa of gypsum residue - a precipitated solid predominately comprised of calcium sulfate dihydrate (gypsum), but also incorporating radionuclides and heavy metals. The gypsum

residue will contain 300 - 500 Bq/g total activity and is classified as low-level radioactive waste, as per the International Atomic Energy Agency's *Classification of Radioactive Waste General Safety Guide No. 1*.

The disposal method for the refinery waste streams is yet to be determined, pending the outcome of further hydrometallurgical studies and impact assessments which are expected to be completed during 2019. Conceptually, the two disposal options for the refinery by-product streams are:

- placed in engineered, lined cells within the Project site for permanent storage; (Figure 5) or
- placed into the mine voids with the combined ore processing/MSP tailings (Figure 6).

Radiation will be managed in accordance with Iluka's Radiation Management Licence (no. 300042022) as issued by the Victorian Department of Health and Human Services, and the *Murray Basin Operations Radiation Management Plan and Radioactive Waste Management Plan* required as a condition of licence.

A site-specific addendum to the existing approved radiation management plans will be prepared for the Wimmera Project, and will describe management measures such as minimising exposure time, increasing distance from exposure sources, and shielding of sources that will be used to ensure that radiation exposure to people and the environment meets prescribed statutory limits and is ALARA. These measures will be informed by:

- a radiological assessment for the Wimmera Project to be undertaken in the second half of 2019; and
- guidance documents such as the *Guide for Radiation Protection of the Environment – Guide G-1* (ARPANSA 2015). The purpose of the Guide is to provide best practice guidance on how to assess environmental exposures and demonstrate protection of the environment from the human activities, past and present, that give rise to such exposures.

Iluka's licence and radiation management plans are regulatory documents approved by the Victorian Government under the *Radiation Act 2005*.

15.2.3 Excavated material

The Mineral Separation Plant (MSP) will produce approximately 150 ktpa of barren oversize waste rock. This will be placed into the mine void.

15.2.4 Other wastes

No onsite landfill is proposed. Non-hazardous waste (eg construction and domestic waste) will be collected for recycling where practicable or collected and disposed of offsite by a licensed contractor.

Hazardous and liquid waste (eg hydrocarbons and waste oils) will be transported offsite for disposal by licensed contractors.

15.3 What level of greenhouse gas emissions is expected to result directly from operation of the Project facility?

Approximately 50,000 to 100,000 tonnes per annum of carbon dioxide (CO₂-e) are estimated to be emitted from the Project operations. This estimate does not include onsite diesel use, which will be calculated once the required plant list is known (Section 15.1.3).

15.4 Are there any other environmental issues arising from the proposed Project?

No.

16 Environmental management

16.1 What measures are currently proposed to avoid, minimise or manage the main potential adverse environmental effects?

16.1.1 Siting

The Project layout will be designed to recover the mineral sand resources as efficiently as possible whilst minimising environmental impacts, informed by baseline environmental studies. For example, as previously noted, although the indicative mineralised extent includes portions of the Jallumba Marsh Flora Reserve and the Red Gum Swamp, Iluka has chosen to exclude these areas from the mine layout development envelope and thereby avoid impact associated with these areas.

16.1.2 Design

All infrastructure will be designed and managed to comply with applicable technical specifications, legislation and guidelines.

Tailings storage facilities will be designed in accordance with Department of Economic Development, Jobs, Transport and Resources *Technical Guideline - Design and Management of Tailings Storage Facilities* (April 2017). As part of the rehabilitation process, the tailings storage facilities will be made geotechnically stable then capped with overburden, subsoil and topsoil, with the final land surface in harmony with the surrounding environment.

To minimise demand for water, processing plant wastewater will be treated onsite and recirculated until it is eventually disposed as part of the saline brine by-product. The disposal methodology will be informed by impact assessments to be undertaken during the second half of 2019 and early 2020.

16.1.3 General environmental management

All Iluka sites operate under an environmental management plan (EMP), which is a key component of an approved Mine Work Plan required under the *Mineral Resources (Sustainable Development) Act 1990*.

A site-specific EMP will be prepared for the Wimmera Project covering the construction, operational, closure, rehabilitation and post-closure phases. The EMP will outline mitigation measures and environmental performance criteria (where relevant) for the following aspects:

- air quality;
- biodiversity;
- contaminated land management;
- erosion management;
- groundwater quality and management;
- heritage;
- noise;
- radiation;
- rehabilitation;
- soil quality;
- spill prevention and management;
- surface water quality and management;
- traffic and transport;
- visual amenity; and
- waste disposal and management.

16.1.4 Radiation

As summarised in Section 3.6.7, 14.3 and 15.2.2, the disposal method for the low-level radioactive waste from the refinery waste streams is yet to be determined. Conceptually, the two disposal options for the refinery waste streams are:

- placed in engineered, lined cells within the Project site for permanent storage; (Figure 5) or
- placed into the mine voids with the mineral separation plant tailings (Figure 6).

The zircon and rare earth products produced at the refinery are expected to have an activity content over 1 Bq/g and would therefore be considered radioactive. These products will be temporarily stored at site prior to transport.

Radioactive materials will be handled, stored, transported and disposed in accordance with international best practice and applicable Australian legislation.

Radiation will be managed in accordance with Iluka's Murray Basin Operations Radiation Management Plan. A site-specific addendum to the Radiation Management Plan will be prepared for the Wimmera Project to ensure that exposure to radiation meets prescribed statutory limits and is as low as is reasonably achievable.

16.1.5 Other

No.

17 Other activities

17.1 Are there any other activities in the vicinity of the proposed Project that have a potential for cumulative effects?

Other activities in the local region that have a potential for cumulative effects include:

- mineral exploration activities associated with the Stavely Arc release. Stavely Block 9 (Century Minerals) wraps around the northern, eastern and southern sides of the project area;
- the WIM Resources 'Avonbank' mineral sands project located at Dooen, immediately north-east of Horsham; and
- the proposed Innogy 'Rifle Butts Road' windfarm, located approximately 13 km north-east of the project area.

The likelihood of these projects progressing is unknown. Where the projects are sufficiently developed to provide details such as traffic generation, the potential cumulative impacts of the projects and the Wimmera Project will be assessed.

18 Investigation program

The following baseline environmental assessments have been undertaken to inform Project design:

- Cardno 2019, *Iluka baseline ecological assessments - WIM100 ecology report*;
- GHD 2018, *WIM100 Desktop cultural heritage assessment*;
- GHD 2019, *Wimmera project baseline noise assessment*;
- GHD 2019, *Wimmera project baseline vibration assessment*;
- GHD 2019, *Wimmera project meteorological assessment*;
- Jacobs 2018, *WIM100 East preliminary baseline groundwater assessment*; and
- Water Technology 2018, *Baseline surface water assessments - WIM100*.

Baseline assessments for radiation, air quality and soil are in progress. Targeted ecological assessments, based on the recommendations of the baseline ecological assessments, is planned for the second half of 2019.

18.1 Have any environmental studies not referred to above been conducted for the Project?

No.

18.2 Has a program for future environmental studies been developed?

Yes, in addition to the baseline assessments outlined in Section 18, the following investigations and assessments are underway or proposed:

- road and traffic impact assessment;
- air quality impact assessment;
- surface water impact assessment;
- groundwater impact assessment;
- ecological impact assessment;
- noise and vibration impact assessment;
- socioeconomic impact assessment;
- landscape, visual and lighting impact assessment;
- hazard assessment;
- geotechnical assessment;
- radiological impact assessment; and
- flotation reagent impact assessment

These will be prepared in accordance with Victorian Government scoping requirements that are anticipated to be issued for the Project.

Once the alignment and potential disturbance footprints for the water pipeline, gas pipeline and electricity line are known, baseline studies and technical impact studies will be undertaken for these areas, as applicable.

18.3 Has a consultation program conducted to date for the Project?

Yes, Iluka is committed to high levels of community engagement. A community consultation plan is being prepared for the Wimmera Project to ensure that stakeholder interests are heard and actioned where reasonable.

Consultation activity undertaken to date is outlined in Section 10.

18.4 Has a program for future consultation been developed?

Yes, consultation activities are outlined in the draft Wimmera Project Community Consultation Plan.

19. Other activities

Are there any other activities in the vicinity of the proposed project that have a potential for cumulative effects?

NYD No

The Project has the potential for contributing to increased light and heavy vehicle traffic on the surrounding roads as the result of transportation requirements during the construction and operational phases. Additionally, the cumulative impact on visual, noise and air quality in the region may be affected as the result of an additional mine in the region. Further studies will be undertaken in consideration of these activities to properly understand the potential consequences of an increase in mining activity.

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Authorised person for proponent:

I, Marcus Little, Principal Environmental Specialist & Radiation Safety Officer, Murray Basin (Iluka Resources Limited), confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature



Date

12 July 2019

Person who prepared this referral:

I, Philip Towler, Associate Director (EMM Consulting), confirm that the information contained in this form is, to my knowledge, true and not misleading.

Signature



Date

12 July 2019