# Application for Works Approval

**Division 3, Part V *Environmental Protection Act 1986***

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| **Works Approval Number** | W6214/2019/1 |
| **Applicant** | Australian Garnet Pty Ltd |
| **ACN** | 121 051 965 |
| **File Number** | DER2018/001613 |
| **Premises** | Balline Garnet Mine<br>George Grey Drive<br>YALLABATHARRA WA 6535<br><br>Legal description –<br>Tenements M70/1280, G70/253 & L70/134 within Lot 1 on Diagram 91564, Lot 300 on Plan 60565 & Lot 1431 on Plan 251608 |
| **Date of Report** | 29 April 2019 |
| **Status of Report** | Final |

# Overview of premises

## Background and classification of premises

The Balline Garnet Mine (Premises) is a heavy mineral sands deposit proposed to be mined by Australian Garnet Pty Ltd (Applicant) at the southern margin of the Carnarvon Basin, approximately 40 km south of Kalbarri and 540 km north of Perth, in the Shire of Northampton.

Approvals under the *Environmental Protection Act 1986* (EP Act) and *Mining Act 1978* (Mining Act) were granted in 2010 to the previous owner, Altura Mining Pty Ltd (Altura) through its subsidiary company Australian Garnet Pty Ltd, however the project did not immediately proceed due to market conditions. In 2014, the Applicant acquired the Australian Garnet portfolio from Altura and completed an updated feasibility study, which identified optimisations to the design, extent and operating parameters of Altura's original proposal. Mining Act approval was subsequently sought and approved for the expansion; however the EP Act approval expired in 2016.

This Application is to replace the expired approval, and includes the Applicant's expanded proposal, relating to the following Prescribed Premises category:

| Classification of Premises | Description | Premises design capacity |
|---|---|---|
| Category 8 | Mineral sands mining or processing: premises on which mineral sands ore is mined, screened, separated or otherwise processed. | 8,400,000 tonnes per annual period |

## Description of Application

The Application seeks to develop an open pit mine, processing plant and supporting infrastructure for the mining and processing of heavy mineral sands. The complete project will involve the eventual mining of three open cut pits and processing of mineral sands ore through a wet gravity separation plant and a dry processing plant. However, the Applicant has identified the 'Menari' deposit for initial development in the first 3 – 4 years of operations, with approval for future mining of 'Menari North' (Balline North and South deposits) to be sought through a separate application at a later date.

Mining will primarily target alluvial garnet located in the area and potentially a full suite of other heavy minerals including ilmenite, zircon and rutile. Predicted mining rates for the 'Menari' deposit are initially 4.2 million tonnes per annum (Mtpa) in the first year, increasing to 8.4 Mtpa in the second and subsequent years. Feasibility study results indicate that a 5.3% heavy mineral head grade be targeted, which would result in a total mine life of 3 – 4 years in 'Menari' and a further 9 – 10 years in ''Menari' North' – there is also significant exploration potential for the deposit to extend the mine life further. A summary of the Application is provided below:

| Element | Description |
|---|---|
| Premises name | Balline Garnet Mine |
| Mine status | Undeveloped 'greenfield' project |
| Commodity mined | Mineral sands |
| Life of mine | 'Menari' deposit: 3 – 4 years<br>'Menari' North deposit: 9 – 10 years (separate proposal) |
| Land tenure | M70/1280 & G70/253 are held exclusively by the Applicant.<br>The land within the Premises boundary comprises private freehold lots and agreements are in place to allow initial mining and processing to commence |
| Ore quantity | 23.0 million tonnes at a rate of approximately 6.9 Mtpa |
| Overburden removed | 0.02 million tonnes |

| | |
|---|---|
| Total material disturbed | 23.0 million tonnes |
| Garnet recovered | 0.8 million tonnes (‘Menari’ only) |
| Maximum pit depth | 45 m below ground level |
| Area of disturbance | 175 hectares (‘Menari’ deposit) |
| Clearing | Up to 175 hectares |
| Dewatering | For use in processing only |
| Ore processing | In-pit mining trommel, wet separation plant, flocculant thickener and associated infrastructure to be used to produce a heavy mineral concentrate |
| Secondary processing | Drying of HMC, prior to magnetic separation and screening. Tailings returned as a slurry to the mine void |

The Premises is located within leases M70/1280 and G70/253, which sit over third party freehold lots, and are approximately 247 ha in total area. It is immediately adjacent to George Grey Drive and approximately 2 km from the coast. The GMA Garnet mine is located approximately 5 km south.

The ‘Menari’ orebody covers an area approximately 1.8 km long and up to 900 m wide. The total disturbance area (i.e. the orebody and disturbance areas required for access and mine infrastructure) is approximately 175 ha.

## Construction and site development

The construction and site development phase of the project will take approximately 17 months and is expected to commence in mid-2019. The initial site development works will involve installation of the main mine access and internal roads, installation of water supply and management infrastructure, installation of power supply infrastructure and development of the process plant area including the Wet Concentrator Plant (WCP) and thickener, Dry Separation Plant (DSP) and associated infrastructure.

Pre-production mining and stockpiling

An initial starter pit is proposed to be excavated, using a front end loader (FEL) and dozer fleet, adjacent to the wet processing plant. A skid-mounted mining unit plant (MUP) will be mobilised within the starter pit, in preparation for start-up, commissioning and mining.

Topsoil and subsoil will be stripped from the starter pit, sand tails stockpile and solar drying ponds, and stored in separate temporary stockpiles to the side of the initial mine void. In the first phase of mining there is no overburden.

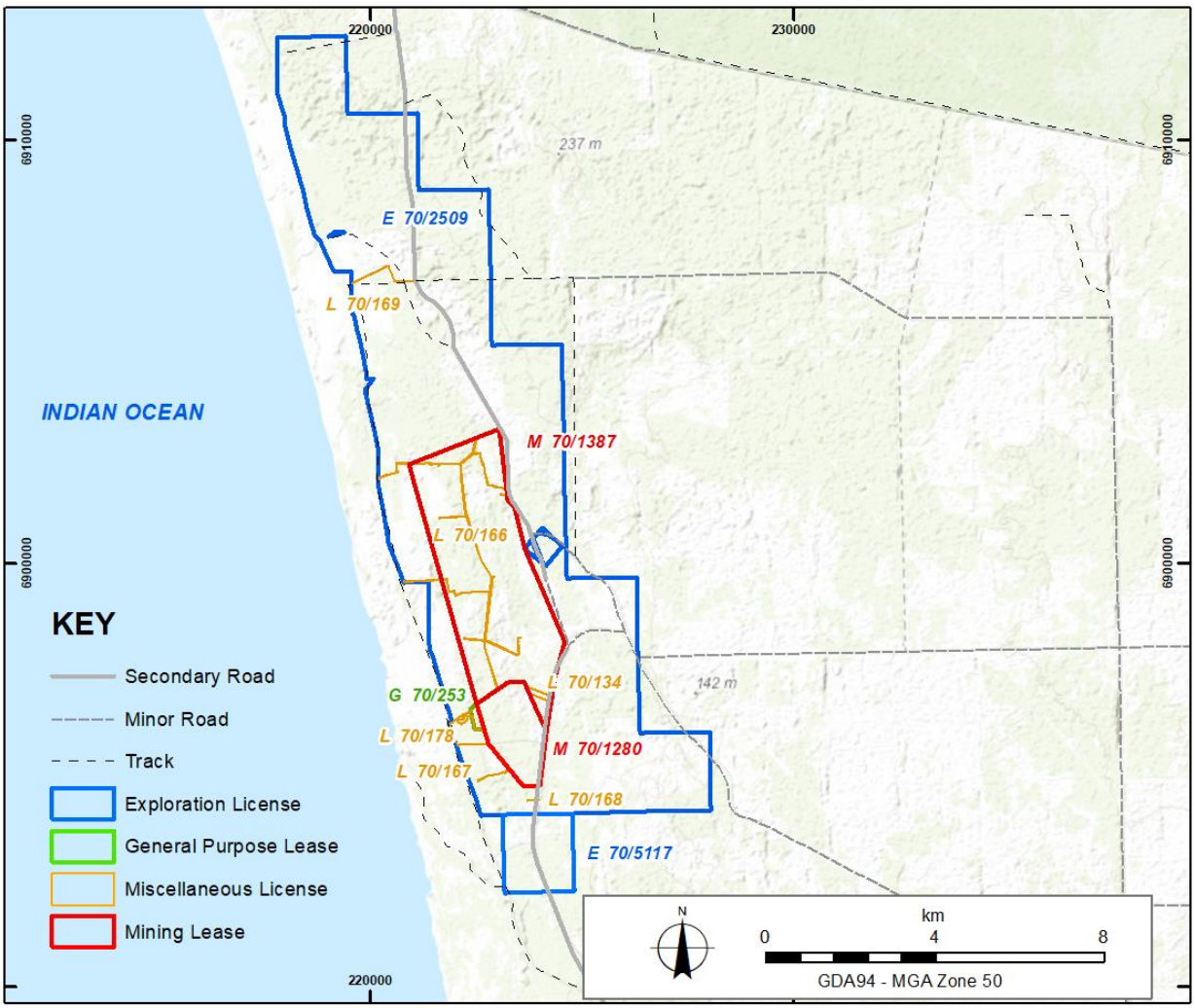
Ore from the starter pit will be pre-mined to basement and stockpiled on in-situ ore (approx. 60,000 bank cubic metres (bcm)).

Commissioning

Commissioning will be carried out over a 1 month period, at the completion of which the mine will become operational, and will generally include:

- Hydro-testing of pipelines and pump systems function testing;
- Commissioning of the raw water system;
- Commissioning of the process control system;
- Dry and wet commissioning of the MUP, WCP circuit and thickener; and
- Commissioning of the DSP.

To wet commission the mining unit and WCP circuits and associated equipment, it will be necessary to process a volume of ore. Approximately 400,000 bcm of ore will be processed, with the heavy mineral concentrate (HMC) stored at a temporary HMC stockpile.




▲ ***Location of the Balline Garnet project.***

## Operational aspects

The mining and processing operations will incorporate conventional dry mining, followed by wet separation to produce both garnet and heavy mineral concentrates using conventional gravity separation. By design, the mine will not intersect the watertable, which is mostly below the basement of the resource. The Applicant has advised that groundwater intersects some limited areas of the deposit, however these are only small in size and will be excluded from mining, to avoid the requirement for dewatering.

Further processing in the DSP, which will predominantly use magnetic separation and screening techniques, will upgrade the concentrate to produce high grade garnet, ilmenite/iron and non-magnetic minerals.

Mine voids will be backfilled progressively throughout the life-of-mine by tailings.

### *Mining operations*

The 'Menari' deposit is predominantly a small undeveloped low strip, medium grade alluvial garnet deposit. Topsoil and subsoil will be pre-stripped and stockpiled separately, or placed on areas undergoing rehabilitation. The garnet resource is located close to the surface, therefore overburden will be minimal.

Topsoil and overburden removal will occur on a 12-hour (7 am to 7 pm), 7 days per week basis, while mining will occur on a continuous (24 hours per day) basis to a maximum depth of around

45 m below ground level (mbgl). Full production is expected to commence in late 2020 or early 2021, following the commissioning period. The 'Menari' deposit will be mined as a single mine pit, which has been divided into 52 mining blocks. A general overview of the proposed mining sequence is as follows:

| Mine block | Timing | Comment |
|---|---|---|
| 1 - 12 | Dec 2020 – Apr 2022 | Start is NE corner of 'Menari' |
| 13 - 25 | May 2022 – Apr 2023 | |
| 26 – 39 | May 2023 – Mar 2024 | |
| 40 – 52 | Apr 2024 – Apr 2025 | Finish ''Menari'; on eastern side |

***Ore processing***

Processing will occur on a 24-hour, 7 days per week basis and will involve a FEL delivering mined ore directly into a mobile in-pit mining unit. The FEL will operate continuously and be supported by a bulldozer during the day shift to tidy up the pit floor and push over the mining face when required. When the pit face gets too far away for the FEL, the mining unit will be shut down and moved closer to the pit face.

The mining unit will consist of a hopper and coarse oversize screening, which will remove any oversize rocks, sticks and trash greater than 2.5 mm. The remaining material will be made into a slurry of approximately 30% solids and pumped to the WCP.

<u>Wet Concentrator Plant</u>

The WCP will beneficiate heavy mineral concentrate using conventional gravity separation techniques employing spirals and up current classification.

Slurried ore from the mining unit will be sent to a bank of desliming cyclones mounted above a constant density tank (CD tank) which will be located adjacent to the spiral classification circuit.

Overflow from the cyclones, which will contain the bulk of the slimes material, will report through to a high rate thickener, while the underflow will go through to the CD tank, which will provide a steady state de-slimed feed to the WCP gravity spiral circuit.

The deslimed sands will be processed through a wet spiral separation circuit which will extract the heavy minerals from mined ore on the basis of difference in size and specific gravity. In the wet concentrator, spiral classifiers use water and gravity-induced centrifugal forces to separate the heavy minerals, including garnet, from the lighter reject sand.

The rougher middlings and resultant scavenger concentrate will be treated on the middlings cleaner spirals to produce a final concentrate. Most silica sand will be sent to the tails which will join the scavenger spirals tails for pumping to the tailings dam.

The heavy mineral concentrate from the rougher spirals and middlings cleaner spirals will be upgraded on the concentrate cleaner spirals, where a heavy mineral sands product will be cut, dewatered and sent forward for classification.

The heavy mineral concentrate extracted by the spirals will be passed through cyclones and then treated in a flatbed classifier. Fresh bore water will be used for elution in the classifier to wash any remnant chloride, resulting from the salt content in the deposit and the use of brackish water in the concentrate stage, off the garnet product as it travels on a vacuum filter belt. Elution flow will be set to remove fine silica to the classifier overflow for discarding. The separated tailing sands will initially be deposited into the tailings dam, from where they will be transferred to the mine void for disposal.

The concentrate cleaner spirals and classifier underflow is the final wet plant garnet product, which will be stockpiled on an unsealed storage area using dewatering cyclones and allowed to drain to <5% moisture content.

Overall heavy mineral recovery from the WCP will be around 90%, with 85% comprising garnet concentrate and the other 6% as black sand concentrate.

Dry Separation Plant

Stockpiled garnet from the WCP will be further processed on-site at the DSP, which will comprise of a feed bin feeding a rotary dryer, followed by Rare Earth Magnetic Separators (REMS).

Dried product discharging from the dryer will be screened to remove oversize trash then further screened into coarse and fine heavy mineral streams. Each of these streams will be fed to two 1,500 mm REMS units which will be hybrid units, with the initial separation into magnetic, paramagnetic and non-magnetic products preformed on a drum and retreatment of selected products on more selective rolls.

Non-magnetic minerals (silica sand with rutile and zircon) will spin off and be returned to the mine void as backfill. Magnetic products (ilmenite/iron) will be further treated and placed in a load-out silo in preparation for trucking off-site, while the paramagnetic product (garnet concentrate) will be stored in separate silos in preparation for haulage to the Geraldton port.

The end products will range in particle diameter from 125 microns up to 850 microns and will be stored in silos located adjacent to the DSP, prior to haulage off-site.

***Tailings management***

The tailings streams generated from the spirals and classification circuit of the WCP will comprise benign sands (predominantly silica sand) and clays, with minor impurities such as limestone and heavy minerals.

Sand tailings will form the majority of the residues from the WCP and will be pumped back to, and deposited within, the mining void using tailings cyclone stackers. Initially, there will be a requirement to stockpile the sand tailings, until the initial mine void has been opened up.

Approximately 3 – 4% of the tailings material will be classed as fines (less than 53 microns), which are typically dominated by the mineral calcite with clays and originate from the cyclone overflow at the WCP.

Clay fines will be treated in a high-rate thickener with an anionic polyacrylamide flocculant (e.g. Flomin AL/OL ranges) added to assist in fines separation.

The thickened underflow will be pumped to specially constructed ponds, which will be located off the mine path, for drying by solar evaporation. Five unlined solar drying ponds are proposed to be constructed, with decant water returned to the process water circuit. Each pond will undergo a rotation process on an approximate 9 month cycle:

The Applicant expects that seepage from the solar drying ponds will be minimal, as these structures will effectively self-seal as the fines settle and consolidate. Once the sand tails area becomes open the slimes dams will be moved to the sand tails areas.

***Pipeline network***

Slurried materials will be transferred around the Premises using high density polyethylene pipelines. The pipelines, which will be in 10 m lengths with flanged sections (butt flange welded to the end of the line and bolted to a corresponding flange) will be used to transfer the following:

Pipelines will have designated pipeline corridors, and have been designed with spillage sumps at suitable locations approximately every 500 m. These locations will be contained and have the ability for water recovery. Further pipeline corridors across access roads will have drainage swales cut out of the roads to allow surface water runoff.

***Mine water management***

As discussed above, mining will not occur below the watertable and therefore mine dewatering will not be required. In addition, due to the high hydraulic conductivity of the ore and surrounds,

the Applicant expects very little rainfall runoff will be recovered directly from the mine pit.

Raw water at the site is brackish (3,000 – 7,000 mg/L TDS) and is suitable for ore processing, dust suppression and equipment wash-down. A small reverse osmosis (RO) desalination plant will be constructed to provide potable water for rinsing of the final garnet products and for human consumption.

The annual project water demand will be around 1.7 GL/yr, increasing to 3.4 GL/yr after the first year, with the following major water use categories:

- Ore processing – 1,405,000 kL, increasing to 2,810,000 kL after the first year;
- Dust suppression – 150,000 kL, increasing to 300,000 kL after the first year; and
- Feed water to the RO plant – 145,000 kL, increasing to 290,000 kL after the first year.

The RO plant is expected to produce about 101,600 kL/yr of potable water and 43,200 kL/yr of brine (at salinities in the order of 17,500 mg/L TDS and pH 8.3) in the first year of operation. These volumes are expected to increase after the first year to 203,200 kL/yr of potable water and 86,400 kL/yr of brine. The brine will be combined with elute from product rinsing and discharged to the process water dam for reuse in the process.

Approximately 650,000 kL/yr of process water is expected to be lost through seepage from and entrainment in tailings, with a further 600,000 kL/yr lost through evaporation and 150,000 kL/yr for dust suppression. After the first year, these volumes are expected to double. Given the very low fines content of the Balline sand deposits, it is expected that seepage from the sand tailings will drain through the base of the pit void, to the underlying watertable.

In order to supplement the mine water demand, the Applicant proposes to strategically locate production bores close to the sand tailings facilities where possible, to intercept/recover a portion of the tailings water lost as seepage. In addition, supernatant water will be decanted off the solar drying ponds and recycled via the process water dam.

Water distribution network

Water abstracted from the Tumblagooda sandstone aquifer via production bores will be transferred to a raw water dam and a process water tank (located near the process plant), from where it will be distributed to processing facilities and associated activities.

Raw water will be stored within a 6,700 $m^3$ capacity, HPDE-lined earthen wall dam located adjacent to the WCP. The dam will be the eventual destination of all recovered water on the Premises, for use as general process water.

Stormwater management

Due to the high infiltration rates associated with the sand and sandy loam soils present at the Premises (12-13 mm/hr), only events of 1-hour duration for all ARI events and a 6-hour 1:100 year ARI event would exceed the estimated infiltration rates and generate surface water runoff.

All potential drainage lines will be directed away from infrastructure and mining areas. Surface water runoff from concrete plant areas and buildings will be collected via sumps and returned to the process water dam.

## Infrastructure

| **Prescribed Activity Category 8** | |
|---|---|
| ***Fixed operations*** | |
| 1 | WCP, including thickener and associated pumps |
| 2 | DSP, including rotary dryer and baghouse |
| 3 | Skid-mounted MUP, including slurry pipelines, pumps and conveyors |
| 4 | HMC product stockpile area |
| 5 | Sand tailings and clay fines system, including pipelines, booster pumps and stackers |

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| 6 | Process water dams (2) |
| 7 | Sand tailings storage area (initial) |
| 8 | Solar drying dams (6) |
| 9 | Return water pipeline network |
| 10 | Topsoil stockpiles |
| ***Mobile equipment*** | |
| 1 | 3 x Front End Loaders (2 x Komatsu WA600; 1 x CAT 966) |
| 2 | 1 x Bulldozer (CAT D10) |
| 3 | 1 x Excavator (CAT 330) |
| 4 | 2 x Haul trucks (CAT D400) |

## Environmental siting

The Premises is located in the Mid West region, adjacent to the coast and north of the Hutt River, a prominent feature of the locality. The road between Northampton and Kalbarri, George Grey Drive, runs along its eastern edge.

The local area has been extensively cleared for agriculture, however there are large tracts of uncleared land to the north, east and south; some of which are vested within conservation areas (e.g. Kalbarri National Park to the north and Utcha Well Nature Reserve to the south). Much of the area where initial mining and the processing plant will be located is uncleared land comprising remnant native vegetation.

There are two farm houses on rural properties within a 5 km radius of the Premises, with the closest being approximately 1.0 km east of the site boundary and 2.5 km from the proposed processing plant site. A popular beach holiday and camping site known as ‘Half Way Bay’ is located on crown land approximately 2.5 km south-west of the processing plant site.

No specified ecosystems or areas of high conservation value have been identified in proximity that may be directly impacted from the proposed activities. There are no naturally occurring surface water bodies or surface expressions of groundwater in the immediate area, predominantly due to the high infiltration rates associated with the sand and sandy soils present throughout the Premises (typical rate of infiltration 12-13 mm/hr (URS, 2010)).

Geology

The Premises occurs at the southern end of the Carnarvon Basin where there is the presence of relatively thin Quaternary alluvial, aeolian and shoreline deposits (Superficial Formations) that sit unconformably over the Silurian-aged Tumblagooda Sandstone.

The Tumblagooda Sandstone forms the bedrock sequence in the Gascoyne coastal domain and is relatively shallow in the project area. To the south near the GMA Garnet Mine, it typically occurs about 20 metres below ground level (mbgl).

Cemented sediments of the Superficial Formations (Quaternary alluvial, Aeolian and shoreline deposits) occur at depth throughout the deposit area, with the top of the Tumblagooda Sandstone occurring at between 20 and 75 mbgl:

- Superficial Formations in the deposit area are dominated by unconsolidated calc-arenites, which typically comprise fine to coarse grained quartz (and minor feldspar) sands that are texturally variable (from poorly to well sorted and sub-angular to well rounded). The matrix of these sands typically comprises finer and variably cemented quartz, calcite and clay. Minor amounts of garnet and calcareous fossil shells were also identified;
- in the near-surface zone to about one metre, sediments are often dominated by windblown fine to medium grained quartz sands, with a minor organic soil component;

- strong (but variable) cementing of the upper sections of the Superficial Formations is prevalent, but cementing also occurs locally in the lower sections;
- in the north and eastern areas covered by drilling, the Superficial Formations contain significant amounts (>10-20%) of clay, often as dark green calcareous (possibly glauconitic) clays and clayey sands. These clay-rich zones typically occur as bands or layers up to five metres thick in the lower sections of the Superficial Formations;
- the contact of the Superficial Formations with the underlying Tumblagooda Sandstone bedrock is difficult to determine from the observed drill cuttings, with several drill holes intersecting possible weathered sections of the Tumblagooda Sandstone, and a lack of definitive clasts of consolidated Tumblagooda Sandstone; and
- the unconformity surface of the Tumblagooda Sandstone is very flat and dips gently to the west.

Hydrogeology

Based on groundwater investigations conducted at the Premises, the following conceptual hydrogeological model has been developed:

- The project area is underlain by a highly permeable unconfined aquifer within the unconsolidated cal-arenite sediments of the Superficial Formations;
- The Superficial aquifer is regionally wedge-shaped, and is bounded to the east by the contact with the underlying Tumblagooda Sandstone. To the west of the proposed pits, the Superficial Formations are at least 35 m thick;
- Groundwater flow is in a westerly to south-westerly direction, with discharge from the Superficial Formations to the ocean near the coastline;
- The Superficial aquifer is highly permeable with hydraulic conductivities in the range of 40-80 m/day. The coarse clean sand and gravel sequences intersected by aircore drilling throughout the project area supports the hydraulic conductivities derived from aquifer testing;
- Direct rainfall recharge to the Superficial Formations is considered to be relatively low, in the order of 1-5% in the project area;
- Groundwater salinity within the Superficial Formations ranges from about 2,000 mg/L to 7,000 mg/L near the proposed mine pits. East of these locations, salinity in the Superficial or Tumblagooda Sandstone can be less than 1,000 mg/L;
- No freshwater lenses are evident at the top of the watertable, indicating rainfall recharge rates are low. Most bores display a uniform salinity profile with depth, although three of the 11 bores show a two-fold increase with depth;
- Soil infiltration rates near the processing plant area are in the order of 11 – 18 m/day based on field testing, confirming the relatively high infiltration rates that can be expected from the sand tailings dams (URS, 2010).

Flora and vegetation

Beard (1979) has mapped vegetation in the area as consisting predominantly of Shrublands, *Acacia rostellifera* thicket. While much of the coastal area between Kalbarri and Geraldton has been cleared for agricultural purposes, this particular vegetation association is well represented as fragmented remnants across the Shires of Irwin, Northampton and Shark Bay.

A large proportion of the Premises has been historically cleared, however there is a large area of remnant vegetation in good to very good condition .The majority of vegetation recorded within the Premises occurs on undulating low hills and ridges comprising limestone and sand, by plant taxa that have no reliance on groundwater. However, vegetation occurring on exposed limestone clay loam flats near the lowest position in the landscape, closest to the coastline in the south-west of the Premises and where depth to groundwater is at its shallowest, are likely to have interactions with groundwater at least seasonally during the year.

Flora and vegetation values of significance within and adjacent to the Premises include two Priority flora taxa: *Melaleuca huttensis* (Priority 1) and *Beyeria cinerea* subsp. *Cinerea* (P3), as well as Vegetation association 4[1], which is closely affiliated with a State listed priority ecological community (Onshore, 2013).

Climate

The site has a Mediterranean climate characterised by hot, dry summers and mild, wet winters during which 80% of the rainfall occurs (May to September). Only 4% of rainfall occurs during the summer months. The annual evaporation rate is around 2,550 – 2600 mm, which significantly exceeds annual average rainfall of 357 mm. In recent years, the annual rainfall has been below average.

During summer the prevailing winds are southerly to south-easterly (typically 21-30 km/hr) in the mornings, and south to south-westerly in the afternoons. Winds are generally stronger in the afternoon during summer. Throughout winter the winds are generally in a more north and easterly direction in the mornings, and south-westerly in the afternoons.

## Legislative context and other approvals

### Relevant approvals

| Legislation | Number | Approval |
|---|---|---|
| Part IV of the EP Act | N/A | Not considered a significant proposal |
| *Mining Act 1978 (WA)* | Reg ID 55347 | Mining Proposal & Mine Closure Plan for the Balline Garnet Mine |
| *Rights in Water and Irrigation Act 1914 (WA)* | GWL 170860(4) | Licensed allocation 1,700,000 kL/yr from the Gascoyne Groundwater Area, Carnarvon-Tumblagooda aquifer, for the purposes of mineral ore processing and dust suppression |

*Mining Act 1978 (WA)*

The Department of Mines, Industry Regulation and Safety (DMIRS) has approved a Mining Proposal (Registration ID: 55347) to develop the mineral sands deposit on tenements M70/1280 and G70/253, which is over private land. A Project Management Plan (PMP) has been subsequently approved by DMIRS for the 'Menari' mine in February 2017.

DMIRS has also approved a MCP for the project (Australian Garnet, 2015), which pre-dated the current closure guidelines. A number of issues were identified that required addressing in the 2019 revision regarding closure obligations, stakeholder consultation and refinement of completion criteria. The Applicant is currently preparing a revised MCP, for submission to DMIRS in 2019.

*Rights in Water and Irrigation Act 1914 (WA)*

Groundwater abstraction in gazetted areas is regulated by DWER under section 5C of the RIWI Act. A Licence to Take Water has previously been issued from the Carnarvon-Tumblagooda aquifer (1.7 GL/a) for mineral ore processing and other mining purposes, including dust suppression. An application has been submitted to increase the water allocation to 3.4 GL/a to cater for increased mining rates after the first year of operations.

[1] Mallee of *Eucalyptus fruticosa*, *Eucalyptus oraria* over Scattered High Shrubs of *Acacia rostellifera*, *Pittosporum ligustrifolium* over Scattered Low Shrubs of *Rhagodia latifolia* var. *latifolia.*

*Radiation Safety Act 1975 (WA)*

Deposits of mineral sands contain levels of naturally occurring radioactive materials (NORM). The radioactive constituents are mostly thorium with smaller amounts of uranium, and their respective decay products. Monazite is the most common radioactive mineral and typically constitutes less than 0.5% of the mined ore; however any operation in which radioactive containing material is extracted from the ground and processed can potentially concentrate NORM in product, by-product or waste streams.

The management of radiological risk (to human health and the environment) from NORM is undertaken jointly by DMIRS and the Radiological Council of WA (RCWA). Prior to the commencement of any stage of mining to which radiation regulations apply, the Applicant is required to obtain approval for a Radiation Management Plan (RMP) and a Radiation Waste Management Plan (RWMP) for the proposed activities at that stage. Both plans are reviewed by DMIRS and RCWA against defined requirements before the grant of approval to operate.

### Works approval and licence history

A works approval was previously issued to Altura in August 2010 (W4709/2010/1) to authorise initial mine construction works as per the original mining proposal. The expiry was extended in 2013 for a further 3 years as works had not commenced, however it later expired in 2016.

This Application is to replace the expired approval, including changes following the updated feasibility study conducted by the Applicant

Clearing of native vegetation

Up to 90 hectares (ha) of native vegetation is required to be cleared to facilitate mining and construction of the process plant. A clearing permit was previously issued to Altura in December 2010 (CPS 3891/1) to authorise clearing for this purpose as per the original mining proposal. The expiry was extended in 2015 for a further 5 years as clearing had not yet taken place.

A second clearing permit was issued by DMIRS in August 2015 for a further 50 ha of native vegetation within an expanded footprint that also includes the processing plant site on G70/253 (CPS 6614/1).

## Modelling data

### Noise model

The Applicant has undertaken a noise impact assessment for the project using the noise modelling software *SoundPLAN 7.2*, to predict noise levels at each nearby receptor for day time mining operations during the initial, mid development and final development mining scenarios.

The model (Herring Storer, 2017) predicts compliance with the assigned noise levels at the closest noise sensitive premises during weekday (Monday – Saturday) day time mining and processing operations.

The model predicts minor exceedances of the day time assigned level at the closest receptor to the north-east on Sundays and public holidays during light westerly wind conditions, as the strong prevalent winds in the area are unlikely to mask the tonal characteristics from mining and processing operations. However the model predicts compliance during these periods where the CAT AD400 Haul Truck is not in use.

DWER technical review

- The methodology of the noise modelling and impact assessment seem appropriate;
- The processing operation will be located >2 km to any of the neighbouring noise sensitive premises. From the type and size of the processing plants, DWER considers that processing noise will be able to comply with the most stringent (i.e. night-time) assigned

noise levels;

- Topsoil and overburden removal will be carried out during the day period (i.e. 7 AM to 7 PM). Buffer distances from the mining operation to noise sensitive premises vary, with the closest being around 1 km. Based on the type and size of the mining equipment, DWER considers that mining operation noise would be able to comply with the day time assigned noise level of $L_{A\ 10}$ 45 dB(A) from Monday to Saturday
- Compliance with the day time assigned noise level of $L_{A\ 10}$ 40 dB(A) for Sunday and public holidays is uncertain at the closest noise sensitive receptor during calm or light westerly wind conditions and when the mining operation is within close proximity. The proposed mitigation measures to minimise this risk by using reduced equipment items seems appropriate; and
- It has not been assessed or demonstrated if noise from the mining operation can comply with the night-time assigned noise level during the time period between 7 AM and 9 AM on Sundays and public holidays. DWER considers that compliance will be very difficult to achieve during this time period – the Applicant may be required to clearly exclude this time period for the mining operation.

**Key Findings:**

1. Processing operations will occur on a 24 hour, 7 days per week basis. Noise impacts from the processing operation has not been assessed in the noise model, as the plant is located >2 km from the nearest receptor and is considered likely to comply with the most stringent (i.e. night time) assigned noise levels.
2. Full compliance with the Noise Regulations is predicted for weekday (Monday to Saturday) mining and processing operations.
3. The model indicates the potential for exceedances of the day time assigned level at the closest receptor to the north-east on Sundays and public holidays during calm or light westerly wind conditions. Compliance can be achieved during these conditions by restricting the use of the CAT AD400 haul truck, which is only proposed to be used occasionally and on a weekday campaign basis.

## Risk assessment

| Risk Event | | | | | | Consequence rating | Likelihood rating | Risk | Reasoning | Regulatory controls (Refer to conditions of the granted Works Approval) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Source/Activities** | | **Potential emissions** | **Potential receptors** | **Potential pathway** | **Receptor (impact)** | | | | | |
| ***Construction, mobilisation, positioning of infrastructure and other pre-production works*** | Civil excavation/ earthworks/ vehicle movements on unsealed roads<br>Construction of WCP and DSP, temporary sand tails stockpile and solar drying ponds<br>Clearing of native vegetation, topsoil removal in starter pit area | Noise associated with construction works | Users of George Grey Drive<br>Rural/residential dwellings located >1 km from process plant site | Air / wind dispersion | Amenity impacts/ health impacts | Slight | Unlikely | Low | There is sufficient separation between the process plant and off-site receptors (>2.5 km). The proposed works are short-term (~18 months) and will occur during day time hours only. | None specified in WA. |
| | | Dust associated with machinery and vehicle movements | | | | Slight | Unlikely | Low | | None specified in WA. |
| | | Groundwater acidification associated with disturbance (oxidation) of ASS | Groundwater | Leaching from in situ ASS material | Groundwater contamination (acidification) | Minor | Rare | Low | Mining activities will not occur below the water table, and the high carbonate content of the dune sand further lowers the risk of acid generation. | None specified in WA. |
| | Pre-production mining and stockpiling | Noise associated with heavy vehicle movements | Users of George Grey Drive<br>Rural/residential dwellings located >1 km from process plant site | Air / wind dispersion | Amenity impacts/ health impacts | Slight | Unlikely | Low | There is sufficient separation between the starter pit works and off-site receptors (>2.5 km). The proposed works are short-term (~18 months) and will occur during day time hours only. | None specified in WA. |
| | | Dust associated with heavy vehicle movements | | | | Slight | Unlikely | Low | | None specified in WA. |
| | | Dust lift-off from ore stockpile(s) | | | | Slight | Unlikely | Low | There is sufficient separation between the starter pit and off-site receptors (>2.5 km), where ore stockpiles will remain in-pit. The proposed pre-mining works are short-term (1 month commissioning). | |
| ***Commissioning works and restricted operating period*** | Commissioning and restricted operation of WCP, DSP and associated infrastructure | Noise associated with operation of fixed plant | Users of George Grey Drive<br>Rural/residential dwellings located >1 km from process plant site | Air / wind dispersion | Amenity impacts/ health impacts | Slight | Unlikely | Low | There is sufficient separation between the process plant site and off-site receptors (>2.5 km). Commissioning and the restricted operating period will occur during day time hours only, in which noise levels are expected to comply with the Noise Regulations. | None specified in WA. |
| | | Particulate emissions from drying garnet concentrate | | | | Minor | Unlikely | Medium | Exhaust and ventilation gases from the DSP and drying process will be directed through a bag filter to limit particulate emissions to acceptable levels (i.e. below 50 mg/m$^3$). The dryer will be gas-fired.<br>The nearest off-site receptor is located 2.5 km away and upwind of the proposed DSP site. It is therefore considered that amenity and human health impacts to off-site receptors would only occur in exceptional circumstances. | WA to specify infrastructure controls:<br>- DSP design capacity;<br>- Make and model of dryer and baghouse;<br>- Testing to validate emissions; |
| | Stockpiling of HMC | Seepage of water entrained within HMC | Soil, groundwater | Through base of stockpile pad | Soil, groundwater contamination | Slight | Unlikely | Low | HMC will be stockpiled on an unsealed surface and allowed to drain to around 5% w/w. The wash water used on the HMC will be fresh water treated through the RO plant to reduce the salt content of the HMC, therefore any seepage will be predominantly fresh water compared to existing groundwater quality (3,000 – 7,000 mg/L TDS).<br>Any water runoff from the stockpiles will be contained within a sump for reuse within the process. | None specified in WA. |
| | | Surface water runoff | | Direct discharge | | Minor | Unlikely | Medium | | WA to specify infrastructure controls:<br>- HMC stockpile surface water controls – diversion drain and sump. |
| | | Dust lift-off from stockpile(s) | Users of George Grey Drive<br>Rural/residential dwellings located >1 km from process plant site | Air / wind dispersion | Amenity impacts/ health impacts | Slight | Unlikely | Low | HMC stockpile(s) will be located adjacent to the WCP/DSP, where there is sufficient separation to off-site receptors (>2.5 km). Garnet sand has less propensity to lift-off compared to other mineral sands due to its coarseness (average grain size ~500 µm). | None specified in WA. |

| Risk Event | | | | | | Consequence rating | Likelihood rating | Risk | Reasoning | Regulatory controls (Refer to conditions of the granted Works Approval) |
|---|---|---|---|---|---|---|---|---|---|---|
| Source/Activities | | Potential emissions | Potential receptors | Potential pathway | Receptor (impact) | | | | | |
| | Stockpiling of sand tailings on temporary unlined tailings storage area, prior to disposal to mine void | Seepage of water entrained in the sand tails to groundwater | Soil, groundwater | Through base of storage area | Soil, groundwater contamination | Minor | Rare | Low | Sand tailings (consisting principally of silica sand (83%) with other minor impurities) will have undergone physical separation only and therefore unlikely to contain contaminants that might otherwise be present in sand tailings that have undergone secondary processing (i.e. mostly clean sand). | None specified in WA. |
| | | | | | Groundwater mounding | Moderate | Unlikely | Medium | Relatively high water losses are expected from seepage beneath the initial tailings storage area given the clean sandy nature of the soils. Groundwater bores will be located and operated in such a way as to recover a significant portion of the water predicted to seep beneath the storage area, to limit any potential mounding effects to within 1 m of the surface. This is not considered significant given the natural groundwater level is at least 5 mbgl.<br>The GOS considers the potential for groundwater mounding around tailings disposal areas and discusses the need for contingency trigger values. | WA to specify:<br>- development of baseline groundwater level monitoring around tailings storage area;<br>- development of trigger values for groundwater recovery during operations. |
| | | Rupture of pipeline causing mine tailings discharge to land | Vegetation, including vegetation adjacent to pipeline alignment | Direct discharge | Soil and groundwater contamination | Minor | Possible | Medium | Sand tailings will be slurried with brackish water, therefore ruptures may impact on native vegetation through sedimentation or salt impacts. Flow meters and pressure gauges on pipelines should enable early detection of spills and leaks. | WA to specify:<br>- pipelines must be constructed with automatic cut-outs/secondary containment/ pressure sensors. |
| | Disposal of clay slimes to solar drying dams (initial) | Seepage of water entrained in the clay slimes to groundwater | Soil, groundwater | Through base of solar drying ponds | Soil, groundwater contamination | Minor | Unlikely | Medium | The percentage of clay slimes within the ore is expected to be minimal. Clay slimes will settle and consolidate, and effectively self-seal the ponds given the natural water retention properties (>40% clay content). Some seepage is expected, but is not considered to be significant. | WA to specify:<br>- construction requirements for solar drying ponds;<br>- location of drying ponds for disposal. |
| | | | | | Groundwater mounding | Slight | Unlikely | Low | | None specified in WA. |
| | | Rupture of pipeline causing mine tailings discharge to land | Vegetation, including vegetation adjacent to pipeline alignment | Direct discharge | Soil, groundwater contamination | Minor | Possible | Medium | Clay slimes will be slurried with brackish water, therefore ruptures may impact on native vegetation through sedimentation or salt impacts. Flow meters and pressure gauges on pipelines should enable early detection of spills and leaks. | WA to specify:<br>- automatic cut-outs/secondary containment/ pressure sensors to be maintained on pipelines. |
| | | Dust lift-off from solar drying ponds | Users of George Grey Drive<br>Rural/residential dwellings located >1 km from process plant site | Air / wind dispersion | Amenity impacts/ health impacts | Slight | Unlikely | Low | Solar drying ponds will be located adjacent to the WCP/DSP, where there is sufficient separation to off-site receptors (>2.5 km). Any dust lift-off is not expected to be significant, or impact on off-site receptors. | None specified in WA. |
| | | Overtopping/ breach of containment causing discharge to land | Vegetation, including vegetation adjacent to solar drying ponds<br>Groundwater | Direct discharge | Soil, groundwater contamination | Minor | Unlikely | Medium | Providing solar drying ponds are appropriately constructed and maintained, the risk of overtopping and breach of containment is considered to be Low, i.e. would not occur in most circumstances. | WA to specify:<br>- construction requirements for solar drying ponds;<br>- must maintain operational freeboard whilst in use. |
| | Stockpiling of garnet concentrate | Nil | N/A | N/A | N/A | Minor | Rare | Low | Final garnet products will be stored in sealed silos, prior to haulage to the Geraldton port storage facility. | None specified in WA. |

| Risk Event | | | | | | Consequence rating | Likelihood rating | Risk | Reasoning | Regulatory controls (Refer to conditions of the granted Works Approval) |
|---|---|---|---|---|---|---|---|---|---|---|
| **Source/Activities** | | **Potential emissions** | **Potential receptors** | **Potential pathway** | **Receptor (impact)** | | | | | |
| | Disposal of RO plant brine to process water pond | Spills/ leaks/ rupture of RO pipeline | Vegetation, including vegetation adjacent to process water ponds<br>Groundwater | Direct discharge | Soil, groundwater contamination | Minor | Unlikely | Medium | RO brine will be hypersaline, however the volumes being produced is expected to be minor (kL/yr). Providing the transfer pipeline is appropriately constructed and maintained, the risk of spills/leaks/ruptures is considered to be Low. It is expected that any spills/ leaks or ruptures would be localised. | WA to specify:<br>- automatic cut-outs/secondary containment/ pressure sensors to be maintained on pipelines. |
| | | Use for dust suppression | Vegetation, groundwater | Direct discharge | Vegetation, groundwater | Moderate | Possible | Medium | There is a risk of adverse impacts to the health of native vegetation if water used for dust suppression contains significant dissolved salt levels. This activity will therefore require specified controls to minimise the risk of impacts. | WA to specify:<br>- water to be used for dust suppression must not impact on the health of native vegetation |
| ***Pre-mining works*** | Clearing of vegetation, topsoil and overburden removal | Groundwater acidification associated with disturbance (oxidation) of ASS | Groundwater | Leaching from in situ ASS material | Groundwater contamination (acidification) | Minor | Rare | Low | Clearing activities and topsoil/overburden removal will not occur below the water table, and the high carbonate content of the dune sand further lowers the risk of acid generation. | None specified in Licence. |
| | | Noise associated with heavy machinery movements | Users of George Grey Drive<br>Rural/residential dwellings located >1 km | Air / wind dispersion | Amenity impacts/ health impacts | Slight | Unlikely | Low | There is sufficient separation between the mine voids and off-site receptors (>2.5 km). Pre-mining works will be limited to day time hours only, in which noise levels are expected to comply with the Noise Regulations. | None specified in Licence. |
| | | Dust associated with heavy machinery movements | | | | Slight | Unlikely | Low | There is sufficient separation between the mine voids and off-site receptors (>2.5 km). | None specified in Licence. |
| ***Category 8: Mineral sands mining or processing*** | Mining and processing of ore | Groundwater acidification associated with disturbance (oxidation) of ASS | Groundwater | Leaching from in situ ASS material | Groundwater contamination (acidification) | Minor | Rare | Low | Mining activities will not occur below the water table, and the high carbonate content of the dune sand further lowers the risk of acid generation. | None specified in Licence. |
| | | Noise associated with mobile and fixed plant operation | Users of George Grey Drive<br>Rural/residential dwellings located >1 km | Air / wind dispersion | Amenity impacts/ health impacts | Minor | Possible | Medium | There is a risk of noise levels exceeding the Noise Regulations at the nearest receptor during calm or light-westerly wind conditions. Noise from mining and processing operations under most other circumstances are predicted to be acceptable. | Licence to specify:<br>- Restricting mining fleet numbers during westerly wind conditions;<br>- Applicant controls to minimise noise, as specified in Noise Management Plan. |
| | | Dust associated with mining fleet movements | | | | Minor | Possible | Medium | There is a risk of fugitive dust causing off-site impacts during strong prevailing westerly winds. | Licence to specify:<br>- Applicant controls to minimise dust, as specified in Dust Management Plan. |
| | | Dust lift-off from stockpiles | | | | Minor | Possible | Medium | | |
| | | Surface water runoff | Soil, groundwater | Direct discharge | Soil, groundwater contamination, sedimentation | Minor | Unlikely | Medium | Due to the sandy nature of the soils, it is expected the majority of surface water will rapidly infiltrate. The local area has low average annual rainfall (~350 mm/yr). | None specified in Licence. |
| | Drying and classification of garnet concentrate in DSP | Particulate emissions from drying garnet concentrate | Users of George Grey Drive<br>Rural/residential dwellings located >1 km | Air / wind dispersion | Amenity impacts/ health impacts | Minor | Rare | Low | Exhaust and ventilation gases from the DSP and drying process will be directed through a bag filter to limit particulate emissions to acceptable levels (i.e. below 50 mg/m$^3$). The dryer will be gas-fired.<br>The nearest off-site receptor is located 2.5 km away and upwind of the proposed DSP site. It is therefore considered that amenity and human health impacts to off-site receptors would only occur in exceptional circumstances. | None specified in Licence. |

| Risk Event | | | | | | Consequence rating | Likelihood rating | Risk | Reasoning | Regulatory controls (Refer to conditions of the granted Works Approval) |
|---|---|---|---|---|---|---|---|---|---|---|
| Source/Activities | | Potential emissions | Potential receptors | Potential pathway | Receptor (impact) | | | | | |
| | Rinsing of final garnet products | Disposal of saline wash water | Soil, groundwater | Direct discharge | Soil, groundwater contamination | Minor | Unlikely | Medium | Wash water will contain high salinity concentration, however the volumes being produced is expected to be minor. Providing the transfer pipeline is appropriately constructed and maintained, the risk of spills/leaks/ruptures is considered to be Low. It is expected that any spills/ leaks or ruptures would be localised. | Licence to specify infrastructure controls:<br>- Wash water to be transferred to process water dam. |
| | Stockpiling of HMC | Seepage of water entrained within HMC | Soil, groundwater | Through base of stockpile pad | Soil, groundwater contamination | Slight | Unlikely | Low | HMC will be stockpiled on an unsealed surface and allowed to drain to around 5% w/w. The wash water used on the HMC will be fresh water treated through the RO plant to reduce the salt content of the HMC, therefore any seepage will be predominantly fresh water compared to existing groundwater quality (3,000 – 7,000 mg/L TDS).<br>Any water runoff from the stockpiles will be contained within a sump for reuse within the process. | None specified in Licence. |
| | | Contaminated stormwater runoff | | Direct discharge | | Minor | Unlikely | Medium | | Licence to specify infrastructure controls:<br>- HMC stockpile surface water controls – diversion drain and sump. |
| | | Dust lift-off from stockpile(s) | Users of George Grey Drive<br>Rural/residential dwellings located >1 km from process plant site | Air / wind dispersion | Amenity impacts/ health impacts | Slight | Unlikely | Low | HMC stockpile(s) will be located adjacent to the WCP/DSP, where there is sufficient separation to off-site receptors (>2.5 km). Garnet sand has less propensity to lift-off compared to other sands due to its coarseness (average grain size ~500 µm). | None specified in Licence. |
| | Disposal of sand tailings to mine void | Seepage of water entrained in the sand tails to groundwater | Soil, groundwater | Through base of storage area | Soil, groundwater contamination | Minor | Rare | Low | Sand tailings (consisting principally of silica sand (83%) with other minor impurities) will have undergone physical separation only and therefore unlikely to contain contaminants that might otherwise be present in sand tailings that have undergone secondary processing (i.e. mostly clean sand). | None specified in Licence. |
| | | | | | Groundwater mounding | Moderate | Unlikely | Medium | Relatively high water losses are expected from seepage beneath the mine voids given the clean sandy nature of the soils. Groundwater bores will be located and operated in such a way as to recover a significant portion of the water predicted to seep beneath the mine voids, to limit any potential mounding effects to within 1 m of the surface. This is not considered significant given the natural groundwater level is at least 5 mbgl.<br>The GOS considers the potential for groundwater mounding around tailings disposal areas and discusses the need for contingency trigger values. | Licence to specify:<br>- groundwater level monitoring around mine voids;<br>- trigger values for groundwater recovery. |
| | | Rupture of pipeline causing mine tailings discharge to land | Vegetation, including vegetation adjacent to pipeline alignment | Direct discharge | Soil, groundwater contamination | Minor | Possible | Medium | Sand tailings will be slurried with brackish water, therefore ruptures may impact on native vegetation through sedimentation or salt impacts. Flow meters and pressure gauges on pipelines should enable early detection of spills and leaks. | Licence to specify:<br>- automatic cut-outs/secondary containment/ pressure sensors to be maintained on pipelines. |
| | Drying of clay slimes | Seepage of water entrained in the clay slimes to groundwater | Soil, groundwater | Through base of solar drying ponds | Soil, groundwater contamination | Minor | Unlikely | Medium | The percentage of clay slimes within the ore is expected to be minimal. Clay slimes will settle and consolidate, and effectively self-seal the ponds given the natural water retention properties (>40% clay content). Some seepage is expected, but is not considered to be significant. | Licence to specify:<br>- ongoing construction requirements for solar drying ponds;<br>- location of drying ponds for disposal. |
| | | | | | Groundwater mounding | Slight | Unlikely | Low | | None specified in Licence. |
| | | Rupture of pipeline causing mine tailings discharge to land | Vegetation, including vegetation adjacent to pipeline alignment | Direct discharge | Soil, groundwater contamination | Minor | Possible | Medium | Clay slimes will be slurried with brackish water, therefore ruptures may impact on native vegetation through sedimentation or salt impacts. Flow meters and pressure gauges on pipelines should enable early detection of spills and leaks. | Licence to specify:<br>- automatic cut-outs/secondary containment/ pressure sensors to be maintained on pipelines. |

| Risk Event | | | | | | Consequence rating | Likelihood rating | Risk | Reasoning | Regulatory controls (Refer to conditions of the granted Works Approval) |
|---|---|---|---|---|---|---|---|---|---|---|
| Source/Activities | | Potential emissions | Potential receptors | Potential pathway | Receptor (impact) | | | | | |
| | | Dust lift-off from solar drying ponds | Users of George Grey Drive<br>Rural/residential dwellings located >1 km from process plant site | Air / wind dispersion | Amenity impacts/ health impacts | Slight | Unlikely | Low | Solar drying ponds will be located adjacent to the WCP/DSP, where there is sufficient separation to off-site receptors (>2.5 km). Any dust lift-off is not expected to be significant, or impact on off-site receptors. | None specified in WA. |
| | | Overtopping/ breach of containment causing discharge to land | Vegetation, including vegetation adjacent to solar drying ponds<br>Groundwater | Direct discharge | Soil, groundwater contamination | Minor | Unlikely | Medium | Providing solar drying ponds are appropriately constructed and maintained, the risk of overtopping and breach of containment is considered to be Low, i.e. would not occur in most circumstances. | Licence to specify:<br>- ongoing construction requirements for solar drying ponds;<br>- must maintain operational freeboard whilst in use. |
| | Naturally Occurring Radioactive Materials (NORM) | Seepage to groundwater | Soil, groundwater | Lateral or vertical seepage through base of mine void | | Moderate | Unlikely | Medium | Radiological risks regulated by DMIRS and RCWA. | N/A. |

## Consultation

| Submitter | Comment | DWER response |
|---|---|---|
| Department of Mines, Industry Regulation and Safety | A mining proposal (MP) and mine closure plan (MCP) were submitted to DMIRS seeking approval for mining activities on M70/1280, L70/134 and G70/253 in June 2015 – these were approved in October 2015. The MCP is due for review in 2020. The proponent is restricted to only undertake the activities in the approved MP and any expansion or change would require approval through an updated MP. | Noted. |
| Department of Biodiversity, Conservation and Attractions | The taxonomic and conservation status of the Short Range Endemics identified, and the potential for significant impact, has not been addressed in the 2013 fauna report.<br>Nearby mining operations have resulted in dust-related damage to the restricted Beard's Vegetation Association Tall Forest *Acacia rostellifera*. This indicates soils in the area are liable to create dust and vegetation types present are susceptible to damage through this indirect effect. | Conditions will be applied on the Licence to require operational dust management controls consistent with industry standard practices and the Applicant's dust management plan. |
| Department of Planning, Lands and Heritage | The three reported Aboriginal heritage places have not yet been assessed by the Aboriginal Cultural Material Committee regarding whether they are sites to which the *Aboriginal Heritage Act 1972* (AHA) may apply. However, no approvals are required under the AHA if the proposed works are able to avoid the reported places. | Noted. |
| Shire of Northampton | The Applicant is required to lodge an application for development approval for the extractive industry land zoning, including the temporary accommodation camp.<br>The Applicant is required to lodge a separate application for development approval for any additional infrastructure for the generation of power on the site.<br>The proposed mine is located 2.5 km from the Halfway Bay lease areas and 1.5 km from the Lucky Bay campgrounds. Noise modelling should therefore consider noise impacts on these areas.<br>The Applicant is advised to consult with Main Roads WA to determine the requirements in terms of modifications and intersecting access ways at George Grey Drive.<br>It is recommended the application be referred to the Department of Planning, Lands and Heritage for their advice regarding an aboriginal heritage registered site located within 1 km of the proposed mine. | The Applicant has been advised to contact the Shire to discuss these matters. |
| Nearby landowners | Letters sent to all nearby landowners, no response received within the specified timeframe. | N/A. |

# Conclusion

This assessment of the risks of activities on the premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this decision report (summarised in Appendix 2).

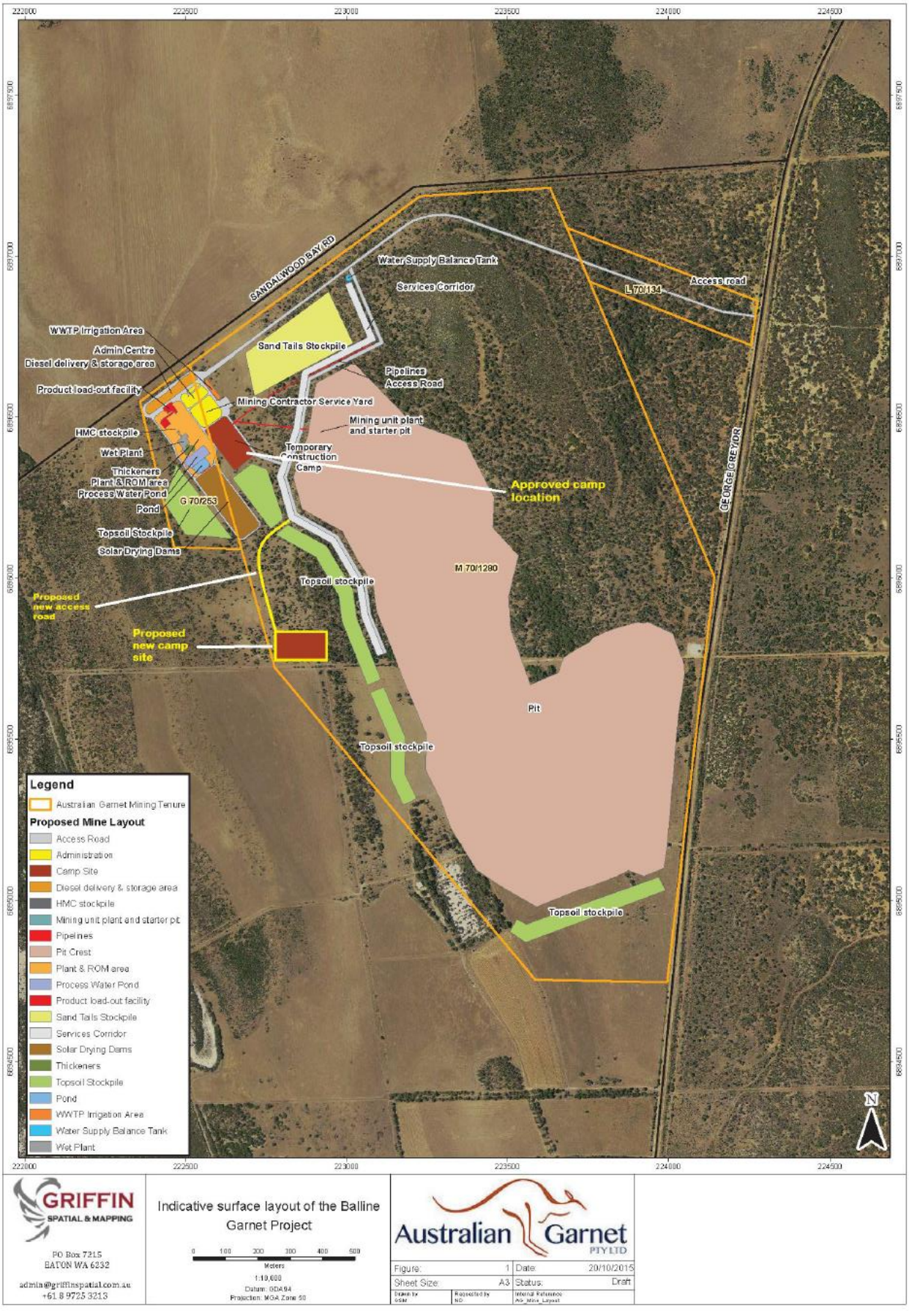
Based on this assessment, it has been determined that the Works Approval will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

DWER notes that it may review the appropriateness and adequacy of controls at any time and that, following a review, DWER may initiate amendments to the approval under the EP Act.

***TIM GENTLE***
***MANAGER, RESOURCE INDUSTRIES***
***REGULATORY SERVICES***

Delegated Officer
Under section 20 of the *Environmental Protection Act 1986*

# Appendix 1: Proposed mine layout



# Appendix 2: Key documents

| Document title | In text ref | Availability |
|---|---|---|
| Australian Garnet Pty Ltd – Balline Garnet Mine – Works Approval application and supporting information | Application | DWER records (A1745325) |
| Australian Garnet Pty Ltd, December 2018. *Mining Proposal for Menari North*. | Australian Garnet, 2018 | DWER records (A1779479) |
| DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth. | DER, 2015a | accessed at www.dwer.wa.gov.au |
| DER, October 2015. *Guidance Statement: Setting Conditions.* Department of Environment Regulation, Perth. | DER, 2015b | |
| DER, February 2017. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth. | DER, 2017a | |
| DER, February 2017. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth. | DER, 2017b | |
| Geowater Consulting, July 2014. Balline Garnet Project – Groundwater assessment for increased abstraction to 1.70 GL/year. Report prepared for Australian Garnet Pty Ltd by Geowater Consulting Pty Ltd | Geowater, 2014 | DWER records (A1779475) |
| Herring Storer, November 2017. Environmental Noise Assessment – Balline. Report prepared for Australian Garnet Pty Ltd by Herring Storer Acoustics | Herring Storer, 2017 | DWER records (A1779473) |
| Onshore Environmental, November 2013. Balline Garnet Project – Level 2 Flora and Vegetation Survey. Report prepared for Australian Garnet Pty Ltd by Onshore Environmental Pty Ltd | Onshore, 2013 | DWER records (A1779476) |
| URS, January 2010. Balline Garnet Project – Groundwater supplies – water bore installation and aquifer testing phase. Report prepared for Altura Mining Limited by URS Australia Pty Ltd | URS, 2010 | DWER records (A1779477) |