FQM AUSTRALIA NICKEL	Ravensthorpe Nickel Project	Document Owner: FQM Australia Nickel
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Licence L8008 Amendment:

Attachment 3B Proposed Activities - Supporting Information

Ravensthorpe Nickel Project

Revision Number: 0

Date Published: 3/10/2024

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ABBREVIATIONS

Abbreviation	Description
DWER	Department of Water and Environmental Regulation
EP Act	*Environmental Protection Act 1986*
FQMAN	First Quantum Minerals Australia Nickel
mAHD	Australian Height Datum
MS	Ministerial Statement
s.	Section
The Project	Ravensthorpe Nickel Project
TSF	Tailings Storage Facility
VT	Vegetation Type
WA	Western Australia

1 INTRODUCTION

The Ravensthorpe Nickel Project (the Project) is a nickel mining and processing project in the Esperance Plains Interim Biogeographical Regionalisation of Australia bioregion of Western Australia. The mine is owned by First Quantum Minerals Australia Nickel (FQMAN), herein referred to as 'the Proponent' or 'FQMAN'. The Project is located at Bandalup Hill, 35 km to the east of the town of Ravensthorpe (Figure 1-1).

The Project was originally approved by the Minister for the Environment on 4 June 1999 (Ministerial Statement 509) after being assessed under Part IV of the *Environmental Protection Act 1986* (EP Act) (EPA Assessment number 1199). In March 2002, the Proponent sought authorisation for some substantial changes to the project, including most notably expansion of the operation to include mining of two further ore-bodies (Hale–Bopp and Shoemaker Levy mine pits). The operational changes necessitated amendments to some of the original Ministerial conditions under Section 46 of the EP Act and these were approved through Ministerial Statement 633 (5 September 2003) which superseded the original Ministerial Statement. The project has been amended further on five subsequent occasions, with 'non-substantial' changes approved in 2004, 2008, 2010, 2014 and 2019.

The Project has operated under a Part V licence (L8008/2004) since 2005. The Part V licence has been amended on five occasions, most recently in 2023. The current operating licence (L8008/2004/3) is valid to 13 May 2026.

The Project currently consists of three nickel laterite deposits (Halley's, Hale-Bopp, and Shoemaker-Levy) and various associated infrastructure, including waste rock dumps (WRDs), a run-of-mine (ROM) pad, a processing plant and associated infrastructure, a conveyor (between Shoemaker-Levy and the processing plant), pipelines and corridors, evaporation ponds, an accommodation village, water and power infrastructure, a limestone quarry and two tailings storage facilities (TSF1 and TSF2). The Project also includes a seawater intake area, pumping station, and seawater pipeline at Masons Bay.

FQMAN proposes to modify its arrangements for managing process residues and some non-process residues at the Ravensthorpe operation. Specifically, the company wishes to:

- co-dispose mineral residues (other than production tailings) at TSF1 and TSF2, along with the production tailings already approved for disposal at TSF2, and
- establish a Category 89 landfill for disposal of up to 2,500 tonnes per annum of non-process waste within the exhausted Halley's mine void.

The current Part V licence does not authorise these activities and, accordingly, a licence amendment is required. As part of the proposed licence amendment, FQMAN also seeks approval of a number of administrative changes to improve the accuracy and/or the effectiveness of the licence, as outlined in Section 4. The risks associated with the proposed amendment is detailed in Section 5 and Attachment 8B, and the management and monitoring controls are outlined in Sections 6.

This document is Attachment 3B of FQMAN's licence amendment application. The purpose of this supporting information document is to provide information to allow (Department of Water and

Environmental Regulation (DWER) to assess the risk implications of allowing the additional prescribed activities and administrative changes to licence conditions proposed by FQMAN at its Ravensthorpe operation.

FQMAN does not consider that the proposed additional activities constitute a significant change to the proposal as assessed under Part IV of the EP Act. The proposed changes can be regulated under Part V of the EP Act and, as a result, FQMAN does not propose to seek an amendment to Ministerial Statement 633. The approach is consistent with, and reflects advice presented in EPA's *Interim Guidance - Taking decision-making processes into account in EIA* (EPA, 2021).

Figure 1-1: Location of Ravensthorpe Nickel Operations

2 ENVIRONMENTAL CONTEXT

This section provides a brief overview of the social and biophysical setting of the Ravensthorpe Nickel project, focussing on those aspects which have the potential to be impacted by proposed changes in waste management practices. No additional clearing of native vegetation is required to implement the proposed operational changes. Neither would the proposed changes to waste management result in material changes to air emissions from the Project.

2.1 Social setting

The Project is located approximately 35 km east of the town of Ravensthorpe and about 3.5 km west-northwest of the locality of Jerdacuttup in the Goldfields/Esperance region of Western Australia (WA). The landscape to the east of the Project is predominantly agricultural (mostly broad-acre farming), while substantial areas of remnant native vegetation characterise areas to the west and north. Agricultural production is the key economic activity underpinning the local economy, although tourism is also an important component of economic activity in the Shire and is likely to grow in the future. The closest sensitive receptor to the mine operations area is an agricultural homestead located approximately 3.9 km southwest of TSF2 and the Jerdacuttup primary school, located approximately 6.8 km east-southeast of TSF2. The closest sensitive receptor to the Halley's pit void is an agricultural homestead located approximately 8.3 km southwest of the pit void. The Jerdacuttup primary school lies approximately 9.2 km to the southeast of the pit void.

The Project lies within two overlapping Native Title Claim areas - Wagyl Kaip (Native Title Claim WC1998/070) and Southern Noongar (WC1996/109). Both claims have been determined, with the outcome in each being that Native Title does not exist. Notwithstanding this, the Wagyl Kaip and Southern Noongar Indigenous Land Use Agreement (ILUA) covering both these claim areas was registered with the National Native Title Tribunal on 17 October 2018. Although their determined claim area lies mostly outside the current mine operations area, the Esperance Nyungar Native Title claimants (WCD2014/002) also have a demonstrated cultural heritage interest in the Bandalup area.

There are many culturally significant sites for the Wagyl Kaip and Southern Noongar and Esperance Nyungar people in the southwest region of WA, some of which are in the Shire of Ravensthorpe. Surveys conducted in the Project area have identified that local waterways are considered to have historical and mythological significance for Traditional Owners.

2.2 Regional setting and climate

The Project is located in the Esperance Plains region (and the Fitzgerald and Recherche subregions) of the Interim Biogeographic Regionalisation for Australia (IBRA) (DoEE, 2012). The Esperance Plains region experiences a warm Mediterranean climate with winter precipitation. The average monthly rainfall is highest in the winter months of July and August (47 mm and 46 mm). Ravensthorpe receives an average of 427 mm of rain annually (BOM, 2023a). Predicted rainfall depths for various storm return intervals (expressed as annual exceedance probability) and durations are shown in Figure 2-2.

The highest temperatures are in the summer months (December to February), with January recording the highest average daily temperature of 29°C (Figure 2-1). In future, the climate in southwestern Western Australia is predicted to become hotter and drier as a result of climate change (DWER, 2021).

The prevailing winds recorded at Ravensthorpe (Bureau of Meteorology station number 010633) are south-easterly and can reach in excess of 30 km/h in all seasons. During winter and spring, strong north-westerly winds have been recorded in excess of 40 km/h.

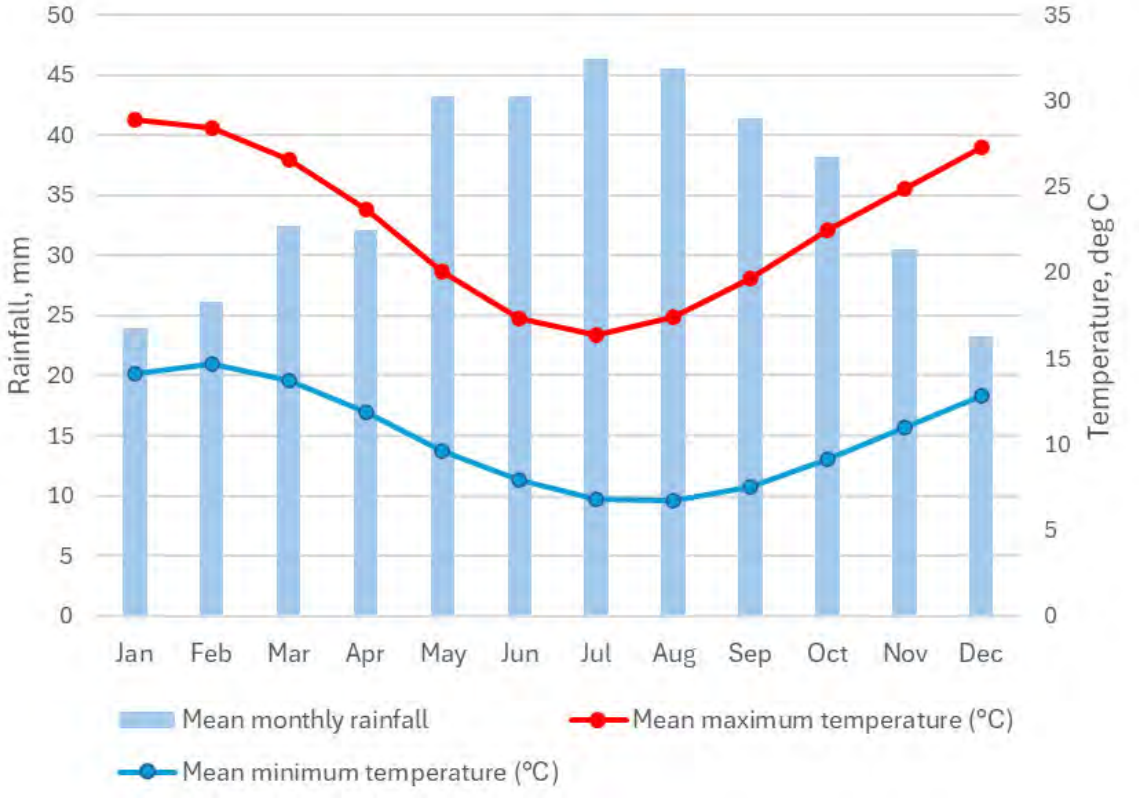

Figure 2-1: Climate averages (Ravensthorpe BoM station no 010633)

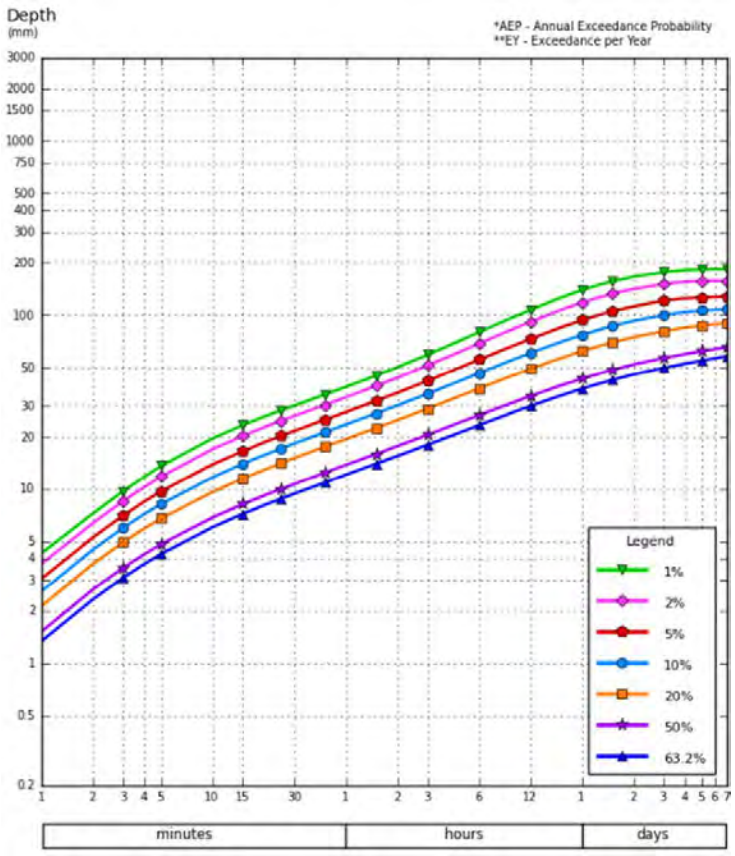

Figure 2-2: Ravensthorpe Nickel Operations – rainfall intensity/frequency/duration curves

2.3 Surface water

The Project lies within the Bandalup and Burlabup Creek subcatchments of the Jerdacuttup River catchment, which terminates at the semi-permanent and hypersaline Jerdacuttup Lakes, approximately 30 km south of the Project area (Figure 2-3). All streams within the Project area are ephemeral. Flows are variable, responding to seasonal rainfall. A combination of high permeability soils, mostly flat topography and deep water table levels results in a very low proportion of rainfall translating into surface run-off. Most surface flows terminate higher in the catchment, recharging groundwater aquifers.

There is negligible surface expression of groundwater throughout the Project area and the Jerdacuttup River catchment. Discharge mainly occurs along Bandalup Creek and the Jerdacuttup River drainage lines to the west and south-west of the Project area. The Project is not located within a *Rights in Water and Irrigation Act 1914* (RiWI Act) Surface Water Proclamation Area. The nearest water source protection area (Ravensthorpe) lies approximately 22 km to the west of the Project area.

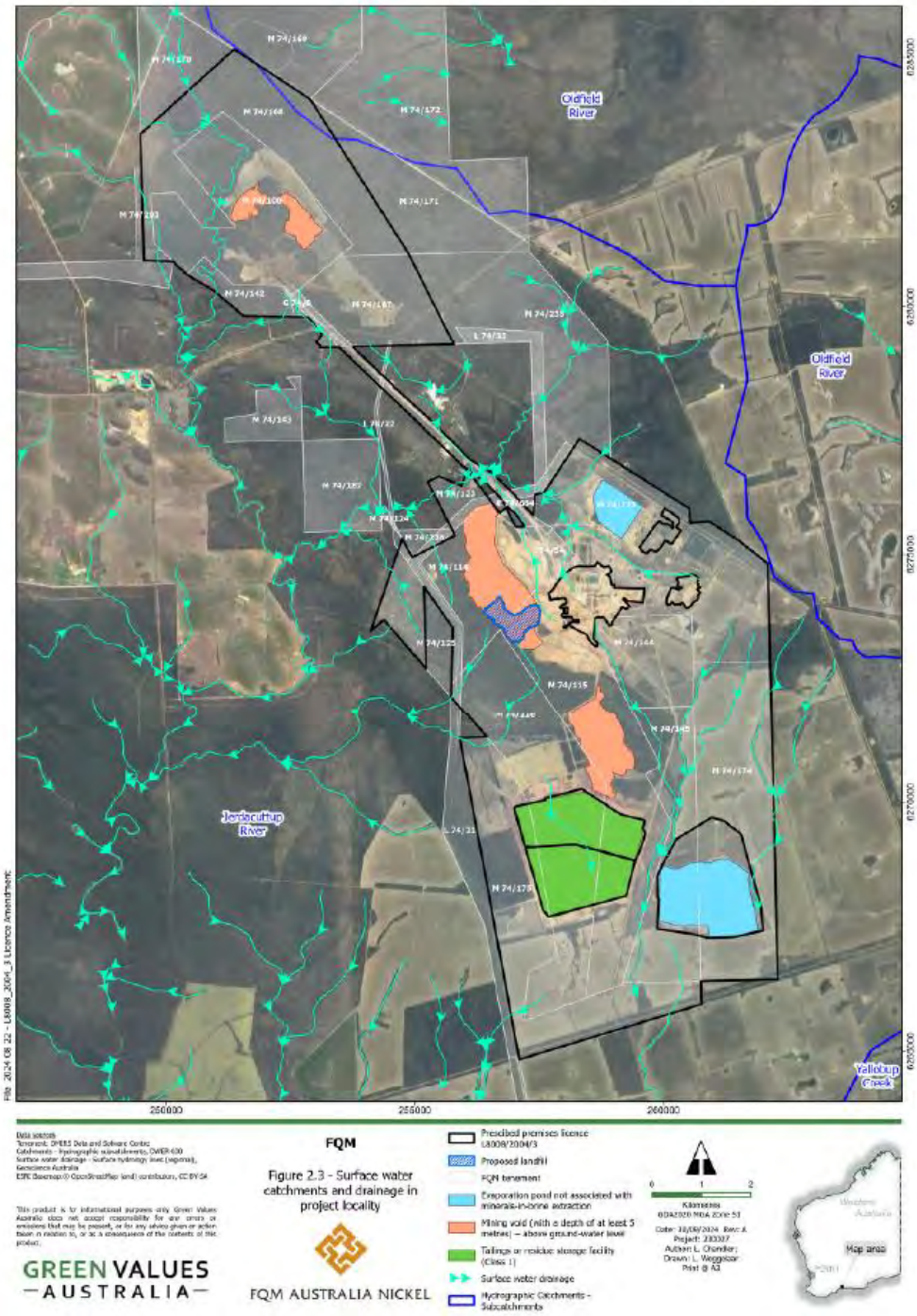

Figure 2-3: Surface water catchments and drainage in project locality.

2.4 Groundwater

The regional groundwater table is hosted in an unconfined fractured and weathered basement rock aquifer and in the Jerdacuttup Palaeochannel to the south. Minor groundwater occurs in Quaternary sediments (Golder, 2019). Regional groundwater levels lie at 80 to 200 metres Australian Height Datum (mAHD). The groundwater table is a subdued reflection of surface topography and typically occurs at depths of 13 m to 16 m below ground surface level. Groundwater flow is to the southwest, where groundwater ultimately discharges into the rivers and lakes in the coastal area. Groundwater recharge is limited and episodic and is substantially exceeded by annual evapotranspiration, which ranges between 1600 to 1800 mm (Golder, 2019).

The natural watertable in the Project area lies at elevations ranging between 90 mAHD and 190 mAHD (corresponding to depths ranging from about 17 m to 14 m below ground level). All open pits are above the watertable, and no dewatering is required during mining operations. The water table elevation near the Halley's pit is approximately RL140mAHD, or about 5 m below the lowest point of the pit floor (at RL145mAHD).

Depths to groundwater in close proximity to the tailings storage facilities have been affected by seepage of water from the TSFs. Groundwater level rises (mounding) of up to approximately 12 m have been reported immediately beneath the TSF footprint during the period from January 2013 to April 2023 (Golder Associates, 2023). The mounding effect dissipates with increasing distance from the TSFs and no mounding effects are apparent at a distance of about 2 km south of TSF2. In April 2023, groundwater levels in bores monitoring groundwater near TSF2 ranged from less than 4.5 m below ground level to 17 m below ground level.

Regional bores to the south of TSF2 which are unaffected by mine activities generally have total dissolved solids (TDS) concentrations in the range 13,000 mg/L to 32,000 mg/L and pH values in the range of approximately 6.5 to 7.8. The high salinity limits groundwater use for agriculture. Groundwater quality in proximity to TSF2 is hypersaline. Groundwater pH values close to the TSF complex are similar regional groundwater but have shown a declining trend in areas near TSF2 since about mid-2018.

A summary of baseline groundwater quality recorded at the Project is provided in Table 2-1.

Table 2-1: Summary of Baseline Groundwater Quality Recorded at the Project

Bore water composition	Units	Data value
Chloride, Cl	mg/L	1,000 – 10,000
Sodium, Na		3,000 – 6,000
Sulphate, SO_4		1,500 – 4,000
Magnesium, Mg		600 – 900

Calcium, Ca		40 – 170
Potassium, K		60 – 130
Nitrogen, N (as Nitrate, NO_3)		0.1 – 0.2
Bicarbonate, HCO_3		150 – 1200
Fluoride, F		0.4 – 1.5
Silica, SiO_2		36
Nickel		0.007 – 1.6
Cobalt		<LOD – 0.14
Total Dissolved Solids, TDS		13,000 – 18,000
pH	pH unit	6.4 – 7.3
Temperature Range	°C	10 – 25

2.5 Biodiversity

2.5.1 Flora and Vegetation

The vegetation of the Esperance Plains region is characterised by a mallee-heath formation on sand plains (Beard, 1990). The Project is adjacent to the Fitzgerald River Biosphere, one of five UN recognised international biospheres reserves in Australia. The biosphere reserves are recognised for their biological richness, species endemism and high level of threats to biodiversity.

A total of 18 vegetation types (VTs) occur within the Project area (Eco Logical Australia, 2018). Most of the native vegetation in the Project area was ranked as being in Pristine condition, with few weeds recorded and small areas of disturbance. Several ephemeral drainage lines were mapped as being in ‘Excellent’ overall condition, with degrading processes including weed infestations and possible drought and/or salinisation observed (Woodman, 2017a). Small areas of remnant vegetation within and adjacent to cleared farmland and existing Project infrastructure have been subject to historic grazing and considered to be in ‘Very Good’ condition due to grazing impacts on the understorey.

Vegetation in the Project area has a high degree of speciation and local endemism. A total of 523 endemic species of flora have been confirmed from within the orebody areas and fringing habitats on Bandalup Hill and the Shoemaker-Levy deposit (Western Botanical, 2005). Of these, almost 5% are regarded as having conservation significance, with some restricted to the Bandalup Corridor (Western Botanical, 2005). However,

the majority of taxa are widespread regionally and are well-represented within the region, and more broadly in the coastal strip between Esperance and Albany (Western Botanical, 2005).

The Project area is within the Southwest Botanical Province of Western Australia in which 40% of described plant species are susceptible to *Phytophthora cinnamomi* dieback and additional 14% being highly susceptible. A baseline survey for the presence of Phytophthora dieback was undertaken in 1999 and follow up surveys have been undertaken regularly. The native vegetation within the Project area is composed of both interpretable and uninterpretable vegetation types. Most of the Project area is uninfested by dieback; however, there is a site at the intersection of Mason Bay Road and the South Coast Highway which has an infestation of *Phytophthora pseudocryptogea* X *cryptogea*. The current hygiene measures being implemented by FQMAN under its Dieback Management Plan (2019) have been successful in preventing the spread of dieback throughout the Project area (Glevan Consulting, 2020).

2.5.2 Terrestrial fauna and habitats

Twelve broad fauna habitats have been identified and mapped within the Project area. A total of 45 fauna species comprising three amphibians, 32 birds, 12 mammals and 29 reptiles have been recorded in the Project area (Stantec, 2019). Ten fauna species listed as conservation significant have been confirmed within the fauna survey area:

- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*)
- Malleefowl (*Leipoa ocellata*)
- Chuditch (*Dasyurus geoffroii*)
- Heath Mouse (*Pseudomys shortridgei*)
- Western Mouse (*Pseudomys occidentalis*)
- Western Whipbird (*Psophodes nigrogularis oberon*)
- Quenda (*Isoodon fusciventer*)
- Western Brush Wallaby (*Notamacropus ir*ma)
- Peregrine Falcon (*Falco peregrinus*)
- Eula's Planthopper (*Budginmaya eulae*).

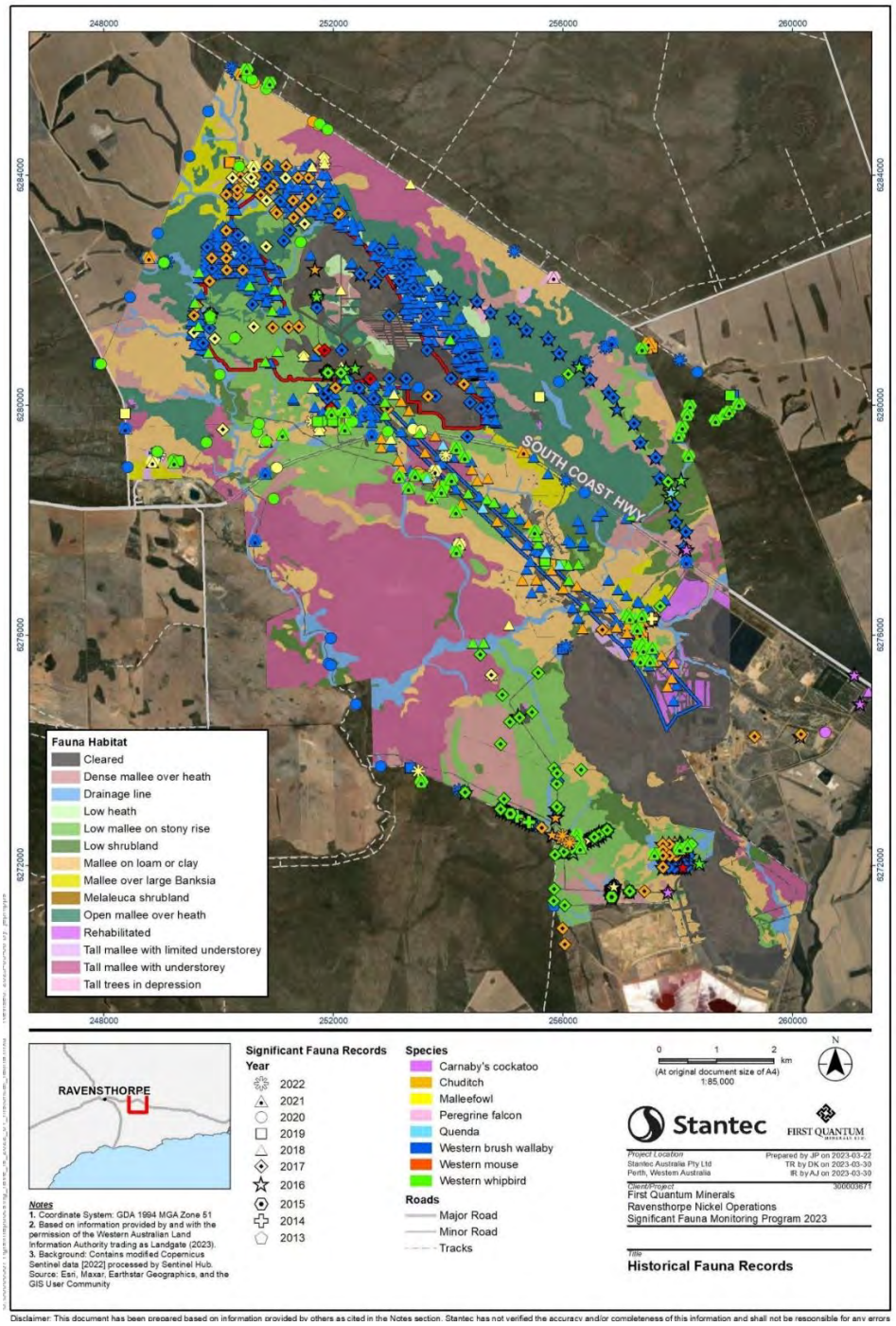

Figure 2-4: Habitats and threatened fauna observations in project locality (Stantec, 2023)

2.5.3 Conservation areas

The Project is located within the Bandalup Corridor, a buffer zone for the Fitzgerald Biosphere Reserve. The Bandalup Corridor is an area of remnant vegetation which, along with other vegetation corridors such as the Ravensthorpe Ranges and Carlingup Corridor, links the Fitzgerald River National Park and Biosphere Reserve with vegetation to the north-east, including the Great Western Woodlands, leading to the eastern Goldfields.

The nearest conservation reserves to the Project include Nature Reserve 27177 (20.64 ha), for conservation of flora, 1.5 km to the west; and Nature Reserve 43060, Scarlet Pear Gum Reserve, located on the corner of Mason Bay Road and Jerdacuttup Road. Other reserves in the region include the adjacent and heritage listed Fitzgerald River National Park to the south-west, Kundip Nature Reserve to the south-west and Jerdacuttup Lakes Nature Reserve to the south of the Project.

3 PROJECT OVERVIEW

3.1 Operational history and current status

The Project (originally proposed by Comet Resources NL) was assessed by the WA EPA in 1998 and was approved under Ministerial Statement 509 in June 1999. The Project was acquired by BHP in 2002 and implementation of a revised project (assessed via a Section 46 amendment and authorized under Ministerial Statement 633 (5 September 2003) commenced in 2008. BHP placed the Project under care and maintenance in 2009.

FQMAN purchased the Project from BHP in 2010 and made further modifications and upgrades following assessment and permitting under Parts IV and V of the *Environmental Protection Act 1986* ('the EP Act') and the *Mining Act 1978*. First product was produced in October 2011. Commercial production at the Project continued until August 2017, when the site was again placed into care and maintenance. At that stage, the majority of ore in the southern mine pits, Halleys and Hale-Bopp, had been mined but no mining (or other disturbance associated with implementation of MS 633) had occurred within the approved Shoemaker Levy mining footprint.

In August 2016, FQMAN lodged a referral under Part IV of the EP Act, seeking approval to change several aspects of the project approved under Ministerial Statement 633. The proposed changes (which are still under assessment) have been modified since the initial referral (most recently in June 2023). The changes being assessed by the EPA relate to proposed expansion of mining and storage of waste rock at the Shoemaker-Levy operations area (EPA assessment number 2100). No changes to tailings storage are proposed under the modified activities currently under assessment. The operational changes currently under assessment by the EPA would have no effect on the waste management arrangements proposed in the current licence amendment application.

Operations at the Project resumed in March 2020. Mining operations at the new Shoemaker-Levy mine commenced in October 2020, with the mine being officially opened in November 2021. Construction of a new 9 km overland conveyer was completed in November 2021. The conveyor is used to transport crushed ore from the Shoemaker-Levy mine to the plant for processing.

FQMAN suspended operations at the Project on 29 June 2024 as a result of low commodity prices and high production costs. The Project is currently managed under a care and maintenance plan. No specific date has been set for recommencement of operations.

3.2 Key Operational Activities

A general arrangement plan showing the locations and extent of key project components associated with the licence and this licence amendment is provided in

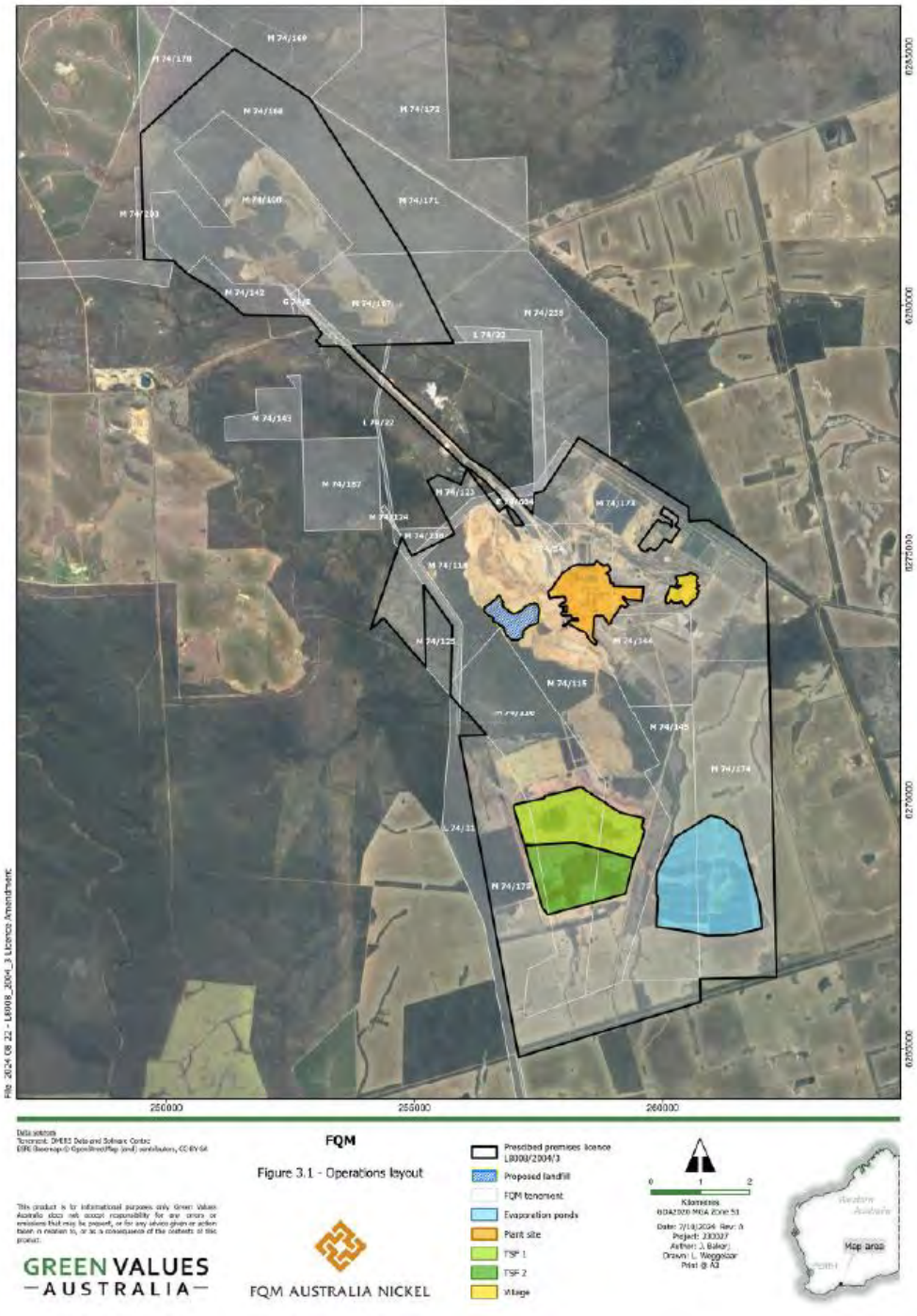
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Figure 3.1 - Operations layout
Prescribed premises licence L8000/2004/3
Proposed landfill
FQM tenement
Evaporation ponds
Plant site
TSF 1
TSF 2
Village
Map area
GREEN VALUES AUSTRALIA
FQM AUSTRALIA NICKEL

Figure 3-1.

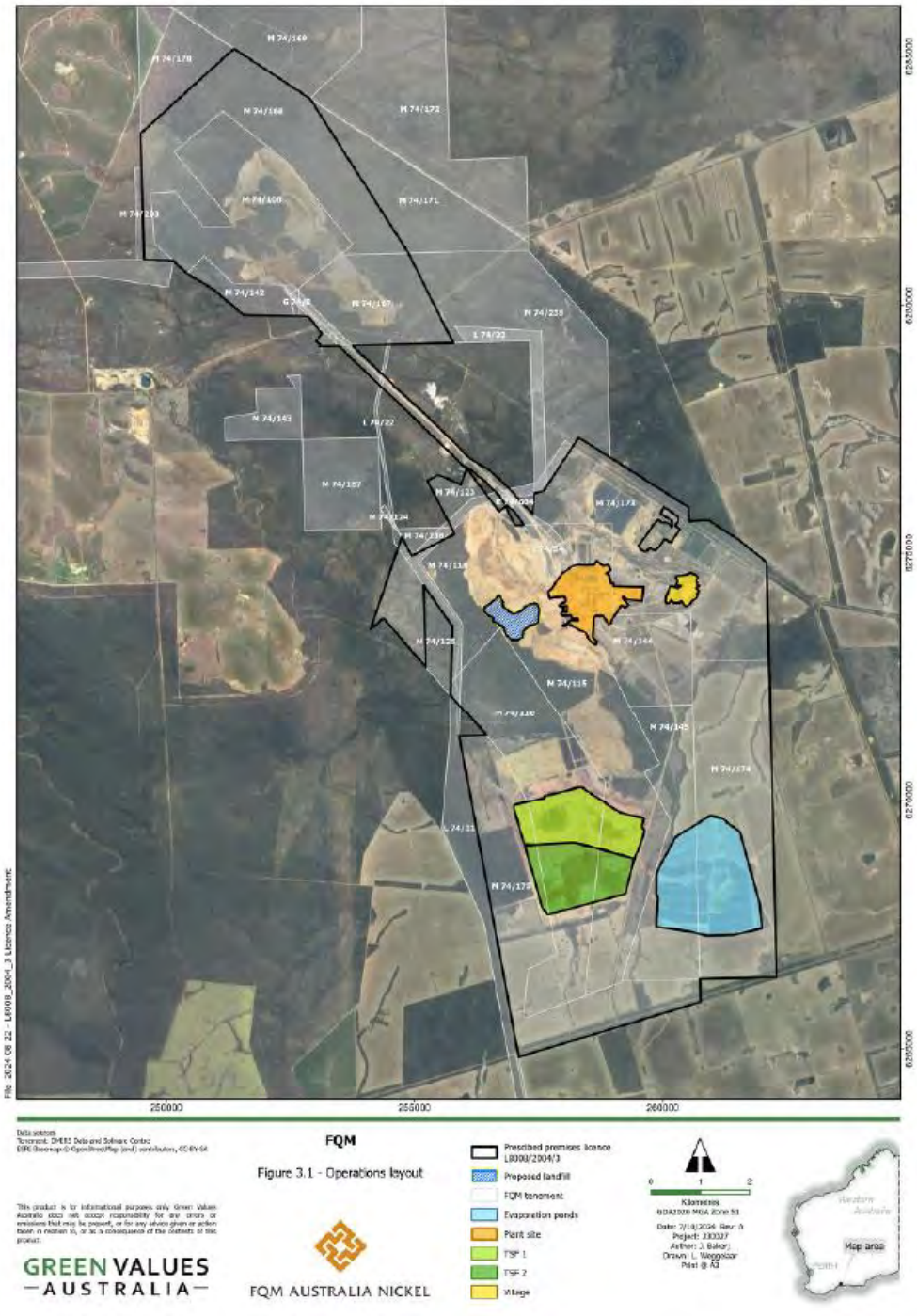

Figure 3-1: Prescribed Premises and Operations layout

3.2.1 Mining and Processing

Mining at the Project uses conventional open cut mining methods. The nickel content in the mined ore is upgraded through a beneficiation process, followed by a series of treatments utilising pressure and atmospheric acid leach technology and solution purification techniques. The Project produces a mixed nickel-cobalt hydroxide, which is bagged and placed into containers before being transported by road to Esperance.

Project infrastructure includes open pits, waste rock dumps, tailings storage facilities (TSF 1 and 2), run-of-mine (ROM) pad, processing plant and infrastructure, conveyor (between Shoemaker-Levy and the processing plant), pipelines and corridors, evaporation ponds, accommodation village, water and power infrastructure and a limestone quarry. The Project also includes a seawater intake area, pumping station and seawater pipeline at Masons Bay.

3.2.2 Waste Management

3.2.2.1 Waste rock (beneficiation rejects)

The waste material used to backfill the Halleys and Hale-Bopp exhausted mine voids consists of beneficiation reject materials (saprolitic and limonitic waste) from the Shoemaker-Levy deposit. Soil Water Consultants (SWC) conducted a review of geochemical characteristics of the waste rock from the Shoemaker-Levy deposit in 2017 (SWC, 2017a). Conclusions presented by SWC (2017a) include:

- The deposit mineralogy, chemistry and regolith profile of Shoemaker-Levy are akin to the Halleys and Hale-Bopp deposits and represents a continuation of the preserved lateritic profile which has formed from weathering of the upper layers of the serpentinised Bandalup ultramafics.
- The different regolith units which have formed as a result of the weathering processes are well understood and defined from the long history of mining centred on the Halleys and Hale-Bopp deposits, and this knowledge can be transferred to the Shoemaker-Levy deposit.
- The prolonged weathering and leaching of the lateritic and saprolitic profile has resulted in pervasive oxidation of materials above the saprolite/saprock boundary. The oxidation means that sulphides present within the parent rock would have oxidised to sulphate forms, largely removing the risk of acid mine drainage.
- The underlying ultramafic materials which have not undergone extensive weathering may still contain sulphide minerals, but only represent a fraction of the waste material; largely as remnant ‘cores’ within the saprolite units which were more resistant to weathering due to lower permeability.
- Static leach testing of reject material sourced from mining operations have shown that the limonitic and saprolitic waste materials contain low overall metals contents which are highly immobile under neutral leaching conditions. Therefore, the risk of development of metalliferous drainage within the analogous materials to be mined at the Shoemaker-Levy deposit is likely to be low.

Mine Earth were commissioned to undertake additional assessments of geochemical properties of beneficiation rejects at the Project (Mine Earth, 2022). FQMAN collected six samples from various stockpiles. The assessment found the following:

- All samples were classified as non-acid-forming (NAF) and displayed a circum-neutral pH.
- Samples stockpiled for <2 months (recent stockpiles) displayed high salinity and samples stockpiled for >1 year (older stockpiles) displayed low-moderate salinity.
- All samples were classified as sodic to highly sodic.
- Elemental enrichments were low to moderate (up to ten times the average crustal abundance) across all elements.
- Water extraction testwork identified that Ni and Cr were elevated in leachates, but did not exceed ANZECC Livestock Drinking Water Guidelines.

3.2.2.2 Tailings Disposal

FQMAN currently operates two TSFs (TSF 1 and TSF 2). TSF 2 shares a common wall with the southern embankment of TSF 1. Tailings from the plant are pumped to TSF1 & 2 located approximately 5 km south of the plant site via a high-density polyethylene pipeline fitted with 280 mm diameter spigot off-takes at approximately 60 m intervals. The tailings slurry is delivered at a solid's concentration of approximately 35%.

The tailings storage complex is a conventional peripheral spigot discharge type dam with a central decant for solution recovery. The active area of tailings discharge into the facility is progressively cycled around the TSF in order to keep the location of the supernatant water centred at the end of the decant access causeway. The facility is managed so as to maintain an operating pond extent of no more than 10% of the beach area. This is achieved by controlling the flow of water back to the process plant and maximising off-takes following periods of high rainfall on the TSF. Seepage and groundwater monitoring of the TSF is carried out on a regular basis.

The tailings supernatant solution recovered is either returned to the plant for use or directed to the nearby evaporation ponds for storage and evaporation. The tailings dam walls are raised as required to maintain a minimum freeboard. TSF 2 is the current operational TSF which is a single cell facility approved to operate at RL126.4mAHD (L8008/2004, approved 22 August 2023). Works Approval W6739/2022/1 issued by DWER on the 4th of May 2023 permits construction of Stage 4 (RL129.7mAHD) and Stage 5 (RL132.7mAHD) (downstream construction method) to TSF2.

3.2.2.3 Other Mineral Wastes

The Project produces several other mineral waste streams from processing activities, including the following:

- Salt accumulation within the evaporation ponds – The Project utilises seawater for process water and also to supply the Reverse Osmosis plant for potable water, the steam turbines and as wash water for

the final product. The hypersaline water with tailings is pumped to the TSF where the solids are deposited and the remaining salt water is pumped to the evaporation ponds. As the water evaporates salt residue builds up reducing the capacity of the evaporation ponds.

- Sulphur filter residue – The Project's sulphuric acid plant burns sulphur for production that requires filtering before being used in the plant, these impurities build up on the filter and need to be removed and disposed of.
- Magnesium oxide – The Project uses Magnesium oxide for PH control through the precipitation circuit. The disposal of this is ad-hoc and is required if there is a spill or during maintenance activities.
- Slurry spills - slurry spill associated with processing operations and maintenance activities requiring clean up as part of normal operations, and
- Wash-down facility silt – To manage the risk of dieback at the Project vehicle wash down facilities are established to prevent the spread. Washdown facilities build up with soils which require periodic clean out and disposal of to bioremediation facility.

Samples of the mineral waste streams were collected and static geochemical characterisation was undertaken by WSP for suitability and geochemical compatibility for disposal within TSF1 and TSF2.

Key findings from the static geochemical characterisation are as follows (WSP, 2024):

- **Sulfur filter residue:** primarily comprises elemental sulfur based on mineralogical and multi-elemental analysis. Most samples are geochemically enriched in S, Te, and Sb. The low S sample is classified as NAF and the mixed and high S samples are classified as UC(NAF), but likely to be NAF based on alkaline NAG pH result. The water leachate is alkaline and brackish with low concentrations of most soluble metal(loid)s. Leachate concentrations of SO4, Cl, Ca and TDS exceed the selected water quality guidelines in some samples. Concentrations of the dissolved metal(loids) selected for assessment remained within the comparator guidelines.
- **Liquor neutralisation material (MgO):** the major mineral phase identified is brucite (magnesium hydroxide mineral) and the samples are geochemically enriched in S and Mg. The MgO samples are classified as NAF. Leachate results are variable, which may be due to different contact ratios employed by the laboratory for analysis. In the second round of testing, water leachate is highly alkaline and non-saline with low concentrations of most soluble metal(loid)s. Major ion and trace dissolved metal(loid) concentrations are within the comparator guidelines.
- **Evaporation pond salt:** the major mineral phases include halite (sodium chloride mineral) and bloedite (sodium magnesium sulfate mineral) and the samples are geochemically enriched in Na and S. The samples are classified as NAF or NAF-barren. Water leachate is circum-neutral to slightly alkaline and hypersaline with low concentrations of most soluble metal(loid)s. Leachate TDS, SO4, Cl, Mg, Mn, Ni, and Cd concentrations exceed the guideline values in at least one of the two samples. It

should be noted that limit of reporting (LOR) values for several metal(loid)s were affected by high ionic strength leachates, resulting in values higher than the comparison guidelines (i.e., As, Be, Cd, Cr, Pb, Mo, Se, Tl, U, B, Fe, and Hg).

- **Recovery slurry spills:** the major mineral phases include gypsum and quartz with minor presence of jarosite, alunite, and calcite. The sample is geochemically enriched in Cr, Ni, S and Se. The recovery slurry spills sample is classified as NAF. Water leachate is circum-neutral and hypersaline with low concentrations of most soluble metal(loid)s. Leachate TDS, Cl, SO4, Mg, Mn, and Ni exceed the selected water quality guidelines. The LOR values for As, Cr, Mo, Se, and Tl are at or above the guideline values and therefore cannot be used for screening purposes.
- **Wash-down facility silt:** the major mineral phase is quartz with minor presence of carbonate and clay minerals, and is geochemically enriched in Cr, Ni, Se and Te. The wash-down facility silt samples are classified as NAF. Water leachate is slightly alkaline and non-saline with low concentrations of most soluble metal(loid)s. Leachate Cl and Ni concentrations exceed the selected water quality guidelines.
- **Production tailings:** the major mineral phases include gypsum and quartz with minor presence of hematite, jarosite, alunite, and calcite. The sample is geochemically enriched with Cr, S and Se. The production tailings sample is classified as UC(PAF), which is in contrast to the NAF classification for TSF2 production tailings previously assessed. Water leachate is circum-neutral and hypersaline with low concentrations of most soluble metal(loid)s. The TDS, Cl, SO4, Mg, Ni, and La concentrations exceed the selected water quality guidelines. The supernatant is circum-neutral and hypersaline with low concentrations of soluble metal(loid)s. Supernatant concentrations of TDS, Mg, SO4, Cl, Al, Cd, Co, Mn, Ni and La exceed the selected water quality guidelines.
- **TSF 2 tailings:** the sample is geochemically enriched in Cr, Ni, S, Se, and Te. The sample is classified as NAF. Water leachate is circum-neutral and saline with low concentrations of soluble metal(loid)s. Leachate TDS, SO4 Cl, Ni, Cr, Mn and Mg exceed the water quality comparison guidelines. The LORs for Mo, Se, and Tl are at or above the comparative guideline values and cannot be used for screening purposes.
- **Blend 1 (waste streams):** represents blend of all waste stream samples in the proportional tonnage expected to be deposited on TSF1 or TSF2; represents the resulting drainage from the interaction of individual waste streams. Blend 1 mainly comprises evaporation pond salt (98%). The sample is geochemically analogous to the evaporation pond salt, comprising mainly magnesium sulfate minerals (kieserite and caminite), geochemically enriched in S, and is classified as NAF. Water leachate is alkaline and hypersaline with low concentrations of soluble metal(loid)s. Dissolved Ni concentrations exceed selected guideline values, and is approximately three-fold higher than that in the evaporation pond salt leachate.

- **Blend 2 (waste streams/tailings):** represents the anticipated drainage resulting from the interaction of waste streams and TSF2 tailings. Blend 2 is mainly comprises TSF2 tailings (95%). The sample is geochemically analogous to TSF2 tailings, mainly comprising quartz, calcium/magnesium suldate, jarosite, and hematite phases, is geochemically enriched in S, Cr, Ni and Te, and is classified as NAF. Water leachate is similar to TSF2 tailings leachate composition. Leachate is alkaline and hypersaline with low concentrations of soluble metal(loid)s. Dissolved metal(loid) concentrations remain within the comparator guidelines.

The results from the compatibility assessment between the waste streams and tailings indicate that waste streams placed on the surface of TSF1 or TSF2 are unlikely to significantly alter seepage from the TSFs (WSP, 2024). This is based on the following:

- Blend 2 is geochemically similar to tailings collected from the surface of TSF2. Blend 2 represents a composite of individual waste streams and tailings samples, which were prepared based on estimated annual tonnages to be placed on the TSFs.
- None of the waste streams have the potential to generate AMD, similar to TSF2 tailings.
- The Blend 2 leachate composition aims to (conservatively) simulate potential at-source seepage resulting from the interaction of waste streams with tailings.
    - The Blend 2 leachate composition is generally of better quality in comparison to the TSF2 tailings leachate: Overall lower salinity (as TDS) and major ion concentrations. Both the tailings and the Blend 2 sample are MgSO4 dominant.
    - Overall lower trace dissolved metal(loid) concentrations, notably reductions in soluble Mn and Ni concentrations.

The full report (WSP, 2024) is included as Attachment 8A of this licence amendment application.

3.2.2.4 Non-process wastes

Non-process wastes comprised of putrescible, inert and general wastes that cannot be recycled are currently disposed of at the Ravensthorpe Shire landfill at 283 Moir Road, Ravensthorpe (L8839/2014/1).

Controlled wastes are removed from site by a controlled waste carrier for correct disposal at an appropriately licenced facility.

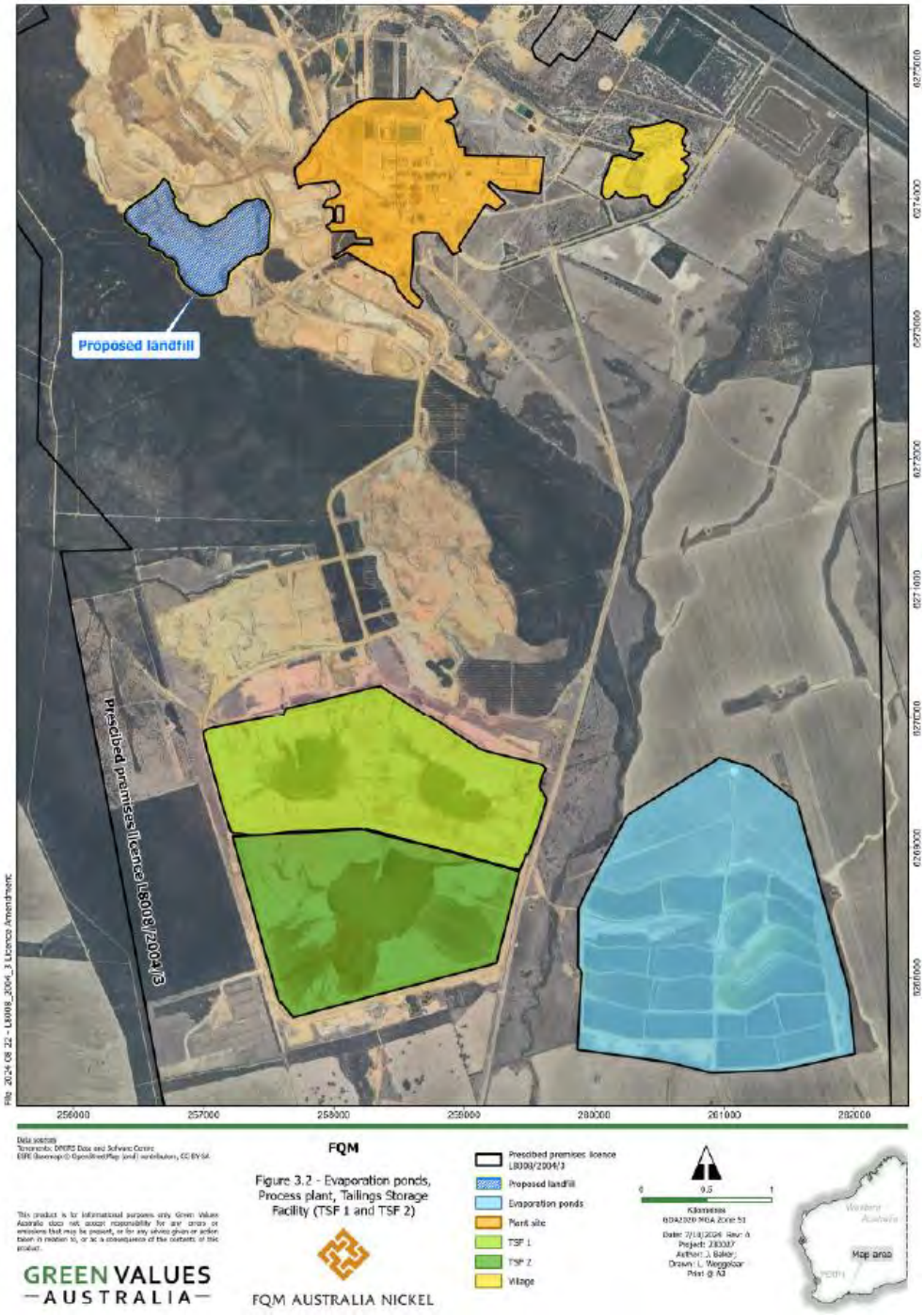

Figure 3-2: Evaporation Ponds, Process Plant Tailings Storage facilities layout

4 PROPOSED CHANGES TO L8008/2004/3

4.1 Process Mineral Waste Disposal to TSF1 and TSF2

Condition 6 of L8008/2004/3 currently authorises disposal of only production tailings generated during processing of RNO ore at TSF2. The licence allows up to 4.56 Mtpa (in total) of production tailings to be disposed of at TSF1 and TSF2. FQMAN proposes to amend Condition 6 of the licence to permit disposal of the following types and quantities of other production mineral waste stream materials to be disposed of at TSF1 and TSF2:

- Up to 4.56 Mtpa of production tailings;
- Up to 500,000 tpa of salt collected from evaporation ponds;
- Up to 1,000 tpa sulfur filter residue,
- Up to 500 tpa of magnesium oxide; and
- Up to 300 tpa of washdown facility silts.

Details of the properties of these waste streams is presented in Section **Error! Reference source not found.**.

Details of the proposed changes to the licence conditions is presented in Section 4.5.

Disposal of these wastes into the TSF is not expected to significantly alter the water balance of TSF1 or TSF2 and monitoring in accordance with Condition 41 will continue to monitor the water balance of the facility.

4.2 Landfill

FQMAN seeks approval to establish a landfill for disposal of non-process wastes that cannot be recycled. These include the following wastes, which are currently disposed of at the Ravensthorpe Shire landfill at 283 Moir Road, Ravensthorpe (L8839/2014/1). To enable operational efficiencies and reduce pressure on the Ravensthorpe Shire landfill site FQMAN propose to establish an onsite Class II Category 89 Putrescible landfill within part of the exhausted Halley's mine void. Productive mining ceased at the Halley's void during 2017. Disposal of coarse beneficiation reject material into the Halley's mine void commenced during 2014, in accordance with a Section 45C amendment to Ministerial Statement 633 (approved on 23 September 2010).

FQMAN proposes to also dispose of the following waste types[1] to the Halley's mine void:

- Putrescible wastes (food and packaging wastes) (approx. 70%)

[1] Waste types are as defined in the Landfill Waste Classification and Waste Definitions 1996 (as amended 2019)

- Clean fill and uncontaminated fill; (approx. 5%)
- Inert waste type 1 (approx. 5%)
- Inert waste type 2 (including scrap tyres, rubber and plastic materials from mine and process waste). (approx. 20%)

The waste types proposed will eventually be covered by the coarse beneficiation reject material and rehabilitated at closure as described in Section 6.

The proposed landfill location is presented in Figure 4-1 (included as attachment 2).

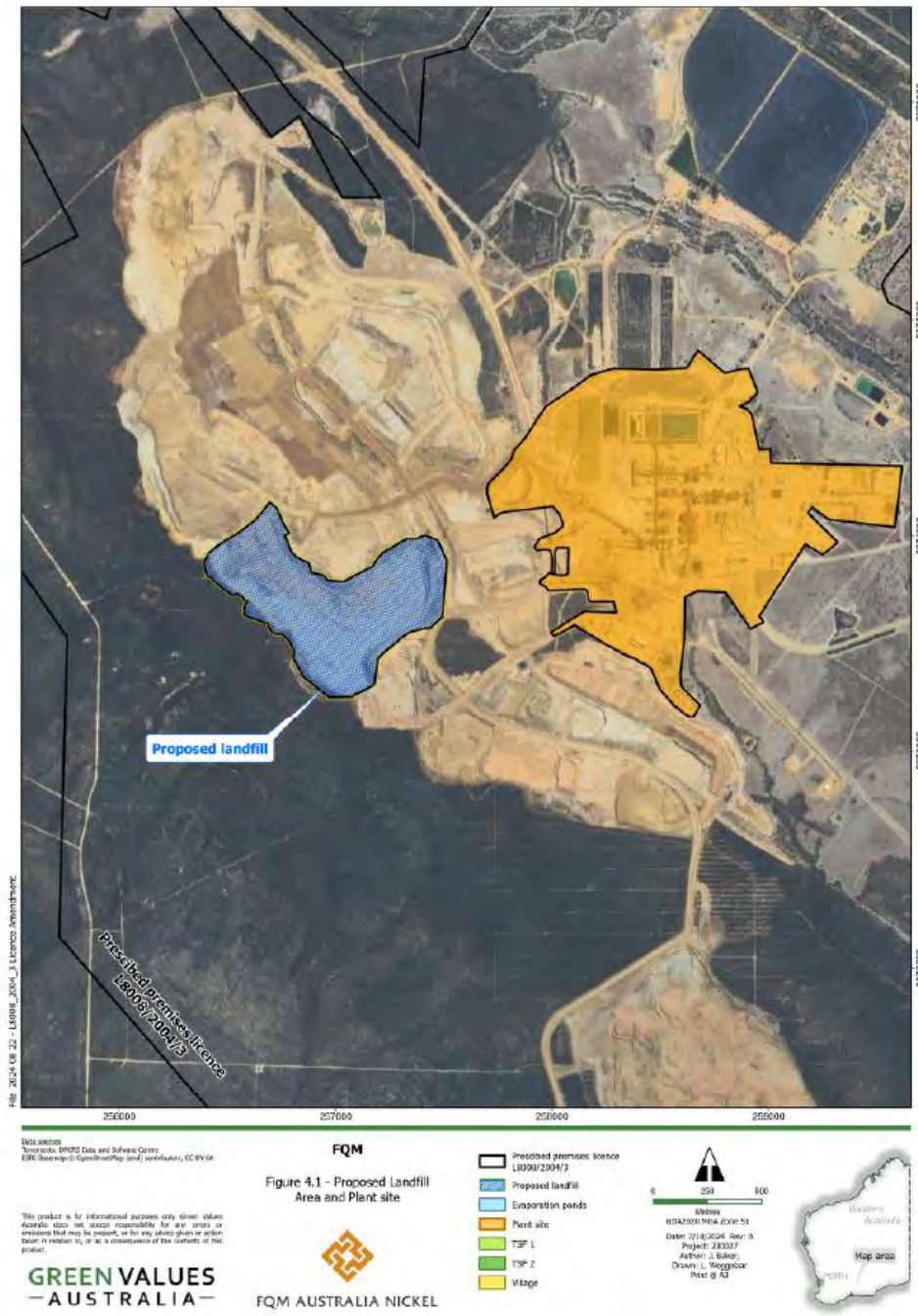

Figure 4-1: Proposed Landfill area and Plant Site layout

4.3 Administrative Changes

The following minor administrative changes are proposed for the licence:

- The Proponent's (FQMAN's) registered business address has changed from that listed on the current licence. The correct address has been detailed in the licence amendment application form.
- Premise details – an error is noted on the current licence where tenement listed as M74/54 is incorrect and should be replaced by L74/54. This has been correctly detailed in the licence amendment application form.

4.4 Transfer of Works Approval W6739 Conditions to L8008/2004/3

FQMAN requests the relevant conditions associated W6739 be transferred to the licence as detailed in Table 4-1.

4.5 Proposed Changes to Existing Licence Conditions

Table 4-1 summarises the conditions of L8008/2004/3 (issued 22 August 2023) which are proposed to be revised by FQMAN. Risks associated with the proposed amendments are detailed in Section 5.

Table 4-1: Summary of licence conditions (L8008/2004/3) relevant to this amendment application

Licence Reference	Current condition	Proposed amendment	Reason for amendment	Risk ID
2 & Table 1	Table 1	Remove or revise condition 2 and Table 1 as construction of recovery wells has been completed	Construction of the groundwater recovery wells has been completed. The conditions do not align with the recovery equipment installed. FQMAN to provide construction completion details separately.	N/A
4 & Table 2	The Licence Holder must ensure that the Premises infrastructure listed in Table 2 is repaired and operated in accordance with the requirements specified in Table 2.	Remove condition 4 and Table 2 as this has been completed.	Remove condition as this has been completed.	N/A

Licence Reference	Current condition	Proposed amendment	Reason for amendment	Risk ID
6	The Licence Holder must only deposit tailings sourced from the premises into TSF2	The Licence Holder must only deposit tailings and other approved mineral wastes sourced from the premises into TSF1 and TSF2.	FQMAN seeks authorisation to co-dispose other mineral wastes from the Ravensthorpe plant to TSF1 and TSF2. The other process mineral waste streams include: • evaporation pond salt (up to 500,000 tpa), • sulfur filter residue (up to 1,000 tpa), • magnesium oxide (up to 500 tpa), and • washdown facility silt (up to 300 tpa).	1, 2, 3, 4
7	The Licence Holder shall ensure that tailings, process liquors, decant water and saline waters are only discharged into containment cells, dams or ponds with the relevant infrastructure requirements and at the locations specified in Table 3 and identified in Figures 2a, 2b and 2c within Schedule 1.	The Licence Holder shall ensure that tailings, approved mineral wastes, process liquors, decant water and saline waters are only discharged into containment cells, dams or ponds with the relevant infrastructure requirements and at the locations specified in Table 3 and identified in Figures 2a, 2b and 2c within Schedule 1.	To include detail on the approved mineral wastes are included within condition 7.	1, 2, 3, 4
7 – Table 3	Table 3 Map reference 19 - Mining Turkey's Nest - Saline water	Amend material stored within the mining turkeys nest from Saline water to Stormwater	Mining Turkeys nest does not contain Saline water	14

Licence Reference	Current condition	Proposed amendment	Reason for amendment	Risk ID
8	The Licence Holder shall maintain the following freeboards for specified containment infrastructure in Table 3: • 800 mm for all stormwater ponds, process ponds, the limonite pond and mine dams;	Amend licence and condition to remove requirement for stormwater pond monitoring or limits from the licence	Stormwater ponds are not associated with Category 5 activities. The risks associated with stormwater pond management is low and is regulated under *Mining Act 1978* approved activities as this water is typically used dust suppression activities on site.	15
8 & 9	Table 4	Review and align condition 8 and table 4 as there are inconsistencies with the freeboard limits. Request that Condition 8 present the freeboard limits in table form for clarity.	Opportunity for improvement to clarify freeboard and inspection limit requirements.	N/A
9	Table 4 – seawater pipeline	Review requirement for visual inspection of pipelines. Replace "Visual inspection" with "monitoring of remote telemetry"	Condition 5 requires telemetry to detect leaks of pipelines. Remote monitoring via telemetry and alarms provides real time monitoring and is suitable to detect leaks or spills. Visual inspections can form part of routine maintenance and inspection programs.	16
11 – Table 5	Table 5	Review and revise Table 5 to reflect current approved limits for each TSF and Stage.	As the TSF2 Stage 4 and 5 lifts were not a new facility it is more appropriate the conditions be applied as a	N/A

Licence Reference	Current condition	Proposed amendment	Reason for amendment	Risk ID
		Update Table 5 to include W6739/2022/1 applicable conditions and approved limits. Remove subsequent stages that are not yet permitted.	licence condition with this amendment. Remove the duration to complete the works as this does not impact the risk while the Project is in Care and Maintenance and the conditions imposed are suitable to commence construction of the Stage 5 lift upon recommencement of operations.	
17	The Licence Holder must install additional seepage recovery infrastructure designed to recover seepage to reduce groundwater levels below 6 m below ground level (mbgl) by 24 August 2024	Revise or remove condition as condition has been completed in accordance with the requirements of condition 2.	Condition has been completed in accordance with the requirements of condition 2.	N/A
24	The Licence Holder shall ensure that a high-capacity water truck is always available at the Shoemaker-Levy primary crushing facility stockpiles to supress fugitive dust from the stockpiles.	The Licence Holder shall ensure that a high-capacity water truck is always available at the Shoemaker-Levy primary crushing facility stockpiles to supress fugitive dust from the stockpiles during crushing and stockpiling operations.	Risk of dust emissions while not operating is reduced.	17
Table 12	Table 12 currently specifies monitoring required for tailings	Refer to proposed Table 12 amendment shown in Table 4-2.	Revised condition would also include monitoring required of volumes of approved	

Licence Reference	Current condition	Proposed amendment	Reason for amendment	Risk ID
	disposal and decant water recovery.		mineral waste to be disposed at TSF1 and TSF2.	
Table 14	Table 14 currently requires the following water quality parameters to be monitored at the Ravensthorpe TSFs and evaporation ponds: pH, electrical conductivity, total dissolved solids, carbonate, bicarbonate, hydroxide, total alkalinity, calcium. chloride, potassium, magnesium, sulfur, sulfate. aluminium, arsenic, barium, beryllium, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, tin, vanadium, zinc.	FQMAN suggests adding the following parameters to the standard monitoring suite: sodium, chromium (total), chromium (hexavalent).	The proposed additional parameters are characteristic and/or diagnostic of some of the mineral waste streams and may assist in interpreting monitoring results.	N/A
Table 14	Monitoring of ambient groundwater quality – MB4	Removal of MB4 from licence	MB4 was destroyed during construction of the TSF2 Stage 4 raise. Notification to DWER is provided as Attachment 8C	N/A
Table 16	Table 16 summarises information required to be included in the annual environmental report and references "Table 13 - Monitoring of tailings deposition and decant water recovered during operations"	The Table number should be corrected to "Table 12" and modified to read, "Monitoring of tailings deposition, other approved waste disposal and decant water recovered during operations". Other table numbers in Table 16 may also have to be corrected.	Editorial corrections and alignment with proposed disposal of specified mineral wastes at TSF1 and TSF2.	N/A

Licence Reference	Current condition	Proposed amendment	Reason for amendment	Risk ID
Table 19	Table 19 provides definitions for selected terms in the Part V licence	Table 19 be amended to include definitions for 'Tailings', 'Sand Rejects' and 'Approved minerals wastes' including: evaporation pond salt, sulfur filter residue, magnesium oxide and washdown facility silt arising from operations at the Ravensthorpe plant.	Amendment provides clarity to the type and source of materials approved for disposal at TSF1 and TSF2.	N/A

Table 4-2: Process monitoring (suggested revision to Table 12 of L8008/2004)

Process description	Parameter	Units	Frequency	Method
Tailings deposition	Volumes of tailings deposited into the TSF1 East Cell, TSF1 West Cell and TSF2	m3	Cumulative monthly during deposition	None specified
	Volumes of decant water recovered from TSF1 and TSF2	m3		
Other mineral waste deposition	Volumes of approved minerals wastes deposited into TSF1 and TSF2	m3	Cumulative monthly during deposition	None specified

5 RISK ASSESSMENT

5.1 Risk Identification and Assessment Methods

A qualitative risk assessment in accordance with the DWER Guidance Statement: Risk Assessments (DWER 2020) and the risk rating matrix in Table 5-1 was undertaken to identify and manage potential risks associated with this licence amendment proposed for the Project. The risk assessment process identified the following:

- Emission sources
- Potential pathways from the source to the receptor
- Environmental receptors
- Potential impacts of project emissions on receptors
- Project specific controls and mitigation measures to prevent or limit emissions and mitigate impacts
- The likelihood, consequence and overall risk rating associated with this factor
- The requirement for monitoring.

Table 5-1: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

5.2 Potential risks associated with proposed licence amendments

The Risk Assessment is provided as Attachment 8B of this licence amendment application.

6 RISK MANAGEMENT

6.1 Engineering and Operational controls

The following engineering and operational controls will be undertaken to manage the waste disposal types proposed by this licence amendment.

6.1.1 Landfill

The operation of the landfill will be managed in accordance with the following engineering and operational controls:

- Waste types described in Section 4.2 will be disposed of into trenches with dimensions of 10m wide, up to 50m long and up to 5m deep;
- Waste trenches are to be enclosed by earth bunds with an open end for access to prevent surface water ingress to waste disposal area;
- Tyres and rubber waste is to be disposed of within dedicated trenches separate from general and putrescible waste;
- Waste disposed of will be covered progressively at a minimum rate of weekly during operations and fortnightly during care and maintenance;
- No waste will be disposed of within 4m of groundwater;
- Upon a trench reaching capacity they will be covered by a minimum of one meter of rejects or waste rock material;
- Waste trenches will be located a minimum of 10m from external rehabilitation final landform surfaces;
- Completed landfill trenches will be totally encapsulated within the backfilled landform and rehabilitated at closure in accordance with the approved Mine Closure Plan.

6.1.2 Mineral Waste Management

Mineral wastes will be managed with the following engineering and operational controls:

- Mineral wastes described in section 3.2.2.3 will be disposed of within TSF1 and TSF2 only.
- Mineral wastes will be disposed of by load and haul operations.
- Mineral waste disposed of will not exceed the minimum operating freeboard of TSF1 and or TSF2.
- Wastes will be disposed of progressively as required by the Project and be within the annual limits imposed by the licence.
- TSF1 and TSF2 will be rehabilitated in accordance with the approved Mine Closure Plan.

6.2 Monitoring and Surveillance

FQMAN conduct regular monitoring and inspections as specified within the Licence. This monitoring and inspection schedule is not proposed to change unless otherwise detailed in the proposed amendments within Section 4. Additional monitoring and surveillance proposed for this licence amendment is detailed in Section 6.2.1 and 6.2.2 below.

6.2.1 Landfill

- Monthly inspections are to be undertaken, and windblown waste is to be collected and returned to active waste trench.
- A waste disposal record register to be maintained to record waste types and volumes disposed of.
- Waste trench locations will be surveyed, and records maintained.

6.2.2 Mineral Wastes

- A waste disposal record register to be maintained to record waste types and volumes disposed of.
- Groundwater monitoring shall continue in accordance with the requirements of the licence to monitor for potential changes or impacts arising from the mineral waste disposal.

6.3 Emergency preparedness and response

No change is proposed with this Licence amendment where there is a response to an emergency at the Project. FQMAN will respond in accordance with the RNO Emergency Management Plan (RNO-HS-HS-PLN-4005) and or the Care and Maintenance Emergency Management Plan (RNO-HS-HS-PLN-4017).

6.4 Performance and compliance: review and reporting

No changes are proposed with regards to performance monitoring and reporting. Waste monitoring results as detailed in Section 6.2 will be reported in annual reports to DWER. Performance monitoring and compliance reporting will be in accordance with the requirements of L8008/2004/3.
In the event an incident occurs FQMAN will notify DWER and or DEMIRS of the incident and appropriate action plan for the incident.

7 SUMMARY AND CONCLUSIONS

The proposed amendments of L8008/2004/3 does not represent a significant change to the nature of the Project or materially change its impact on the environment.

8 REFERENCES

Department of Water and Environmental Regulation (DWER) 2017. Risk Assessments

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