



Amendment Report

Licence Number	L9037/2017/1
Licence Holder	Process Minerals International Pty Ltd
ACN	063 988 894
File Number:	DER2017/000308-1
Premises	Mount Marion Lithium Project Shire of Coolgardie Mining Tenements M15/1000 and M15/717
Date of Amendment	Thursday, 19 September 2019

Amendment

The Chief Executive Officer (CEO) of the Department of Water and Environmental Regulation (DWER) has amended the above Licence in accordance with section 59 of the *Environmental Protection Act 1986* (EP Act) as set out in this Amendment Report.

Louise Lavery

A/Manager – Resource Industries

an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

Definitions and interpretation

Definitions

In this Amendment Notice, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
AER	Annual Environment Report
Category/ Categories/ Cat.	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CEO	means Chief Executive Officer. CEO for the purposes of notification means: Director General Department Administering the <i>Environmental Protection Act 1986</i> Locked Bag 33 Cloisters Square PERTH WA 6850 info@dwer.wa.gov.au
Delegated Officer	an officer under section 20 of the EP Act
Department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EP Regulations	<i>Environmental Protection Regulations 1987 (WA)</i>
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of and during this Review
Licence Holder	Process Minerals International Pty Ltd
Noise Regulations	<i>Environmental Protection (Noise) Regulations 1997 (WA)</i>
Occupier	has the same meaning given to that term under the EP Act.
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as

	specified at the front of this Decision Report.
Risk Event	as described in <i>Guidance Statement: Risk Assessment</i>

Amendment

This amendment is made pursuant to section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the Licence issued under the EP Act for a prescribed premises as set out below.

This amendment is limited only to an amendment for Categories 6 (dewatering), 85B (water desalination plant) and 5 (Processing or beneficiation of metallic or non-metallic ore). No changes have been made to Categories 57 (tyre storage), 64 (landfill), 73 (bulk storage of chemicals) or 85 (Sewage facility) on the Existing Licence.

The following guidance statements have informed the decision made on this amendment

- *Guidance Statement: Regulatory Principles (July 2015)*
- *Guidance Statement: Decision Making (February 2017)*
- *Guidance Statement: Risk Assessment (February 2017)*

Amendment description

On 11 April 2019 Process Minerals International Pty Ltd (the Licence Holder) submitted an application for an amendment to Licence L9037/2017/1 (Mount Marion Lithium Project). The amendment application has sought approval to;

- Permit the use of coarse rejects (coarse fraction of the tailings stream) for construction purposes (bedding material for pipework, sheeting within mining pits etc.). Approximately 10,000 tonnes / annual period to be used within the Premises boundary for these purposes.
- Approval to discharge a volume of oleic acid sludge material (from the Dissolved Air Flotation (DAF) process) into the Ghost Crab Pit TSF as part of the tailings stream due to a plant upgrade. This equates to a discharge of approximately 35,040 tonnes per year of treatment sludge to the Ghost Crab Pit TSF;
- Permit the disposal of 0.73 GL per annum of RO (reverse osmosis) brine into the Mt Marion pits (N1, N2 and C1), which will be mined below the water table. The Mt Marion pits consist of 14 staged pits within the northern and central areas;

This involves the approval to construct discharge pipelines from the RO Plant and turkey's nests to the discharge pits. See Figure 3 for pipeline layout. Category 85B will be added to the Licence as a result of these amendments;

- Permit the disposal of 0.65 GL of dewater from the North (N1 & N2) and Central pits (C1) into adjacent pits not currently being mined or to one of the containment structures (turkeys nests) onsite;

This involves the approval to construct discharge pipelines from the North and Central Pits to other Mt Marion pits and/or turkeys nests. See Figure 3 for dewatering pipeline route. Category 6 will be added to the Licence as a result of these amendments; and

- Use of dewater / RO Brine water for dust suppression onsite.

This assessment has resulted in DWER issuing a consolidated Revised Licence L9037/2017/1 which incorporates the above requested changes. The Revised Licence also incorporates changes to conditions outlined in Amendment Notice 1 and Amendment Notice 2 (refer to Table 4 for description of amendment). Impacts from emissions and discharges as a result of the changes outlined in Amendment Notice 1 and Amendment Notice 2 have not been reassessed as part of this amendment. A simple transfer of conditions has occurred to produce a single consolidated Licence instrument.

Table 2 below outlines the proposed category and throughput capacity changes to the Licence.

Table 2: Proposed Category and throughput capacity changes

Category	Current throughput capacity	Proposed throughput capacity	Description of proposed amendment
5	3 million tonnes per annual period	No change proposed	Disposal of 35, 040 tonnes/yr of oleic acid sludge material into Ghost Crab Pit TSF as part of tailings stream. No changes to the approved throughput capacity for this Category is required.
57	1000 tyres	No change proposed	Not applicable
64	1250 tonnes per annual period		
73	480 kL LNG 554 kL Diesel		
85	70 m ³ /day		
6	Not on Existing Licence	0.65 GL per annual period	Construction of turkey nests and pipelines and the operation of these pipelines to discharge 0.65 GL of dewater from the north and central pits into adjacent pits not currently being mined.
85b	Not on Existing Licence	0.73 GL per annual period	Construction of turkey nests and pipelines and the operation of these pipelines to discharge 0.73 GL of RO Brine to Mt Marion pits.

Overview of Premises

The Mount Marion Lithium Project comprises the mining of spodumene (lithium bearing) ore from open cut pits, with trucks transferring the ore to the run of mine (ROM) pad for processing. Processing of the ore occurs approximately 2km away from the mining activities and consists of crushing, wet beneficiation (including flotation) circuits. Tailings (waste) from the processing plant are to be discharged to Ghost Crab Pit, a previously mined open pit, which also supported an underlying underground mining operation.

Water for the processing plant will be sourced from recovered tailings supernatant water, which will be treated in a reverse osmosis plant prior to use.

A diesel and LPG fuelled power station is located on the Premises, of a capacity below 10MW per annum, therefore not requiring licensing under Part V of the EP Act.

The expected mine life is 18 years. The tailings disposal method selected for the operation, discharging to Ghost Crab Pit, will be exhausted at approximately year 6 to year 7, necessitating an additional tailings disposal option at that time.

The site layout is shown in Figures 1 and 2 below.

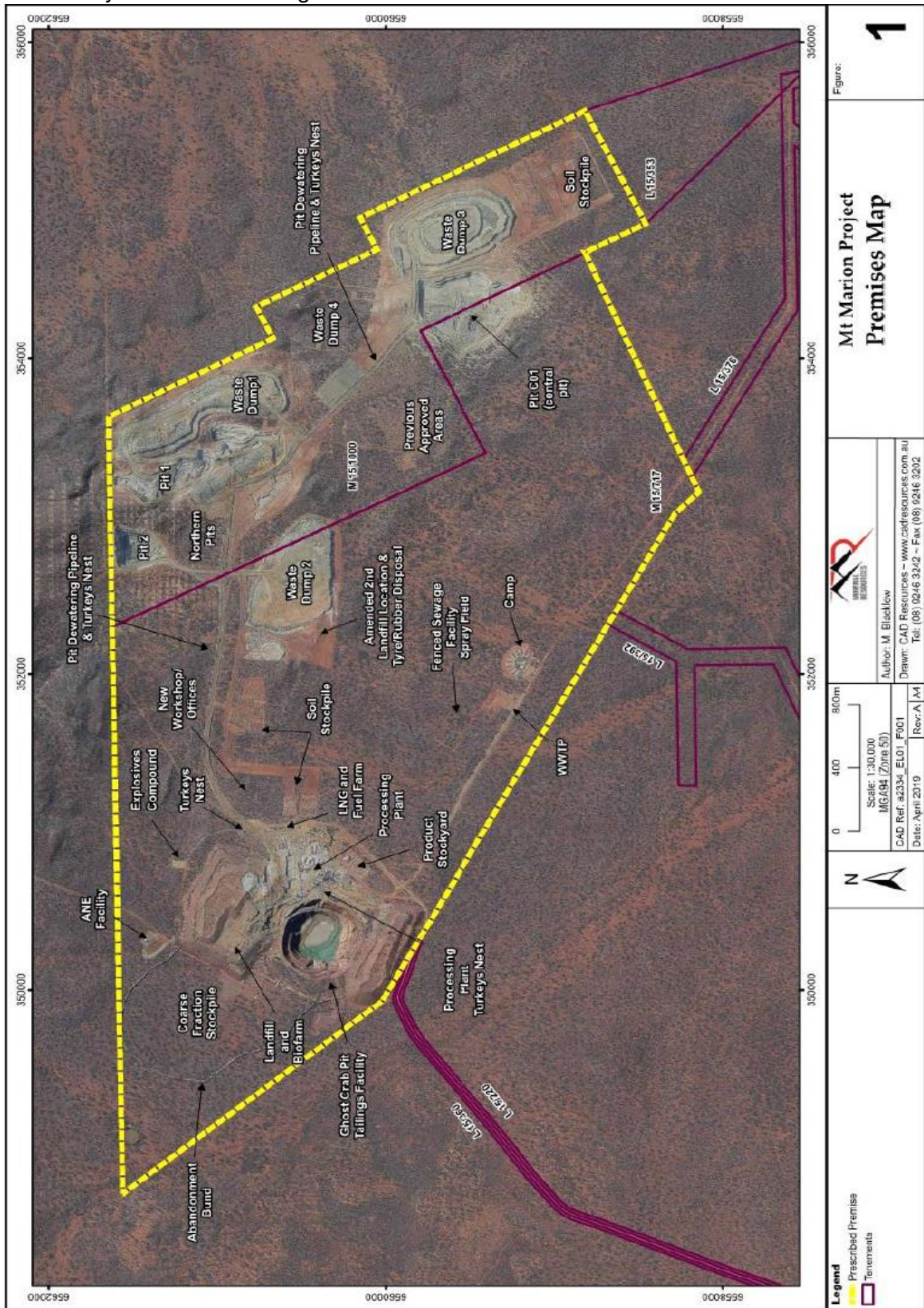


Figure 1: Premises site layout

L9037/2017/1



Figure 2: Map showing location of the Mt Marion Processing Plant key infrastructure and Tailings Facility

Coarse reject (tailings) material

The Licence Holder is proposing to use up to 10,000 tonnes/annum of tailings coarse rejects material for operational use (within operational pits and/or within the process plant footprint). Coarse reject material will not be used within haul roads or walkways. The remaining coarse reject material is disposed in previously approved locations (Ghost Crab Pit, northern Waste Rock Landform and co-mingled disposal into the Waste Rock Landform – WD2).

The Licence Holder has committed to only using coarse reject material in locations that have sufficient surface water controls to avoid any potential contaminated runoff impacting surrounding vegetation. Locations will be documented using a Site Disturbance Permit (SDP) which will document the locations where coarse rejects material are to be used, ensure that the correct surface water controls are implemented, and provide an auditable record for SDP close-out and mine closure. This will be done in accordance with the Licence Holder's obligations under the *Contaminated Sites Act 2003*.

A Geochemical assessment of the coarse rejects was completed by Martinick Bosch Sell Pty Ltd (MBS Environmental) in 2017. A summary of the results is outlined below;

- The coarse rejects sample was classified as non-acid forming (NAF) based on its very low sulfur content (0.1%) and is not expected to produce acidic seepage as a result of sulfide oxidation;
- Coarse reject sample was significantly enriched (GAI value of three or more) in rare elements including beryllium, bismuth, caesium, rubidium, antimony, selenium, tin, tantalum, tellurium and thallium;
- Depleted in common rock forming elements calcium and magnesium, but close to average global abundance concentrations of potassium and sodium.
- Not enriched in environmentally significant metals and metalloids including arsenic, selenium, cadmium, copper, chromium, mercury, zinc and lead. Most concentrations were below the laboratory reporting limit (MBS, 2017).

The coarse reject sample was also assessed according to US EPA SW-846 test method 1313 (LEAF test) to assess potential for metal and metalloid dissolution/leaching as influenced by different pH values (from 2 to 13 pH units on a 1:10 extraction ratio). Results from this assessment indicated the following:

- Other than amphoteric metals and metalloids (e.g. aluminium), most elements were more soluble under acidic (pH 2) conditions;
- The highest concentration of fluoride (1.2 mg/L) was also recorded under acidic (pH 2) conditions, noting that all concentrations were below the livestock drinking water guideline of 2 mg/L;
- Antimony and tin were the only elements that were more soluble under strongly alkaline conditions (pH 13). The maximum concentrations were 0.001 and 0.01 mg/L, respectively, and were not considered environmentally significant;
- Environmentally significant metal and metalloid concentrations were very low under circum-neutral to moderately alkaline conditions (MBS, 2017).

RO Brine disposal

RO Brine is currently being disposed of within the Ghost Crab pit TSF, which is also a source of water for the processing plant. The continued disposal of RO Brine will result in a cumulative increase in salinity, which will eventually result in water being unsuitable for use in the Plant. Therefore the Licence Holder is proposing to dispose of 0.76 GL per annum of RO brine into the Mt Marion pits, North and Central (consisting of 14 staged pits within the northern and central areas).

RO brine will firstly be disposed into Pit N2 for temporary storage between June 2019 and August 2020, whilst mining and backfilling of Pit C1 is completed. Once completed, RO brine

will be disposed directly into Pit C1 and the water stored in Pit N2 will also be transferred to Pit C1. Discharge locations shall be a single point spigot within the pits placed to ensure discharge to the base of the pit with minimal erosion of pit walls. The RO brine shall be disposed in the pits and associated infrastructure at locations shown in Figure 3.

The major infrastructure requiring construction for RO brine disposal is outline below in Table 3.

Table 3: RO Brine disposal infrastructure

Infrastructure/ Equipment	Requirements (design and construction)
Discharge pipeline	<ul style="list-style-type: none"> • Up to 500mm diameter welded poly pipeline • Bunding or V-drains for spill containment • Isolation valves installed • Flow meters and telemetry installed for leak detection
Turkeys Nests	<ul style="list-style-type: none"> • Constructed with minimum 1.5mm welded HDPE liner • Minimum operational freeboard of 300mm is to be maintained • Fenced to prevent fauna access

RO brine is saline and contains some elements that exceed the ANZECC livestock Drinking Water Guidelines. Boron, cadmium, sulphate, magnesium, calcium and total dissolved solids (TDS) exceed the Livestock Drinking Water Guidelines. Metals and salt concentration of RO brine is generally higher than the surrounding groundwater (based on surrounding bore and in pit water quality) (PMI, 2019). In particular, the uranium concentration in one sample (0.74 mg/L exceeded the guideline (0.2mg/L).

Further testing of water quality in production bores (PB01 and PB06) indicated radioactivity significantly in excess of the gross alpha and gross beta ANZECC trigger values of 0.5 Bq/L respectively (MRL, 2019). PB01 recorded a gross alpha activity of 19.7 Bq/L and PB06 16 Bq/L whilst the gross beta activity was 4.3 Bq/L in PB01 and 20 Bq/L in PB06. The ANZECC trigger values are a screening tool to determine whether radionuclide concentrations are of concern. At these levels the groundwater may present a risk if released to the environment. No testing of radioactivities of the RO brine water have been completed at the time of this assessment, however it is likely that the radioactivity of this stream will also be elevated as the production bore water is the source input into the RO plant.

The Licence Holder has committed to conducting further investigation into the source and extent of the naturally occurring radionuclides in groundwater, including the investigating the association with mineralogy at the Premises to determine the presence of uranium and/or thorium.

Dewatering discharge to pits

It is proposed to dispose 0.65 GL of dewater into the Mt Marion pits. In the first instance, this dewater will be used to supplement the water supply of the Plant by way of piping this back to the processing turkeys nest. If dewatering rates of 20 L/s or greater yield are achieved, further hydrogeological drilling will be undertaken and dewatering bores established to replace the sumps.

The dewater will be captured and pumped via pipelines to one or more of the adjacent Mt Marion pits not being currently mined or one of the proposed turkeys nests. Inter-pit transfer will also be required to manage water and transfer around the mining areas. This flexibility will allow for smooth transition from one mining location to another as the Project develops. The pipeline route and dewater disposal pits are shown below in Figure 3.

The major infrastructure requiring construction for dewatering disposal is outline below in Table 4.

Other approvals

The Licence Holder has provided the following information relating to other approvals as outlined in Table 5.

Table 5: Relevant approvals

Legislation	Number	Approval
<i>Rights in Water and Irrigation Act 1914</i>	Groundwater Licence (GL) 174427	GL174427 has been successfully amended to include dewatering activities and an increase in abstraction allocation. The amended Licence allows for 1GL/annum to be abstracted from a combination of dewatering and production bores located on the prescribed premise across tenements M15/1000 and M15/717.
<i>Environmental Protection Act 1986, Division 3, Part V (Works Approval)</i>	W5734/2014/1 as amended	Approval to construct the following: Category 5: Wet and dry beneficiation plant, reverse osmosis plant, tailings storage facility infrastructure at Ghost Crab Pit (pipelines, pumps, return water ponds); Category 57: used tyre storage area; and Category 64: putrescible landfill by trenches in waste rock landforms.
<i>Mining Act 1979</i>	-	Mining proposal is currently under assessment with the Department of Mines, Industry Regulation and Safety (DMIRS)

Licence Amendment history

Table 6 provides the Licence amendment history for the Premises.

Table 6: Licence amendments

Instrument	Issued	Amendment
L9037/2017/1	27/06/2017	Licence issued for the operation of a lithium processing plant and associated infrastructure (landfilling, wastewater treatment etc).
L9037/2017/1	16/12/2017	Amendment Notice 1 – authorise disposal of coarse rejects to either: <ul style="list-style-type: none"> the western verge of the Ghost Crab Pit in an encapsulated landform; or comingled with waste rock and disposed of to waste rock landforms; or discharged onto the northern ramp of the existing Ghost Crab Pit.
L9037/2017/1	31/05/2019	Amendment Notice 2 – <ul style="list-style-type: none"> authorise an increase in category 5 throughput and increases in categories 64 (operating an additional landfill)

		and 85 (second wastewater treatment plant and doubling of sprayfield area). <ul style="list-style-type: none"> Amendment of category 73 storage capacity and monitoring bores for groundwater monitoring.
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Location and receptors

The Mount Marion Lithium Project Prescribed Premises is located on mining tenements M15/717 and M15/1000. The Premises is located approximately 36km south of Kalgoorlie, on the Woolibar pastoral station in the Shire of Coolgardie.

Mining of gold ore was previously conducted on M15/717 and gold mining also occurred on M15/1000. Ghost Crab Pit, located on M15/717 is the site of a previously mined out open pit and underground operation at the base of the Pit.

Table 7 below lists the relevant sensitive land uses in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 7: Receptors and distance from activity boundary

Residential and sensitive premises	Distance from Prescribed Premises
Woolibar station homestead (residential premises).	15km east of the Premises.
Town of Kambalda.	23km south east of Premises.

Table 8 below lists the relevant environmental receptors in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

Table 8: Environmental receptors and distance from activity boundary

Environmental receptors	Distance from Prescribed Premises
Department of Biodiversity, Conservation and Attractions managed lands and waters	<p>“Class C” Yallari Timber Reserve, 2.3km southwest of the Premises</p> <p>Karamindie State Forest, 6km northwest of Premises</p> <p>Kambalda Nature Reserve, 5km southeast of Premises</p>
Threatened/Priority Flora	<p>The 2016 survey recorded a listed Priority 3 flora species under the <i>Wildlife Conservation Act 1950</i>, <i>Diocirea acutifolia</i>. It was recorded at 28 locations in the survey area. This species is widespread and in large numbers in the local and regional area.</p> <p>A 2009 survey recorded 3 x Priority 3 flora species (<i>Diocirea acutifolia</i>, <i>Austrostipa blackii</i> and <i>Allocasuarina eriochlamys subsp grossa</i>) within the Premises.</p>
Threatened/Priority Fauna	<p>Malleefowl (<i>Leipoa ocellata</i>) habitat is present within the boundaries of the Prescribed Premises. A survey in 2010 identified two extinct malleefowl mounds within the Premises</p>

	boundary. Malleefowl is listed as vulnerable under the EPBC Act and is on schedule 1 of the <i>Wildlife Conservation Act 1950</i> , that is, fauna that is rare or is likely to become extinct.
Public drinking water source areas	No public drinking water source areas are located with a 100km radius of the Premises.
Major watercourses/waterbodies	<p>No major surface watercourses are located on or adjacent to the Premises. The nearest surface water receptor is Lake Lefroy, a saline lake located 24 km to the south east of the Premises. Lake Lefroy is also the groundwater receptor, from where the Wollubar/Lefroy palaeochannel discharges.</p> <p>Lake Lefroy is a regionally significant salt lake, with peak biological productivity during large rainfall events, wherein invertebrate species coming out of dormancy are able to reproduce.</p>
Groundwater	<p>The palaeochannel tributary passing through the Ghost Crab pit is hypersaline with a TDS of between 32 000 and 40 000 mg/L and pH of 6.4 (PSM 2016) and therefore not considered of environmental value.</p> <p>Groundwater samples taken from pegmatite intrusive stratigraphy at the Project (2km east of Ghost Crab Pit) recorded low salinity water (TDS 4 500 – 5 200 mg/L and alkaline pH (7.9 – 8.3).</p> <p>Both groundwater sources are used for the purposes of mining or industrial applications. Adjacent towns are serviced by scheme water.</p>

Risk assessment

Tables 9 and 10 below describe the Risk Events associated with the amendment consistent with the *Guidance Statement: Risk Assessments*. Both tables identify whether the emissions present a material risk to public health or the environment, requiring regulatory controls.

Table 9: Risk assessment for proposed amendments during construction

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning	
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts					
Category 6 – dewatering & Category 85B – water desalination plant	Construction of dewatering pipelines and infrastructure.	Dust	No residences or other sensitive human receptors in proximity.	Air / wind dispersion	Health and amenity impacts	N/A	N/A	N/A	<p>Minimal dust is expected to be generated during construction of the new pipelines, turkey nests and other associated infrastructure.</p> <p>The distance to residential receptors is considered to be too great for dust impacts from construction activities to occur. It is considered that a pathway for dust emissions to residential receptors does not exist.</p> <p>Any potential dust emissions can be regulated by section 49 of the EP Act.</p>
	Construction of discharge pipelines and turkeys nests for disposal of RO brine.	Noise	Construction occurring within disturbed area within mine site. No flora or fauna is expected to be impacted.				N/A	N/A	N/A

Table 10: Risk assessment for proposed amendments during operation

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning	
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts					
Cat 5 Processing or beneficiation of metallic or non-metallic ore	Use of coarse – fraction spodumene tailings for construction purposes within operational pits and/or within the process plant footprint.	Leachate with soluble metals/ metalloids.	Soil and native vegetation.	Leachate infiltration into soil and surface runoff.	Adverse impacts to the health and survival of vegetation.	Slight	Unlikely	Low	<p>Approximately 10,000 tonnes per annum of coarse reject tailings material is proposed to be used for construction purposed within operational pits (sheeting) and/or within the process plant footprint.</p> <p>The chemical analysis of the coarse-tailings materials (MBS 2017) indicated that these materials were significantly enriched in the following elements: beryllium, bismuth, caesium, lithium, rubidium, antimony, selenium, tin, tantalum, tellurium and thallium.</p> <p>Leachate test results of coarse fraction samples indicated that leachate from the coarse reject material is likely to have low concentrations of soluble alkali metals (rubidium and lithium), be moderately alkaline (pH 9.4) and of low salinity. (MBS 2017). At alkaline to neutral pH, (expected site conditions) leachability of metals is at the lowest concentrations across the pH range.</p> <p>The Licence Holder is proposing to use coarse reject tailings material within operational pits and/or within the processing plant footprint only. The Licence Holder has committed to only using coarse reject material in locations that have sufficient surface water controls (bunds, v-drains, sediment ponds) to avoid any potential contaminated runoff impacting surrounding vegetation.</p> <p>Locations will be documented using a</p>

									<p>Site Disturbance Permit (SDP) which will document the locations where coarse rejects material are to be used, ensure that the correct surface water controls are implemented, and provide an auditable record for SDP close-out and mine closure. This will be done in accordance with the Licence Holder's obligations under the <i>Contaminated Sites Act 2003</i>.</p> <p>If coarse reject material comes in contact with soil (e.g if used for other construction activities such as bedding material for pipelines or walkways) there is the potential for an increase in rate of release of lithium and thallium from the coarse reject material. This is because tailings produced from pegmatites have a high phosphorus content and are vulnerable to acid-leaching by soil microorganisms and fungi that want to remove this nutrient from minerals within rock particles (Banfield <i>et al.</i>, 1999; Gadd, 2007). This biological attack could greatly increase the rate of release of lithium and thallium from tailings.</p> <p>The Delegated Officer has determined that the use of the coarse reject material for construction purposes will be restricted to operational pits and/or within the process plant footprint only to ensure contact with soil is minimized and that any contaminated runoff will be captured.</p> <p>A condition will be added to the Licence restricting the use of the coarse reject material.</p>
	Dust	Native vegetation	Via air; associated with deposition of coarse rejects	Adverse impacts on vegetation and fauna habitat	Slight	Unlikely	Low	<p>Moisture content of the tailings coarse reject material is approximately 5 -8%. Water carts will be used to for dust suppression to minimize dust lift off when constructing with coarse reject material. Coarse rejects will be used for</p>	

									construction purposes within disturbed mining areas (operational pits and processing area footprint) and therefore it is unlikely for dust emissions from the use of tailings coarse reject material to impact sensitive receptors.
	Disposal of oleic acid sludge into Ghost Crab Pit TSF as part of the tailings stream.	Tailings leachate	Groundwater	Seepage through soil	Contamination of groundwater	Slight	Unlikely	Low	<p>It is proposed that oleic acid sludge will now be mixed into the tailings stream at 4 m³/hr with fine tailings (96 m³/hr at 25% solids by mass). Previously it was disposed separately so that water could be decanted from the pit. The previous strategy is to be replaced by an adjusted single tailings stream approach.</p> <p>The amount of oleic acid sludge being disposed of into the Ghost Crab pit TSF is small (35,040 tonnes/yr) compared to the amount of tailings being deposited (3 million tonnes per annual period). This amount of sludge is unlikely to change the risk profile of the tailings being deposited within the TSF.</p> <p>Groundwater is hypersaline, and is not used except for mining/industrial applications.</p> <p>The Licence Holder has committed to updating the Tailings Operating Manual to include this change in the tailings stream and its impacts on the operation of the TSF (rate of rise, beaching of tailings etc).</p>
Category 85B – water desalination plant	Discharge of hypersaline RO brine into various pits within the northern and central mining areas.	Hypersaline RO Brine	Native vegetation	Groundwater mounding lateral seepage at base of the pit	Inundation of vegetation rootzones	Moderate	Unlikely	Medium	<p>The Licence Holder is proposing to dispose of 0.76 GL per annum of RO brine into the Mt Marion pits (consisting of 14 staged pits within the northern and central areas).</p> <p>Golder has undertaken a water balance in March 2019. The results of the water balance indicate that some mounding will</p>

									<p>occur however there is no groundwater dependent vegetation within the project area (Golder, 2019).</p> <p>One significant flora taxon have been identified on the Premises, <i>Diocirea acutifolia</i>, a listed Priority 3 species. It was recorded in 28 locations and is considered to be widespread and in large numbers throughout the local and regional area. No Declared Rare Flora, Threatened Ecological Communities or Priority Ecological Communities occur within or in proximity to the Premises.</p> <p>There is potential for increasing groundwater levels impacting on surrounding vegetation, particularly due to brackish salinity levels. However, no Groundwater Dependent Ecosystems have been identified within the area (Golder, 2018) and proposed pit freeboards (6 m) are considered adequate to minimise any impacts.</p>
		Overtopping of pits	Surrounding soils and native vegetation	Direct discharge	Decline/death of vegetation via inundation	Moderate	Rare	Medium	<p>The north and central pits (receiving pits) will be developed to varying depths with most pits having a maximum depth of 225 - 290m AHD. The deepest pit will be Pit N11 with a maximum depth of approximately 300 m below natural ground level (90 m AHD). Pre-mining depth to groundwater was 20 – 50 m below ground level.</p> <p>Golder has undertaken a water balance in March 2019. The results of the water balance (Golder, 2019) indicate;;</p> <ul style="list-style-type: none"> • Pit N02 pit lake level would reach a maximum elevation of 374.4 mAHD (approximately 10 m above pre-mining groundwater levels and 20 – 25 m below pit crest) by August 2020 when RO waste water discharge will cease.

									<ul style="list-style-type: none"> Pit C01 pit lake level would increase from August 2020 to December 2020 as RO brine is directly discharged from the RO Plant and transferred from Pit N02. The maximum pit lake elevation would be 370.5 mAHD in June 2023 (approximately 10 m above pre-mining groundwater levels and 30 m below pit crest). <p>The Licence holder has committed to maintaining a 6 m freeboard within the receiving pits at all times.</p> <p>The RO Brine is saline therefore if overtopping would occur mid-level onsite impacts would occur. The likelihood of overtopping of pits occurring is rare due to the Licence holder's controls.</p>
	Operation of RO Brine discharge pipelines	Saline RO brine	Vegetation adjacent to the dewatering pipeline	Pipeline failure resulting in direct discharge	Surrounding soil contamination which could inhibit vegetation growth and survival.	Minor	Unlikely	Low	<p>RO brine is saline and contains some elements that exceed the ANZECC livestock Drinking Water Guidelines and the surrounding groundwater quality. Boron, Cadmium, Sulphate, Magnesium, Calcium and Total Dissolved Solids (TDS) exceed the Livestock Drinking Water Guidelines. Metals and salt concentration of RO brine is generally higher than the surrounding groundwater (based on surrounding bore and in pit water quality) (PMI, 2019).</p> <p>Pipelines will be installed within v-drains. Pipeline corridor will be located within previously disturbed areas and no additional clearing of native vegetation will be required. Flow meters and telemetry will be installed for leak detection. Daily inspection of pipelines will also occur.</p> <p>It is considered unlikely that a pipeline failure would result in impacts to vegetation given the Licence Holder</p>

									controls.
	Discharge of saline RO brine into turkeys nests	Saline RO brine	Vegetation adjacent to the dewatering pipeline	Overtopping of turkeys nests Resulting in direct discharge or Seepage through failed HDPE liner	Surrounding soil contamination which could inhibit vegetation growth and survival.	Minor	Unlikely	Low	<p>Turkeys nests will be lined with a HDPE liner welded by specialist teams. The design will ensure that a 300 mm freeboard will be maintained during operation to reduce the risk of overtopping. Turkey nests will be situated within previously disturbed areas.</p> <p>The welded HDPE liner of the turkeys nests will have integrity checks prior to first fill and will be suitably fenced. Inspections of turkeys nests will occur daily.</p> <p>If overtopping of turkey nests were to occur then low-level onsite impacts may occur. Based on the Licence Holder controls it is unlikely that this event will occur</p>
Category 6 – dewatering	Abstraction resulting in drawdown of groundwater levels	None	Groundwater dependent ecosystems	Abstraction of groundwater	Reduction in groundwater availability for dependent vegetation	N/A	N/A	N/A	Not within scope of Part V of the EP Act. Regulated under the RiWI Act and Part IV of the EP Act.
	Discharge of hypersaline mine dewater to various pits	Saline mine dewater	Native vegetation	Groundwater mounding/ lateral seepage at base of the pit	Inundation of vegetation root zones.	Moderate	Unlikely	Medium	<p>The Licence Holder is proposing to discharge 0.65 GL of dewater into the various Mt Marion pits. Water will be moved between pits as mining operations progress.</p> <p>The volume of dewatering will be variable over time, based on the current limited hydrogeological assessment (Golder, 2018). Predicted dewatering rates range from negligible to 120 L/s towards the end of mine life. Further hydrogeological investigations are required to better understand the receiving environment to</p>

									<p>assist in future planning for dewatering activities.</p> <p>Pre-mining depth to groundwater was 20 – 50 m below ground level.</p> <p>One significant flora taxon have been identified on the Premises, <i>Diocirea acutifolia</i>, a listed Priority 3 species. It was recorded in 28 locations and is considered to be widespread and in large numbers throughout the local and regional area. No Declared Rare Flora, Threatened Ecological Communities or Priority Ecological Communities occur within or in proximity to the Premises.</p> <p>There is potential for increasing groundwater levels impacting on surrounding vegetation, particularly due to brackish salinity levels. However, no Groundwater Dependent Ecosystems have been identified within the area (Golder, 2018) and proposed pit freeboards (6 m) is considered adequate in this situation to minimise any impacts.</p> <p>Conditions will be added to the Licence to ensure volume of dewater discharged is monitored on a continual basis. A condition will be added to the Licence to ensure a freeboard is maintained within the pits to limit the potential for groundwater mounding.</p>
	Saline mine dewater	Surrounding soils and native vegetation	Direct discharge	Decline/death of vegetation via inundation.	Moderate	Unlikely	Medium	<p>It is proposed to dispose 0.65 GL of dewater into the Mt Marion pits. In the first instance, this dewater will be used to supplement the water supply of the Plant by way of piping this back to the processing turkeys nest.</p> <p>The dewater will be captured and pumped via pipelines to one or more of the adjacent Mt Marion pits within the</p>	

									<p>Prescribed Premises not being currently mined or one of the containment structures (turkeys nests). Inter-pit transfer will also be required to manage water and transfer around the mining areas. This flexibility will allow for smooth transition from one mining location to another as the Project develops.</p> <p>The volume of dewatering will be variable over time, based on the current hydrogeological assessment (Golder, 2018). Predicted dewatering rates range from negligible to 120 L/s towards the end of mine life. Further hydrogeological investigations are required to better understand the receiving environment to assist in future planning for dewatering activities.</p> <p>The Licence Holder has stated within the application documents (PMI, 2019) that prior to discharge the freeboard requirements for each pit will be established to ensure it meets 1% AEP 72-hour rainfall event freeboard requirements and ensure no effect upon surrounding vegetation from rising groundwater levels. A minimum 6 m freeboard requirement will be implemented by the Licence Holder.</p> <p>The Licence Holder has stated within their application documents (PMI, 2019) that they will be reviewing selected exploration holes around the pit extents to utilise as monitoring locations for groundwater levels and water quality. Once confirmed, these locations will be converted into fit for purpose monitoring bores. Locations of these will be recommended by the consultant hydrogeologist who has been engaged for this work.</p>
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									Dewater is saline therefore if overtopping would occur mid-level onsite impacts would occur. The likelihood of overtopping of pits occurring is unlikely based on the Licence Holder's controls.
		Saline mine dewater	Vegetation adjacent to the dewatering pipeline	Pipeline failure causing direct discharge	Surrounding soil contamination which could inhibit vegetation growth and survival	Moderate	Possible	Medium	<p>Dewater is saline with a TDS range between 10,000 – 18,000 mg/L. pH approximately 7.3-8.3.</p> <p>Pipelines will be installed within v-drains. Pipeline corridor will be located within previously disturbed areas and no additional clearing of native vegetation will be required. Flow meters and telemetry will be installed for leak detection. Daily inspection of pipelines will also occur.</p> <p>If rupture of dewatering pipelines were to occur then mid-level onsite impacts may occur. Pipeline rupture could occur at some time. Based on this the Delegated Officer has determined the overall risk rating for this event to be medium.</p> <p>Conditions will be added to the Licence to control this risk.</p>
	Use of dewater/RO brine for dust suppression on roads/ haul roads etc.	Saline mine dewater containing elevated radioactive elements	Soil and vegetation along haul roads/ adjacent to disturbed areas.	<p>Direct discharge to land contaminating soil with elevated radioactive elements</p> <p>Indirect pathways to surface water through runoff and uptake by plants and animals</p>	Surrounding soil contamination which could lead to the spread of radioactive elements to vegetation, fauna and surface water.	Major	Possible	High	<p>The Licence Holder is proposing to use pit water (from dewatering activities) and RO Brine for dust suppression purposes on site.</p> <p>Recent pit water and RO Brine water quality provided in the application supporting document (PMI, 2019) is summarised below;</p> <ul style="list-style-type: none"> RO Brine –saline and contains some elements (boron, cadmium, sulphate, magnesium, calcium and TDS (~50 000 mg/L) that exceed the ANZECC livestock Drinking Water Guidelines and the surrounding groundwater quality. Metals and salt

									<p>concentration were generally higher than the surrounding groundwater (based on surrounding bore and in pit water quality);</p> <ul style="list-style-type: none"> • Pit water is saline (10 000 -18 000 mg/L TDS) and metal/metalloid concentrations generally meet ANZECC livestock drinking water guidelines, with the exception of boron and uranium. One of the pit water samples indicated that uranium is elevated (1.5 mg/L compared to the ANZECC livestock drinking water guideline of 0.2 mg/L). <p>As outlined above uranium concentration in the pit water and the RO brine is elevated. Additionally radioactivity concentrations in source production bores indicates radioactivity in excess of the respective ANZECC trigger values, so it would be inferred that the brine also has elevated radioactivity concentrations. Given this, the water is not suitable for dust suppression.</p> <p>No information on radionuclide concentrations (radium 226, radium 228, uranium 238, thorium, gross alpha and gross beta) have been provided for pit water or RO brine at this time, however commitments have been made to provide this information by the Licence Holder.</p> <p>Based on this information and in the absence of a radionuclide assay on pit water/RO brine the Delegated Officer has determined that the risk to the environment is not acceptable to allow the use of this water for dust suppression.</p> <p>A condition will be added to the Licence</p>
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									<p>ensuring that this water is not used for dust suppression. A specified action condition will be added requiring analysis of radiological quality of the pit water in N1, N2 and C1 pits and the RO brine to be undertaken and the data to be provided to DWER for assessment.</p> <p>Note that the protection of human health from radioactive material is managed under the <i>Radioactive Safety Act 1975</i>.</p>
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Licence Holder's comments

The Licence Holder was provided with the draft Amendment report and Licence on 5 September 2019. A response was received from the Licence Holder on 18 September 2019 requesting the 21 day comment period to be waived with no further comments provided.

Decision

Construction of infrastructure

Based on the Licence Holder's application the Delegated Officer has determined that the construction of RO brine disposal and dewatering pipelines, turkeys nests and associated infrastructure presents a low risk to the environment. As a result of this assessment Condition 3, Table 3 has been updated to include the design and construction requirements for the dewatering/RO brine pipelines and turkeys nests.

Coarse reject (tailings) material

Based upon the Licence Holder's application the Delegated Officer has determined that the use of coarse reject (tailings) material for construction purposes within operational pits or within the processing plant footprint presents a low risk to the environment providing it is managed in accord with the proposed controls.

A new condition (condition 9) has been added to the Licence to ensure coarse reject (tailings) material is restricted for use only within operational areas.

Disposal of oleic sludge into Ghost Crab Pit TSF

Based upon the Licence Holder's application the Delegated Officer has determined that the discharge of 35 040 tonnes of oleic acid sludge material from the DAF process into the Ghost Crab Pit TSF as part of the tailings stream presents a low risk to the environment. As the oleic acid sludge material will be mixed with tailings to form a single tailings stream no changes to existing conditions are required. Conditions 1, 6 and 8 (to do with tailings disposal) within the Existing Licence are adequate to manage the risk associated with this emission.

Dewater and RO Brine disposal into Mt Marion pits.

Based upon the Licence Holder's application the Delegated Officer has determined that the disposal of RO Brine and dewatering water into the Mt Marion pits presents a low - medium risk to the environment. The Delegated Officer has determined that these risks are acceptable subject to amendments to the existing regulatory controls in the Licence as shown below;

- Condition 1 has been amended to allow for the discharge of dewater and RO Brine into onsite pits.
- Condition 6 has been amended to ensure dewatering pipelines and RO Brine pipelines v-drains are maintained and kept clear of sediment.
- Condition 6 has also been amended to ensure all turkey nests onsite are lined with HDPE and a freeboard of 300mm is maintained.
- Condition 6 has also been amended to ensure a minimum vertical freeboard of 6m must be maintained below the lowest crest for all disposal pits.
- Condition 11 (previously condition 9) has been amended to include the daily inspections of dewatering pipelines and RO brine pipelines.

A new condition has been added to the Licence (Condition 20) that requires the Licence Holder to record and report the total volume of dewater and RO Brine discharged to the Mt Marion pits per year.

Categories 6 and 85B have been added to Table 8 within Schedule 2, with corresponding discharge limits of 0.65 GL per year for Category 6 and 0.73 GL per year for Category 85B. Dewatering and RO Brine disposal infrastructure have been added to Table 9 within Schedule 2. A new Figure 3 has also been added to the Licence to show the pipeline layout.

Use of pit water and RO Brine for dust suppression activities

Based upon the Licence Holder's application the Delegated Officer has determined that the use of dewater and RO Brine for dust suppression activities onsite presents a high risk to the environment. The Delegated Officer has determined that this risk is unacceptable and therefore does not approve the use of this water for dust suppression.

Condition 10 has been added to the Licence to prevent the use of dewater or RO Brine for dust suppression activities on site.

A specified action condition (new condition 21) has been added to the Licence requiring the Licence Holder to carry out a radiological assay on pit water and RO Brine to determine the radiological quality of this water. This data must be presented as a report to the CEO by 31 October 2019.

Other amendments

New conditions (9, 10, 20 and 21) have been added to the Licence resulting in conditions numbers changing.

New maps of the premises and dewatering pipeline route have been added to Schedule 1.

Amended conditions from Amendment Notice 1 and Amendment Notice 2, along with changes made as part of this amendment have been amalgamated into one Revised Licence document. Impacts from emissions and discharges as a result of the changes outlined in Amendment Notice 1 and Amendment Notice 2 have not been reassessed as part of this amendment.

Appendix 1: Key documents

	Document title	In text ref	Availability
1	Application Form for Licence amendment to L9037/2017/1 (including all attachments), Process Minerals International Pty Ltd, 11 April 2019	PMI, 2019	DWER records (A1781025, A1781096)
2	Banfield, J.F., Barker, W.W., Welch, S.A. and Taunton, A., 1999. Biological impact on mineral dissolution: Application of the lichen model to understanding mineral weathering in the rhizosphere. <i>Proceedings of the National Academy of Sciences USA (PNAS)</i> , 96 , 3404-3411.	Banfield <i>et al</i> , 1999	The paper is available from website https://www.pnas.org/content/pnas/96/7/3404.full.pdf .
3	DWER, July 2015. <i>Guidance Statement: Regulatory principles</i> . Department of Environment Regulation, Perth.		accessed at www.dwer.wa.gov.au
4	DWER, November 2016. <i>Guidance Statement: Risk Assessments</i> . Department of Environment Regulation, Perth.		
5	DWER, November 2016. <i>Guidance Statement: Decision Making</i> . Department of Environment Regulation, Perth.		
6	Gadd, G.M., 2007. Geomycology: biogeochemical transformations of rocks, minerals, metals and radionuclides by fungi, bioweathering and bioremediation. <i>Mycological Research</i> , 111(1) , 3-49.	Gadd, 2007	The paper is available from web site http://dzumenvis.nic.in/Microbes%20and%20Radionuclide%20Pollution/pdf/Geomycology%20biogeochemical%20transformations.pdf
7	Golder Associates Pty Ltd, April 2018, Mount Marion Lithium Mine LoM Dewatering Concept Study. Reference number 1895723-001-R-Rev0.	Golder, 2018	DWER records (A1781096)
8	Golder Associates Pty Ltd, March 2019, Technical memorandum - reference number 1790460-012-M-Rev0, Mt Marion Brine Disposal Water Balance.	Golder, 2019	DWER records (A1781096)
9	MBS Environmental, Mount Marion Project Coarse Rejects Geochemical Assessment, November 2017.	MBS, 2017	DWER records (A1577416)
10	MRL (2019) Letter response to DWER request for further information, dated 7 June 2019	MRL, 2019	DWER records (A1799512)