



Application for Licence Amendment

Division 3, Part V *Environmental Protection Act 1986*

Licence Number	L9000/2016/1
Licence Holder	Gruyere Management Pty Ltd
ACN	615 728 795
File Number	DER2016/001956-1
Premises	Gruyere Gold Project Mining tenement L38/254 and Part of L38/255 and M38/1267 COSMO NEWBERY WA 6440
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1. Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
Annual Period	means a 12 month period commencing from 1 July until 30 June in the following year
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
cfu/100mL	colony-forming units per 100 millilitres
CIL	Carbon in Leach
Decision Report	refers to this document
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 As of 1 July 2017, the Department of Environment Regulation (DER), the Office of the Environmental Protection Authority (OEPA) and the Department of Water (DoW) amalgamated to form the Department of Water and Environmental Regulation (DWER). DWER was established under section 35 of the <i>Public Sector Management Act 1994</i> and is responsible for the administration of the <i>Environmental Protection Act 1986</i> along with other legislation
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 this amendment
GRJV	Gruyere Project Joint Venture
ha	hectare
HDPE	high density polyethylene
IWF	Integrated Waste Landform
kL	kilolitre

Term	Definition
Licence Holder	Gruyere Management Pty Ltd
mbgl	metres below ground level
MCSP	Mobile Crushing and Screening Plant
Minister	the Minister responsible for the EP Act and associated regulations
MS	Ministerial Statement
Mtpa	million tonnes per annum
NTU	Nephelometric Turbidity Units
Occupier	has the same meaning given to that term under the EP Act
OWS	Oil Water Separator
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
Primary Activities	as defined in Schedule 2 of the amended Licence
Revised Licence	the amended Licence issued under Part V, Division 3 of the EP Act following the finalisation of this amendment
RiWI Act	<i>Rights in Water and Irrigation Act 1914</i>
Risk Event	as described in <i>Guidance Statement: Risk Assessment</i>
RL	Reduced Level
RO	Reverse Osmosis
ROM	Run of Mine
SAG	semi-autogenous
TDS	Total Dissolved Solids
tpa	tonnes per annum
TSF	Tailings Storage Facility
WWTP	Wastewater Treatment Plant

2. Purpose and scope of assessment

On 5 November 2018 Gruyere Management Pty Ltd (Licence Holder) submitted an application (Gruyere, 2018a) to the Department of Water and Environmental Regulation (DWER) to amend the *Existing Licence* at the Gruyere Gold Project (Premises) issued under the *Environmental Protection Act 1986* (EP Act) for the following changes:

- Inclusion of category 5 for the Carbon in Leach (CIL) processing plant to produce gold doré, Tailings Storage Facility (TSF) and tailings pipeline infrastructure;
- Increase in capacity for category 54 for the Process Plant Wastewater Treatment Plant (WWTP) to accommodate the requirements of the mining administration and processing plant areas; and
- Inclusion of category 73 for the bulk storage of chemicals.

The emissions and discharges associated with the construction and operation of the above infrastructure has been previously assessed under Works Approval *W6002/2016/1*. Compliance documentation (Construction Completion Report) for the above infrastructure was received by DWER on 15 May 2019. The infrastructure was then authorised to be commissioned for three months.

During this amendment the Licence Holder has proposed design changes for Stages 2 to 6 of the perimeter embankment construction which will include (Construction Completion Report):

- A change from a linear upstream slope to the TSF retaining embankment to an upstream slope that incorporates small horizontal berms (1.5 m) between each of the six stages (i.e. a setback of 1.5 m from the outer crest line of the as-built embankment to the inner toe line of the proposed embankment raise). The upstream slope in the original design had no berms;
- A revised upstream select mine waste (Zone C1 material) crest width of 4.5 m. The crest width of Zone C1 in the original design was shown as 3.0 m wide. The inclusion of a 1.5 m wide berm between each lift has resulted in a change of 4.5 m of Zone C1 for each lift, and
- A change of in the minimum crest width for future stages to 23.5 m as opposed to the previously approved 28.0 m crest width.

This assessment has resulted in DWER issuing a Revised Licence L9000/2016/1 (Attachment 1), which incorporates *Amendment Notices 1 to 4* (refer to Table 9) which also authorises operation of the Category 5 and 73 infrastructure.

2.1 Application details

Table 2 lists the documents submitted for this amendment.

Table 2: Documents and information submitted for this amendment

Document/information description	Date received
Environmental Licence Amendment Application – (L9000/2016/1) Gruyere Gold Project prepared for Gruyere Management Pty Ltd by MBS Environmental, November 2018	5 November 2018

3. Background

The Gruyere Project Joint Venture (GRJV) is a 50:50 unincorporated joint venture between Gold Road Resources Limited and Gruyere Mining Company Ltd (a wholly owned subsidiary of

Goldfields Limited). The Licence Holder acts as the manager and agent for and on behalf of the GRJV, to develop and operate the Premises, which is a greenfields gold deposit in the Yamarna greenstone belt of Western Australia. The Yamarna greenstone belt is a newly discovered gold region covering approximately 5,000 square kilometres on the eastern side of the Yilgarn Craton. The Premises is located on L38/254 and Part of L38/255 and M38/1267, which are owned and managed by the Licence Holder.

The Revised Licence relates to the following primary activities at the Premises for the prescribed premises Categories as defined in Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) as listed in Table 3.

Table 3: Prescribed Premises Categories

Classification of Premises	Description	Approved Premises production or design capacity or throughput
Category 5	Processing or beneficiation of metallic or non-metallic ore: premises on which — (a) metallic or non-metallic ore is crushed, ground, milled or otherwise processed; or (b) tailings from metallic or non-metallic ore are reprocessed; or (c) tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam.	8,800,000 (dry) tonnes per Annual Period
Category 12	Screening etc. of material: premises (other than premises within category 5 or 8) on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.	1,752,000 tonnes per Annual Period
Category 54	Sewage facility: premises – (a) on which sewage is treated (excluding septic tanks); or (b) from which treated sewage is discharged onto land or into waters.	225 cubic metres (m ³) per day (m ³ /day)
Category 64	Class II putrescible landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled “Landfill Waste Classification and Waste Definitions 1996” published by the Chief Executive Officer and as amended from time to time) is accepted for burial.	1,800 tonnes per Annual Period
Category 73	Bulk storage of chemicals etc.: premises on which acids, alkalis or chemicals that – (a) contain at least one carbon to carbon bond; and (b) are liquid at STP (standard temperature and pressure), are stored.	1,306 m ³ in aggregate

4. Overview of Premises

4.1 Operational aspects

The operational aspects as defined within the *Existing Licence* including *Amendment Notices 1 to 4, W6002/2016/1, Gruyere, 2018a* and *Construction Completion Report* are detailed below.

Category 5 – Processing or beneficiation of metallic or non-metallic ore

The ore processing circuit comprises of the following unit processes:

- Run of Mine (ROM);
- Primary crushing;
- Crushed ore stockpile;
- Semi-autogenous (SAG) Milling;
- Ball Milling;
- Pebble crushing;
- Gravity recovery circuit with intensive leach and dedicated electrowinning;
- Thickening;
- Hybrid CIL circuit;
- Elution and gold recovery; and
- Tailings disposal.

The carbon handling and gold recovery system comprises of the following:

- 18 tonne mild steel rubber lined acid wash column;
- 18 tonne stainless steel elution column;
- Elution heater;
- A split Anglo American Research Laboratories (AARL) elution system;
- 1.5 tonnes per hour carbon regeneration kiln and quench tanks;
- A hydraulic transfer pumping system for carbon transfer including a carbon fines removal system;
- An electrowinning circuit including rectifier;
- A cathode washing station and filter to recover precious metal precipitate;
- A smelting furnace and crucible to produce gold doré; and
- A secure goldroom with a vault and safe for the storage of bullion.

A process plant flow diagram is shown in Figure 1.

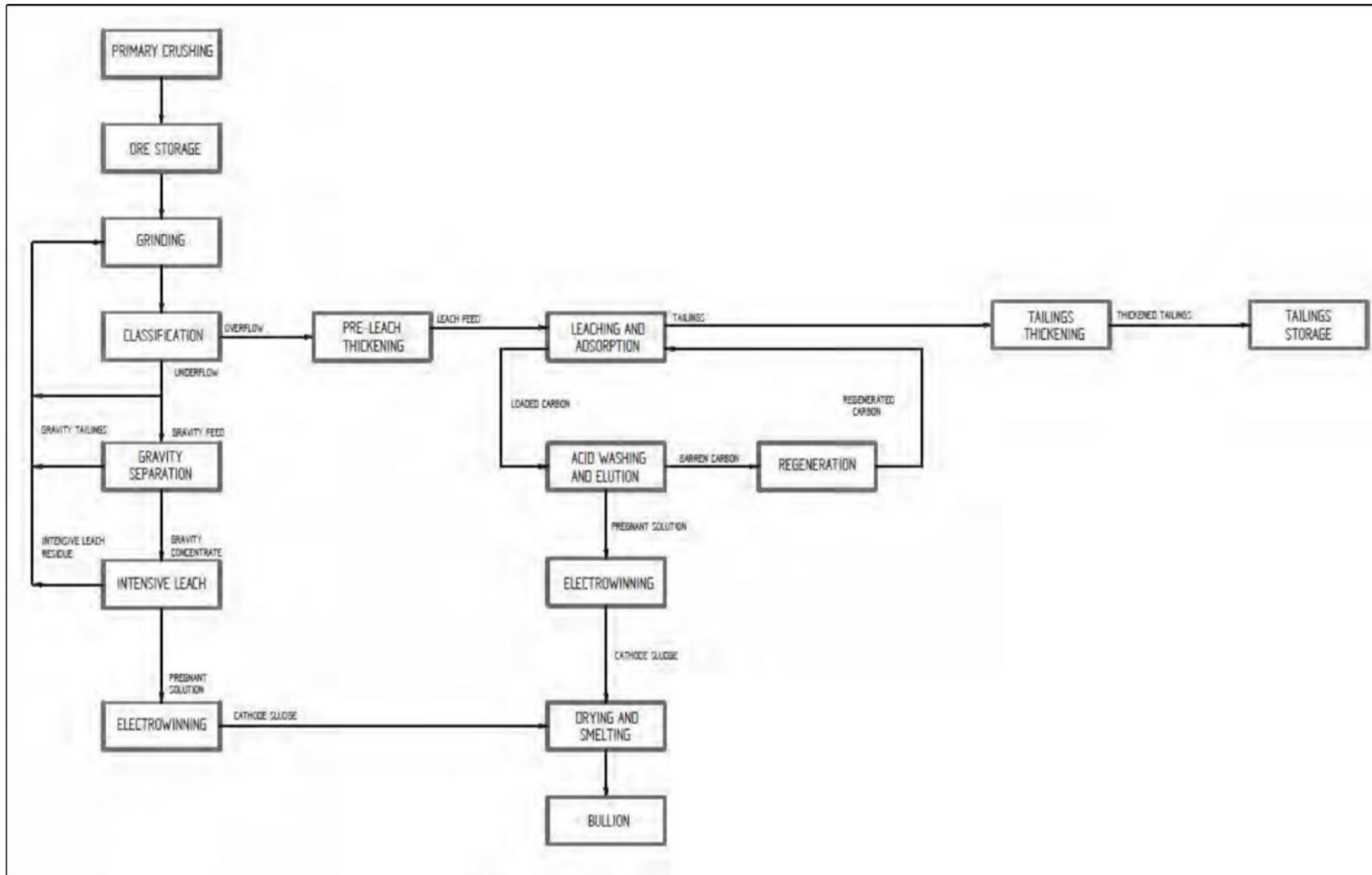


Figure 1: Processing Plant Flow Diagram

Processing Plant

Crushing, Conveying and Stockpiles

ROM ore is trucked from the mine to an earthen ROM pad and tipped directly into the primary crusher dump pocket or stockpiled on the ROM pad for reclaim at a later stage by front end loader. Any oversize material fed into the dump pocket is fragmented by a fixed rock breaker to permit it to pass into the primary crusher.

A self-cleaning magnet located at the crusher discharge conveyor head chute removes magnetic tramp metal from the ore stream and discharges it into a tramp metal bin. The stockpile feed conveyor discharges onto the open air coarse ore stockpile.

Crushed ore is reclaimed from the crushed ore stockpile via three apron feeders under the stockpile discharging ore onto the mill feed conveyor which runs within the tunnel beneath the stockpile. The mill feed conveyor feeds the grinding circuit.

Grinding and Classification

Two 600 tonne lime silos, each fitted with a variable and fixed speed drive weighing screw feeders, doses lime onto the mill feed conveyor to provide protective alkalinity in the leaching and adsorption circuit.

The mill feed conveyor transports crushed ore to the two stage grinding circuit. The first stage is a grate discharge SAG mill in open circuit with pebble crushing and the second stage is an overflow discharge ball mill in closed circuit.

Gravity Recovery

The gravity circuit consists of four centrifugal concentrators treating a portion of the ball mill discharge stream. Gravity concentrate is leached intensively using a vendor supplied reactor to yield a pregnant solution from which precious metals is recovered by electrowinning.

The gravity concentrators operate in a staggered pattern so that while one unit is flushing the other units are collecting concentrate. The tailings from the gravity concentrators return to the combined mill discharge hopper.

Concentrate from the gravity concentrators discharges to the intensive leach reactor. The batch leach process is initiated on a daily basis. After leaching, the residue is returned to the mill discharge hopper by a centrifugal slurry pump and the pregnant solution is forwarded to electrowinning located in the gold room.

Electrowinning is carried out in a dedicated electrowinning cell. The cathodes are stainless steel and the precious metal precipitate is removed by washing the loaded cathodes in a cathode washing station and filtering the resulting sludge. The filter cake is dried in an oven and then combined with fluxes and smelted to produce gold doré.

Leaching and Adsorption

After screening to remove trash, the cyclone overflow from the grinding circuit is thickened and then leached with cyanide in a hybrid CIL circuit that consists of a single stage of leaching and six stages of leaching and adsorption. The total nominal pulp residence time in the hybrid CIL is 24 hours.

The cyclone overflow from the grinding circuit gravitates to two of three duty trash screens to remove trash after which it is dosed with flocculant and thickened in the 38 metre (m) diameter high rate thickener to 50% solids weight per weight (w/w). The thickener underflow is pumped by centrifugal slurry pumps to the CIL tanks. The thickener overflow gravitates to the process water pond via a sedimentation pond.

The leaching and adsorption circuit consists of a single 5,000 m³ leaching tank and six 4,200 m³ CIL tanks. Cyanide is stage dosed into the discharge of the leach tank and the first CIL tank

as required. Oxygen is injected down the agitator shaft of the leach tank and the first two CIL tanks as required.

Tailings Disposal

Final tailings from the leaching and adsorption circuit is screened to recover carbon fines and then thickened prior to being pumped to the TSF. The tailings from the leaching and adsorption circuit gravitates to two of three duty tailing screens. Tailings screen oversize (predominately carbon fines) is collected into carbon bags for subsequent treatment. Tailings screen undersize gravitates to the tailings thickener.

Tailings thickener underflow is pumped by one of two centrifugal slurry pumps arranged in a duty/standby configuration into a tailings distribution box. The contents of the tailings distribution box gravity discharges into one of two tailings hoppers each arranged in a duty/standby configuration. Each tailings hopper has a two-stage pumping system to pump the tailings slurry to the TSF. Decant return from the TSF is returned to the process water pond via a sedimentation pond.

TSF

A purpose built Integrated Waste Landform (IWL) (i.e. a TSF built within a Waste Rock Landform) has been constructed to store tailings from the processing plant. The IWL is located immediately east of the pit and north-east of the processing plant.

TSF Design

The total design storage capacity is 61,940,000 m³ (92.92 million tonnes) based on an assumed tailings dry density of 1.5 tonnes per m³ and is based on a production rate of 8.2 million tonnes per annum (Mtpa). Table 4 summarises the IWL storage capacity volumes over the life of the Premises.

The IWL TSF is an above ground facility with six stages comprising a starter embankment, then four lifts of 5 m and one lift of 7.2 m from the Stage 1 (starter) crest Reduced Level (RL) 412 m to the final Stage 6 crest RL 439.2 m. The maximum embankment height of Stages 1 and 6 are approximately 13.5 m and 41 m respectively.

Table 4: IWL Storage Capacity Volumes (Construction Completion Report)

Stage	Embankment Crest RL (m)	Storage Area (ha)	Storage Volume (Mm ³)	Cumulative Storage Volume (Mm ³)	Cumulative Storage Capacity (Mt)	Cumulative Storage Life (Years)
1 (Starter)	412.0	203.0	5.94	5.94	8.91	1.1
2	417.0	207.6	8.02	13.96	20.94	2.6
3	422.0	212.8	10.28	24.24	36.36	4.7
4	427.0	218.0	10.53	34.77	52.15	6.8
5	432.0	223.2	10.80	45.56	68.33	8.9
6 (Final)	439.2	230.9	16.06	61.62	92.43	12.2

TSF Operation

Tailings is pumped in the form of slurry from the process plant to the TSF via a large diameter high density polyethylene (HDPE) pipe. At the crest of the embankment the pipe divides into two distribution lines to distribute the tailings around the facility.

Tailings is deposited into the TSF, sub-aerially from a slurry ring, located on the perimeter embankment of the facility. Spigots or discharge locations are 60 m apart and comprise spigot off-take and valve assemblies discharging into conductor pipes to deliver tailings to the beach level. Tailings deposition is carried out such that the supernatant pond is maintained around the central decant structure and away from the perimeter embankments. This allows water from the TSF to be removed from the TSF via an independent decant pump located within the central decant tower and pumped back to the processing plant.

Category 12 – Screening etc. of material

A mobile crushing and screening plant (MCSP) is located at borrow pits at the TSF. The MCSP produces aggregate for haul roads, laydown yards and compounds on an as needs basis. The MCSP has a processing ability of 90-200 tonnes per hour, a feeding size of 480-750 millimetres (mm) and produces an outlet size of 65-200 mm.

Category 54 – Sewage facility

The Licence Holder operates two WWTPs at the Premises, the Miner's accommodation village WWTP (200 m³/day) and the WWTP at the process plant (25 m³/day).

Wastewater is collected via buried piping into suitably located pump pits and pumped to the balance tank at the WWTPs. The WWTPs consist of a balance tank and moving bed bioreactor/s with waste streams directed to a sludge tank and a treated effluent tank. The treated effluent tank discharges by pump to a spray field for irrigation.

Effluent from the WWTPs is treated to a secondary level of treatment (Category C) in accordance with *NWQMS, 1997* and to comply with a Low Exposure Risk Level (level of human contact) in accordance with *DoH, 2011*, with effluent achieving the specifications detailed in Table 5.

Table 5: Effluent specifications

Analyte	Units	Miner's accommodation village WWTP	Process plant WWTP
Biochemical Oxygen Demand	mg/L	<20	<20
Total Suspended Solids	mg/L	<30	<10
Total Nitrogen	mg/L	<40	<30
Total Phosphorus	mg/L	<5	<8
Turbidity	NTU	<5	<5
Chlorine Residual	mg/L	>0.2-2	>0.2-2
pH	pH units	6.5-8.5	6.5-8.5
<i>E.coli</i>	cfu/100mL	<10	<10

The process for both WWTPs is as follows:

- Macerated sewage is pumped into the influent screen from the toilet facilities (at the Miner's accommodation village and inside the mill and processing area). The influent screen removes suspended solid matter greater than 2 mm in size. Solid matter removed from the influent screen is discharged via a chute to a solids bin below. Screened sewage passes through the influent screen and flows by gravity into the balance tank.
- The balance tank receives mixed liquor return and recycle activated sludge from the bioreactor. The balance tank has an influent mixing pump to mix the wastewater inside the balance tank to ensure the wastewater is homogenous before pumping to the bioreactor.
- An influent feed pump supplies screened, mixed sewage and mixed liquor suspended solids to the bioreactor. The bioreactor serves as the primary unit for bulk organic (chemical oxygen demand and biochemical oxygen demand) and nitrogen removal, via anoxic and aerobic digestion.
- The screened, mixed sewage and mixed liquor suspended solids from the balance tank is pumped to the aerobic tank where it is aerated. Air is introduced into the aerobic tank by aeration blowers.
- The clarifier tank is inside the bioreactor. The clarifier removes heavier solids by means of settlement and separation from the liquid phase. The hopper bottom channels the sediment to the centre of the clarifier tank before the sediment is returned to the balance tank as recycle activated sludge or the sludge tank as waste activated sludge and is controlled by timer.
- The tertiary chlorination system comprises a recirculation pump, which circulates the contents of the treated effluent tank on a continuous basis. Treated water is delivered to the irrigation spray field via the treated effluent distribution pump set.

Category 64 – Class II putrescible landfill site

A Class II unlined landfill at the Premises accepts all putrescible, inert waste type 1 (bricks and concrete) and inert waste type 2 (tyres and cleaned ammonium nitrate bags) in accordance with the *Landfill Waste Classification and Waste Definitions, 1996* and has a design capacity of 1,800 tonnes per annum (tpa).

The landfill facility is a trench design, consisting of multiple cells created within a larger 250 m x 150 m landfill area. Each cell is approximately 30 m long by 10 m wide by 4 m deep. The design length of 30 m incorporates a ramp down into the trench where waste can be deposited and then compacted prior to more waste being deposited. Each cell is surrounded by an earthen bund of approximately 1 m in height.

Tyres (approximately 90 tpa) are directly landfilled, and no more than 100 tyres are stored at the Premises at any one time. Ammonium nitrate bags (approximately 14 tpa) contain prill and the bags are shaken out to ensure no prill remains within the bags.

Pallets are currently stored within a designated cell with a 2 m high earthen perimeter bund. The pallets are burned on a monthly basis for training purposes. Fire control measures are in place such as fast response vehicles; and water trucks are in place when burning occurs.

Category 73 – Bulk storage of chemicals, etc.

Table 6 outlines the bulk storage of chemicals needed to operate the Premises.

Table 6: Bulk storage of chemicals

Fuel type	Purpose	Storage infrastructure and location
Diesel	Refuelling heavy and light fleet vehicles	6 x 110 kL self bunded storage tanks located directly north of the power station
Oil	Equipment and maintenance purposes	7 x 10 kL self bunded storage tanks located within the mining area workshops

Fuel is delivered to the Premises by tanker trucks and stored in self bunded tanks compliant with AS 1940-2004 *“The storage and handling of flammable and combustible liquids”*. The fuel bowser and delivery inlets are situated on a concrete pad draining to a sump to contain any rain water or fuel spillage, which is then pumped to the washdown bay oil water separator (OWS) for treatment prior to discharge to the environment or on-site use (i.e. dust suppression).

Potentially contaminated stormwater generated at the Power Station, (which is excluded from the Premises - refer to section 4.3) is treated by the OWS system at the Power Station (to less than 5 mg/L) prior to being pumped to the Premises for further treatment at the OWS located at the Bulk Diesel Storage area. From the OWS at the Bulk Diesel Storage area the treated oily water is pumped via a sub-surface pipeline to the tailings hopper where it is mixed with process tailings and discharged to the TSF.

4.2 Infrastructure

The Premises infrastructure, as it relates to Category 5, 12, 54, 64 and 73 activities, is detailed in Table 7 with reference to the site layout (Figures 2, 3, 4 and 5).

Table 7: Premises infrastructure

	Infrastructure	Site Plan Reference
	Prescribed Activity Category 5	
	Mining using conventional drill, blast, load and haul open pit mining methods. The CIL processing facility is designed to process up to 7.5 Mtpa of Gruyere fresh ore and up to 8.8 Mtpa of oxide ore. Tailings is thickened and disposed of to an above ground TSF. The TSF has a perimeter underdrain and an underdrainage network around the central decant which reports to a seepage recovery sump.	
1	ROM pad and coarse ore stockpile	As shown in Figure 3 – ROM Pad; and Figure 4 - Ore Storage - Stockpile
2	Primary Crushing Plant (open circuit gyratory crusher)	As shown in Figures 2 - Processing Plant, Grinding Media, Crusher & Feed Conveyor and Primary Crushing Station; Figure 3 - Processing Plant; and Figure 4 - Pre-Leach Thickener and Tailings Thickener
3	Two stage grinding circuit (SAG milling with pebble crushing and ball milling)	
4	Gravity recovery circuit with intensive leach and dedicated electrowinning	
5	Leaching and Adsorption (Hybrid CIL circuit that consists of a single stage of leaching and six stages of leaching and adsorption)	

	Infrastructure	Site Plan Reference
6	Thickening	
7	Smelting	
8	Carbon regeneration	
9	Above ground TSF – waste fines slurry pipeline, perimeter embankment, cut-off trench, decant tower, decant return pipeline, seepage recovery sump, perimeter underdrain, underdrainage network and perimeter surface water diversion structure	As shown in Figure 2 – TSF; and Figure 3 - TSF and TSF decant
10	Processing reagents (carbon, flocculant, hydrochloric acid, sodium cyanide, sodium hydroxide, smelting fluxes and quicklime)	As shown in Figure 2 – Reagents Store; and Figures 3 and 4 - Reagent Storage, Acid Storage and Cyanide Storage
11	Containment ponds (HDPE lined process water pond and a sedimentation pond)	As shown in Figures 3 and 4 - Process Water Pond, Raw Water Pond and Site Drainage Pond
Prescribed Activity Category 12		
A MCSP is located at the Premises to produce aggregate for haul roads, laydown yards and compounds on an as needs basis.		
1	MCSP	Not shown, but located within the TSF footprint (Figure 2 – TSF)
Prescribed Activity Category 54		
Wastewater from the Premises ablutions (i.e. Miner’s accommodation village area and process plant area) are treated in two modular WWTPs before being discharged to dedicated spray fields.		
Miner’s accommodation village WWTP		
1	Pump pits with duty/standby macerating pumps, control panel and alarms	Not shown, but refer to Figure 2 - WWTP and Turkeys Nest; and Spray field for location
2	Influent screen	
3	Influent feed pump	
4	3 x 55 kL modular fiberglass bioreactor	
5	250 kL balance tank	
6	50 kL sludge tank	
7	250 kL treated effluent tank	
8	2 ha spray field with above ground sprinkler arrangement	

	Infrastructure	Site Plan Reference
9	Fencing around the boundary of the WWTP and spray field	
Process plant WWTP		
1	Pump pits with duty/standby macerating pumps, control panel and alarms	Not shown, but refer to Figure 2 – WWTP and Sprayfield; and Figure 3 – WWTP
2	Influent screen	
3	Influent feed pump	
4	Moving bed reactor	
5	32 kL balance tank	
6	9 kL sludge tank	
7	32 kL treated effluent tank	
8	2 ha spray field with above ground sprinkler arrangement	
9	Fencing around the boundary of the WWTP and spray field	
Prescribed Activity Category 64		
All putrescible, inert waste type 1 (bricks and concrete) and inert waste type 2 (tyres and cleaned ammonium nitrate bags) are disposed of at the Class II unlined landfill facility. The landfill has a capacity of 1,800 tpa.		
Landfill facility		
1	Fencing around the boundary	Not shown, but refer to Figure 2 - Landfill for location
2	Signage	
3	Firebreak at least 3 m in width around the boundary of the facility	
Landfill trench		
1	250 m x 150 m landfill area	As shown in Figure 2 - Landfill
2	Each cell approximately 30 m long x 10 m wide x 4 m deep, surrounded by an earthen bund of 1 m in height at surface level	
3	Length of 30 m which incorporates a ramp down into the trench	
Designated palette cell		
1	Located within landfill facility	Not shown, but refer to Figure 2 - Landfill for location
2	Surrounded by a 2 m earthen perimeter bund	

	Infrastructure	Site Plan Reference
Waste Rock Landform		
1	For the disposal of Inert Waste Type 2 (tyres and cleaned ammonium nitrate bags only)	As shown in Figure 5 – Waste Rock Landform
Prescribed Activity Category 73		
The Premises includes bulk storage of acids, alkalis and chemicals that contain at least one carbon to carbon bond and are liquid at standard temperature and pressure at various locations around the Premises.		
1	6 x 110 kL (~600 m ³ total capacity) self bunded diesel storage tanks for refuelling of light and heavy vehicles located directly north of the power station	As shown in Figure 4 - Bulk Diesel Storage
2	7 x 10 kL (~60 m ³ total capacity) self bunded oil storage tanks (total capacity 70 kL)	As shown in Figure 5 - Workshop
3	<p>Various ore processing reagents, including:</p> <ul style="list-style-type: none"> • hydrochloric acid (70 m³); • sodium cyanide (734 m³); and • sodium hydroxide (30 m³). <p>Processing reagents are stored in a designated reagents shed or bulk storage units.</p>	As shown in Figure 2 – Reagents Store; and Figures 3 and 4 - Reagent Storage, Acid Storage and Cyanide Storage
Other activities		
1	OWS	Not shown, but refer to Figure 4 – Bulk Diesel Storage for location
2	Washdown facility	Location not shown
3	Workshops	As shown in Figure 5 – Workshop

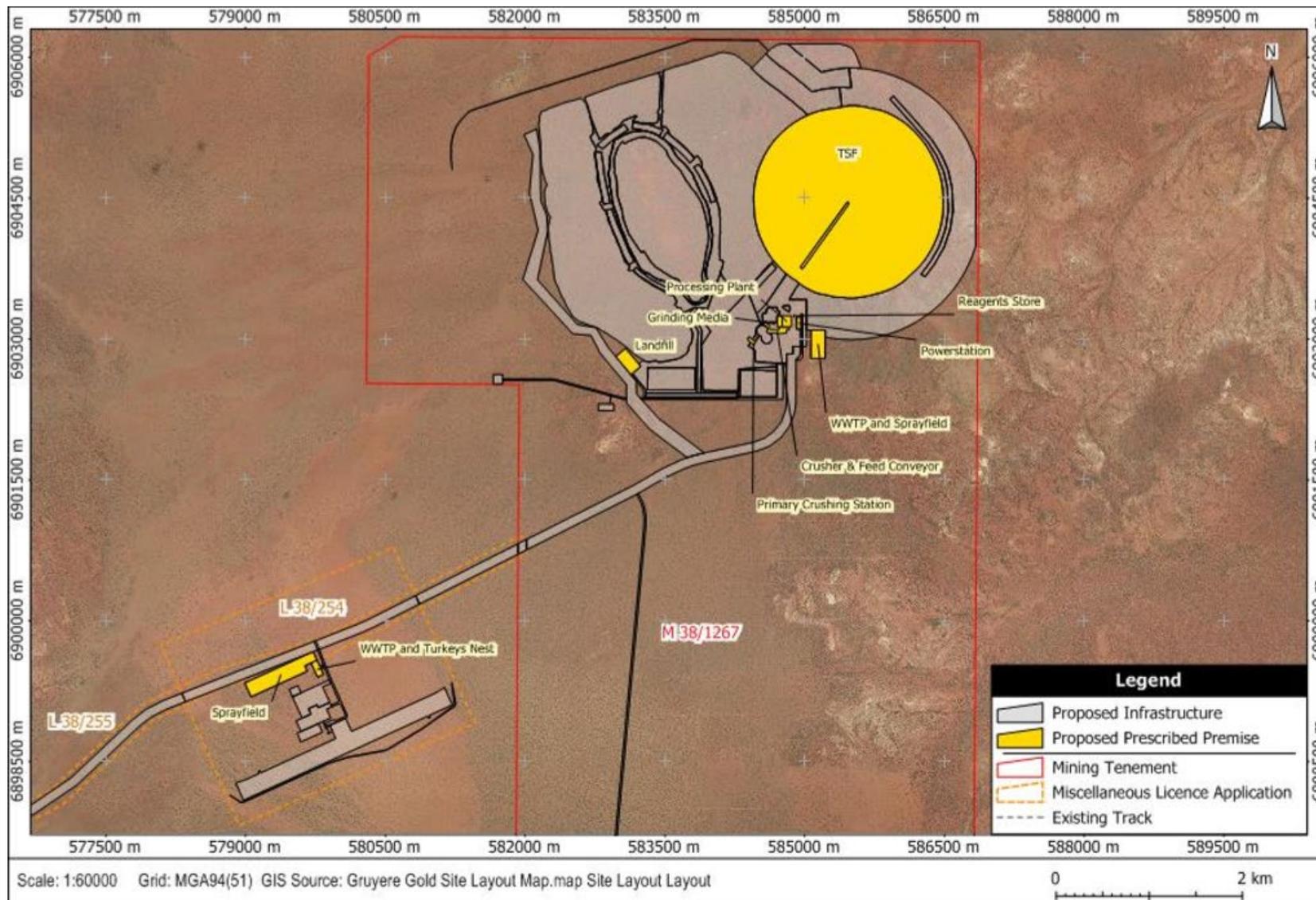


Figure 2: Site layout 1

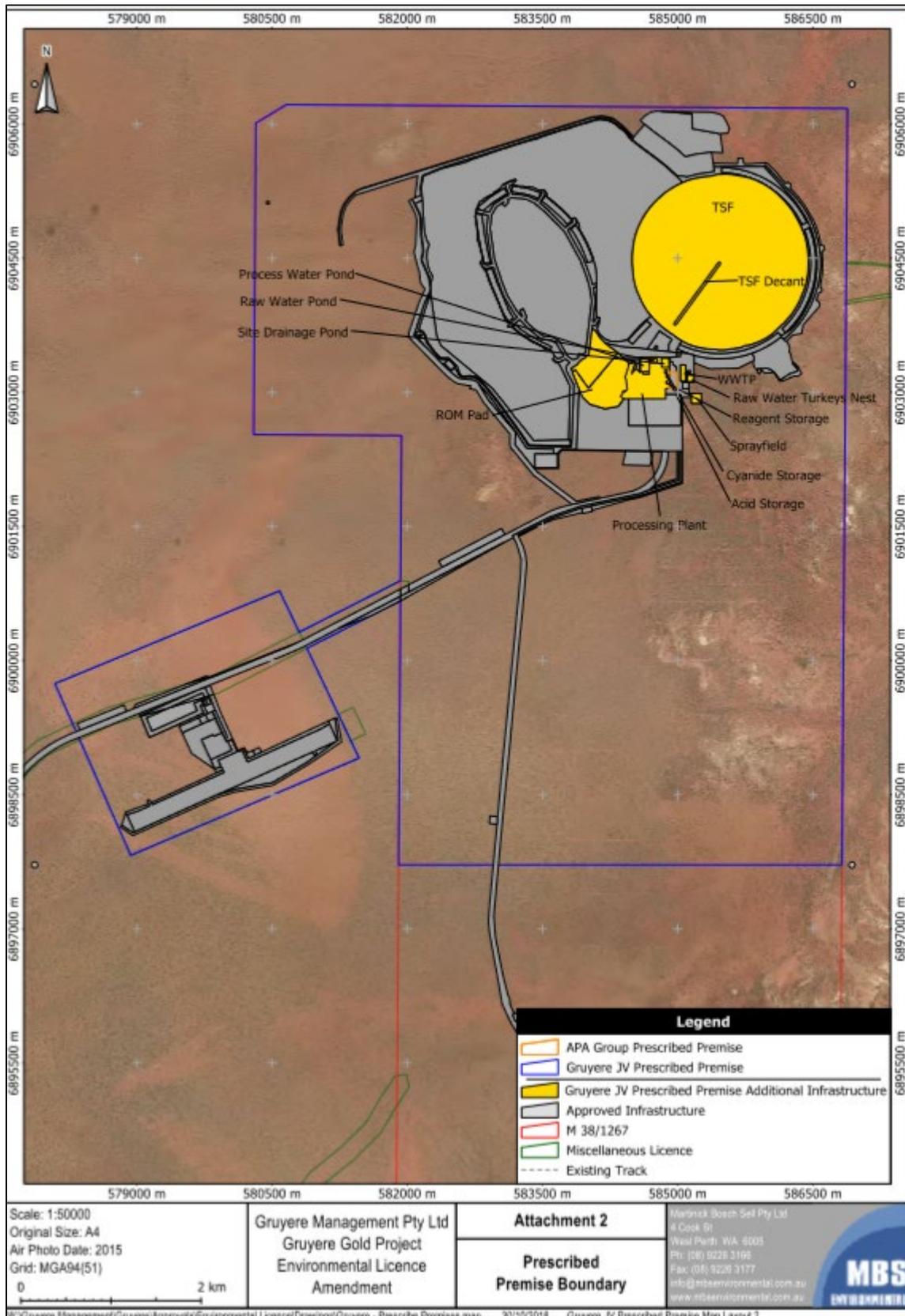


Figure 3: Site layout 2

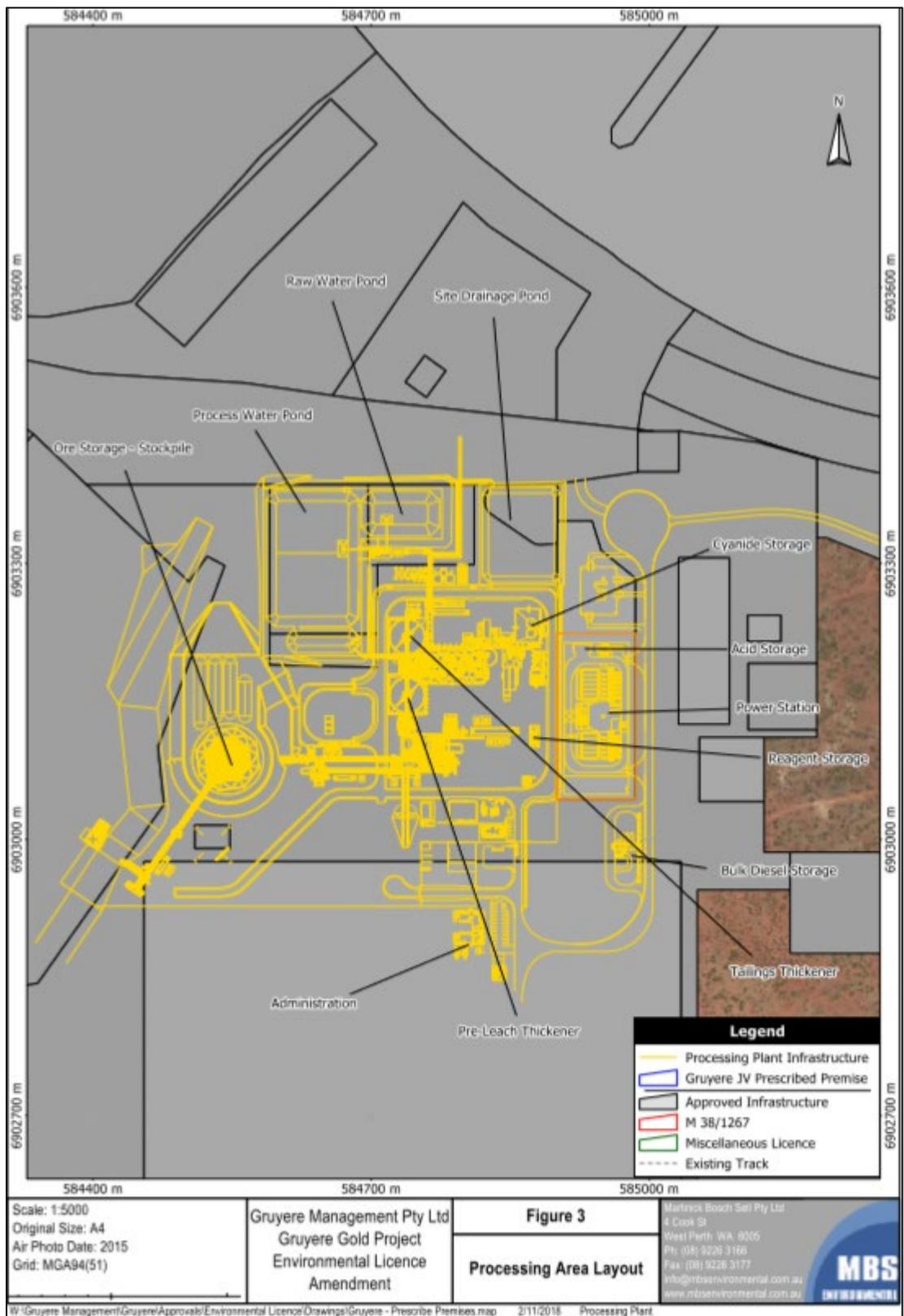


Figure 4: Site layout 3

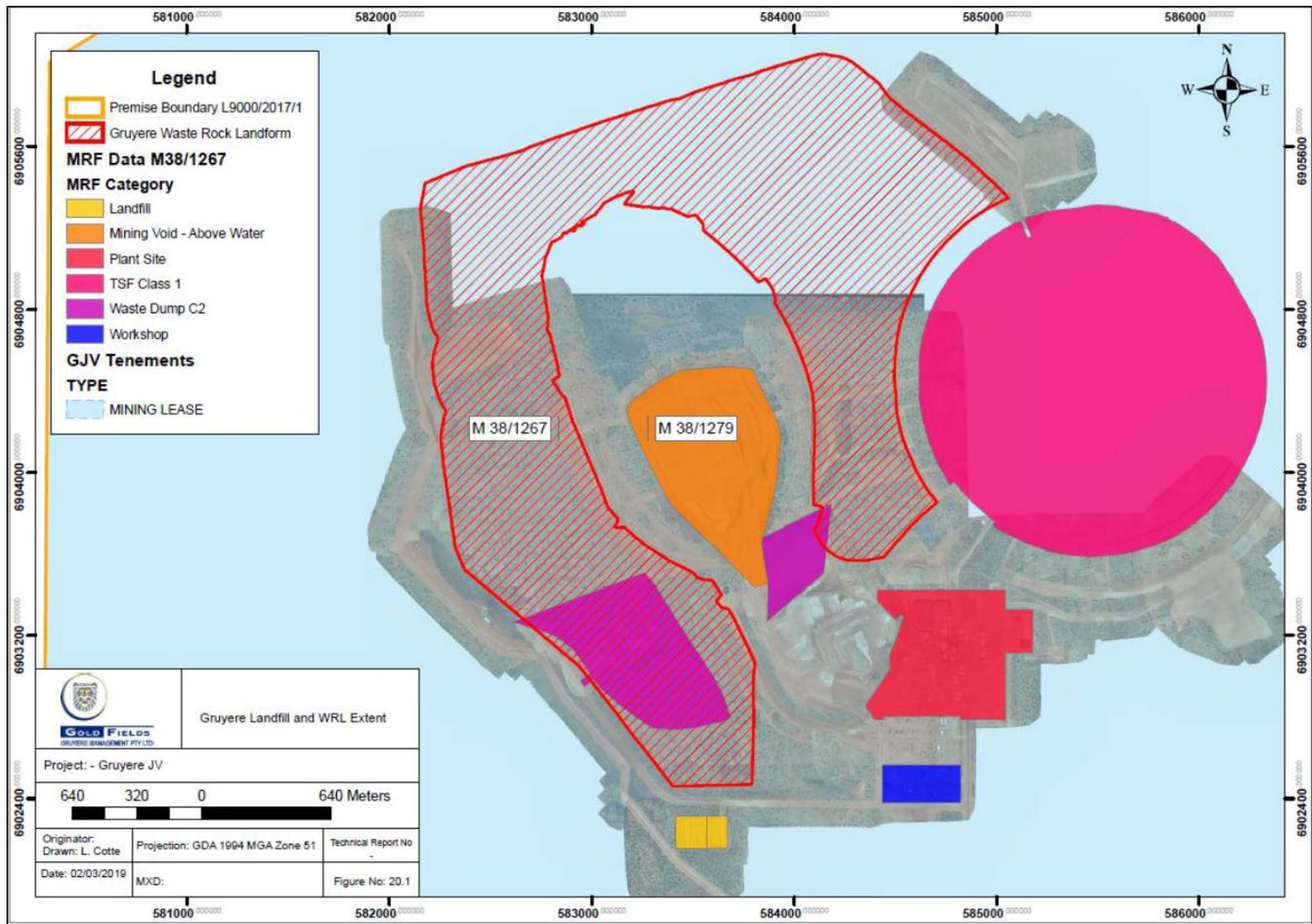


Figure 5: Site layout 4

4.3 Exclusions to the Premises

The following activities/infrastructure are occurring/located at the Premises which are not within the scope of this assessment:

- Mining ore from open pits.
- Abstraction of groundwater. This activity is regulated under the *Rights in Water and Irrigation Act 1914* (RiWI Act).
- Mine dewatering. This activity is not regulated by DWER as it does not trigger category 6 under the EP Regulations because the mine dewater is not discharged to the environment, but rather stored on-site for use in the process plant.
- 44 megawatt Gruyere Power Station, is operated by APA Power Holdings Pty Ltd under Licence L9153/2018/1 (granted on 23 August 2018). The location of the Gruyere Power Station has been excised from the Premises.
- Treated effluent from the WWTPs may be used for dust suppression on-site. This activity is not regulated by DWER and the Licence Holder requires approval from the Department of Health prior to this occurring.
- Reverse Osmosis (RO) plant to treat approximately 1.2 million litres per day (ML/day) of slightly saline water (approximately 5,000 mg/L Total Dissolved Solids (TDS)) from the Anne Beadell borefield. Approximately 480 m³ of brine is produced by the RO plant each day, which is pumped to the process water pond. Permeate is pumped to the four potable water storage tanks. This activity is not regulated by DWER, however the brine pipelines and the process water pond may be regulated by DWER.
- Bioremediation pad. As this facility does not receive liquid waste from other Premises, it does not trigger category 61 under the EP Regulations. The Licence Holder should note that the discharge of hydrocarbons to the environment is an unauthorised discharge under the *Environmental Protection (Unauthorised Discharges) Regulations 2004* and the facility should be operated to comply with the *Assessment and management of contaminated sites* and the *ASC NEPM*.
- Laboratory.
- Laydown and storage areas.
- Offices.
- Airstrip.
- Borefields.
- Explosives magazine.
- Borrow pits and stockpiles.
- Roads and parking areas.
- Communication facilities (telephone, radio, internet).
- Access roads and tracks.

5. Legislative context

Table 8 summarises approvals relevant to the assessment.

Table 8: Relevant approvals

Legislation	Number	Subsidiary	Approval
RiWI Act	GWL176189 and GWL177087	Gruyere Management Pty Ltd	Groundwater abstraction activities
<i>Mining Act 1978</i>	REG ID: 73852	Gruyere Management Pty Ltd	The Licence Holder has stated (Gruyere, 2019a) that a Pro-Forma will be submitted to the Department of Mines, Industry Regulation and Safety regarding the change to stage 2 – 6 of the TSF Mining Proposal Gruyere Gold Project (Version 6) Gruyere Gold Mine, Anne Beadell and Yeo Borefields
	REG ID: 71094	Gruyere Management Pty Ltd	Mining Proposal Gruyere Project Gruyere Gold Mine, Anne Beadell and Yeo Borefields
	REG ID: 69619	Gruyere Management Pty Ltd	Gruyere gold Mine, Anne Beadell and Yeo Borefields Mining Proposal – Part 1
	REG ID: 67934	Gruyere Management Pty Ltd	Gruyere Gold and Anne Beadell Borefield Mining Proposal
	REG ID: 63733	Gold Road Resources Limited	Part 1 – Stage 2 Mining Proposal Gruyere Gold Project

5.1 Part IV of the EP Act

5.1.1 Background

Gold Road Resources Limited referred a proposal to the Environmental Protection Authority (EPA) on 2 March 2016 to develop the Gruyere Gold Project. On 15 June 2016 the EPA set the level of assessment at Assessment on Proponent Information – Category A (API – A). The API document was reviewed by the EPA and the Report and Recommendations of the EPA (*Report Number 1587*) were released to the Minister for Environment (Minister) on 16 November 2016. Ministerial Statement (MS) 1048 granting approval for the project to be implemented was signed by the Minister on 29 December 2016.

On 24 August 2016 the EPA gave authorisation under section 41A(3) of the EP Act to Gold Road Resources Limited for the minor or preliminary works (Stage 1) for the construction of an accommodation camp, a WWTP with spray field, a turkey's nest dam, a temporary RO plant and an access road from the accommodation camp to the T-junction (located near the spray

field) in addition to an access road from the T-junction to the mining lease.

5.1.2 Report Number 1587

The Minister's decision that the proposal may be implemented subject to conditions was informed by an EPA assessment (Assessment Number 2083), which produced *Report Number 1587*. In its assessment the EPA determined that the following were key environmental factors relating to the proposal:

- **Subterranean Fauna** – potential impacts on stygofauna habitat and species from the abstraction of groundwater from the Yeo and Anne Beadell borefields for production water, noting that abstraction of groundwater would be from the aquifer lying beneath the calcrete habitat of the stygofauna; and
- **Flora and Vegetation** – direct impacts from the clearing of 2,260 ha of flora and vegetation within the development envelopes.

5.1.3 MS 1048

MS 1048 for the proposal to develop a below water table gold deposit and associated infrastructure at the Gruyere Gold Project was signed by the Minister on 29 December 2016 and has conditions (6-1 to 6-7) requiring Gold Road Resources Limited to prepare, submit and implement a Management-based Condition Environmental Management Plan with the objective of maintaining the biodiversity and ecological integrity of subterranean fauna in the Yeo Palaeochannel.

A change to the proposal approved under section 45C of the EP Act (associated with clearing and groundwater dewatering and abstraction) was signed on 4 September 2017 by the Chairman of the EPA.

A change to the proposal approved under section 45C of the EP Act (associated with an increase in the development envelope) was signed on 18 April 2018 by the Chairman of the EPA.

5.2 Part V of the EP Act

5.2.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

The guideline and guidance statements which inform this assessment are:

- *Guideline: Decision Making (June 2019);*
- *Guidance Statement: Regulatory Principles (July 2015);*
- *Guidance Statement: Setting Conditions (October 2015);*
- *Guidance Statement: Risk Assessments (February 2017);* and
- *Guidance Statement: Environmental Siting (November 2016).*

5.2.2 Works approval and licence history

Table 9 summarises the works approval and licence history for the Premises.

Table 9: Works approval and licence history

Instrument	Issued	Nature and extent of works approval, licence or amendment
W5997/2016/1	6/01/2017	New works approval for category 54 WWTP at the Miner's accommodation village.
W6002/2016/1	3/02/2017	New works approval for category 5 (gold processing plant and TSF), category 52 (power station), category 64 (landfill), category 73 (bulk fuel facility) and category 85 (sewage facility).
W5997/2016/1 and W6002/2016/1	4/04/2017	Transfer of works approvals from Gold Road Resources Pty Limited to Gruyere Management Pty Ltd.
L9000/2016/1	4/08/2017	New licence for a category 54 WWTP at the Miner's accommodation village, constructed under W5997/2016/1.
L9000/2016/1	19/10/2017	Amendment Notice 1 Licence amendment to include the category 64 landfill constructed under W6002/2016/1.
L9000/2016/1	12/03/2018	Amendment Notice 2 Licence amendment to include category 12 for the MCSP.
W6002/2016/1	5/07/2018	Works approval amendment to update TSF design and location of ambient groundwater monitoring bores.
L9000/2016/1	27/08/2018	Amendment Notice 3 Licence amendment to excise the location of the Gruyere Power Station (category 52) from the existing prescribed premises boundary. The Gruyere Power Station is operated by APA Power Holdings Pty Ltd under Licence L9153/2018/1.
L9000/2016/1	5/04/2019	Amendment Notice 4 Licence amendment to increase the capacity of category 64 from 1,400 tpa to 1,800 tpa and to include inert waste type 2 as a waste type to be accepted in the landfill
L9000/2016/1	24/07/2019	Licence amendment (and amendment notices consolidation) to include category 5 (process plant and TSF); category 73 (bulk fuel facility); and increase the design capacity of category 54 with the inclusion of the process plant WWTP.

5.2.3 Clearing

The clearing of native vegetation is not approved under the Revised Licence. The clearing of no more than 2,938 ha (which includes up to 15 ha of the groundwater dependent ecosystem DD-MWS1) within the 19,931 ha development envelope has been authorised under MS 1048.

6. Consultation

The original Licence application was advertised in the West Australian on 21 November 2016 for a 21 day public comment period. No comments were received.

7. Location and siting

7.1 Siting context

The Premises is located approximately 80 km east of Cosmo Newbery and 150 km north-east of Laverton in Western Australia as shown in Figure 6. The Premises is located on the Yamarna Pastoral Lease, which is operated by the Licence Holder. Yamarna Station is in the process of being de-stocked and will be rested to improve the grazing rangeland capability.

The workforce for the Premises is housed at the Miner's accommodation village located approximately 6 km south-west of the processing plant and TSF. As the Miner's accommodation village is operated by the Licence Holder, it will not be considered a sensitive land use or receptor.

7.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 10. The closest residential area to the Premises is Cosmo Newbery, which has a population of approximately 57 people in 2016 (2016 Census Quickstats).

Table 10: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Closest residential zoned premises (zoned settlement Shire of Laverton Planning Scheme No. 2)	The residential area of Cosmo Newbery is approximately 92 km to the west of the processing plant.

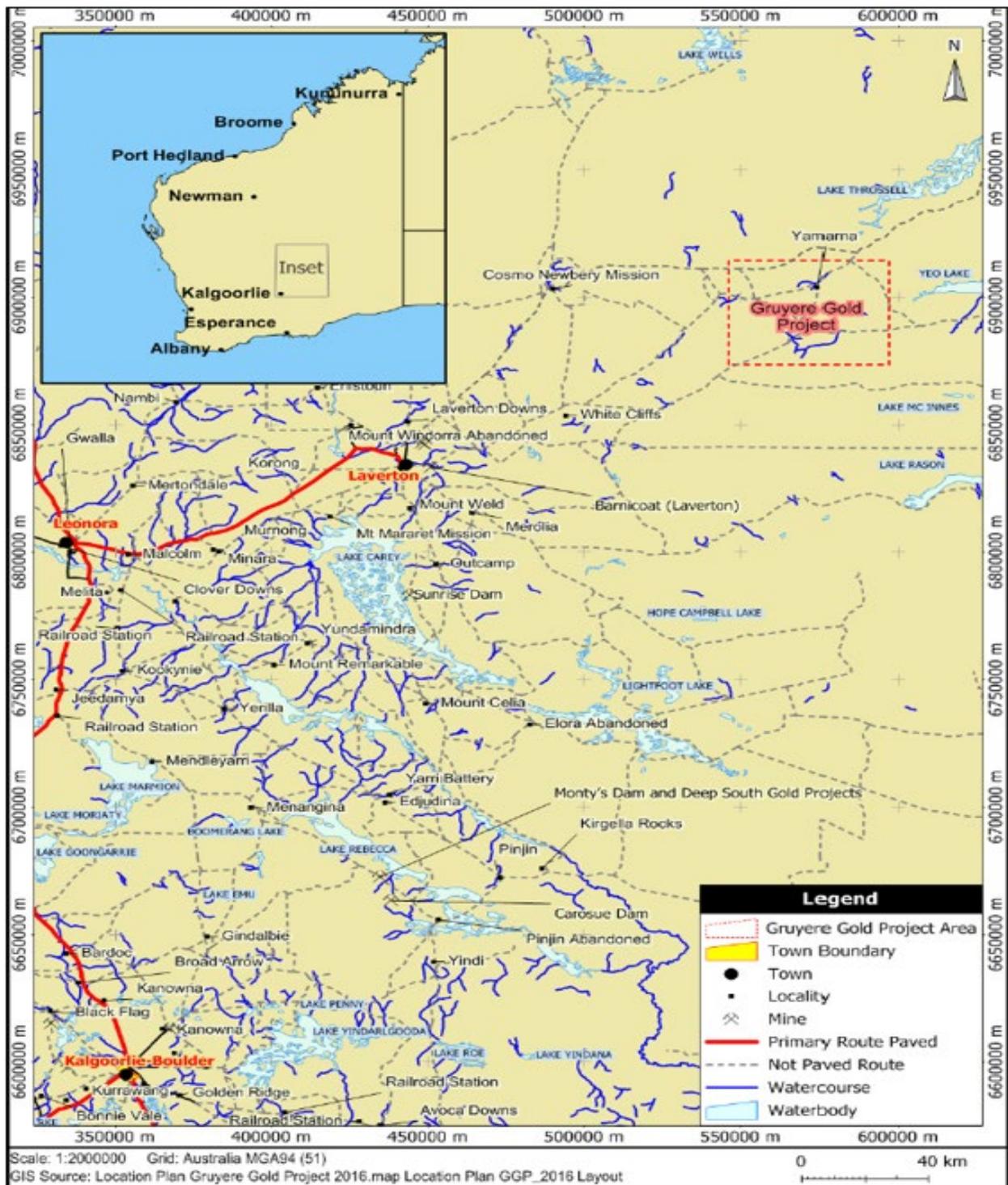


Figure 6: Regional location

7.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are shown in Table 11. Table 11 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem.

The table has also been modified to align with the *Guidance Statement: Environmental Siting*.

Table 11: Environmental values

Specified ecosystems	Distance from the Premises
Ramsar Sites in Western Australia	Lake Ballard is greater than 30 km to the south-west of the TSF.
Department of Biodiversity, Conservation and Attractions Managed Lands and Waters	Yeo Lake Nature Reserve boundary is located approximately 12 km east of the processing plant.
Threatened Ecological Communities and Priority Ecological Communities	There are no Threatened Ecological Communities or Priority Ecological Communities within or in a 30 km radius of the Premises.
Declared Rare Flora	There are no Declared Rare Flora within or in a 30 km radius of the Premises.
Biological component	Distance from the Premises
Threatened/Priority Flora	Two Priority Flora taxa <i>Calytrix warburtonensis</i> (Priority 2) and <i>Thryptomene nealensis</i> (Priority 3) were identified within M38/1267. Neither of these species has been identified in areas of proposed disturbance (Gold Road, 2016a).
Threatened/Priority Fauna	Database searches identified 21 species of conservation significance that have the potential to occur within the project area. Of these 21 species only two (Rainbow Bee-eater and Southern Marsupial Moles) were observed during the surveys. The Rainbow Bee-eater was recorded outside the project footprint and the Southern Marsupial Moles (Priority 4 species) were recorded during the borefield surveys. The Licence Holder has stated that " <i>habitat will be avoided through pipeline alignment and placement of the pipeline on the surface of dunes (with shallow covering) as opposed to a directional cut through the dune</i> " (Gold Road, 2016a).

7.4 Hydrogeology

Gold Road, 2016a states that the geological units in the Gruyere region comprise Archean age basement of the Yilgarn Craton with scattered overlying Permian sedimentary deposits and Cenozoic deposits within the Yeo palaeodrainage.

Groundwater occurs within the Quaternary alluvial and calcrete aquifer, and the thicker confined Werillup Formation. The Perkolilli Shale between the Quaternary and Werillup Formation forms an aquitard between the two aquifers. Table 12 presents a summary of the aquifers present surrounding the Premises.

The nearest aquifer of significance to the Premises is the Yeo Palaeochannel, a calcrete aquifer, located approximately 25 km to the west of the Premises. The Yeo Palaeochannel occurs within the Quaternary Deposits, being approximately 14 m thick. Outside of the Yeo Palaeochannel, other aquifers are present within the weathered profile (saprolite and saprock) and fractured rock bedrock, however these are considered minor in comparison.

Table 12: Summary of aquifer types in the Gruyere region

Aquifer	Geological Unit	Maximum Saturated Thickness (m)	Bore Yield (kL/day)	Aquifer Potential	Water Quality
Palaeovalley					
Alluvial and Calcrete	Quaternary Deposit	14	0 – 500	Low – Moderate	Brackish - Saline
Perkolilli Shale	Perkolilli Shale	29	-	Aquitard	-
Yeo Palaeochannel Aquifer	Werillup Formation	+81	200 – 2,000	High	Saline - Hypersaline
Permian					
Permian	Paterson Formation	+100	-	Low – Moderate	Brackish - Hypersaline
Archean Basement					
Archean Basement	Upper Saprolite	~50	-	Low	Brackish - Saline
	Lower Saprolite	~100	0 – 1,000	Low – Moderate	Brackish - Saline

7.5 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 13.

Table 13: Groundwater and water sources

Groundwater and water sources	Distance from Premises	Environmental value
Public Drinking Water Source Area (PDWSA)	There are no PDWSA within the Premises. The Priority 1 Laverton Water Reserve is approximately 140 km south-west of the TSF.	The Laverton Water Reserve provides potable water to the Laverton Town Water Supply.
Groundwater and groundwater salinity	<p><i>Gold Road, 2016a</i> states that groundwater can be located at an average depth of 65 m below ground level (mbgl). Standing water levels measured in the exploration holes ranged between 30 m to 40 m depth.</p> <p>Recharge occurs via infiltration and through localised drainage systems during large rainfall events.</p> <p>There is a groundwater bore</p>	Groundwater salinity (TDS) is 1,000 – 3,000 mg/L) which is considered brackish (Salinity status classifications).

Groundwater and water sources	Distance from Premises	Environmental value
	located approximately 6 km west of the Premises (based on available GIS dataset – WIN Groundwater Sites).	
RiWI Act	The Premises is located in the Proclaimed Goldfields Groundwater Area.	N/A.
Watercourses	<p>Reetz Creek and Lake Throssell are approximately 15 km to the south and north-east of the Premises respectively.</p> <p>There are a few unnamed, ephemeral and relatively minor watercourses which drain in a generally south-west to north-west direction towards Lake Throssell.</p> <p>According to DWER's GIS dataset there is a Major Tributary, Minor River and Minor Tributary (Watercourse – Minor, Non Perennial) approximately 26 km to the west, 14 km to the north and 25 km to the south-west of the Premises respectively</p>	Unnamed creeks in the regional area are dry throughout the year except during periods of rain activity from seasonal thunderstorms and occasional cyclone remnants.

7.6 Other ecological characteristics

Baseline surveys undertaken for the Premises identified stygofauna populations within the mine site and borefield development envelopes. Within the Yeo Palaeochannel, the Quaternary Detritals aquifer in the Yeo Palaeochannel, which lies within colluvium, alluvium and saturated calcrete, are considered the main habitats for stygofauna. Stygofauna was identified by the EPA as a preliminary factor during the assessment of the Premises in both *Report Number 1587* and *MS 1048* (refer to sections 5.1.2 and 5.1.3).

Key Finding: The Delegated Officer has determined that potential impacts to subterranean fauna from abstraction of groundwater is sufficiently regulated under Part IV of the EP Act.

7.7 Soil type

DWER's GIS dataset identifies the soil in the area to be plains with longitudinal and ring dunes with interdune corridors, plains and occasional salt pans. The chief soils are the red earthy sands (Uc5.21) of the interdune plains and corridors. Associated are the red sands (Uc1.23) of the dunes which may also cover some interdune areas, where they may overlies laterite, or silcrete, or calcrete (kunkar) (Northcote, 1960-68).

7.8 Meteorology

7.8.1 Regional climatic aspects

The Premises is located within the semi-arid zone of Western Australia with mild winters and hot summers (Gold Road, 2016a).

7.8.2 Rainfall and temperature

The Bureau of Meteorology, provides the mean rainfall and maximum temperatures for Laverton (mean maximum temperature 1991-2019 and mean rainfall 1994-2019) as shown in Figure 7. Annual rainfall in the semi-arid zone is highly variable and subject to drought periods. Rainfall is related both to locally generated thunderstorms and to dissipating tropical cyclones tracking south-east (Gold Road, 2016a).

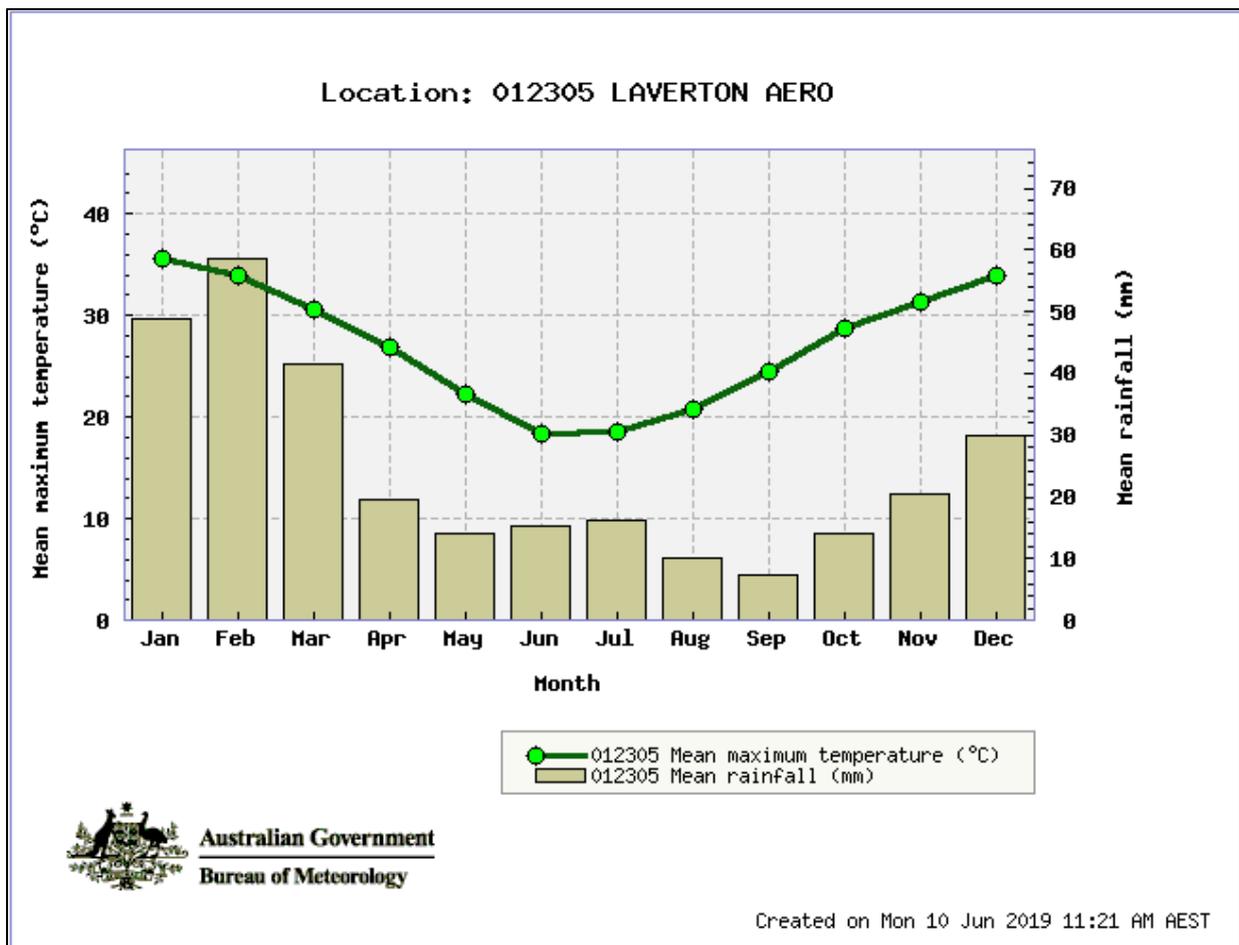


Figure 7: Mean temperatures and rainfall, Laverton Aero

Source: Bureau of Meteorology website www.bom.gov.au

8. Risk assessment

8.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DWER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 14.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Table 14 below.

Table 14: Identification of emissions, pathway and receptors during operation

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Category 5 Processing or beneficiation of metallic or non-metallic ore	Operation of process plant, movement of ore product between these and the stockpiles via conveyors	Dust associated with ore processing, ROM pad, primary crushing, two stage grinding, conveyors and stockpiles	No residences and sensitive land uses within 12 km of the Premises	None	No	No receptor present.
		Flora and vegetation	Air / wind dispersion	Potential suppression of photosynthetic and respiratory functions		The Delegated Officer considers that the natural dust tolerance of vegetation species should prevent vegetation impacts. There are no Declared Rare Flora, Threatened Ecological Communities or Priority Ecological Communities within or in a 30 km radius of the Premises.

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	Wet processing (leach and adsorption, electrowinning and tailings thickening)	Gold processing slurry with cyanide and metals in solution	Terrestrial ecosystems adjacent to where the spillage has occurred	Pipeline failure or tank/bund overflow causing spill to ground	Death or adverse impact to adjacent vegetation Soil contamination	Yes – Refer to section 8.4 Potential to cause soil contamination if spills occur.
	Process water pond	Overtopping or seepage of contaminated water The process water pond will contain TSF return water; pit dewatering; brine from the RO plant; and Yeo Borefield water	Terrestrial ecosystems adjacent to pond	Overflow from process water pond; seepage through liner	Soil and groundwater contamination	Yes – Refer to section 8.5 Potential to cause soil and groundwater contamination if overflows or leaks occur.
	Sedimentation pond	Contaminated water as the sedimentation pond will receive water from the thickener overflow and decant return from the TSF	Terrestrial ecosystems adjacent to pond	Overflow from sedimentation pond; seepage through liner	Soil and groundwater contamination	Yes – Refer to section 8.5 Potential to cause soil and groundwater contamination if overflows or leaks occur.
	Carbon regeneration Smelting	Gaseous and particulate emissions from carbon regeneration kiln and	No residences and sensitive land uses within 12 km of the Premises	Air / wind dispersion	Poor ambient air quality	No No receptor present; potential Occupational Health and Safety risk to workers to be managed under <i>Mines Safety and Inspection Act 1994</i> .

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
		smelting furnace					
	All processing activities	Noise	No residences and sensitive land uses within 12 km of the Premises	Air / wind dispersion	None	No	No receptor present.
		Contaminated stormwater runoff	Drainage lines Riparian vegetation	Stormwater runoff from cleared and operational areas Gravity flow overland	Soil contamination, increase in sedimentation inhibiting vegetation growth and survival	Yes – Refer to section 8.6	Potential impact on water quality and vegetation from increased sedimentation.
		Leaks and spills of ore, hydrocarbons and chemicals	Terrestrial ecosystems adjacent to where the spillage has occurred	Spill to ground or leak, overflow during filling or leak from pipework	Potential contamination of soil due to presence of hydrocarbons / chemicals and heavy metals Temporary loss of habitat	No	The Delegated Officer considers the general provisions of the EP Act, <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i> and <i>Dangerous Goods Safety Act 2004</i> and associated Regulations sufficient in terms of regulatory controls.
	TSF	Tailings overflows from the TSF	Terrestrial ecosystems adjacent to the TSF	Direct discharge to land and infiltration to soil	Soil contamination inhibiting vegetation growth and survival	Yes – Refer to section 8.7	Potential to cause soil contamination if overflows occur.
		Discharge of tailings through TSF embankment failure	Drainage lines in pathway of tailings Soil and vegetation	Direct discharge to land and infiltration to soil	Death or adverse impact to adjacent vegetation Soil contamination	No	Managed by the Department of Mines, Industry Regulation and Safety under the <i>Mining Act 1978</i> .
		Tailings seepage	Adjacent vegetation Soil	Seepage to ground adjacent to the TSF and seepage from	Groundwater mounding Inundation of vegetation rooting	Yes – Refer to section 8.7	Potential to cause groundwater mounding, soil contamination, loss of vegetation and loss of habitat of subterranean fauna.

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
		Subterranean fauna Groundwater	the base of the TSF with infiltration into soils	zone and decrease in quality of habitat of subterranean fauna Soil contamination inhibiting vegetation growth and survival, and health impacts to fauna			
		Dust from surface of TSF containing tailings contaminants	No residences, sensitive land uses or specified ecosystems within 12 km of the Premises	Air / wind dispersion	Potential to be deposited on vegetation and may prevent photosynthesis and plant respiration	No	The Delegated Officer considers that the natural dust tolerance of vegetation species should prevent vegetation impacts. There are no Declared Rare Flora, Threatened Ecological Communities or Priority Ecological Communities within or in a 30 km radius of the Premises.
		Spillage of tailings through leaks, pipeline ruptures or failure	Terrestrial ecosystems adjacent to the process plant, TSF and pipelines	Direct discharge to land and infiltration to soil	Soil contamination inhibiting vegetation growth and survival, and health impacts to fauna	Yes – Refer to section 8.7	Potential for soil contamination through release of tailings slurry/ tailings supernatant.
Category 12 Screening etc. of material	Operation of MCSP	Dust associated with crushing and screening activities	No residences, sensitive land uses or specified ecosystems within 12 km of the Premises	Air / wind dispersion	Health and amenity impacts	No	No receptor present.
		Noise associated with crushing and screening activities			Amenity impacts	No	No receptor present.
		Stormwater runoff from the	Yeo Lake Nature Reserve approximately 12 km from	Stormwater runoff	Soil contamination inhibiting vegetation	No	The Delegated has considered the following: <ul style="list-style-type: none"> The MCSP is located within the TSF

Risk Events					Continue to detailed risk assessment	Reasoning
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
		MCSP area	the Plant Soil and surface water drainage		growth and survival	footprint; <ul style="list-style-type: none"> The TSF has a 2-3 m in depth diversion drain that runs along its eastern edge. Stormwater is diverted to this diversion drain (Gruyere JV, 2018); and There are no watercourses in the vicinity of the MCSP and the Yeo Lake Nature Reserve is 12 km away. Based on the above, the impact from stormwater runoff at the MCSP area would result in minimal on-site impacts:
Category 54 WWTPs	Treatment of sewage	Odour	No residences, sensitive land uses or specified ecosystems within 12 km of the Premises	Air / wind dispersion	Amenity	No No receptor present.
	Sewage pipes and holding tanks	Sewage discharge from the rupture of pipes / overtopping and storage tanks failure	Vegetation adjacent to discharge area (Vegetation characteristic of the zone are mulga shrublands and spinifex grasslands with mallee)	Direct discharges to land and irrigation	Soil contamination	Yes – Refer to section 8.8 Potential soil contamination from the release of untreated effluent.
	Irrigation of treated effluent	Treated effluent discharged to spray field for irrigation	Terrestrial ecosystems		Facilitated growth of weeds Increase in nutrient levels in soil Ponding in the spray field	Yes – Refer to section 8.8 Potential for ponding in the spray field and increase in nutrient levels in soil if effluent is not treated to recommended levels.
Category 64 Class II	Landfilling to active trench/cell	Dust (vehicle movement and burial of	No residences, sensitive land uses or specified ecosystems within 12 km of	Air / wind dispersion	Health and amenity	No No receptor present.

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts			
putrescible landfill site		waste)	the Premises				
		Noise from the operation of the machinery to cover waste etc.	No residences, sensitive land uses or specified ecosystems within 12 km of the Premises	Air / wind dispersion	Amenity	No	No receptor present.
		Leachate	Adjacent vegetation Soil Groundwater	Via soil and groundwater	Contamination of groundwater and contamination of soil with excess organic nutrients, metals, and eutrophication	Yes – Refer to section 8.9	Potential contamination of surrounding environment including soil and groundwater if waste acceptance criteria is not met.
		Odour	No residences, sensitive land uses or specified ecosystems within 12 km of the Premises	Air / wind dispersion	Amenity	No	No receptors present.
	Poor management of landfill operation	Windblown waste	Terrestrial ecosystems	Direct discharge / movement by surface water following rainfall	Soil contamination May attract vermin/feral animals	Yes – Refer to section 8.9	Potential for impact to terrestrial ecosystems.
	Burning of pallets for training purposes	Fire	No residences, sensitive land uses or specified ecosystems within 12 km of the Premises	Air / wind dispersion	Health and amenity	Yes – Refer to section 8.9	Potential contamination of surrounding environment including soil and groundwater if fire control measures are not in place.
Category 73 Bulk storage of chemicals, etc.	Bulk storage of fuels and other chemicals	Breach of containment causing hydrocarbon / chemical discharge to land and soil	Soil and vegetation	Direct discharge to land and infiltration to soil	Soil contamination inhibiting vegetation growth and survival, and health impacts to fauna	No	Storage and handling requirements of bulk fuel (diesel) managed under the <i>Dangerous Goods Safety Act 1994</i> , and regulations administered by the Department of Mines, Industry Regulation and Safety.

Risk Events					Continue to detailed risk assessment	Reasoning	
Sources/Activities		Potential emissions	Potential receptors	Potential pathway			Potential adverse impacts
		Spillage or discharge of hydrocarbons / chemical through pipeline, pump or tank leaks or failure				No	
Ancillary activities	Workshop and wash down facility	Hydrocarbons	Soil and groundwater	Release to ground	Soil and/or groundwater contamination	Yes – Refer to section 8.10	Potential to cause soil and groundwater contamination if poor management of drainage or discharge occurs.

8.2 Consequence and likelihood of risk events

A risk rating will be determined for Risk Events in accordance with the risk rating matrix set out in Table 15 below.

Table 15: 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

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 16 below.

Table 16: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
		Environment	Public health* and amenity (such as air and water quality, noise, and odour)	
Almost Certain	The risk event is expected to occur in most circumstances	Severe	<ul style="list-style-type: none"> onsite impacts: catastrophic offsite impacts local scale: high level or above offsite impacts wider scale: mid-level or above Mid to long-term or permanent impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are significantly exceeded 	<ul style="list-style-type: none"> Loss of life Adverse health effects: high level or ongoing medical treatment Specific Consequence Criteria (for public health) are significantly exceeded Local scale impacts: permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	<ul style="list-style-type: none"> onsite impacts: high level offsite impacts local scale: mid-level offsite impacts wider scale: low level Short-term impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are exceeded 	<ul style="list-style-type: none"> Adverse health effects: mid-level or frequent medical treatment Specific Consequence Criteria (for public health) are exceeded Local scale impacts: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	<ul style="list-style-type: none"> onsite impacts: mid-level offsite impacts local scale: low level offsite impacts wider scale: minimal Specific Consequence Criteria (for environment) are at risk of not being met 	<ul style="list-style-type: none"> Adverse health effects: low level or occasional medical treatment Specific Consequence Criteria (for public health) are at risk of not being met Local scale impacts: mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	<ul style="list-style-type: none"> onsite impacts: low level offsite impacts local scale: minimal offsite impacts wider scale: not detectable Specific Consequence Criteria (for environment) likely to be met 	<ul style="list-style-type: none"> Specific Consequence Criteria (for public health) are likely to be met Local scale impacts: low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	<ul style="list-style-type: none"> onsite impact: minimal Specific Consequence Criteria (for environment) met 	<ul style="list-style-type: none"> Local scale: minimal to amenity Specific Consequence Criteria (for public health) met

[^] Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting*.

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines*.

"onsite" means within the Prescribed Premises boundary.

8.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 17 below:

Table 17: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

8.4 Risk Assessment – Spills of processing reagents

8.4.1 Description of spills of processing reagents

During wet processing of gold ore, processing reagents released to ground may occur from overflowing tanks (poor or faulty process control), pipeline failures, failures of bunding or sump pumps, or catastrophic mechanical failures of tanks.

8.4.2 Identification and general characterisation of emission

Alkaline liquors with metals and cyanide in solution.

8.4.3 Description of potential adverse impact from the emission

The release of gold processing slurries may inundate and destroy adjacent vegetation and result in localised soil contamination.

8.4.4 Licence Holder's controls

The Licence Holder's controls to manage spills of processing reagents are set out in Table 18 below.

Table 18: Licence Holder's controls for processing reagents

Site infrastructure	Operation details		
Ore processing area	Ore processing activities conducted within bunded areas draining to sumps with recovery pumps.		
Reagent area	Processing reagents stored in designated shed or bulk storage units as shown below:		
	Reagent	Purpose	Storage infrastructure and location
	Carbon	Adsorption of gold	Typical site storage (240 m ³) – 550 kg bulk bags
	Flocculant	Collect slimes	Typical site storage (125 m ³) – 700 kg bags or bulk tanker delivery
	Hydrochloric Acid	Removal of CaCO ₃	Typical site storage (70 m ³) – 36 m ³ liquid solution
	Sodium Cyanide	Dissolution of gold	Typical site storage (734 m ³) – 44 m ³ liquid solution
	Sodium Hydroxide	Reversal of adsorption process	Typical site storage (8 m ³) – 25 kg bags on pallets
Quicklime	Reduction of cyanide loss as HCN gas	Typical site storage (1,200 m ³) – Bulk delivery	
Processing reagents stored in according to Australian Standards AS1940 and AS1692.			
Reagent area has a sump pump to collect spills.			

8.4.5 Consequence

If spills occurs and impact on vegetation, this could result in low level on-site impacts. Therefore, the consequence is **minor**.

8.4.6 Likelihood of Risk Event

The likelihood of a spill resulting in impact to vegetation is **unlikely**.

8.4.7 Overall rating for spills of processing reagents

Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 15) determines the overall rating of risk for processing reagent spills impacting on vegetation to be **medium**.

8.5 Risk Assessment – Leaks or overflows from the ponds

8.5.1 Description of overflows from the ponds

A HPDE lined process water pond stores TSF return water, pit dewatering, brine from the RO plant and Yeo Borefield water. The sedimentation pond is utilized to allow sediments to settle

out prior to water entering the process water pond. Releases to the environment may occur through overflows due to poor process controls or extreme rainfall events.

8.5.2 Identification and general characterisation of emission

Processing reagents such as flocculant, sodium cyanide and sodium hydroxide are used in the gold processing circuit. TSF return water mixed with smaller amounts of saline liquor and dissolved metals from the RO plant are stored within the process water pond prior to being used in the processing plant.

8.5.3 Description of potential adverse impact from the emission

The release of process water from an overflow may inundate vegetation and impact on adjacent vegetation and result in localised soil contamination.

8.5.4 Criteria for assessment

Australian & New Zealand Guidelines for Fresh & Marine Water Quality provide recommended trigger values for freshwater quality and the *Assessment and management of contaminated sites* and *ASC NEPM* provides ecological and human health assessment levels for soil.

8.5.5 Licence Holder's controls

The process water pond and sedimentation pond are HDPE lined with freeboard markers installed. The process water pond also has the capacity to hold the volume of water associated with a 1:100 year, 72 hour storm event.

Water within the process water pond and sedimentation pond is used in a closed loop system within the processing plant, therefore water from the ponds does not discharge to the environment (W6002/2016/1).

8.5.6 Consequence

The impact from overflows from the sedimentation and process water ponds at the Premises could result in mid level on-site impacts and low level off-site impacts at a local scale. Therefore, the Delegated Officer considers the consequence to be **moderate**.

8.5.7 Likelihood of Risk Event

Based upon the distance to nearest receptors, depth to groundwater and Licence Holder's controls, the environmental impact from an overflow of the ponds will probably not occur in most circumstances. Therefore, the likelihood of the consequence is **unlikely**.

8.5.8 Overall rating for overflows from the ponds

Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 15) determines the overall rating of risk of overflows from the ponds at the Premises to be **medium**.

8.6 Risk Assessment – Stormwater runoff

8.6.1 Description of stormwater runoff

Cleared and operational areas may result in turbid water and sediment being discharged on and off the Premises during rainfall events.

8.6.2 Identification and general characterisation of emission

Stormwater at the Premises has the potential to become contaminated with sediments from

processing, hydrocarbons, heavy metals, metalloids and hazardous chemicals and wastes.

8.6.3 Description of potential adverse impact from the emission

Soil contamination may inhibit vegetation growth and cause health impacts to fauna. Stormwater runoff may also pick up sediment from cleared areas and result in smothering of nearby vegetation, impacting growth and survival.

Rainfall events at the Premises are likely to be of short duration and high intensity, and large volumes can be experienced. Contaminated stormwater during rainfall events may be mobilised and transported within minor drainage system on the Premises.

8.6.4 Licence Holder's controls

The Licence Holder's controls in place to reduce and manage stormwater runoff are listed below:

- Diversion bunds and culverts have been constructed to separate clean and potentially contaminated water;
- Stormwater from operational areas is collected and either reused within the operations or contaminants are removed prior to release to the environment;
- Where stormwater is likely to be contaminated with hydrocarbons, water is directed to an OWS system prior to discharge to the environment or re-use on-site; and
- A Surface Water Management Plan is implemented.

8.6.5 Consequence

The impact from contaminated stormwater runoff at the Premises could result in low level on-site impacts and minimal off-site impacts at a local scale. Therefore, the consequence is **minor**.

8.6.6 Likelihood of Risk Event

Based upon the distance to nearest receptors, groundwater located from 30 mbgl and Yeo Lake approximately 12 km east, an environmental impact from stormwater runoff will probably not occur in most circumstances. Therefore, the likelihood of the consequence is **unlikely**.

8.6.7 Overall rating for stormwater runoff

Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 15) determines the overall rating of risk for stormwater at the Premises to be **medium**.

8.7 Risk Assessment – TSF pipeline ruptures, overtopping and seepage

8.7.1 Description of TSF pipeline ruptures, overtopping and seepage

The TSF has a total design storage capacity of 61.94 Mm³ (92.92 Mtpa) based on an assumed tailings dry density of 1.5 t/m³ and based on a production rate of 8.2 Mtpa.

All tailings produced from processing is pumped in the form of a slurry (60% solids (by weight) (i.e. 40% water by weight)) from the process plant to the TSF via a large diameter HDPE pipe.

Decant water recovered from the TSF will be pumped back to the sedimentation pond and then to the process plant for re-use.

8.7.2 Identification and general characterisation of emission

Gold Road, 2016a states that samples of tailings were composited from a selection of 32 blended samples. A selection of four composite samples for geochemical assessment from the 32 metallurgical samples representing four ore areas across the pit area indicates that:

- Tailings samples had generally low levels of total sulfur (0.32 to 0.53%), with moderate amounts of sulfate-sulfur and estimated sulfide sulfur (non sulfate-sulfur) concentrations ranging from 0.02 to 0.40%.
- Levels of Acid Neutralisation Capacity (ANC) were moderate and sufficient to readily compensate for the marginal presence of reactive sulfides. ANC was identified to be predominantly present as readily reactive calcite (calcium carbonate (CaCO_3)).
- All tailings samples were classified as Non Acid Forming (NAF) with an alkaline reaction under simulated oxidation conditions (Net Acid Generation (NAG) pH of 9.4 to 10.8).
- Analysis of samples for total metals identified very low concentrations of environmentally significant metals and metalloids. While there was marginal enrichment in arsenic and selenium in some samples, concentrations are lower than most other gold deposits of the Yilgarn Craton.
- Fresh water leachates for all tailings samples were alkaline (pH 9.27 to 9.41), with moderate levels of soluble alkalinity (38 to 42 mg/L as CaCO_3). Based on the raw water proposed to be used for site processing (21,000 mg/L TDS), tailings are also predicted to be saline to hypersaline, saturated with respect to gypsum and calcite and have a tendency to form a gypsum crust at or just below the tailings surface.
- Tailings are not expected to be spontaneously dispersive.
- Concentrations of soluble metals, metalloids and cyanide species were very low and at a 1:5 extraction ratio, well below *ANZECC, 2000 Livestock* health based drinking water guidelines.
- Based on results of dilute acid leach testing, primary metals that may be released from partial or complete oxidation of the low levels of available sulfidic materials in tailings, would be calcium (from subsequent acid neutralisation), iron and manganese – all of which are low toxicity metals with solubility dependent on final pH.

In addition a sample of supernatant from a 50% solids tailings slurry was examined to indicate the nature of tailings pore water during the operational phase of the TSF. Consistent with low levels of enrichment in the ore and tails, the supernatant was very low in most metals and metalloids. Elevated concentrations of selenium (0.07 mg/L) and mercury (0.01 mg/L) were recorded in the supernatant under the high salinity, high cyanide conditions of trial processing.

8.7.3 Description of potential adverse impact from the emission

Discharge of tailings through pipeline failure or embankment overtopping will impact upon adjacent vegetation through toxicity and physical smothering as well as sedimentation and contamination of surface water systems.

Lateral movement of seepage through ground may contaminate soil, groundwater and impact vegetation in the path of the seepage through inundation and toxicity of contaminants.

Seepage analyses were carried out using the groundwater module of the GeoStudio 2012 computer software package (Seep/W). The objective of the seepage analysis was to estimate seepage from the IWL/TSF via the immediate foundation and perimeter embankment for the revised design of the Stages 2 to 6 perimeter embankment, and compare with results for the existing approved design (Construction Completion Report).

The revised embankment model was the same for the current approved design, i.e. the

maximum embankment height is nominally 40 m at the planned final Stage 6 crest RL 439.2 m, and the future staged embankments comprise an HDPE liner placed over the upstream Zone C1 material, with the exception that the total crest width of future staged embankments is varied from 26.5 m (Stage 2 raise) to 23.5 m (final Stage 6 raise).

The cases analysed for the current approved design and those of the revised design are shown below:

Cases for current approved embankment design

- Case 2C Stage 6 (final) embankment (final crest RL 439.2 m and total crest width of 28 m) with full deposited tailings behind wall.
- Upstream zone embankment comprising Zone C1 material and HDPE liner.
- Liner placed up to Stage 6 crest RL 439.2 m and anchored into trench.
- A central HDPE liner (150 m radius) and an assumed normal operating pond size (150 m radius or about 3% of the final TSF surface area).
- Case 2D As in Case 2C, with underdrainage system (i.e. 1 drain near the upstream embankment toe and 8 central drains over central liner spaced at 20 m apart).

Cases for revised embankment design

- Case 2E Similar to Case 2C, but with minor changes in the total embankment crest width (i.e. 26.5 m (Stage 2 raise) to 23.5 m (final Stage 6 raise)).
- Case 2F Similar to Case 2D, but with minor changes in the total embankment crest width (i.e. 26.5 m (Stage 2 raise) to 23.5 m (final Stage 6 raise)).

Table 19 summarises the estimated seepage flux for the current approved design (Cases C and D) and the revised design (Cases E and F) including leakage through liner defects (i.e. the underdrainage system assumed not to be working) for Cases C and E.

Table 19: Results of seepage analyses including leakage rate through liner defects (Construction Completion Report)

Case	Estimated Seepage		Estimated Seepage (including leakage through liner defects)	
	Total flux (m ³ /sec per m)	Total seepage (m ³ /day)	Leakage rate (m ³ /day)	Total seepage (m ³ /day)
<u>Current approved design</u> Case 2C (Final Stage 6)	3.52E-07	163.8*	1.25	165.1
<u>Revised design</u> Case 2E (Final Stage 6)	3.5E-07	163*	1.25	164.3
<u>Current approved design</u> Case 2D with underdrainage system (Final Stage 6)	2.46E-08	11.2*		
<u>Revised design</u> Case 2F with underdrainage system (Final Stage 6)	2.42E-08	11.15*		

*The estimated seepage does not comprise leakage through liner defects.

The results of the analyses indicate the following:

- Total seepage (including leakage through liner defects) for the revised design (with minor changes in the embankment crest width) would be up to 164.3 m³/day (Case 2E) under normal operating pond conditions (i.e. nominal pond radius of 150 m);
- The seepage figure is very similar to the figure from the currently approved design (i.e. <1% difference when comparing Case 2E against Case 2C); and
- A significant reduction in seepage with inclusion of a perimeter underdrain and an underdrainage network around the central decant (Case 2F), i.e. a 93% reduction in seepage (final stage) compared to the case without underdrainage (Case 2E).

A preliminary water balance analysis for the TSF during operation was undertaken using a mathematical simulation to examine the expected inflows into and outflows from the TSF. Inflows and outflows from the facility were estimated on a monthly basis and under average climatic conditions. Three cases were examined, with various rainfall data comprising average annual/monthly rainfall (Case 1), worst case wet year (i.e. highest annual rainfall, Case 2) and worst case dry year (i.e. lowest annual rainfall, Case 3) refer to Table 20 (Gruyere, 2018b).

The following assumptions were used in the analyses:

- The climate data from Laverton (approximately 160 km west of the Premises) was used

in the analyses;

- Mean evaporation is approximately 3,000 mm;
- For Case 1: the average annual rainfall used in the analyses was approximately 230 mm;
- For Cases 2 and 3 (worst cases): the highest and lowest annual rainfalls used in the analyses were approximately 577 mm and 79 mm respectively (based on the wettest and driest “wet/dry” season from historical site data). Noting, the lowest monthly rainfall was not available, this has been extrapolated based on the lowest annual rainfall and mean annual rainfall;
- Slurry input of 7.5 Mtpa (average) at 60% solids;
- Tailings runoff coefficient varying from 0.2 to 0.4;
- Evaporation pan factor of 0.7;
- Average storage area of 216 ha (estimated average area during operation);
- TSF pond area of approximately 70,700 m² calculated based on the assumed nominal operating pond of 150 m radius (approximately 3% of average storage area);
- Running beaches of approximately 57 ha (approximately 27% of average storage area). This is estimated based on 8 to 10 spigots (at 60 m intervals) operating at any time, and the immediately adjacent beach area remaining wet;
- Retained moisture content of 30% (based on drained settling test); and
- Average seepage flow through the TSF ‘foundation’ of 95 m³/day.

The results of the analyses suggest an annual average water return of 32%, 40% and 28% of tailings slurry water deposited into the facility will be available for recovery under average climatic conditions, worst case wet year and worst case dry year respectively.

Table 20: Water Balance Analysis (Calculations) for Cases 1, 2 and 3

PROJECT : GRUYERE GOLD PROJECT - TSF DESIGN - DETAILED ENGINEERING														Date : 09-Feb-17	
CLIENT : GOLD ROAD RESOURCES LTD														JOB No : GEOTPERT50025AB	
LOCATION : GRUYERE PROJECT, WESTERN AUSTRALIA														Rev : 0	
SUBJECT : WATER BALANCE														CASE AS-1	
USING THROUGHPUT = 7.5Mtpa; % Solids = 80%														AVERAGE RAINFALL DATA	
		Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
		Days per month	31	28	31	30	31	30	31	31	30	31	30	31	365.0
INFLOWS															
RAINFALL (Mean rainfall for years 1967 -1998)															
Monthly Rainfall (mm)			19.6	35.2	19.5	22.8	24.6	20.9	16	14.6	10.1	11.6	13	15.8	227.9
Average Daily Rainfall (mm)			0.63	1.26	0.63	0.76	0.79	0.70	0.52	0.48	0.34	0.37	0.43	0.54	
Tailings Dam Storage Area (m2)	(average)		2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	
Runoff Coefficient Tailings			0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.3	0.4	
Catchment Area above Storage (m2)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Runoff Coefficient Catchment			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Pool Area (m2)			70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	
Running Beaches (m2)			570 400	570 400	570 400	570 400	570 400	570 400	570 400	570 400	570 400	570 400	570 400	570 400	
Rainfall Inflow Total Volume (m3/day)			789.1	1 569.1	789.1	946.6	990.4	869.5	565.9	523.4	318.0	353.5	475.1	797.2	
SLURRY WATER															
Tonnes per year			7 500 000												
Operating hours per year															
Total tonnes per month			636 986.3	575 342.5	636 986.3	616 438.4	636 986.3	616 438.4	636 986.3	636 986.3	616 438.4	636 986.3	616 438.4	636 986.3	7 500 000.0
% Solids =			60.0												
Tailings Output Solids (tpd)			20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	
Volume of Water (m3/day)			13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	5 000 000.0
OTHER WATER INFLOWS															
Despice Recovery (from Underdrainage System) (m3/day)	(average)		88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	
Other			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Other Water Inflow Total (m3/day)			88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	
TOTAL INFLOW (m3/day)			14 678.3	16 368.2	14 672.2	14 736.7	14 777.8	14 668.7	14 963.0	14 310.8	14 106.2	14 140.8	14 282.2	14 684.3	
OUTFLOW-LOSSES FROM TAILINGS DAM															
EVAPORATION (from pond and beaches)															
Evaporation Rate (Daily - mm)			14	12.1	10.1	7.1	4.4	3.2	3.2	4.3	5.8	9.3	11.5	13.1	99.10
Evaporation Rate (Monthly - mm)			434.00	338.80	313.10	213.00	136.40	99.00	99.00	133.30	204.00	288.30	345.00	406.10	3007.20
Fan Factor			0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	
Monthly Dam Evaporation Rate (mm)			303.8	237.2	219.2	149.1	95.5	67.2	69.4	93.3	142.8	201.8	241.5	284.3	
Average Daily Evaporation Rate (mm)			9.8	8.5	7.1	5.0	3.1	2.2	2.2	3.0	4.8	6.5	8.1	9.2	
Pool Area & Running Beaches (m2)			641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	
Daily Evaporation Loss/Outflow (m3/day)			6 282.8	5 430.1	4 532.6	3 196.3	1 974.6	1 436.1	1 436.1	1 929.7	3 051.6	4 173.6	5 160.9	5 878.9	
EVAPOTRANSPIRATION (from drying tailings)															
Evaporation Rate (Daily - mm)			14.0	12.1	10.1	7.1	4.4	3.2	3.2	4.3	5.8	9.3	11.5	13.1	
Evaporation Rate (Monthly - mm)			434.0	338.8	313.1	213.0	136.4	99.0	99.2	133.3	204.0	288.3	345.0	406.1	
Evapotranspiration Rate (Pan/3)			144.7	112.9	104.4	71.0	45.5	32.0	33.1	44.4	68.0	96.1	115.0	135.4	
Average Daily Evapotranspiration Rate (mm)			4.7	4.0	3.4	2.4	1.5	1.1	1.1	1.4	2.3	3.1	3.8	4.4	
Area Transpiring (m2)			75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	
Daily transpiration Loss (m3/day)			354.1	306.0	255.5	179.6	111.3	80.9	80.9	108.8	172.0	235.2	290.9	331.3	
SEEPAGE															
Through Deposited Tailings & Dam Floor (m3/day)	(average)		95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	
Total Despice Outflow (m3/day)			95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	
RETENTION															
Tailings Output (tpd)			20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	
Moisture Content of Tailings (average)			30%												
Volume Retained in Tailings (m3/day)			6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	
TOTAL OUTFLOW-LOSSES FROM TAILINGS DAM (m3/day)			12 896.3	11 896.6	11 047.4	9 826.2	8 346.3	7 778.4	7 778.4	8 287.9	9 483.0	10 888.2	11 711.1	12 488.8	
BALANCE INFLOW-OUTFLOW/LOSSES (m3/day)			1 882.0	3 960.7	3 624.8	6 110.6	6 432.3	6 880.3	6 676.8	6 012.7	4 622.1	3 472.4	2 661.1	2 114.7	
BALANCE INFLOW-OUTFLOW/LOSSES (m3/month)			62 080.2	84 098.6	109 289.8	163 314.3	199 401.9	208 408.2	203 876.0	188 393.9	138 884.2	107 646.4	78 603.6	86 668.2	
RETURN WATER TO THE PLANT (if available)															
Total Water Return per month (balance of inflow-outflow for planning) (m3/month)			52 080.2	94 098.6	109 289.8	163 314.3	199 401.9	206 408.2	203 876.0	186 393.9	138 884.2	107 646.4	76 603.6	65 668.2	1 593 240.9
Volume of Water Return per day (m3/day)			1 680.0	3 360.7	3 524.8	5 110.5	6 432.3	6 680.3	6 576.6	6 012.7	4 622.1	3 472.4	2 551.1	2 114.7	
Water Return per month (as % of tailings slurry water)			12%	25%	26%	37%	47%	50%	48%	44%	34%	25%	19%	15%	
Annual Water Return Available (m3/year)			1 689 241												
Annual Average Water Return (as % of tailings slurry water)			92%												
Summary of Water Balance															
Water shortfall (make up water) or excess of requirements (m3/day)			-12 019	-10 338	-10 174	-8 588	-7 266	-6 818	-7 122	-7 686	-9 076	-10 226	-11 148	-11 584	
Total water in excess of requirements (m3/month)			-372 577	-289 463	-315 388	-267 645	-225 256	-204 551	-220 792	-238 264	-272 295	-317 012	-334 425	-359 101	-3 406 759
Total water in excess of requirements (m3/year) =			-3 406 759												

PROJECT : GRUYERE GOLD PROJECT - T&F DESIGN - DETAILED ENGINEERING														
CLIENT : GOLD ROAD RESOURCES LTD														
LOCATION : GRUYERE PROJECT, WESTERN AUSTRALIA														
SUBJECT : WATER BALANCE CASE A3-2 USING THROUGHPUT = 7.6Mtpa; % Solids = 80% HIGHEST RAINFALL DATA (WORST CASE - WET YEAR)														
	Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
	Days per month	31	28	31	30	31	30	31	31	30	31	30	31	365.0
INFLOWS														
RAINFALL														
Monthly Rainfall (mm)	(Highest rainfall for years 1967 - 1998)	49.41	88.74	49.16	57.48	62.02	52.69	40.34	37.31	25.46	29.24	32.77	49.92	574.5
Average Daily Rainfall (mm)		1.59	3.17	1.59	1.92	2.00	1.76	1.30	1.20	0.85	0.94	1.09	1.61	
Tailings Dam Storage Area (m2)	(average)	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670	2 158 670
Runoff Coefficient Tailings		0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.3	0.4	
Catchment Area above Storage (m2)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Runoff Coefficient Catchment		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Pool Area (m2)		70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700
Running Beaches (m2)		570 400	570 400	570 400	570 400	570 400	570 400	570 400	570 400	570 400	570 400	570 400	570 400	570 400
Rainfall Inflow Total Volume (m3/day)		1 989.4	3 955.6	1 979.3	2 391.3	2 496.9	2 192.1	1 426.5	1 319.6	801.7	891.1	1 197.7	2 009.7	
SLURRY WATER														
Tonnes per year		7 500 000												
Operating hours per year														
Total tonnes per month		636 986.3	575 342.5	636 986.3	616 438.4	636 986.3	616 438.4	636 986.3	636 986.3	616 438.4	636 986.3	616 438.4	636 986.3	7 500 000.0
% Solids		60.0												
Tailings Output Solids (tpd)		20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9
Volume of Water (m3/day)		13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	5 000 000.0
OTHER WATER INFLOWS														
Seepage Recovery (from Underdrainage System) (m3/day)	(average)	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5
Other		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other Water Inflow Total (m3/day)		88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5
TOTAL INFLOW (m3/day)		16 778.6	17 742.7	16 788.4	16 178.6	16 284.0	16 879.2	16 218.7	16 108.7	14 688.8	14 678.2	14 884.8	16 798.8	
OUTFLOW-LOSSES FROM TAILINGS DAM														
EVAPORATION (from pond and beaches)														
Evaporation Rate (Daily - mm)		14	12.1	10.1	7.1	4.4	3.2	3.2	4.3	6.8	9.3	11.5	13.1	99.10
Evaporation Rate (Monthly - mm)		434.00	338.80	313.10	213.00	136.40	96.00	99.20	133.30	204.00	288.30	345.00	406.10	3007.20
Pan Factor		0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	
Monthly Dam Evaporation Rate (mm)		303.8	237.2	219.2	148.1	95.5	67.2	69.4	93.3	142.8	201.8	241.5	284.3	
Average Daily Evaporation Rate (mm)		9.8	8.5	7.1	5.0	3.1	2.2	2.2	3.0	4.8	6.5	8.1	9.2	
Pool Area & Running Beaches (m2)		641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	
Daily Evaporation Loss/Outflow (m3/day)		6 282.8	5 430.1	4 832.6	3 186.3	1 974.6	1 436.1	1 436.1	1 829.7	3 051.6	4 173.6	5 160.9	5 878.9	
EVAPO-TRANSPIRATION (from drying tailings)														
Evaporation Rate (Daily - mm)		14.0	12.1	10.1	7.1	4.4	3.2	3.2	4.3	6.8	9.3	11.5	13.1	
Evaporation Rate (Monthly - mm)		434.0	338.8	313.1	213.0	136.4	96.0	99.2	133.3	204.0	288.3	345.0	406.1	
Evaop-transpiration Rate (Pan/3)		144.7	112.9	104.4	71.0	45.5	32.0	33.1	44.4	68.0	96.1	115.0	135.4	
Average Daily Evapo-transpiration Rate (mm)		4.7	4.0	3.4	2.4	1.5	1.1	1.1	1.4	2.3	3.1	3.8	4.4	
Area Transpiring (m2)		75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	
Daily transpiration Loss (m3/day)		354.1	306.0	355.5	179.6	111.3	80.9	80.9	108.8	172.0	235.2	290.9	331.3	
SEEPAGE														
Through Deposited Tailings & Dam Floor (m3/day)	(average)	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
Total Seepage Outflow (m3/day)		95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
RETENTION														
Tailings Output (tpd)		20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9
Moisture Content of Tailings (average)		30%												
Volume Retained in Tailings (m3/day)		6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4
TOTAL OUTFLOW-LOSSES FROM TAILINGS DAM (m3/day)		12 888.3	11 886.6	11 047.4	9 826.2	8 346.3	7 778.4	7 778.4	8 287.9	9 483.0	10 888.2	11 711.1	12 488.8	
BALANCE INFLOW-OUTFLOW/LOSSES (m3/day)		2 889.3	6 747.2	4 719.0	6 668.2	7 938.8	8 202.8	7 437.3	8 808.8	6 106.8	4 010.0	3 273.7	3 327.2	
BALANCE INFLOW-OUTFLOW/LOSSES (m3/month)		88 288.4	169 921.4	148 287.9	198 697.8	248 102.0	248 084.3	230 668.0	211 073.7	160 176.2	124 811.6	98 211.8	108 144.0	
RETURN WATER TO THE PLANT (if available)														
Total Water Return per month (balance of inflow-outflow for planning) (m3/month)		89 288.4	160 921.4	146 287.9	196 597.3	246 102.0	246 084.3	230 556.0	211 073.7	153 175.2	124 311.5	98 211.8	103 144.0	2 005 753.5
Volume of Water Return per day (m3/day)		2 880.3	5 747.2	4 719.0	6 553.2	7 938.8	8 202.8	7 437.3	6 808.8	5 105.8	4 010.0	3 273.7	3 327.2	
Water Return per month (as % of tailings slurry water)		21%	42%	34%	48%	58%	60%	54%	50%	37%	29%	24%	24%	
Annual Water Return Available (m3/year)		2 006 768												
Annual Average Water Return (as % of tailings slurry water)		40%												
Summary of Water Balance														
Water shortfall (make up water) or excess of requirements (m3/day)		-10 818	-7 951	-8 980	-7 145	-5 760	-5 496	-6 261	-6 890	-8 593	-9 689	-10 425	-10 371	
Total water in excess of requirements (m3/month)		-335 369	-222 640	-278 370	-214 362	-178 556	-164 875	-194 102	-213 584	-257 784	-300 346	-312 747	-321 514	-2 994 247
Total water in excess of requirements (m3/year) =		-2 994 247												

PROJECT : GRUYERE GOLD PROJECT - T&F DESIGN - DETAILED ENGINEERING															
CLIENT : GOLD ROAD RESOURCES LTD													Date	09-Feb-17	
LOCATION : GRUYERE PROJECT, WESTERN AUSTRALIA													Job No	GEOTPERT50025AB	
SUBJECT : WATER BALANCE													Rev	0	
CASE A3-3		USING THROUGHPUT = 7.6Mtpa; % Solids = 80%											LOWEST RAINFALL DATA (WORST CASE - DRY YEAR)		
Month		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL	
Days per month		31	28	31	30	31	30	31	31	30	31	30	31	365.0	
INFLOWS															
RAINFALL															
Monthly Rainfall (mm)		(Driest rainfall for years 1967 -1998)													78.4
Average Daily Rainfall (mm)		0.22	0.43	0.22	0.26	0.27	0.24	0.18	0.16	0.12	0.13	0.16	0.22		
Tailings Dam Storage Area (m2)		(average)													2 158 670
Runoff Coefficient Tailings		0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.3	0.4		
Catchment Area above Storage (m2)		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Runoff Coefficient Catchment		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Pool Area (m2)		70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700	70 700		
Running Beaches (m2)		670 400	670 400	670 400	670 400	670 400	670 400	670 400	670 400	670 400	670 400	670 400	670 400		
Rainfall Inflow Total Volume (m3/day)		271.4	539.7	270.1	326.3	340.7	299.1	194.6	180.0	109.4	121.6	163.4	274.2		
SLURRY WATER															
Tonnes per year		7 500 000													
Operating hours per year															
Total tonnes per month		636 986.3	575 342.5	636 986.3	616 438.4	636 986.3	616 438.4	636 986.3	636 986.3	616 438.4	636 986.3	616 438.4	636 986.3	7 500 000.0	
% Solids =		60.0													
Tailings Output Solids (tpd)		20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	
Volume of Water (m3/day)		13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	13 698.6	5 000 000.0	
OTHER WATER INFLOWS															
Seepage Recovery (from Underdrainage System) (m3/day)		(average)													
Other		88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5		
Other Water Inflow Total (m3/day)		88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5	88.5		
TOTAL INFLOW (m3/day)		14 068.8	14 326.8	14 067.2	14 119.4	14 127.8	14 086.2	13 861.8	13 867.2	13 896.6	13 908.7	13 960.6	14 061.3		
OUTFLOW-LOSSES FROM TAILINGS DAM															
EVAPORATION (from pond and beaches)															
Evaporation Rate (Daily - mm)		14	12.1	10.1	7.1	4.4	3.2	3.2	4.3	6.8	9.3	11.5	13.1	99.10	
Evaporation Rate (Monthly - mm)		434.30	339.80	313.10	213.00	136.40	96.00	99.20	133.30	204.00	288.30	348.00	406.10	3007.20	
Pan Factor		0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70		
Monthly Dam Evaporation Rate (mm)		303.8	237.2	219.2	149.1	95.5	67.2	69.4	93.3	142.8	201.8	241.5	284.3		
Average Daily Evaporation Rate (mm)		9.8	8.5	7.1	5.0	3.1	2.2	3.2	3.0	4.8	6.5	8.1	9.2		
Pool Area & Running Beaches (m2)		641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0	641 100.0		
Daily Evaporation Loss/Outflow (m3/day)		6 282.8	5 430.1	4 632.6	3 186.3	1 974.6	1 436.1	1 436.1	1 929.7	3 051.6	4 173.6	5 160.9	5 878.9		
EVAPO-TRANSPIRATION (from drying tailings)															
Evaporation Rate (Daily - mm)		14.0	12.1	10.1	7.1	4.4	3.2	3.2	4.3	6.8	9.3	11.5	13.1		
Evaporation Rate (Monthly - mm)		434.3	339.8	313.1	213.0	136.4	96.0	99.2	133.3	204.0	288.3	348.0	406.1		
EvaPO-transpiration Rate (Pan/2)		144.7	112.9	104.4	71.0	45.5	32.0	33.1	44.4	69.0	96.1	115.0	135.4		
Average Daily Evapo-transpiration Rate (mm)		4.7	4.0	3.4	2.4	1.5	1.1	1.1	1.4	2.3	3.1	3.8	4.4		
Area Transpiring (m2)		75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5	75 878.5		
Daily transpiration Loss (m3/day)		354.1	306.0	265.5	179.6	111.3	80.9	80.9	108.8	172.0	235.2	290.9	331.3		
SEEPAGE															
Through Deposited Tailings & Dam Floor (m3/day)		(average)													
Total Seepage Outflow (m3/day)		95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0		
RETENTION															
Tailings Output (tpd)		20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9	20 547.9		
Moisture Content of Tailings (average)		30%													
Volume Retained in Tailings (m3/day)		6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4	6 164.4		
TOTAL OUTFLOW-LOSSES FROM TAILINGS DAM (m3/day)		12 896.3	11 896.6	11 047.4	9 826.2	8 846.9	7 778.4	7 778.4	8 297.9	9 483.0	10 888.2	11 711.1	12 468.8		
BALANCE INFLOW-OUTFLOW/LOSSES (m3/day)		1 162.3	2 331.3	3 009.8	4 488.2	5 782.6	6 309.8	6 206.4	6 989.3	4 413.6	3 240.6	2 239.4	1 691.7		
BALANCE INFLOW-OUTFLOW/LOSSES (m3/month)		38 031.6	86 278.4	93 902.7	134 846.4	179 268.2	189 295.1	192 367.0	176 748.9	132 405.2	100 466.8	67 183.2	49 343.7		
RETURN WATER TO THE PLANT (If available)															
Total Water Return per month (balance of inflow-outflow for planning) (m3/month)		36 031.5	65 276.4	93 302.7	134 645.4	179 259.2	189 295.1	192 367.0	175 748.9	132 405.2	100 456.9	67 183.2	49 343.7	1 415 315.2	
Volume of Water Return per day (m3/day)		1 162.3	2 331.3	3 009.8	4 488.2	5 782.6	6 309.8	6 206.4	5 669.3	4 413.5	3 240.5	2 239.4	1 591.7		
Water Return per month (as % of tailings slurry water)		8%	17%	22%	33%	42%	46%	45%	41%	32%	24%	16%	12%		
Annual Water Return Available (m3/year)		1 416 316													
Annual Average Water Return (as % of tailings slurry water)		28%													
Summary of Water Balance															
Water shortfall (make up water) or excess of requirements (m3/day)		-12 536	-11 367	-10 689	-9 210	-7 916	-7 389	-7 493	-8 029	-9 285	-10 458	-11 459	-12 107		
Total water in excess of requirements (m3/month)		-388 626	-318 285	-331 355	-276 313	-245 398	-221 864	-232 291	-248 909	-278 554	-324 201	-343 776	-375 314	-3 584 685	
Total water in excess of requirements (m3/year) =		-3 584 685													

8.7.4 Criteria for assessment

Table 21 outlines the TSF design criteria and specifications (Gruyere, 2018a and Construction Completion Report). The TSF has been designed in accordance with the *TSF Code of Practice* and *ANCOLD, 2012*.

Table 21: TSF design criteria and specifications

TSF	
Type	Engineered above ground.
Footprint	Approximately 303 ha.
Height	41 m.
Storage capacity	61.94 Mm ³ or 92.92 Mt.
Tailings Density	Delivered at approximately 60% solids (by weight). Settling to a stored density of 1.5 t/m ³ .
Tailings Deposition Method	Sub-aerial deposition. Spigot spacing: nominal 60 m.
Water Management System	Central decant system. Perimeter and decant/central underdrainage system reporting to a recovery sump, which is pumped and returned to the processing plant. Tailings recovery bores located on the eastern side of the TSF.

8.7.5 Licence Holder's controls

The Licence Holder's controls for the TSF as set out in Table 22 below (W6002/2016/1 and Construction Completion Report). The TSF is operated in accordance with the *TSF Operations Manual*.

Table 22: Licence Holder's controls for the TSF (refer to Figures 8 to 12 below)

Site infrastructure	Operation details
TSF Embankment	Freeboard of 500 mm over and above the freeboard required to hold the volume of water associated with a 1:100 year, 72 hour storm event. Stage 2 - Embankment crest level of RL 417.0 m. Stage 3 - Embankment crest level of RL 422.0 m. Stage 4 - Embankment crest level of RL 427.0 m. Stage 5 - Embankment crest level of RL 432.0 m. Stage 6 (Final) – Embankment crest level of RL 439.2 m. Daily inspections.
Cut-off trench	Located beneath the perimeter embankment.
Underdrainage	HDPE lined underdrainage sumps located immediately adjacent to the

Site infrastructure	Operation details
system	<p>upstream embankment toe and at the lowest point within the TSF basin.</p> <p>Sumps with a full storage capacity of 585 m³.</p> <p>Central underdrainage piping network around the decant structure to the extent of a decant pond of nominal 150 m radius connected to underdrainage discharge pipes that report by gravity to the perimeter underdrainage sump.</p> <p>The recovered underdrainage water is returned to the tailings beach and hence to the decant system and back to the plant for re-use in the process facility or alternatively directly back to the plant via a dedicated pipeline.</p> <p>Flowmeters installed to allow volumes of seepage recovered from the underdrainage system to be recorded.</p>
Tailings and return water pipelines	<p>Fitted with flow and leak detection sensors.</p> <p>Daily inspections.</p>
Tailings deposition	<p>Sub-aerially and cyclically via multiple spigots.</p> <p>Deposited tailings layer thickness: nominal 300 to 400 mm thickness.</p> <p>Spigotting/tailings deposition carried out such that a tailings beach forms and the supernatant pond (from both rainfall events and tailings deposition) is maintained around the central decant structure.</p>
Decant facility	<p>Decant pond central and as small as practical (i.e. nominal 150 m radius).</p> <p>Decant water recovered is pumped back to the process plant for reuse.</p>
Ambient groundwater monitoring (refer to Figure 12)	<p>Ten groundwater monitoring bores.</p> <p>Quarterly ambient groundwater quality monitoring for the following parameters: sodium, potassium, calcium, magnesium, chloride, sulfate, bicarbonate, antimony, arsenic, cadmium, chromium, cobalt, copper, iron, manganese, mercury, molybdenum, nickel, selenium, thallium, total recoverable hydrocarbons, uranium, zinc, WAD cyanide and total cyanide.</p>
Monitoring instrumentation	<p>Three pairs or six (3 by 2 no.) vibrating wire piezometers to monitor the phreatic surface within the embankment.</p>

8.7.6 Key findings

The Delegated Officer has reviewed the information regarding the operation of the TSF and has found:

1. Structural integrity of the TSF is regulated by DMIRS under the *Mining Act 1978*.
2. A freeboard of 500 mm is to be maintained on the TSF.
3. 10 monitoring bores have been established to monitor groundwater adjacent to the TSF to enable detection of seepage and groundwater mounding.
4. No ambient groundwater samples have been provided by the Licence Holder for the TSF (TSFM1 to TSFM10) for the ability to compare data. The Delegated Officer considers the requirement on the Licence to undertake fortnightly sampling for a 6 month period from the issue of the Revised Licence will provide adequate baseline data.
5. Treated oily water from the OWS at the Buk Fuel Storage area is transferred to the

tailings hopper where it is mixed with process tailings prior to discharge to the TSF. Based on this, the requirement to monitor for total recoverable hydrocarbons as part of the quarterly ambient groundwater monitoring program has been added to the Revised Licence.

6. Process pipelines are fitted with flow and leak detection sensors.

8.7.7 Consequence

The environmental impact of the TSF from seepage, overtopping and pipeline ruptures at the Premises could result in mid-level on-site impacts. Therefore, the consequence is **moderate**.

The Premises should be managed so as to ensure that groundwater quality is maintained at its baseline level. Groundwater quality should therefore be protected to ensure that groundwater remains suitable for its highest beneficial use. Based upon the potential contaminants in the tailings leachate, and that no samples have been provided by the Licence Holder for the TSF monitoring bores, it is unknown if the *Australian & New Zealand Guidelines for Fresh & Marine Water Quality*; and *ANZECC, 2000 Livestock* will be met. Therefore, the consequence is **moderate**.

8.7.8 Likelihood of Risk Event

Based upon the Licence Holder's controls, distance to nearest receptors and specified ecosystems, an environmental impact from TSF pipeline ruptures and overtopping will occur in exceptional circumstances. Therefore, the likelihood of the consequence is **rare**.

Based upon the Licence Holder's controls including the ambient groundwater monitoring program, an environmental impact from seepage will probably not occur in most circumstances. Therefore, the likelihood of the consequence is **unlikely**.

8.7.9 Overall rating for the TSF including pipeline ruptures, overtopping and seepage

Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 15) determines the overall rating of risk for TSF pipelines rupturing, overtopping and seepage at the Premises to be **medium**.

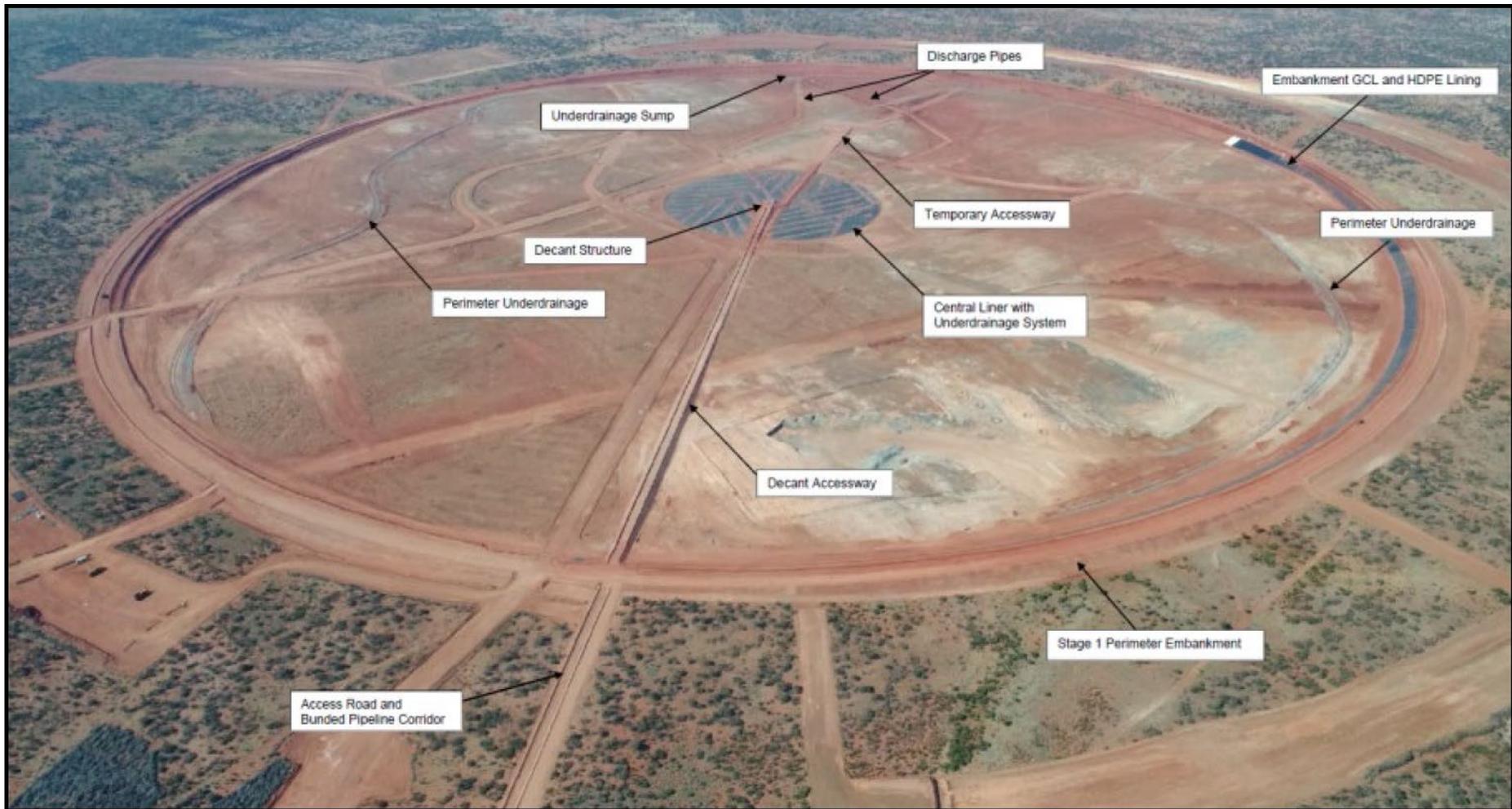


Figure 8: Lined TSF (Starter embankment)

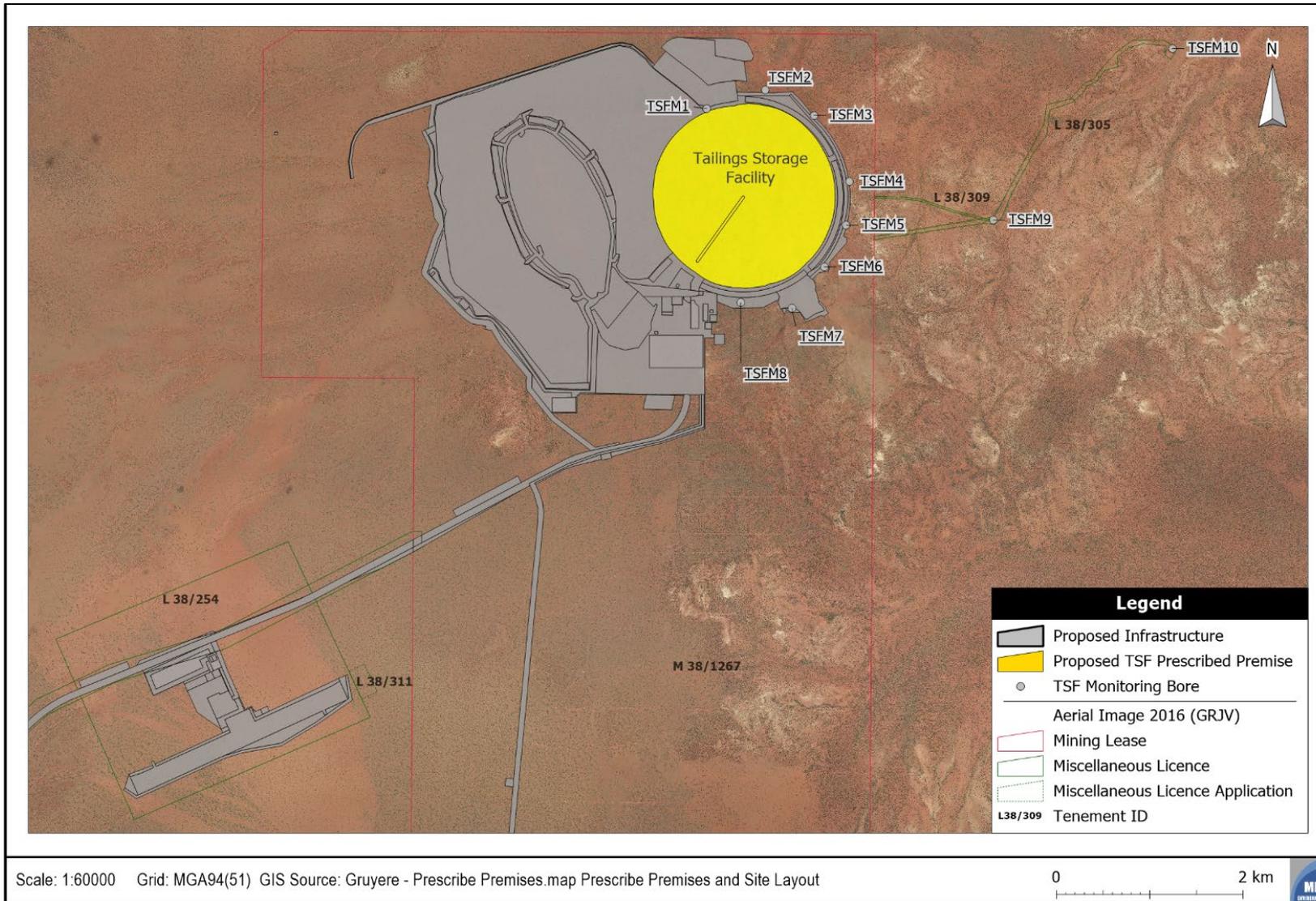


Figure 12: TSF monitoring bore locations

8.8 Risk Assessment – WWTP rupture of pipes, storage tank failure and irrigation

8.8.1 Description of WWTP rupture of pipes, storage tank failure and irrigation

Wastewater is collected via buried piping into suitably located pump pits and pumped to the balance tank at the two WWTPs. Treated wastewater is then discharged to the spray field associated with that WWTP. If the WWTPs were to have a breakdown of pumps, rupture of pipes and tank failure, there is the potential for partially treated wastewater to be released to the environment.

8.8.2 Identification and general characterisation of emission

Treated wastewater may contain high levels of pathogens and nutrients which have been identified as key environmental hazards.

8.8.3 Description of potential adverse impact from the emission

Wastewater accidentally discharged to the environment during the treatment process may cause soil contamination. If wastewater is discharged to the spray field prior to meeting emission standards this could lead to the facilitated growth of weeds, increase in nutrient levels in soil and ponding in the spray field.

8.8.4 Criteria for assessment

The Licence Holder has provided a commitment in the *Existing Licence* and *W6002/2016/1* that the WWTPs comply with a Low Exposure Risk Level (level of human contact) in accordance with *DoH, 2011*.

Relevant land and groundwater quality criteria include *Australian & New Zealand Guidelines for Fresh & Marine Water Quality* and the *ASC NEPM*.

8.8.5 Licence Holder’s controls

The Licence Holder’s controls for sewage discharge from the rupture of pipes, tank failure and irrigation is outlined in Table 23 below.

Table 23: Licence Holder’s controls for the WWTPs and spray fields

Site infrastructure	Operation details
Miners accommodation village WWTP	
WWTP	<p>MAK Water designed 200 m³/day WWTP.</p> <p>Wastewater treated before being discharged to the spray field.</p> <p>Boundary of WWTP fenced with appropriately signposted.</p> <p>The WWTP will meet the following emission standards:</p> <p>Biochemical Oxygen Demand <20 mg/L</p> <p>Total Suspended Solids <30 mg/L</p> <p>Total Nitrogen <40mg/L</p> <p>Total Phosphorus <5 mg/L</p>

Site infrastructure	Operation details
	<p>Turbidity <5 NTU</p> <p>Chlorine Residual 0.2-2 mg/L</p> <p>pH ≥6.5-≤8.5 pH units</p> <p><i>E.coli</i> <10 cfu/100mL</p>
Spray field	<p>2 ha.</p> <p>Fenced and appropriately signposted.</p> <p>Effluent discharge from the WWTP managed to allow effluent to infiltrate or evaporate and prevent surface ponding or runoff from the spray field.</p>
Process plant WWTP	
WWTP	<p>MAK Water designed 25 m³/day WWTP.</p> <p>Wastewater treated before being discharged to the spray field.</p> <p>Contingency storage capacity for up to two days of normal flow if discharge is suspended while any problems are fixed.</p> <p>Boundary of WWTP fenced with appropriately signposted entrance / exit gate.</p> <p>The WWTP will meet the following emission standards:</p> <p>Biochemical Oxygen Demand <20 mg/L</p> <p>Total Suspended Solids <10 mg/L</p> <p>Total Nitrogen <30mg/L</p> <p>Total Phosphorus <8 mg/L</p> <p>Turbidity <5 NTU</p> <p>Chlorine Residual >0.2-2 mg/L</p> <p>pH 6.5-8.5 pH units</p> <p><i>E.coli</i> <10 cfu/100mL</p>
Spray field	<p>2 ha.</p> <p>Fenced and appropriately signposted.</p> <p>Effluent discharge from the WWTP managed to allow effluent to infiltrate or evaporate and prevent surface ponding or runoff from the spray field.</p>

8.8.6 Consequence

Based on the information detailed above and distance to the nearest sensitive receptors and that the wastewater will undergo treatment prior to discharge, the impact of WWTP pipe rupture, tank failure and the irrigation of treated wastewater will result in low level on-site impacts. Therefore, the consequence is **minor**.

8.8.7 Likelihood of Risk Event

Based upon the treatment applied to the wastewater prior to irrigation and Licence Holder's controls, an environmental impact from WWTP pipe ruptures, tank failure and the irrigation of treated wastewater will not occur in most circumstances. Therefore, the likelihood of the consequence is **unlikely**.

8.8.8 Overall rating for WWTP rupture of pipes, storage tank failure and irrigation

Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 15) determines the overall rating of risk for discharges to land from the WWTP and spray field during operation to be **medium**.

8.9 Risk Assessment – Landfill waste disposal and leachate

8.9.1 Description of Landfill waste disposal and leachate

All putrescible, inert waste type 1 (bricks and concrete) and inert waste type 2 (tyres and cleaned ammonium nitrate bags) in accordance with the *Landfill Waste Classification and Waste Definitions 1996* are disposed of into the Premises landfill. The most significant impact of the putrescible landfill on the surrounding environment is from leachate.

8.9.2 Identification and general characterisation of emission

Leachate discharges can enter the environment through seepage and runoff of contaminated stormwater from the active landfill area resulting in groundwater contamination.

8.9.3 Description of potential adverse impact from the emission

Leachate quality varies throughout the operational life of the landfill and after its closure as well. During the early stages of waste degradation and leachate generation the composition is acidic and high in volatile fatty acids (the acetogenic phase). This acid leachate may dissolve other components of the wastes, such as heavy metals. The leachate also contains high concentrations of ammoniacal nitrogen and has both a high organic carbon concentration and a biochemical oxygen demand.

8.9.4 Criteria for assessment

Relevant land and groundwater quality criteria include the *Australian & New Zealand Guidelines for Fresh & Marine Water Quality*, the *Landfill Waste Classification and Waste Definitions 1996* and *ASC NEPM*.

8.9.5 Licence Holder's controls

The Licence Holder's controls for the landfill are set out in Table 24.

Table 24: Licence Holder's controls for the Landfill

Site infrastructure	Operation details
Landfill fence, signage	To be maintained. Sign to be legible.
Landfill trench	<p>250m x 150m landfill area.</p> <p>Each cell approximately 30m long x 10m wide x 4m deep, surrounded by an earthen bund of 1m in height at surface level.</p> <p>Tip face to not exceed 30m in length and incorporates a ramp down where waste is deposited.</p> <p>Firebreak of at least 3m in width around the boundary of the facility.</p> <p>Windblown waste to be collected and put back in the landfill.</p> <p>Waste to be covered at least weekly with 300 mm of soil or clean fill.</p> <p>Regular inspections.</p>
	<p><u>Broken wooden pallets – storage and burning (for training purposes only)</u></p> <p>Stored within a designated cell within the landfill area.</p> <p>2 m high perimeter bund.</p> <p>Fire control methods such as fast attack vehicles and water trucks used on training days.</p>
Waste Rock Landform	<p><u>Tyres¹ and ammonium nitrate bags (inert waste type 2)</u></p> <p>Directly landfilled.</p> <p>No more than 100 tyres stored at the Premises at any one time.</p> <p>Tyres to be disposed in batches not exceeding 1,000 whole tyres.</p> <p>Tyres covered at regular intervals such that no more than 1,000 whole tyres are left exposed at any one time.</p> <p>Each batch of tyres to be separated by at least 100 mm of soil or another dense inert and incombustible material, with a final cover not less than 500 mm.</p> <p>Ammonium nitrate bags shaken to remove prill prior to disposal.</p> <p>Regular inspections.</p>

Note 1: Requirements for landfilling tyres are set out in Part 6 of the EP Regulations.

8.9.6 Consequence

Based on the distance to groundwater (>30 m) and waste to be accepted, an environmental impact from waste disposed and leachate could result in low level on-site impacts. Therefore, the consequence is **minor**.

8.9.7 Likelihood of Risk Event

Based upon the distance to groundwater and Licence Holder's controls, the likelihood of an environmental impact from waste disposal and leachate will not occur in most circumstances. Therefore, the likelihood of the consequence is **unlikely**.

8.9.8 Overall rating for the landfill waste disposal and leachate

Comparison of the consequence and likelihood ratings described above with the risk rating

matrix (Table 15) determines the overall rating of risk for the Landfill during operation to be **medium**.

8.10 Hydrocarbon discharges from the workshops/wash down facilities

8.10.1 Description of hydrocarbon discharges from the workshops/wash down facilities

Oils, greases and diesel released to ground during operations from maintenance workshops and wash down facilities associated with failures of bunding or sumps or catastrophic mechanical failures of tanks.

8.10.2 Identification and general characterisation of emission

Oils and greases (hydrocarbons) may be released to ground (through spills, poor handling or inadequate bunding). Incorrectly sized or a poorly maintained OWS may result in overflow/release of hydrocarbons to ground or to stormwater.

8.10.3 Description of potential adverse impact from the emission

Releases of hydrocarbons outside bunded areas may result in localised soil contamination. Long term undetected spills or leaks may also result in groundwater contamination. Spills may be transported with stormwater during rainfall events.

8.10.4 Criteria for assessment

For large spills or leaks, the criteria in the Schedule B5 of the *ASC NEPM* applies as reference data to determine level of impact.

8.10.5 Licence Holder's controls

The Licence Holder's controls for the workshops and wash down facilities are set out in Table 25 below.

Table 25: Licence Holder's controls for the workshops/wash down facilities

Site infrastructure	Controls
Wash down facilities	<p>Located on concrete pads, which drain to an OWS.</p> <p>Heavy and light vehicles washed down at a purpose-built wash down facility.</p> <p>Sediment from the wash down pad collected in a concrete sump and washwater treated to separate solids and hydrocarbons.</p>
Workshops	<p>Workshop facilities (heavy, light vehicle and maintenance) located on concrete pads which drain to an OWS.</p> <p>Heavy and light vehicle maintenance occurs within the workshops.</p>
OWS	<p>Located within a bunded area.</p> <p>Designed to treat all stormwater and wastewater likely to be contaminated with hydrocarbons.</p>
Bulk oil tanks located within the mining area workshops	<p>Comprise 7 x 10 kL self bunded storage tanks.</p>

Site infrastructure	Controls
All	<p>Spill kits located throughout the Premises and employees trained in their use.</p> <p>Spills or leaks of fuels/oils contained within bunded area and drain to a collection sump for removal and disposal to an appropriately licensed facility.</p>

8.10.6 Consequence

If a localised release of hydrocarbons to ground occurs, then the Delegated Officer has determined that the impact of the spill will be **minor** (on site low-level impact).

8.10.7 Likelihood of Risk Event

The likelihood of a localised release of hydrocarbons resulting in soil contamination is **possible**.

8.10.8 Overall rating of discharges from the workshops/wash down facilities

Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 15) determines the overall rating of risk of discharges to land (localised spill) from the workshops/wash down facilities is **medium**.

8.11 Summary of acceptability and treatment of Risk Events

A summary of the risk assessment and the acceptability or unacceptability of the risk events set out above, with the appropriate treatment and control, are set out in Table 26 below. Controls are described further in section 9.

Table 26: Risk assessment summary

	Description of Risk Event			Licence Holder's controls	Risk Rating	Acceptability with controls (conditions on instrument)
	Emission	Source	Pathway / Receptor (Impact)			
1	Spills of processing reagents	Wet processing plant	Discharges to land causing death or poor vegetation health; localised soil contamination	Ore processing activities conducted within bunded areas Processing reagent storage and containment as detailed in section 8.4.4	Minor consequence Unlikely likelihood Medium risk	Processing reagents to be stored in accordance with: <ul style="list-style-type: none"> AS 1940; and AS 1692. Also subject to the following regulatory controls: <ul style="list-style-type: none"> <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>; and General provision of the EP Act.
2	Leaks or overflows from the ponds (process water and sedimentation)	Water storage pond breaches	Overflow or leak to land causing poor vegetation health and localised soil contamination	HDPE liner Freeboard maintained	Moderate consequence Unlikely likelihood Medium risk	Acceptable, subject to Licence Holder's operational controls conditioned. Subject to the general provisions of the EP Act and the <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i> .
3	Stormwater runoff	Ore processing and handling area Stormwater runoff	Stormwater runoff from cleared and operational areas potentially causing soil contamination and	Stormwater management as detailed in section 8.6.4	Minor consequence Unlikely likelihood Medium risk	No operational controls required as subject to the following regulatory controls: <ul style="list-style-type: none"> <i>Environmental Protection</i>

		Infrastructure drainage	sedimentation			(<i>Unauthorised Discharges</i>) <i>Regulations 2004</i> ; and <ul style="list-style-type: none"> General provision of the EP Act.
4	TSF pipeline ruptures, overtopping and seepage	Rupture of pipelines (tailings and return water) Overflow of TSF tailings Seepage from TSF	Direct discharge to land potentially causing soil contamination inhibiting vegetation growth and survival Groundwater mounding Inundation of vegetation rooting zone and decrease in quality habitat of subterranean fauna	Refer to Licence Holder's controls as detailed in section 8.7.5	Moderate consequence Unlikely likelihood Medium risk	Acceptable, subject to Licence Holder's operational controls conditioned. Infrastructure and monitoring requirements on the Licence.
5	WWTP rupture of pipes, storage tank failure and irrigation	Ruptures of pipes Overtopping of tanks due to failure of equipment Irrigation of treated effluent	Discharges to land potentially causing soil contamination Facilitated growth of weeds Increase in nutrients in soil Ponding in spray field	Refer to Licence Holder's controls as detailed in section 8.8.5	Minor consequence Unlikely likelihood Medium risk	Acceptable, subject to Licence Holder's operational controls conditioned. Infrastructure and monitoring requirements on the Licence.
6	Landfill waste disposal and leachate	Disposal of waste Leachate to soil	Discharges to land Seepage through soil	Refer to Licence Holder's controls as detailed in section 8.9.5	Minor consequence Unlikely likelihood Medium risk	Acceptable, subject to Licence Holder's operational controls conditioned. Infrastructure and monitoring requirements on the Licence.

7	Hydrocarbon discharges during operation of workshops/ wash down facilities	Workshops Wash down facilities	Hydrocarbon spills resulting in localised soil contamination	Refer to Licence Holder's controls as detailed in section 8.10.5	<p>Minor consequence Possible likelihood</p> <p>Medium risk</p>	<p>Acceptable, subject to Licence Holder's operational controls conditioned.</p> <p>Also subject to the following regulatory controls:</p> <ul style="list-style-type: none"> • AS 1940; • AS 1692; • <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>; and • General provision of the EP Act.
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9. Regulatory controls

A summary of regulatory controls determined to be appropriate for the Risk Event follows in this section. Controls are set with regard to the adequacy of controls proposed by the Licence Holder. The conditions of the Revised Licence are set to give effect to the determined regulatory controls.

9.1 Licence controls

9.1.1 Process water pond and sedimentation pond

The following environmental controls, infrastructure and equipment should be maintained at the process water pond and sedimentation pond to manage the risk of emissions at the Premises:

- HDPE liner maintained;
- Freeboard of 500 mm over and above the freeboard required to hold the volume of water associated with a 1:100 year, 72 hour storm event; and
- Daily inspections.

9.1.2 TSF and TSF pipelines (tailings and return water)

The following environmental controls, infrastructure and equipment should be maintained and operated onsite for the TSF and tailings and return water pipeline management:

- Freeboard of 500 mm over and above the freeboard required to hold the volume of water associated with a 1:100 year, 72 hour storm event;
- Daily inspections of the TSF and pipelines' integrity;
- Flow and leak detection sensors maintained.

9.1.3 WWTP

The *Existing Licence* authorises treated wastewater from the Miners accommodation village WWTP to be discharged to the spray field.

During this amendment, the Licence has been updated to also include the Process Plant WWTP. Conditions on Licence for authorised emissions, authorised discharge points, infrastructure and equipment requirements, and waste acceptance.

9.1.4 Landfill

The Licence authorises putrescible waste, inert waste type 1 (bricks and concrete) and inert waste type 2 (tyres and cleaned ammonium bags) to be disposed of at the Premises. The Licence has conditions relating to authorised emissions, authorised discharge points, infrastructure and equipment requirements, and waste acceptance.

9.1.5 Monitoring requirements for the TSF

Ambient groundwater monitoring and the requirement for an annual water balance has been placed on the Revised Licence during this amendment.

Ambient groundwater monitoring has been included on the Revised Licence to identify potential impacts to ambient groundwater quality as a result of seepage from the TSF.

As no previous ambient groundwater samples have been provided by the Licence Holder for the TSF (TSFM1 to TSFM10) for the ability to compare data, a requirement has been placed on the Revised Licence for the Licence Holder to undertake fortnightly sampling for a six month period from the issue of the Revised Licence, which the Delegated Officer considers adequate

to provide baseline data.

9.1.6 Monitoring requirements for the WWTP

Monitoring conditions on the *Existing Licence* for the Miners accommodation Village WWTP.

During this amendment, monitoring requirements for the Process Plant WWTP have been included.

9.1.7 Monitoring requirements for the Landfill

Conditions on the Licence for the monitoring of inputs to the Landfill.

9.1.8 Licence reporting

An Annual Audit Compliance Report is required to be submitted as a condition of the Revised Licence.

10. Determination of Licence conditions

The conditions in the Revised Licence in Attachment 1 have been determined in accordance with the *Guidance Statement: Setting Conditions*.

Table 27 provides a summary of the conditions to be applied to this Revised Licence. Licence conditions may be subject to change following site inspections by DWER.

Table 27: Summary of conditions to be applied

Condition Ref	Grounds
Emissions Conditions 1 and 2	These conditions are valid, risk-based and consistent with the EP Act.
Infrastructure and Equipment Conditions 3, 4 and 5	These conditions are valid, risk-based and contain appropriate controls.
Waste Acceptance Condition 6	This condition is valid, risk-based and consistent with the EP Act.
Waste Input Monitoring Condition 7	This condition is valid and is a necessary administration and reporting requirement to ensure compliance.
Monitoring Conditions 8 and 9	These conditions are valid and necessary to ensure compliance.
Emissions and Discharge Monitoring Condition 10	This condition is valid, risk-based and contain appropriate controls.
Ambient Monitoring Conditions 11 and 12	These conditions are valid, risk-based and contain appropriate controls.
Record-keeping Conditions 13, 14, 15, 16, 17 and 18	These conditions are valid and are necessary administration and reporting requirements to ensure compliance.

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

11. Licence Holder's comments

The Licence Holder was provided with the draft Revised Licence and draft Decision Report on 17 July 2019 for review and comment. The Licence Holder responded on 22 July 2019, addressing a number of outstanding matters and waiving the remaining comment period

(Gruyere, 2019b).

12. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

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

Alana Kidd

Manager, Resource Industries

Delegated Officer

under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text ref	Availability
1	L9000/2016/1 Amendment Notice 1 granted 19 October 2017 Amendment Notice 2 granted 12 March 2018 Amendment Notice 3 granted 27 August 2018 Amendment Notice 4 granted 5 April 2019	Existing Licence Amendment Notice 1 Amendment Notice 2 Amendment Notice 3 Amendment Notice 4	accessed at http://www.der.wa.gov.au
2	Assessment and management of contaminated sites, Contaminated sites guidelines, Department of Environment Regulation, December 2014	Assessment and management of contaminated sites	accessed at http://www.der.wa.gov.au
3	Att: Sonya Poor – Request Waive Consultation Period L9000/2016/1, received from Luc Cotte (Gruyere JV), dated 22 July 2019	Gruyere, 2019b	DWER records (DWERDT181350)
4	Australian Bureau of Statistics, 2016 Census Quickstats for Cosmo Newbery. Accessed 7 June 2019	2016 Census Quickstats	accessed at www.censusdata.abs.gov.au
5	Australian & New Zealand Guidelines for Fresh & Marine Water Quality	Australian & New Zealand Guidelines for Fresh & Marine Water Quality	accessed at http://www.waterquality.gov.au
6	Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Paper No. 4, Volume 3) Primary Industries – Rationale and Background Information	ANZECC, 2000 Livestock	accessed at http://www.waterquality.gov.au
7	Australian Standard AS 1692-2006 Steel tanks for flammable and combustible liquids	AS 1692	accessed at www.saiglobal.com
8	Australian Standard AS 1940-2004 The storage and handling of flammable and combustible liquids	AS 1940	

	Document title	In text ref	Availability
9	Department of Mines and Petroleum Code of Practice, Tailings storage facilities in Western Australia, 2013	TSF Code of Practice	accessed at www.dmirs.wa.gov.au
10	Gruyere Environmental Licence Amendment Application – L9000 received from Jonathon Barker (MBS Environmental), dated 5 November 2018	Gruyere, 2018a	DWER records (A1736109)
11	Gruyere Gold Project – Eastern Goldfields, WA. IWL-Tailings Storage Facility – Operations Manual (GRM Doc No.: 2372-CI-MAN-0001_0), prepared by Coffey Services Australia Pty Ltd for Gruyere Management Pty Ltd, 19 December 2018	TSF Operations Manual	DWER records (DWERDT181350)
12	Gruyere Gold Project – Gruyere Works Approval and Licence Amendment M38/1267, L38/254 and L38/255, prepared for Gold Road Resources Limited by MBS Environmental, October 2016	Gold Road, 2016a	DWER records (A1181347)
13	Gruyere Works Approval Amendment Application, received from Jonathon Barker (MBS Environmental), dated 5 April 2018	Gruyere, 2018b	DWER records (A1648886)
14	<i>Guidance Statement: Environmental Siting</i> , Department of Environment Regulation, November 2016	Guidance Statement: Environmental Siting	accessed at www.dwer.wa.gov.au
15	<i>Guidance Statement: Regulatory principles</i> , Department of Environment Regulation, July 2015	Guidance Statement: Regulatory principles	
16	<i>Guidance Statement: Risk Assessments</i> , Department of Environment Regulation, February 2017	Guidance Statement: Risk Assessments	
17	<i>Guidance Statement: Setting Conditions</i> , Department of Environment Regulation, October 2015	Guidance Statement: Setting Conditions	
18	<i>Guideline: Decision Making</i> , Department of Water and Environmental Regulation, June 2019	Guidance Statement: Decision Making	

	Document title	In text ref	Availability
19	Guidelines for the Non-potable Uses of Recycled Water in Western Australia, Department of Health, August 2011	DoH, 2011	accessed at www.health.wa.gov.au
20	Guidelines on Tailings Dams, Planning, Design, Construction, Operation and Closure, May 2012	ANCOLD, 2012	accessed at www.ancold.org.au
21	Landfill Waste Classification and Waste Definitions 1996 (as amended 2018), Department of Water and Environmental Regulation, April 2018	Landfill Waste Classification and Waste Definitions 1996	accessed at www.der.wa.gov.au
22	Ministerial 1048, Gruyere Gold Project, published on 29 December 2016	MS 1048	accessed at www.epa.wa.gov.au
23	National Environment Protection (Assessment of Site Contamination) Measure 1999	ASC NEPM	accessed at www.legislation.gov.au
24	National Water Quality Management Strategy, Australian Guidelines for Sewerage Systems Effluent Management, Agriculture and Resource Management Council of Australia and New Zealand and Australian and New Zealand Environment and Conservation Council, 1997	NWQMS, 1997	accessed at www.environment.gov.au
25	Northcote, K.H. with Beckmann, G.G., Bettenay, E., Churchward, H.M., Van Dijk, D.C., Dimmock, G.M., Hubble, G.D., Isbell, R.F., McArthur, W.M., Murtha, G.G., Nicolls, K.D., Paton, T.R., Thompson, C.H., Webb, A.A. and Wright, M.J. (1960-1968). Atlas of Australian Soils, Sheets 1 to 10. With explanatory data (CSIRO Aust. and Melbourne University Press: Melbourne)	Northcote, 1960-68	accessed at http://www.asris.csiro.au
26	RE: Gruyere Gold Construction Completion Report, received from Jonathon Barker (MBS Environmental), 6 June 2019	Gruyere, 2019a	DWER records (A1794386)
27	RE: L9000/2017/1 Amendment, received from Nicholas Rudzinkas (Gruyere JV), dated 6 February 2018	Gruyere JV, 2018	DWER records (A1607388)
28	Report and recommendations of the Environmental Protection Authority, Gruyere Gold Project, Gold Road Resources Limited, Report 1587, November 2016	Report Number 1587	accessed at www.epa.wa.gov.au
29	Submission of Works Approval W6002/2016/1 Compliance Completion	Construction Completion	DWER records (A1789033, A1789037, A1789040, A1789041 and

	Document title	In text ref	Availability
	Report, Gruyere Management Pty Ltd, 15 May 2019	Report	A1789045)
30	Understanding-salinity – Salinity status classifications, by total salt concentration table, Department of Water	Salinity status classification	accessed at http://www.water.wa.gov.au/water-topics/water-quality/managing-water-quality/understanding-salinity
31	Works Approvals W6002/2016/1 and W5997/2016/1	W6002/2016/1 W5997/2016/1	accessed at http://www.der.wa.gov.au

Attachment 1: Revised Licence L9000/2016/1
