



Decision Document

Environmental Protection Act 1986, Part V

Applicant: Mt Morgans WA Mining Pty Ltd

Licence : L9010/2016/1

Registered office: Level 2, 1 Preston Street
COMO WA 6152

ACN: 612 053 291

Premises address: Mt Morgans Gold Project
Mining tenements M39/236, M39/395, M39/390, M39/272, M39/18,
M39/228, M39/264, M39/304, M39/240, M39/248, L39/245, L39/246,
M39/441, M39/250, M39/504, M39/745, M39/403, M39/282, M39/36 and
M39/1107
LAVERTON WA 6440

Issue date: 9 February 2017

Expiry date: 9 February 2026

Decision

Based on the assessment detailed in this document the Department of Water and Environmental Regulation (DWER) has decided to amend the licence. DWER considers that in reaching this decision, it has taken into account all relevant considerations and legal requirements and that the Licence and its conditions will ensure that an appropriate level of environmental protection is provided.

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Rebecca Kelly
A/Senior Manager Resource Industries
Officer delegated under section 20
of the *Environmental Protection Act 1986*



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1 Purpose of this Document

This decision document explains how DWER has assessed and determined the application and provides a record of DWER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DWER's assessment and decision making under Part V of the *Environmental Protection Act 1986*. Other approvals may be required for the proposal, and it is the applicant's responsibility to ensure they have all relevant approvals for their Premises.

2 Administrative summary

Administrative details		
Application type	Works Approval ☐ New Licence ☐ Licence amendment ☒ Works Approval amendment ☐	
Activities that cause the premises to become prescribed premises	Category number(s)	Assessed design capacity
	5	2.5 million tonnes per annum
	6	1,200,000 tonnes per annum
	64	4,500 tonnes per annum
	54	100 kL per day
Application verified	Date: N/A	
Application fee paid	Date: N/A	
Works Approval has been complied with	Yes ☐ No ☐ N/A ☒	
Compliance Certificate received	Yes ☐ No ☐ N/A ☐	
Commercial-in-confidence claim	Yes ☐ No ☒	
Commercial-in-confidence claim outcome	N/A	
Is the proposal a Major Resource Project?	Yes ☐ No ☒	
Was the proposal referred to the Environmental Protection Authority (EPA)	Yes ☐ No ☒	Referral decision No:



under Part IV of the <i>Environmental Protection Act 1986</i> ?		Managed under Part V ☐ Assessed under Part IV ☐
Is the proposal subject to Ministerial Conditions?	Yes ☐ No ☒	Ministerial statement No: EPA Report No:
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the <i>Environmental Protection Act 1986</i>)?	Yes ☐ No ☒	
Is the Premises within an Environmental Protection Policy (EPP) Area: Yes ☐ No ☒ If Yes include details of which EPP(s) here.		
Is the Premises subject to any EPP requirements? Yes ☐ No ☒ If Yes, include details here, eg Site is subject to SO ₂ requirements of Kwinana EPP.		

3 Executive summary of proposal and assessment

3.1 Background

The Mount Morgans Gold Project is located approximately 30 km south-west of Laverton. It is owned by Mt Morgans WA Mining Pty Ltd, (MMWM) which is wholly owned subsidiary of Dacian Gold Limited. The site has historically been operated since the 1980s by a number of companies prior to MMWM acquiring it in 2012. The site has been in care and maintenance since 2011.

MMWM applied for and was granted a Works Approval (W6008/2016/1) and Licence (L9010/2016/1) for the following prescribed categories:

- 5 – Processing and beneficiation of metallic or non-metallic ore;
- 6 – Mine dewatering;
- 54 – Sewage facility;
- 65 – Class II or III landfill; and
- 73 – Bulk storage of chemicals.

The following infrastructure is required to be constructed in stages as described by the Works Approval:

- Run of Mines Pads
- Processing plant
- Tailings Storage Facility (TSF)
- Water storage dams
- Workshops
- Administration offices
- Accommodation village
- Waste water treatment plants
- Putrescible landfills
- Pipelines

The Delegated Officer has determined that the activities at the mine trigger all of the above prescribed activities under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations). This document is based on an assessment of the application for a Part V *Environmental Protection Act*



1986 (EP Act) Licence, which was verified on 7 November 2016 and Works Approval compliance reports dated 25 May 2017, 12 July 2017 and 5 July 2017.

MMWM submitted an application on 18 October 2017 to amend Works Approval W6008/2016/1 and Licence L9010/2016/1. MMWM propose the following amendments:

- Amendment to activities associated with Category 6 – Mine dewatering and discharge to existing open pits (50,000 tonnes or more per annum).
- Amendment to activities associated with Category 64 – Class II putrescible landfill site (20 tonnes or more per annum).
- Removal of Category 52 – Electric power generation using a fuel (more than or equal to 10 MW).

Detailed information is provided in Section 3.2 Operational requirements. That amendment was granted on 26 February 2018.

Amendment - 27 March 2018

MMWM submitted a compliance document on 25 January 2018 to demonstrate that infrastructure associated with the Jupiter Processing Plant and Tailings Storage Facility has been constructed in accordance with Works Approval W6008/2016/1. This report was in relation to Stage 4 (construction of the TSF – Cell 1 to 408 mRL) and Stage 5 (construction of the processing plant). This compliance document also included groundwater monitoring results as required by condition 3.1.8 and airborne dust monitoring as required by condition 3.1.2 of the Works Approval.

MMWM submitted a compliance document on 6 February 2018 for the construction of Jupiter Wastewater Treatment Plant (WWTP).

Both of these compliance documents have triggered a DWER initiated amendment to this Licence for activities relating to Category 5 and Category 54.

Detailed information is provided in Section 3.2 Operational requirements.

3.2 Operational requirements

Amendment – 27 March 2018

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

MMWM proposed to construct a carbon-in-leach processing plant with an annual production capacity of 2.5 million tonnes. The processing of the carbon-in-leach plant include crushing, grinding, a gravity circuit, carbon-in-leach circuit and a carbon stripping and goldroom circuit.

A hill side paddock style TSF with two cells, is proposed for the storage of tailings. The TSF will be constructed in stages using an upstream technique. Stage 1 of Cell 1 will be constructed to a maximum height of 9 m (RL 408 mAHD). Cell 2 will be on the north-east side of Cell 1. Both of the cells are proposed to be raised using an upstream method of construction with two stages. Stage 2 construction (first raise of the embankments) will be 4 m height. Stage 3 comprises a 2 m raise to a final elevation of 414 mAHD.

The following table shows an overview of the TSF construction stages:

TSF Cell	Construction Stage	Embankment Crest Elevation (m RL)	Storage Capacity (Mt)
Cell 1	Stage 1 (starter)	408	2.6
	Stage 2	412	3.9



	Stage 3	414	2.3
Cell 2	Stage 1 (starter)	408	3.0
	Stage 2	412	3.7
	Stage 3	414	2.1
	Total		17.6

Tailings will be discharged through multiple rotating spigots on the perimeter embankment of each cell as a slurry consisting of 45%-50% solids. A decant pond will form at the centre of the cells where a central decant tower will pump the water back to the plant for re-use.

MMWM submitted a Compliance Report for the Stage 4 (construction of the TSF – Cell 1 to 408mRL) and Stage 5 (construction of the processing plant).

Processing Plant:

MMWM advised that there have been no changes to the processing plant design as described in the Works Approval W6008/2016/1.

MMWM advised that the Processing Plant has been constructed in accordance with design specifications in Works Approval W6008/2016/1. The ore processing circuit consists of the following processes:

- Primary crushing fed by a dedicated front-end loader from Run of Mine Stockpiles
- Crushed ore stockpile and reclaim feeders providing feed to the SAG mill
- Grinding by open circuit SAG mill followed by ball mill in closed circuit with hydro-cyclones
- Screening and thickening followed by leaching of gold in cyanide tanks and absorption onto activated carbon.
- Carbon Stripping via electrowinning the pregnant liquors and smelting into dore bars

Tailings Storage Facility Cell 1:

There are a number of amendments to the TSF design, as follows:

- Inclusion of an underdrainage system
- Amendment to the embankment filter zone material
- Amendment to the playa clay preparation and permeability requirement

There are two other design amendments:

- Spigot intervals: The Works Approval W6008/2016/1 states that spigots will be placed around the perimeter of the TSF at 36m intervals. The final design includes spigots at 24m intervals.
- Flood protection bund height: The Works Approval W6008/2016/1 states that the TSF will have a flood protection bund, constructed around the downstream perimeter of TSF embankments to an elevation of 401.5m AHD. Following a further detailed flood assessment undertaken by Carrick Consulting (WA) Pty Ltd. in April 2017, the elevation of the flood protection was reduced. The detailed assessment involved a 94-point traverse pick-up of playa lake surface elevations around the processing plant and TSF area. This traverse yielded an average elevation of 399.10 mAHD. Based on this information, the previously recommended 401.5 mAHD flood level provides for a significantly higher bund than is required for protection against any credible flood event. It was therefore proposed that an elevation of 400.50 mAHD should be adopted for detailed design purposes. This revised elevation will yield an average height above the playa lake surface of about 1.40m.

The flood protection bund height is regulated by Department of Mines, Industry Regulation and Safety (DMIRS) under the *Mines Safety and Inspection Act 1994*.

Condition 1.2.2 of the Works Approval states that the Works Approval Holder must not depart from the requirements specified in Table 1.2.1, except where such a departure is minor in nature and does



not materially change or affect the infrastructure, or where such a departure improves the functionality of the infrastructure and does not increase risks to public health, public amenity or the environment.

The Delegated Officer has assessed all of the changes to the design of the TSF and determined that the amendments are not material.

Category 6 – Mine dewatering

For mining purposes, dewatering within the site is necessary. MMWM developed a site wide water balance for water management purposes. It is expected that after water is used for dust suppression and mining purposes any excess water from Jupiter will be discharged to the Mt Marven open pit. Any excess water at Westralia will be discharged to five existing pits; King Street, Ramornie, Ramornie North, and Sarah and Craic.

Dewatering pipelines for the Westralia dewatering have been constructed with the following configurations:

- Westralia open pit to Sarah, Ramornie and Ramornie North open pits;
- Westralia open pit to King Street open pit;
- Westralia open pit to Transvaal;
- Morgans North open pit and Craic open pit;
- Transvaal open pit to Craic open pit;

All pipelines carrying hypersaline water will be banded and fitted with leak detection flow meters and shut/off isolation valves.

The construction of the Westralia dewatering pipelines completed stage 1 of Works Approval W6008/2016/1.

26 February 2018 - Amendment

MMWM are proposing to discharge:

- Dewatering of Ramornie pit with discharge to Sarah pit. This is required due to a conduit of interlinking hydrogeological structures between the proposed underground development and Ramornie pit. Dewatering from the Ramornie pit (via pipelines), in combination with underground dewatering to Sarah pit will result in a temporary pit lake of 207,847m³ (allowing for 5 m freeboard). Use of water stored in Sarah pit will be used for dust suppression (1.5L/s), reuse underground (13 L/s) and reuse at the wash-down pad (03.6 L/s).
- Discharge of water used in the wash-down pad back into Sarah pit (0.6 L/s). This water will be treated through an oil-water separator to reduce the hydrocarbon concentration to 15mg/L. On an annual basis, this accounts for 9% of the total pit volume.
- Transfer of water from Transvaal to Sarah pit to maintain the water supply for the uses above. Dewatering of Transvaal was approved under the Works Approval and Licence, however discharge was proposed to Craic pit.

Category 54 – sewage facility

MMWM proposed to construct two waste water treatment plants (WWTP) under Works Approval W6008/2016/1 granted on 3 January 2017. A WWTP would be constructed at the Westralia accommodation village, and a WWTP constructed at the Jupiter process plant and mine site.

On 12 July 2017, MMWM submitted a Compliance Report for the Westralia Accommodation village WWTP in accordance with the Works Approval. DWER reviewed the Compliance Report, reassessed the risks and amended the Licence on 4 August 2017 to include the Westralia accommodation village.

The constructed Westralia WWTP has been rated for 420 people accommodated at 180 litres per person per day (75.6 kL/day). The plant consists of two 50 kL capacity containerised units (100



kL/day), treating waste water through a combined anoxic/aerobic suspended growth treatment process. The treated waste water will be pumped to a 3.6 Ha irrigation field. As a contingency, a 350kL HDPE lined pond has been constructed for storage of treated wastewater during periods of heavy rainfall or during emergency situations for reprocessing back at the treatment plant.

The construction of the Westralia WWTP partially completes stage 3 of Works Approval W6008/2016/1.

Amendment – 27 March 2018

Jupiter WWTP will include a 7.5 kL/day capacity, with the plant rated for 150 people, based on 50L/person/day. Treated waste water is proposed to be discharged directly into the Jupiter process water circuit.

MMWM submitted a Compliance documented on 6 February 2018 for the Jupiter Waste Water Treatment Plant in accordance with Conditions 4.1.1 and 4.1.2 of Works Approval W6008/2016/1.

The Activated Sludge Bioreactor WWTP designed by Mac Water for the Jupiter Mine Service Area (MSA) is a category 54 sewage facility that has a rated capacity of 7.5m³/day. It consists of one containerised unit, treating waste water through a combined anoxic / aerobic suspended growth treatment process. The treated waste water will be pumped and discharged to the Tailings Storage Facility (TSF).

The following construction tasks have been completed in accordance with Works Approval W6008/2016/1:

- The WWTP, associated tanks and pipe work have been laid out and connected by a licensed plumber as per the manufacture's requirements.
- Pipelines to the TSF have been buried or placed in a V-drain or earthen bund.

Category 64 – Class II or Class III landfill facilities

On 25 May 2017 and 5 July 2017, MMWM submitted a Compliance Reports to DWER for the Westralia plus Jupiter (respectively) Class II or III putrescible landfill facility in accordance with Works Approval W6008/2016/1, granted on 3 January 2017. DWER reviewed the Compliance Reports and amended the Licence to include the Westralia and Jupiter landfill on 27 June 2017 and 17 January 2018 respectively.

26 February 2018 – Licence Amendment:

MMWM are proposing to construct a tyre landfill within Jupiter West Waste Rock Dump. Anticipated tyre usage over the life of mine is shown in

Figure 1:

Machine	Number
150t truck	300
100t truck	300
40t truck	50
Grader	60

Figure 1: Estimate of tyre numbers for life of mine

25 July 2019 – Licence Amendment

On 9 October 2018, MMWM submitted a Licence Amendment application to DWER for the



construction and operation of category 64 Class II or III putrescible landfill facility at the 'Back 'O Beyond' pit which is approximately 150m long, 30m wide and 9m deep to replace the Westralia landfill as it nears capacity. It is anticipated the MMWM operations will generate 2,500 tonnes per annum of inert waste and 2,000 tonnes per annum of putrescible waste for disposal at the Westralia, Jupiter and 'Back 'O Beyond' landfills.

The Delegated officer therefore considered the risk to the environment of the 'Back 'O Beyond' pit landfill remains unchanged from that assessed for the Westralia and Jupiter landfills and determined that the operations of the 'Back 'O Beyond' landfill facility will not result in emissions which are unacceptable to public health or the environment and therefore grants this amendment. See risk assessment in Appendix A titled "Construction and Operation – Landfill".

The Delegated Officer has amended the conditions of the Licence to include the 'Back 'O Beyond' landfill plus conditions that identify waste types for disposal plus the waste cover material requirements and included a map in schedule 1 that demarcates the 'Back 'O Beyond' landfill at the Premises.

3.3 Location and siting

Siting Context

The project is located approximately 30 km south-west of Laverton, in the north eastern Goldfields of Western Australia. Two mining areas within the prescribed premises are proposed. They are: Jupiter (comprising of Heffernans, Doublejay and Ganymede open pits) and Westralia (comprising of Beresford underground, Allanson underground, Morgans North open pit cutback and Transvaal underground).

Sensitive Land Uses

The closest human receptor to the Mt Morgans Gold Project is the Mt Margaret Community, which is located directly northwest of Jupiter and is approximately 2 km from the proposed processing plant. The nearest point from the TSF is 900 m from the community. The nearest point from one of the haul roads is 800 m.

A small section of the project (Craic open pit, magazine compound, a section of the TSF and the production borefield) is located on an active pastoral station running sheep and beef (Glenorn pastoral station lease).

Specified Ecosystems

The project is not located within 30 km of a Public Drinking Water Source Area.

A Level 1 vegetation assessment was carried out in the area in March 2016 by a qualified botanist, in accordance with the Environmental Protection Authority (EPA) "Terrestrial Biological Surveys as an Element of Biodiversity Protection; Position Statement No 3" (EPA 2002) and Guidance Statement No 51 "Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004)". A total of 32 Families, 77 Genera and 195 Species were recorded within the entire area. The results of the survey showed no Declared Rare Flora, no Threatened flora or Priority flora species were recorded in the area. The project has been granted a Native Vegetation Clearing Permit (see below).

A fauna and habitat assessment was carried out in March 2016 by Western Wildlife. The majority of the conservation significant species identified are migratory shorebirds protected under international conventions, 11 in total, which may be present when Lake Carey, a large salt lake situated approximately 2.5 km to the south of the Jupiter prospect is inundated. Two of the migratory shorebirds were recorded in the project area during the fauna survey: the Common Greenshank and the Red-necked Stint. Lake Carey is considered a specified ecosystem because it is habitat for listed migratory shorebirds.



Topography

The project is located in the Eastern Murchison subregion of the Murchison Interim Biogeographic Regionalisation for Australia (IBRA) Bioregion. It lies within the Laverton Greenstone Belt, which forms the north-eastern part of the Eastern Goldfields Province of the Yilgarn Craton of Western Australia. It consists of granitic rocks and areas of sedimentary banded iron formation (BIF) rocks.

Groundwater and water sources

The premises lies within the Lake Carey catchment and this is the nearest surface water body, with the lakeshore approximately 2.5 km to the south of the Jupiter and 4 km from Westralia prospects. It is separated by a banded ironstone formation (BIF) ridge, approximately 80 m high. Lake Carey may fill during occasional intense rainfall events. There are no major river systems in the vicinity of the project area but there are several ephemeral creeks which drain in a southeast direction towards Lake Carey.

Other approvals

MMWM submitted a Native Vegetation Clearing Permit (NVCP) to the then Department of Mines and Petroleum (DMP) in September 2016 for assessment and was approved in December 2016. MMWM hold a current Groundwater Well Licence [GWL169901 (5)] that approves the abstraction of up to 1.4 GL of annual abstraction. A Mining Proposal was submitted to DMP in September 2016 and approved in December 2016.



4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987* and DWER's Operational Procedure on Assessing Emissions and Discharges from Prescribed Premises. Where other references have been used in making the decision they are detailed in the decision document.

DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
General conditions	Licence conditions	Operation General conditions in the Licence include definitions and interpretations of guidelines, standards and codes of practice.	Application supporting documentation
Premises operation	Licence conditions	Operation DWER's assessment and decision making is detailed in Appendix A.	Application supporting documentation General provisions of the <i>Environmental Protection Act 1986</i>
Emissions general	Licence condition	Operation Descriptive limits will be set through a condition of the Licence and therefore a condition regarding recording and investigation of exceedances of limits has been included.	N/A
Point source emissions to air including monitoring	Licence conditions	Operation There are no point sources emissions to air associated with Stage 1 dewatering and Stage 2 landfill.	Application supporting documentation



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
			General provisions of the <i>Environmental Protection Act 1986</i>
Point source emissions to surface water including monitoring	L – no conditions	Operation There are no point source emissions to surface water with the operation at the Mt Morgans Gold Project. No conditions apply. The site lies within the Lake Carey catchment and the lakeshore is 2.5 km to the south of the Jupiter prospect. It is separated by a banded iron formation ridge approximately 80 m high.	Applicant supporting documentation
Point source emissions to groundwater including monitoring	Licence conditions	Operation <i>Emission:</i> Mine dewatering will be transported in pipelines from Westralia to various open pits for storage. <i>Impact:</i> Potential water mounding of the water table in the vicinity of the receiving pits. Mounding can potentially cause impacts on surrounding native vegetation by inundating the roots. The quality of the groundwater being shifted between pits is brackish-saline with total dissolved solids ranging between 1,700 – 12,000 mg/L in the Westralia receiving pits. Generally groundwater in the Westralia area ranges from 6,000 – 14,500 mg/L TDS. The lower values in the pit water are indicative of collected rainwater. A vegetation survey, carried out by a qualified botanist, concluded that of the 195 species recorded in the survey area, no species are listed as Declared Rare Flora, Threatened or Priority species. The majority of vegetation types are Acacia shrub lands which are generally shallow rooted.	Application supporting documentation General provisions of the <i>Environmental Protection Act 1986</i>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<i>Controls:</i> Hydrogeology in the project area consists of fractured rock aquifers generally of low and very low permeability within the basaltic rock mass. Groundwater inflows will be managed through in-pit and underground sumps with discharge to approved open pits as required. It is likely the pits will act as groundwater sinks, rather than sources, due to the low hydrogeological permeability. The water is being shifted within the same aquifer and water quality data of all the pits has been provided to show this is of similar quality. A minimum freeboard of 5 m will be maintained in the pits and a water balance has been calculated to ensure there are sufficient volumes available in all the receiving pits. The proponent has also stated they will commit to water quality monitoring and water volume monitoring of the pits. <u>Risk Assessment</u> <i>Consequence:</i> Minor – some on-site low impacts may occur. <i>Likelihood:</i> Unlikely – given the hydrogeology in the area, and the controls in place by the proponent, it is unlikely the consequence will occur. <i>Risk Rating:</i> Medium <u>Regulatory Controls</u> Regulatory controls will consist of conditions requiring volumetric flow to be recorded to determine volumes of water received, as well as quarterly monitoring of pH and TDS to ensure water quality remains consistent. The proponent's commitment of maintaining a 5 m freeboard on all receiving pits will also be made binding as a licence condition to protect nearby vegetation and to prevent possible overtopping following a significant rainfall event. <u>Residual Risk</u> <i>Consequence:</i> Minor	



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Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		<i>Likelihood:</i> Rare <i>Risk Rating:</i> Low Operation <i>Emission:</i> Discharge of water used in the wash-down pad to be discharged into Sarah pit (0.6 L/s). This water will be treated through an oil-water separator to reduce the hydrocarbon concentration to 15 mg/L. On an annual basis, this accounts for 9% of the total pit lake volume. <i>Impact:</i> Contamination of Sarah pit lake due to ineffective function of oil-water separator with possible ingestion by birds including conservation significant species that may occur in the area. <i>Controls:</i> The Licence Holder is proposing to monitor the pit lake water quality including hydrocarbons, pH and TDS and regular servicing of the oil-water separator to maintain functionality. <u>Risk Rating</u> <i>Consequence:</i> Moderate – onsite impacts mid-level based on the quantity of treated wastewater to be discharged to Sarah pit on an annual basis, the low permeability of the area and the groundwater level is approximately 359m AHD or 90m below natural ground level. <i>Likelihood:</i> Unlikely – the risk event will probably not occur in most circumstances based on the Licence Holder's proposed controls. <i>Risk Rating:</i> Medium risk – acceptable, generally subject to regulatory controls. <u>Regulatory Controls</u>	



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Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		The Licence has been updated to include additional monitoring requirements for Sarah pit and infrastructure inspections for the oil-water separator.	
Emissions to land including monitoring	L - Licence conditions	Operation DWER's assessment and decision making of the sewage facilities is detailed in Appendix A.	Application supporting documentation General provisions of the <i>Environmental Protection Act 1986</i>
Fugitive emissions	L – Licence conditions	Construction, Commissioning and Operation <i>Emission:</i> Dust or total suspended particulate matter (TSP). Dust may be generated during the construction and commissioning phases of the Mt Morgans Gold Project. It may also be generated during the operation of the mine from vehicle movement, crushers, stockpiles and TSFs. <i>Impact:</i> Dust may be harmful to human health, the environment and can have amenity impacts. The type and size of a dust particle determines how harmful the dust is. Dust particles small enough to be inhaled (PM ₁₀ or PM _{2.5}) may cause irritation of the eyes, coughing, sneezing and asthma attacks. Prolonged exposure may result in chronic health impacts Due to the proximity of receptors (Mount Margaret community) situated downwind of the premises, there is a potential risk of fugitive dust emissions during mine construction works and subsequent mining operations having human health impacts. In	Application supporting documentation General provisions of the <i>Environmental Protection Act 1986</i>



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Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		addition to dust generating activities at the mine itself, the haul road is approximately 800 m from Mount Margaret Community. <i>Controls:</i> The Application Supporting Document included an Air Quality Modelling report on dust as PM₁₀. The proponent has committed to the following controls to manage dust emissions during construction and operation: • The use of water carts as required on unsealed surfaces; • Dust collection system; • During high winds, topsoil stripping and spreading activities will be restricted if dust cannot be adequately controlled; • Vehicle and mining equipment to be kept to designated roads; • Vehicle speed limits to be applied; • Sprays will be fitted to the tipping area of the crusher; • Upon completion of tailings deposition, the TSF will be rehabilitated to negate generation of dust; • Regular inspections will be undertaken to evaluate dust control measures <u>Risk Assessment</u> <i>Consequence:</i> Moderate – dust can cause short-term adverse health impacts and mid-level amenity impacts to off-site receptors. <i>Likelihood:</i> Possible – given the proximity of the community to the operation, it is possible the consequence may occur at some time. <i>Risk Rating:</i> Medium <u>Regulatory Controls</u> As a precautionary measure, controls will be imposed in the Works Approval and Licence for dust management, particularly on haul roads to mitigate this risk. Controls	



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		are consistent with commitments made by the application with respect to dust management. In addition, monitoring of dust as PM₁₀ is required for both the Works Approval and the Licence, including an alarm system to warn operators of possible exceedances. A limit of 50 µg/m³ (24 hour average) has been determined based on the Air NEPM. Although DWER does not consider the Air NEPM to be a regulatory standard, it is considered to be an equivalent standard in the absence of an environmental standard for the subject area. The provision for an exceedance of the specified limit has also been included in the Licence which ensures in the event of an exceedance an investigation is undertaken and proof can be provided to demonstrate the exceedance is not attributable to operations on the premises. The conditions imposed on the Works Approval are duplicated on the Licence (Conditions 2.3.1, 3.5.4 & 3.5.5). <u>Residual Risk</u> <i>Consequence:</i> Moderate <i>Likelihood:</i> Unlikely <i>Risk Rating:</i> Medium	
Odour	No conditions	Operation Odours associated with waste discharged to landfill and sewage facilities are addressed in Appendix A.	Applicant supporting documentation
Noise	No conditions	Operation <i>Emission:</i> There is may be potential for excess noise emissions during operation at the mine. Operational noise will include:	Applicant supporting documentation



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		• Crushers and processing plant activities; • Road noise from haul trucks; • Generator noise; • Open pit and underground blasting noise and vibration; • Mobile mining equipment (including loaders, diggers, trucks, drill rigs etc.). <i>Impact:</i> Noise impacts can affect health by increasing stress levels and reduced quality of life and health for human populations, particularly when the source is located near sensitive receptors. Frequency, intensity, duration, meteorological conditions and distance to receptors are all factors which may affect the impact of noise emissions on sensitive receptors. The nearest sensitive receptor for noise is the Mt Margaret Community. Based on the layout of the proposed plant, the community is 2.6 km from the primary crusher and 3-4 kms from the operating pits at Jupiter. <i>Controls:</i> The proponent commissioned a Noise Assessment which was carried out by Herring Storer Acoustics. The modelling concluded that cumulative noise will comply with the <i>Environmental Protection (Noise) Regulations 1997</i> at the nearest sensitive receptor (Mt Margaret Community). The assessment includes construction noise and operational noise. The proponent will also implement the following controls: • Will ensure that the sound power level of the power station does not exceed 100dB (A). Should it exceed this level, noise attenuation will be constructed to reduce noise; • All vehicles and plant equipment will be regularly maintained to ensure they are operating efficiently and are not unduly noisy;	<i>Environmental Protection (Noise) Regulations 1997</i>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
		- Where possible, mufflers and other noise attenuating equipment will be installed and maintained on plant, vehicles and equipment so as to reduce exposure to occupation noise; - A Noise Management Plan will be developed for the construction period in accordance with Regulation 13 of the <i>Environmental Protection (Noise) Regulations 1997</i>. <u>Risk Assessment</u> <i>Consequence:</i> Moderate – the consequence of exceeding assigned noise levels at noise sensitive premises during construction and operation would be mid-level impact on amenity. <i>Likelihood:</i> Unlikely – given the results of the modelling and the proposed controls by the proponent, the likelihood of the event is unlikely. <i>Risk Rating:</i> Medium <u>Regulatory Controls</u> After technical review by the DWER noise specialists, the Delegated Officer is satisfied that noise can be managed adequately and no conditions are required for the Licence. The greatest concern from DWER's review for noise emissions was in regards to the haul road at its closest point to the receptor (800 m). However the proponent confirmed that haulage will occur in multi-combination articulated road trains, which are considerably less noisy than a standard haul truck. <i>The Environmental Protection (Noise) Regulations 1997 apply.</i>	
Monitoring general	Licence conditions	General monitoring conditions will apply to the Licence to ensure water samples are collected in accordance with the applicable standard and submitted to a NATA accredited laboratory for analysis.	General provisions of the <i>Environmental Protection Act 1986</i>



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
			AS/NZS 5667.1
Monitoring of inputs and outputs	No conditions	Monitoring of inputs and outputs for the landfill and sewage facility is required and are addressed in Appendix A.	N/A
Process monitoring	No conditions	Condition 3.4.1 has been added to the Licence to require continuous and accurate recording of tailings discharge, including tailings deposition and return water.	N/A
Ambient quality monitoring	No conditions	Construction and Commissioning Mt Morgans has committed to monitoring ambient groundwater following the drilling of 6 monitoring bores around the TSF prior to the facility becoming operational. The Delegated Officer has formalised Mt Morgans commitment through a Works Approval condition to ensure a baseline of groundwater quality is recorded. The Licence Holder has submitted groundwater monitoring that was submitted as part of the compliance document for three monitoring bores for Cell 1 TSF. Operation DWER's risk assessment is detailed in Appendix A.	Application supporting documentation General provisions of the <i>Environmental Protection Act 1986</i>
Meteorological monitoring	No conditions	No meteorological monitoring is required for the Licence. (Monitoring of wind strength and direction will however be incorporated in ambient dust monitoring as is standard practice).	N/A
Improvements	No conditions	No improvement conditions are required for the Licence.	N/A
Information	Licence conditions	Conditions are included in the licence requiring the submission of an Annual Environmental Report. Non-annual reporting and notification requirement for exceedance of nutrient loading limits are discussed in Appendix A.	N/A



DECISION TABLE			
Works Approval / Licence section	Condition number W = Works Approval L = Licence	Justification (including risk description & decision methodology where relevant)	Reference documents
Licence Duration	N/A	The Licence has been granted to expire on 9 February 2026. No other statutory approvals have been identified as limiting the duration of the Licence.	N/A



5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
23/07/2019	Proponent sent a copy of draft instrument and decision report	No comment was provided by Licence Holder and consultation phase waived.	Not applicable.



6 Risk Assessment

Note: This matrix is taken from the DWER Corporate Policy Statement No. 07 - Operational Risk Management

Table 1: Emissions Risk 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



Table 2: Risk criteria definitions (taken from DWER's *Guidance Statement: Risk Assessments*)

Consequence			Likelihood	
The following criteria will be used to determine the consequences of a risk event occurring:			The following criteria will be used to determine the likelihood of the risk event occurring.	
	Environment	Public Health* and Amenity (such as air and water quality, noise, and odour)		
Severe	- on-site impacts: catastrophic - off-site impacts local scale: high level or above - off-site 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	- 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	Almost Certain	The risk event is expected to occur in most circumstances
Major	- on-site impacts: high level - off-site impacts local scale: mid level - off-site 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	- 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	Likely	The risk event will probably occur in most circumstances
Moderate	- on-site impacts: mid level - off-site impacts local scale: low level - off-site impacts wider scale: minimal - Specific Consequence Criteria (for environment) are at risk of not being met	- 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	Possible	The risk event could occur at some time
Minor	- on-site impacts: low level - off-site impacts local scale: minimal - off-site impacts wider scale: not detectable - Specific Consequence Criteria (for environment) likely to be met	- Specific Consequence Criteria (for public health) are likely to be met - Local scale impacts: low level impact to amenity	Unlikely	The risk event will probably not occur in most circumstances.
Slight	- on-site impact: minimal - Specific Consequence Criteria (for environment) met	- Local scale: minimal impacts to amenity - Specific Consequence Criteria (for public health) criteria met	Rare	The risk event may only occur in exceptional circumstances

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

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

"on-site" means within the prescribed premises boundary



Appendix A

Normal Operations - TSF

Emission Description

Emission: Tailings are deposited in the TSF as a waste product from gold processing including cyanide, metals and metalloids. Seepage from the TSF into the surrounding groundwater is expected to occur over time as tailings are deposited into the facility.

Impact: Contamination of surrounding land, surface water and groundwater with metals, metalloids, sulphide minerals (if present) and cyanide affecting soil and groundwater quality and potentially causing vegetation stress or deaths.

Hydrogeology in the project area consists of fractured rock aquifers generally of low and very low permeability within the basaltic rock mass. A locally significant calcrete aquifer lies to the north east of the plant and TSF site (depicted in Figure 2). The aquifer is low in the drainage system where the water table is shallow (<5 mbgl). This aquifer is utilised by borefields for the project. The quality of this water is approximately 17,000 mg/L TDS.



Figure 2: Location of Calcrete Aquifer in vicinity to the project area

The water quality in the immediate vicinity of the project is hypersaline, generally > 200,000 mg/L TDS. Depth to groundwater is shallow, between 0.5 m and 3.4 m below ground level (mbgl).

The supporting documents indicate that the proposed TSF site is immediately underlain by surficial deposits that are comprised of sandy clays and clays that range in thickness from about 0.3 to 1.6 metres. These materials in turn overlie a clayey weathered profile developed on basaltic bedrock.



This weathered profile appears to be relatively thin, as most of the test pits that were excavated to investigate the site terminated in partially weathered bedrock (saprock). These investigations indicated that the water table was intercepted at depths of about 0.5 to 3.5 metres beneath the site.

The shallow water table and the limited saturated thickness of the regolith have the potential to increase the complexity of water management in the TSF, particularly in parts of the proposed facility where the natural water table is less than about one metre deep. This is because there is an increased risk that groundwater mounding near the TSF would cause the water table to reach the ground surface in these areas, potentially causing waterlogging and vegetation die-back in these areas.

The proposed location of the TSF intercepts with the northern section of a tributary of Lake Carey and within a floodplain area. Lake Carey has been determined to have significant ecological value, particularly following major flood events when it can become a highly productive ecosystem (Outback Ecology *et al*, 2013). The presence of priority flora or fauna as listed under the Wildlife Conservation Act 1950 is justification to designate a receiving environment as a 'Specified Ecosystem' according to DWER's *Guidance Statement: Environmental Siting*. The wider extent of Lake Carey is a Specified Ecosystem due to the presence of a Priority 1 invertebrate species, *Branchinella simplex* (MWH 2015). A Priority 1 plant species, *Tecticornia mellaria*, has also been recorded in the lake's riparian zone. As previously noted, the lake is also habitat for migratory shore birds protected under international conventions. If seepage were to occur from the TSF, this would cause elevated metals, metalloids, sulphides (if present), cyanide and suspended solids which are inhospitable for aquatic biota.

Controls: The TSF has been designed by MMWM to comply with the following:

- *Code of Practice for Tailings Storage Facilities in Western Australia*, Department of Mines, Industry Regulation and Safety;
- Australian National Committee on Large Dams (ANCOLD) May 2012 *Guidelines on tailings dams planning, design, construction and closure*; and
- Department of Mines, Industry Regulation and Safety *Guidelines for preparing a TSF design report*, August 2015.

The embankments have been designed to have a cut-off trench (compacted clayey low permeability) to restrict seepage. The underlying residual clays are of low permeability. The near surface fluvial deposits on the playa surface will be undisturbed providing a low permeability foundation of an average of 2.6×10^{-8} . As the geotechnical investigation concluded that the groundwater level within the TSF embankment footprint is deeper than 1.5 m, the depth of the trench within the flat topography will be limited to 1.5 m to avoid intersecting the shallow groundwater. Underdrainage has been installed at the upstream toe of Cell 1 Stage 1 embankment, draining to HDPE lined underdrainage pond at the toe. A return water pump was installed to transfer seepage/underdrainage back to the TSF (ATC Williams 2018).

A geochemical analysis of simulated tailings samples from the processing ore indicated the materials are classified as Non Acid Forming, except the sample from the Morgans ore, which were classified as Potentially Acid Forming. Liquor extracts were also taken from the tailings samples and analysed for pH, EC, alkalinity, major ions and water soluble metals and metalloids. Results showed the liquor to be alkaline with pH ranging from 9.2 – 9.7.

The following operational commitments have been made by MMWM:



- The discharge point, return water pump, beach and decant pond level will be visually inspected on a daily basis to validate operation is in accordance with design and operational expectations and check for any evidence of instability.
- The tailings delivery line and return water pipes will be visually inspected daily for any visible leaks, bursts or damage.
- An annual geotechnical inspection audit will be undertaken by a qualified geotechnical specialist.
- Emergency procedures will be developed to facilitate an efficient response to any uncontrolled release of tailings or water, failure of the TSF walls or potential accidents which could occur.
- Groundwater monitoring to be carried out in accordance with licence conditions.

Six groundwater monitoring bores will be installed around the TSF and will be monitored prior to commencement of deposition to provide baseline data. Should seepage be detected beyond the toe of the perimeter flood protection bund, shallow seepage collection trenches will be excavated to intercept the seepage, which will be returned to the cells.

Modelling was carried out which indicated the following during normal operating conditions:

- The tailings beach where embankment raises are proposed to be founded will not be saturated;
- Lateral seepage through the embankment construction is not anticipated;
- Lateral seepage rates beneath the perimeter embankment of the TSF are likely to be low (less than 1 m³/day)
- Vertical seepage rates from the operating cell are likely to be low (less than 5 m³/day).

A subterranean fauna desktop study was also carried out to determine the likelihood of the presence of any groundwater dependent ecosystems. The conclusions of the study were that in the Westralia project area stygofauna could persist in relatively good quality of groundwater, however, the low permeability aquifers and fine grained geological units limit the habitat potential. In the Jupiter project area, it was concluded there is a very low likelihood due to the hydraulic conductivity and hypersaline groundwater.

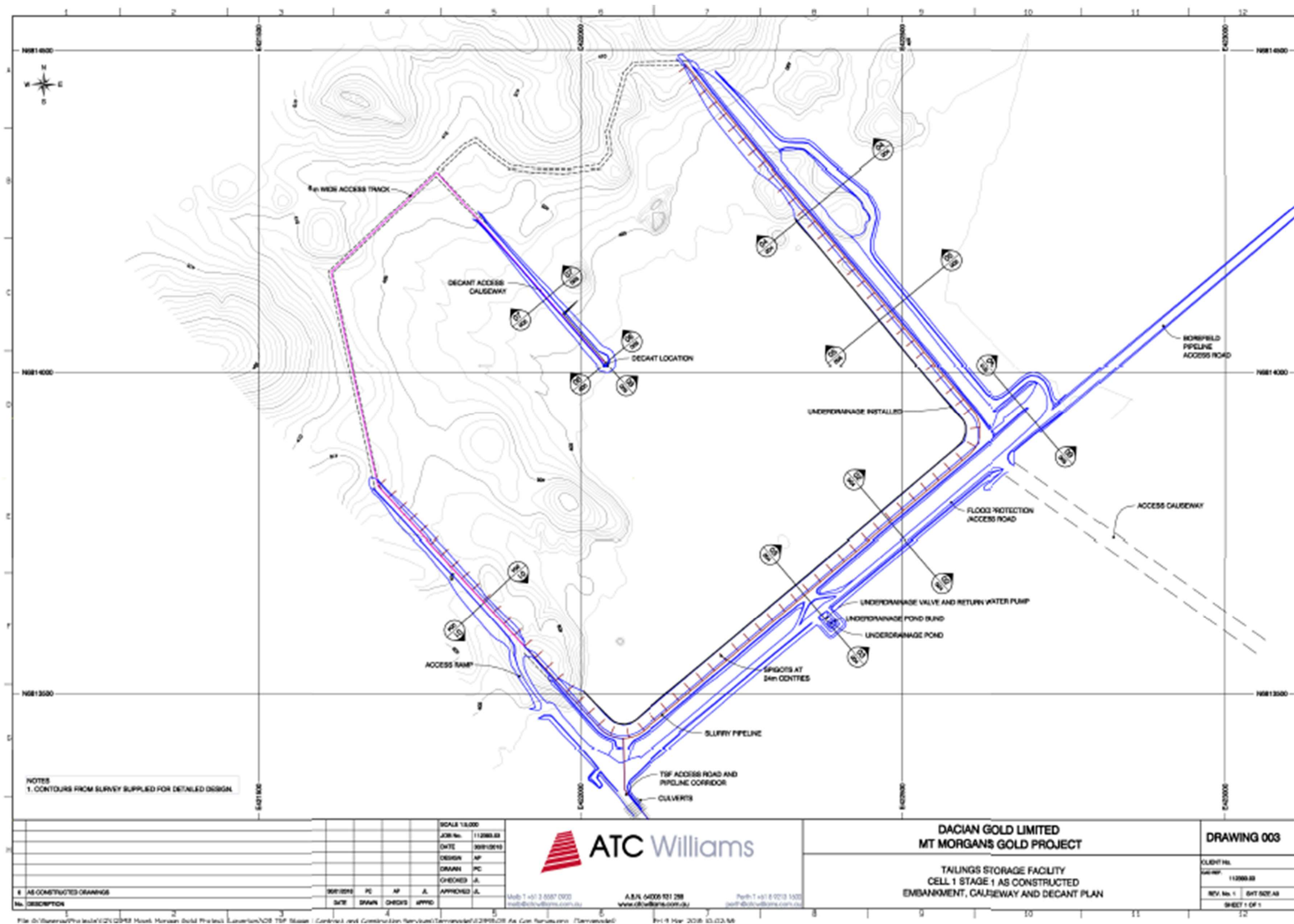


Figure 3: As constructed Cell 1 of the TSF; showing the location of the underdrainage and underdrainage pond)

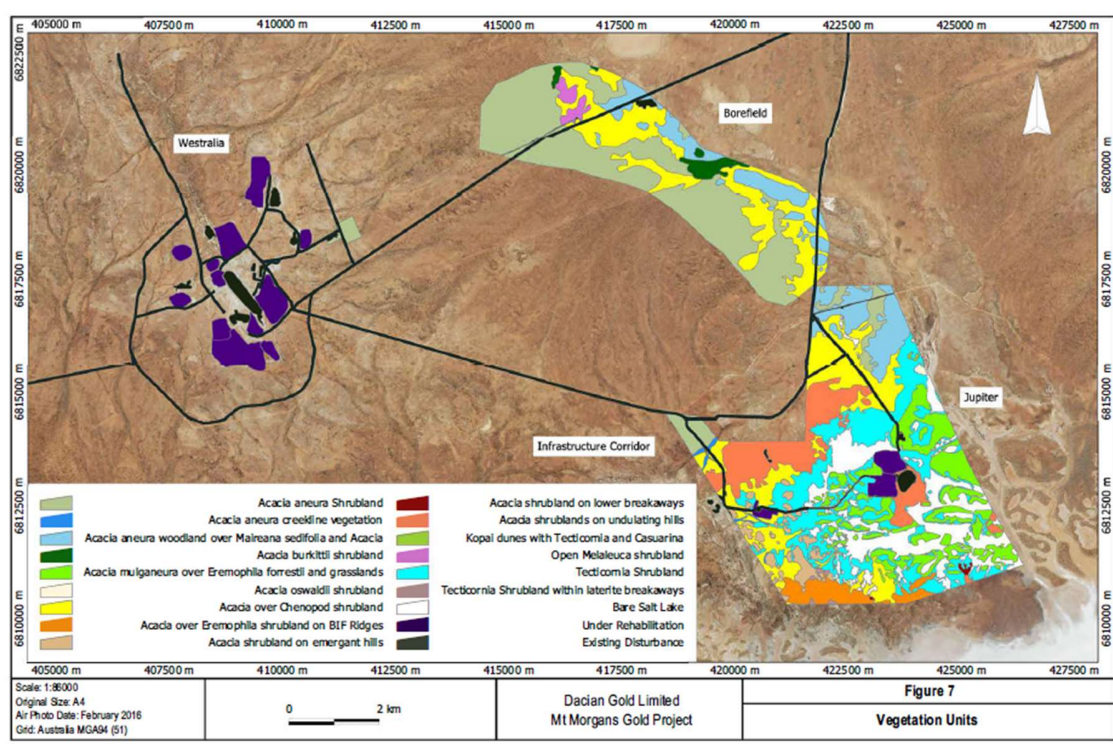


Figure 4: Terrestrial Flora and Vegetation survey

Risk Assessment

Consequence: Moderate

Due to the shallow depth of the water table near the proposed TSF site, groundwater mounding has the potential to impact vegetation in the area due to the effects of increased soil salinity and waterlogging. The shallow depth of the water table and low permeability of the regolith could also make the management of groundwater mounding difficult using interception trenches.

Seepage from the proposed TSF could contain a range of chemical constituents of potential environmental concern.

The most immediate impacts are likely to be associated with the high total dissolved solids (TDS) content of seepage water and the impacts of salinity and increasing water table elevations on the health of vegetation. Other chemical constituents of environmental concern that could be present under the near-neutral pH conditions that are likely to be present in pore-water in the TSF include (MEND, 2004; Smith, 2007): antimony; arsenic; cadmium; chromium; cobalt; copper; manganese; mercury; nickel; selenium; sulfate; thallium; and zinc.

Impacts to vegetation within the zone of influence of the TSF from groundwater mounding.

Likelihood: Possible

These chemical constituents are unlikely to be transported in groundwater flow to Lake Carey due to the low permeability of regolith materials in the area. However, the chemical constituents could be periodically washed in surface runoff to the lake if they were discharged to the soil surface with a rising water table. Potential environmental receptors in Lake Carey include aquatic invertebrates that are periodically present in the lake including insect larvae and brine shrimp, and bird populations that



periodically feed on these invertebrates. Pore-water in the TSF is also likely to contain elevated concentrations of cyanide compounds.

Risk Rating: Medium

Regulatory Controls

The Licence Holder has installed underdrainage at the upstream toe of Cell 1 to collect seepage and direct it to the lined underdrainage pond on the downstream side of the embankment. This seepage will be pumped back to the TSF. Refer to Figure 3 for further detail.

The Licence Holder has provided groundwater monitoring data in the vicinity of the Cell 1 TSF from bores TSFMB01 TSFMB02 and TSFMB03 as required by condition 3.1.8 of the Works Approval, this will provide baseline data for the site.

The additional three bores should be installed within three months of the issue of this amendment, to start background monitoring for Cell 2 of the TSF.

Condition 3.5.1 has been added to the licence as groundwater quality monitoring is required. The following groundwater parameters, including metals and metalloids, are deemed appropriate by the Delegated Officer after consideration of the potential impacts and controls proposed by the Licence Holder and will be required to be monitored on a quarterly basis:

- Total Dissolved Solids
- pH
- Standing Water Level
- WAD Cyanide
- Arsenic (As)
- Antimony (Sb)
- Cadmium (Cd)
- Chromium (Cr)
- Cobalt (Co)
- Copper (Cu)
- Iron (Fe)
- Lead (Pb)
- Manganese (Mn)
- Mercury (Hg)
- Nickel (Ni)
- Selenium (Se)
- Sulfate
- Thallium (Tl); and
- Zinc (Zn)

Condition 3.5.2 and Table 3.5.3 have been included on the licence for the Licence Holder to provide a groundwater management plan to identify groundwater flows and potential sensitive receptors and for the addition of two additional groundwater monitoring bores upstream and downstream of the TSF.

Condition 1.2.3 has been updated to include the TSF as a Containment Infrastructure. Conditions 1.2.2 has been updated to include inspection requirements for the tailings pipelines, return water lines and TSF embankment freeboard.

In addition a condition will be applied requiring a water balance is maintained to track all water inputs (in tailings pore-water and rainfall), outputs (recovery of tailings water and evaporative losses) and



storage (in compacted tailings within the TSF) on a monthly basis to enable seepage to be detected and quantified where there are significant mismatches between water inputs and outputs.

Condition 1.2.6 has been included on the licence to monitor any potential impacts on vegetation within the zone of influence of the TSF.

Residual Risk

Consequence: Moderate

Likelihood: Possible

Risk Rating: Medium

Emergency situation – TSF overtopping

Emission: Overtopping of the TSF releasing tailings supernatant or tailings slurry to surrounding land and surface water either during a storm event or due to operator error.

Impact: Contamination of surrounding soils with metals, metalloids, sulphide minerals (if present), and cyanide affecting soil and groundwater quality and causing vegetation stress or deaths.

Controls: The TSF is designed to withstand the volume of water that would be generated during a 1:100 (Annual Exceedance Probability), 72 hour rainfall event, with a 0.5 m total freeboard.

Risk Assessment

Consequence: Major – overtopping of tailings would cause high-level on-site impacts, with potential for off-site impacts on a wider scale.

Likelihood: Rare – given the controls in place it is considered rare the event will occur.

Risk Rating: Medium

Regulatory Controls

The Licence Holder's commitment to maintain a 500 mm freeboard has been made binding through licence conditions 1.2.1 and 1.2.4. Condition 1.2.1 requires 12 hourly visual monitoring to ensure this is not breached.

Residual Risk

Consequence: Major

Likelihood: Rare

Risk Rating: Medium

Abnormal operation – pipeline breach / leakage, transfer dam overtopping or seepage

Emission: Tailings (the waste product from gold processing which includes cyanide, arsenic and metals) is transported in pipelines through areas of native vegetation. Emissions will occur if the pipelines were to rupture and/or leak.

Transfer dams are also used for temporary storage of mine water. Hypersaline water is transported in pipelines for the purpose of mine dewatering. An emission may occur if the dams or pipelines were to spill or seep.

Impacts: Contamination of surrounding soils with toxic metals, cyanide and dissolved solids affecting soil and groundwater quality and causing vegetation stress or deaths.



Controls: MMWM has committed to visually inspecting the tailings delivery and return water pipelines as well as the containment corridor on a daily basis for any visible leakage or damage. The pipelines will be bunded, flow sensors will be fitted, there will be double casing on the pipeline that traverses the Lake Carey tributary and the causeway will be raised and bunded. The pipelines will also be welded to industry standards in accordance with the Plastic Industry and Pipe Association (PIPA) of Australia guidelines.

MMWM has installed two flowmeters and two shut-off valves on the tailings line; one at the processing plant (actuated shut-off valve) and the other at the TSF (manual shut-off valve). On alarm the tails pumps will shut down thus the line will have only static head and the manual valves at the TSF are at the highest point of the system so there is no urgency in closing these.

The TSF flowmeter is hard wired to the control system, which will trigger a shutdown of the pump in the event a leak is detected. The TSF pipeline is also bunded to allow temporary containment of leaks.

Decant line: The Decant line has a flowmeter at the TSF and at the plant and can be used to isolate flows in the event that a leak is detected. If a leak is detected shut off of the line is achieved by automatic shut-down of the submersible decant pump and this will allow the water to syphon back into the TSF. The Decant pipeline is bunded to allow temporary containment of leaks.

Borefield Line: Each bore is fitted with a flowmeter and pressure gauge. The flow from each bore is totalised and monitored against the flow meter at the break tank. In the event of a leak being detected the pumps would be shut down and the leak isolated before the system was re-started. Shut-off valves are installed at several locations along the length of the pipeline. There is a flow meter at the tank discharge and another in the plant which will identify leakage in the line downstream of the tank.

MMWM has committed to maintaining a minimum freeboard of 0.5 m in all water storage/transfer dams. They are also to be lined with a low permeability liner.

Risk Assessment

Consequence: Moderate – leakage or spills of pipelines would cause mid-level on-site impacts.

Likelihood: Unlikely – given the controls in place it is unlikely the consequence will occur.

Risk Rating: Medium

Regulatory Controls

The Delegated Officer has formalised the commitments made by MMWM for pipeline management into conditions. This will include inspections of pipelines and a condition ensuring the pipes have either telemetry or sufficient secondary containment for a spill event. Condition 1.2.4 regarding freeboard for the containment infrastructure has been included. The proponent committed to daily inspections of the pipelines, however, given the risk rating of medium, the Licence condition will require the pipelines to be inspected 12 hourly, along with the appropriate record keeping of all inspections.

Residual Risk

Consequence: Moderate

Likelihood: Rare

Risk Rating: Medium



Abnormal operation - Dewatering

Emission: Hypersaline water is transported in pipelines for the purpose of mine dewatering. Transfer dams are also used for temporary storage of mine water. An emission may occur if the dams or pipelines were to spill or seep.

Impacts: Contamination of surrounding soils dissolved solids affecting soil and groundwater quality and causing vegetation stress or deaths.

Controls: The pipelines will be banded, flow sensors will be fitted and the pipelines will also be welded to industry standards in accordance with the Plastic Industry and Pipe Association (PIPA) of Australia guidelines. Mt Morgans WA Mining Pty Ltd (MMWM) has committed to maintaining a minimum freeboard of 0.5 m in all water storage/transfer dams. They are also to be lined with a low permeability liner.

Risk Assessment

Consequence: Moderate – leakage or spills of pipelines would cause mid-level on-site impacts, with potential for Specified Consequence Criteria not being met.

Likelihood: Unlikely – given the controls in place it is unlikely the consequence will occur.

Risk Rating: Medium

Regulatory Controls

The Delegated Officer will formalise the commitments made by MMWM for pipeline management into conditions. This will include inspections of pipelines and a condition ensuring the pipes have either telemetry or sufficient secondary containment for a spill event. A condition regarding freeboard for the containment infrastructure will also be included. The proponent committed to daily inspections of the pipelines, however, given the risk rating of medium, the Licence condition will require the pipelines to be inspected 12 hourly, along with the appropriate record keeping of all inspections.

Residual Risk

Consequence: Moderate

Likelihood: Rare

Risk Rating: Medium



Normal Operations – Compliance Report for Sewerage facility

The Westralia Accommodation village WWTP compliance report dated 11 July 2017 confirmed partial compliance with Works Approval W6008/2016/1, granted on 3 January 2017. DWER reviewed the compliance report, evaluated and reassessed the risk to the environment and amended the Licence on 4 August 2017 to include the Westralia WWTP.

The following infrastructure has been constructed at the Westralia Accommodation village WWTP;

- All associated tanks, pipework and pumps and irrigation sprinklers have been installed by licensed plumbers as per the manufacturer's design and specifications;
- A high density HDPE lined contingency pond of 350 kL capacity incorporating a 0.5 m freeboard has been constructed as per engineer certified design. Waste water pumped to the contingency pond is returned to the WWTP for reprocessing and is not discharged to the irrigation field;
- The WWTP capacity of 120 kL/day (420 people at 300 litres per day) was assessed initially at Works Approval W6008/2016/1. A WWTP plant capacity reduction was based on alignment to the Australian Standard (AS/NZS 1547:2012) titled "On-site domestic wastewater management", that predicted sewage output of 180 Litres per person per day. This standard was used by the Licence Holder in final design criteria used for the Westralia accommodation village. Two 50 kL/day Eco farmer 200 WWTP package plants have been constructed to ensure a 100 kL/day treatment capacity and allowing for a 20% capacity contingency given the village population of 420 people.
- The package plants treatment process consist of anoxic degradation, aerobic digestion, clarification and disinfection with chlorine and is consistent with that proposed at Works Approval W6008/2016/1;
- Irrigation field has been reduced from 6 ha to 3.6 Ha with information provided to justify this change. The use of AS/NZS 1547:2012 and Water Quality Protection Note 22 (WQPN22) to determine reduced irrigation area and the nitrogen and phosphorus maximum loading concentrations has been reassessed below;
- A 1.5 m high three strain wire fence, similar to a standard stock fence used by local pastoralists has been erected around the irrigation field parameter. The fence includes a 3 m wide access gate that will remain closed at all times; and,
- Visible and appropriate signs have been erected at the WWTP, contingency pond and around the irrigation field.

The revaluation and reassessment of the risk is discussed in section titled "Post Constructed changes confirmed in Compliance Report dated 11 July 2017" below.

W6008/2016/1 Decision Report

Operation – Emissions to Land

Emission: Nutrient-rich waste water is discharged to designated irrigation fields.

Impact: A build-up of nutrients can cause localised contamination of soils and vegetation which could lead to the deterioration of land quality. In accordance with Water Quality Protection Note 22 (WQPN22) produced by Department of Water in July 2008, the eutrophication risk category based on soil type and location is category D. This means there is a low eutrophication risk due to the soil type being clay/loam alluvium.

Waste water may pose a human health risk to nearby receptors if contamination to drinking water were a possibility.

Controls: The proponent has used guidelines from the Department of Water (DoW) to choose two appropriate irrigation sites. Expected effluent quality and flow rates have been provided by the proponent in the below table:



Expected Effluent Quality		Source of Contribution and Flow Rate			
		Accommodation Village	Westralia MSA	Jupiter MSA	Total
		158,000 (L/day)	18,000 (L/day)	7,500 (L/day)	183,500 (L/day)
Biological Oxygen Demand	20mg/L	3.160 kg/day	0.360 kg/day	0.150 kg/day	3.670 kg/day
Total Suspended Solids	30mg/L	4.740 kg/day	0.540 kg/day	0.225 kg/day	5.505 kg/day
Total Nitrogen	5mg/L	0.790 kg/day	0.09 kg/day	0.037 kg/day	0.917 kg/day
E/Coli	1,000 CFU / 100mL	0.158 ML/day	0.018 ML/day	0.0075 ML/day	0.1835 ML/day

The accommodation village irrigation area will be 6 hectares. A conservative Total Phosphorus (TP) rate of 12 mg/L has been provided separately to the above table.

The predicted effluent qualities, soil type and total irrigation area sizes have been used to calculate the Total Nitrogen (TN) and TP loading in kg/ha/year, with results compared to the DoW Water Quality Protection Note 22. For the Accommodation Village, the TN was calculated at 5.48 kg/ha/year, well below the limit of 480 kg/ha/year. The rate of TP was calculated at 87.6 kg/ha/year, below the limit of 120 kg/ha/year.

The distance from the accommodation camp WWTP to the Mt Margaret community is 13.5 km.

Risk Rating

Consequence: Minor – given the soil types, expected effluent quality and the size of the irrigation areas the consequence has been determined as minor.

Likelihood: Rare – an adverse risk event may occur in exceptional circumstances.

Risk Rating: Low – no regulatory controls are required.

Post Constructed changes confirmed in Compliance Report dated 11 July 2017

Given the Eco farmer 200 WWTP design capacity and expected effluent quality it has been determined that the nutrients irrigated over 3.6 Ha is predicted as follows;

- Total Nitrogen (TN) will be 202 kg/ha/year;
- Total Phosphorus (TP) will be 101 kg/ha/yr;

The predicted nutrient loading concentrations are dependent upon influent quality and volumes processed and appear in the Eco farmer 200 treatment plant design specifications. The nutrient loading limits set by WQPN 22 for the type of soil at the irrigation field (loam/clay soils with Phosphorus Retention Index (PRI) greater than 10) for TN and TP is limited to 480 kg/ha/year and 120 kg/ha/year respectively. The results are below loading limits, but it is noted that TP is approaching the limit recommended by WQPN 22. The Mt Margaret community is located greater than 10 km from the Westralia village WWTP infrastructure so there is no realistic risk of nutrient rich wastewater impacts to the community.

Risk Rating post construction

Consequences: Given the WWTP capacity has decreased from 126 to 100 kL per day and the size of the irrigation field is reduced by 40% and the consequences of nutrient loading, waterlogging or surface pooling at the irrigation field is therefore rated as Moderate.

Likelihood: An adverse risk event of soil eutrophication, water logging or surface water pooling could occur at some time so likelihood is rated at Possible.

Risk Rating: Overall risk is Medium and therefore controls will be placed on the Licence to regulate risk of eutrophication, water logging or surface water pooling:

- WWTP production capacity being limited to 100 kL/day,



- Identify the WWTP effluent emission points,
- Monitoring of WWTP effluent,
- Effluent volume monitoring,
- Annual reporting of the nutrient loading, and,
- Nutrient concentration loading limits.

Operation – point source odour emission from W6008/2016/1

Emission: Odour emissions from the landfills and waste water treatment plants may occur.

Impact: Possible impact on human residents in nearby community, however the nearest resident to the landfills and the WWTPs are over 2 km away at the Mt Margaret Community.

Controls: The locations of the landfills and WWTPs will more than 2 km from areas where any odours may cause a nuisance.

Risk Assessment

Consequence: Minor – a low level impact to amenity may occur.

Likelihood: Rare – given the distance between the source and receptors, it is rare the consequence will occur.

Risk Rating: Low – no regulatory controls are required.

Regulatory Controls

Given the remote location of the facilities, the Delegated Officer is satisfied that odour should not cause any amenity impacts to the Mt Margaret Community.

Post Constructed changes confirmed by Compliance Report dated 11 July 2017

Given the Eco farmer 200 WWTP design capacity and expected effluent quality it has been determined that the waste water irrigated over 3.6 Ha are predicted as follows;

- Total Biological Oxygen Demand (BOD) will be 0.6 kg/ha/day;

The predicted BOD is dependent upon influent quality and volumes processed appear in the Eco farmer 200 treatment plant design specifications. The specific loading to this type of soils (loam/clay soils with Phosphorus Retention Index (PRI) greater than 10) for BOD is 30 kg/ha/day and is considered acceptable (WQPN22) to ensure odours are not generated at the WWTP, the contingency pond, or the irrigation field. The Mt Margaret community is located greater than 10 km from the Westralia village WWTP infrastructure.

Risk rating post construction

Consequences: Given the WWTP capacity has decreased from 126 to 100 kL per day and the size of the irrigation field is reduced by 40% the Delegated Officer considers the consequences of odour to be Moderate.

Likelihood: An adverse risk event will probably not occur in most circumstances so the Delegated Officer considers the likelihood of odour to be Unlikely.

Risk Rating: The Delegated Officer considers the risk rating to be Medium and therefore has determined controls will be placed on the Licence to regulate odour by:

- WWTP production capacity being limited to 100 kL/day,
- Monitoring of WWTP effluent to include BOD, TSS and faecal coliforms,
- Effluent volume monitoring; and,
- Annual reporting of the monitoring data.
- Biological concentration loading limits



Amendment – 27 March 2018

The Jupiter WWTP compliance report dated 6 February 2018 confirmed compliance with Works Approval W6008/2016/1, granted on 3 January 2017. At that time, DWER reviewed the compliance report, evaluated and reassessed the risk to the environment and amended the Licence on 27 March 2018 to include the Jupiter WWTP.

The activated Sludge Bioreactor Plant WWTP for the Jupiter Mine Service Area has a capacity of 7.5m³/day. It consists of one containerised unit, treating waste water through a combined anoxic/aerobic suspended growth treatment process. The treated water will be pumped and discharged to the Tailings Storage Facility (TSF).

The following construction tasks have been completed in accordance with Works Approval W6008/2016/1 and in accordance with the manufacturer's design:

- The WWTP, associated tanks and pipe work have been laid out and connected by a licensed plumber as per the manufacturer's requirements.
- Pipelines to the TSF have been buried or placed in a V-drain or earthen bund.

Operation – Emissions to Groundwater (TSF)

Emission: Nutrient-rich waste water is to be discharged from Jupiter WWTP to the TSF. Some seepage from the TSF into the surrounding groundwater may occur over time as tailings and effluent are deposited into the facility. It is also possible that overtopping of the TSF could occur during a storm event or due to operator error. Waste water is transported in pipelines through areas of native vegetation. Emissions will occur if the pipelines were to rupture and/or leak.

Impacts: A build-up of nutrients can cause localised contamination of soils and vegetation which could lead to the deterioration of land quality.

Impacts: Waste water may pose a human health risk to nearby receptors if contamination to drinking water were a possibility but is not likely to occur in this case.

Controls: The TSF is designed to withstand the volume of water that would be generated during a 1:100 (Annual Exceedance Probability), 72 hour rainfall event, with a 0.5 m total freeboard. The Licence Holder has provided a number of management options including maintaining a freeboard of 500mm, 12 hourly visual inspections, groundwater monitoring and a TSF water balance. The pipelines to the TSF from the WWTP have been buried or placed in a V-drain or earthen bund to capture potential leaks or spills.

Risk Assessment

Consequence: Slight

Likelihood: Possible

Risk Rating: Low

Conditions 1.2.2 has been updated to include WWTP infrastructure to be visually checked on a daily basis.



Construction and Operation – Landfill

The Westralia and Jupiter landfill facility compliance reports confirmed construction in accordance with Works Approval W6008/2016/1, granted on 3 January 2017. DWER reviewed the compliance reports and amended the Licence to include both landfills.

Amendment – 25 July 2019

The proposed 'Back 'O Beyond' pit landfill Licence Amendment application supports construction of the following infrastructure:

- The landfill is located in a historical pit beside the 'Back'O Beyond' pit at Westralia with tipping faces no more than 30m in length, 3042m in width, 2m in depth and include ramped accesses;
- The total length of 'Back 'O Beyond' landfill pit at Westralia will be maximum of 150m in length;
- Bunds surround the pit that divert stormwater away from the landfill;
- Pit is surrounded by a 1.8 m high chain-lock including one row barb wire fence with 6m wide lockable gates;
- Fence/gate is signposted to describe what waste material can and cannot be disposed;
- Gate is padlocked to manage access and the wastes being disposed;
- Landfill facility includes a benign stockpile area of inert cover material that is sufficient to complete weekly covering of waste disposed at the landfill; and,
- Landfill pit floor remain 20m, at RL 423m, above natural groundwater level that is at RL 401m.

The proposed construction and operation of the 'Back'O Beyond' landfill pit at Westralia as described in the Licence Amendment application will be confirmed by a Compliance Report and Annual Monitoring Reporting therefore no alteration to the landfill risk assessment is required. The risk assessment is described below:

Emission: Putrescible and inert waste disposed in landfills, if not managed appropriately, can cause emissions to occur via wind-blown waste, odour, contaminated stormwater and leachate to groundwater.

Impact: Groundwater may be impacted through leachate and contaminated stormwater if not contained. This can have detrimental effects on surrounding flora and fauna. Contaminants can then also end up interacting with surface water bodies. Wind-blown waste can end up in waterways, causing potential fauna death. Vermin or feral animals may also be attracted to the waste material if landfills are not managed properly.

Controls: The proponent has committed to manage the landfills in accordance with the *Environmental Protection (Rural Landfill) Regulations 2002*. Any waste blown or washed away will be collected and returned to the tipping area. Waste will be covered weekly with at least 150 mm of cover material and stormwater is to be diverted away from the landfill (via bunding).

Risk Assessment

Consequence: Minor – the impacts of leachate entering the groundwater would be considered **Low** due to the depth to, quality of the water plus, the lack of beneficial uses in the area.

Likelihood: Unlikely – given the proponent controls the likelihood of the risk event occurring is deemed **Unlikely**.

Risk Rating: **Medium**

Regulatory Controls



The Delegated Officer will formalise the Licence Holder commitment from the Licence Amendment application for types of waste disposed plus the timeframe for covering waste to reduce odour and convert them into new Licence conditions. See Licence conditions 1.2.8 and 1.2.9. Additional requirements for the acceptance and landfilling of controlled waste (including asbestos and tyres) are set out in the *Environmental Protection (Controlled Waste) Regulations 2004* or regulated by conditions of this licence.

Abnormal Operation - Tyre Landfill

Emission A (Air Emissions during a fire): Rubber tyres are not easily ignitable, however when on fire, burning causes intense radiant heat, the incomplete combustion of tyres can be a health risk from the inhalation of particulates. Tyres are very difficult to extinguish and are dangerous to fire fighters.

Emission B (Liquid emissions during a fire): During a tyre fire, pyrolytic oils containing hydrocarbons, metals and particulate matter can be generated and discharged into the environment.

Impact A: If a fire were to occur at the Premises, emissions generated from the combustion of the tyres will contain a number of pollutants including particulate matter (PM), sulfur dioxide (SO₂), polycyclic aromatic hydrocarbons (PAHs) and elemental carbon. These compounds can cause amenity and health impacts to the human population. The closest sensitive receptor to the proposed tyre landfill is the Mt Margaret Community approximately 2 km north west of the landfill.

Impact B: The liquid emissions may not break down readily in the environment and can contaminate land, surface water or groundwater. This can then have a negative impact to users of the water or the land.

Controls: Tyres to be disposed of in batches (not exceeding 1000 used car tyre equivalent), tyres to be covered at regular intervals such that no more than 1000 used tyre equivalents are left exposed at any one time, each batch will be separated by at least 100 mm of soil or another dense inert and incombustible material. Mt Morgans Gold Project has a fully equipped 4WD fire appliance with all associated equipment for dealing with an incident involving a fire, with the ability to connect to external water sources such as water carts and static water supplies. MMWM have an emergency response team consisting of 18 members, with all associated PPE. Training is conducted on a regular basis on site. All emergency team members are being trained to the national standard of RII30709 Certificate III in Mine Emergency Response and Rescue.

Risk Assessment

Consequence: Moderate – potential onsite impacts on a mid-level

Likelihood: Unlikely – given the Licence Holder's proposed controls

Risk Rating: Medium – Acceptable, generally subject to regulatory controls

Regulatory Controls

The Delegated Officer has reviewed the information provided and the risk assessment and considers that the proposed controls are sufficient and will be included on the Licence.



Appendix B

Schematic of Mt Morgan WWTP process

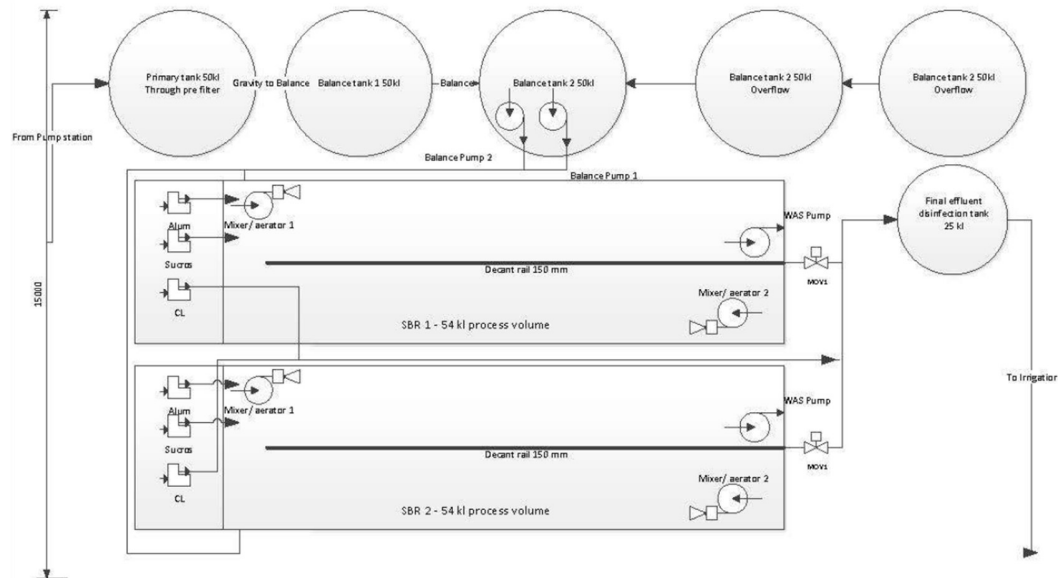
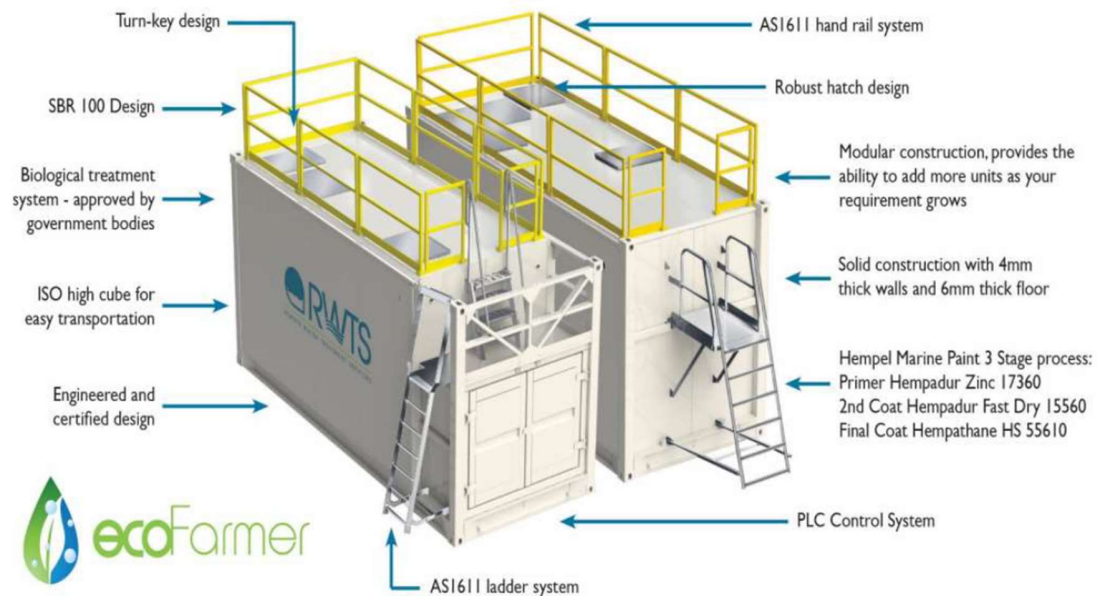
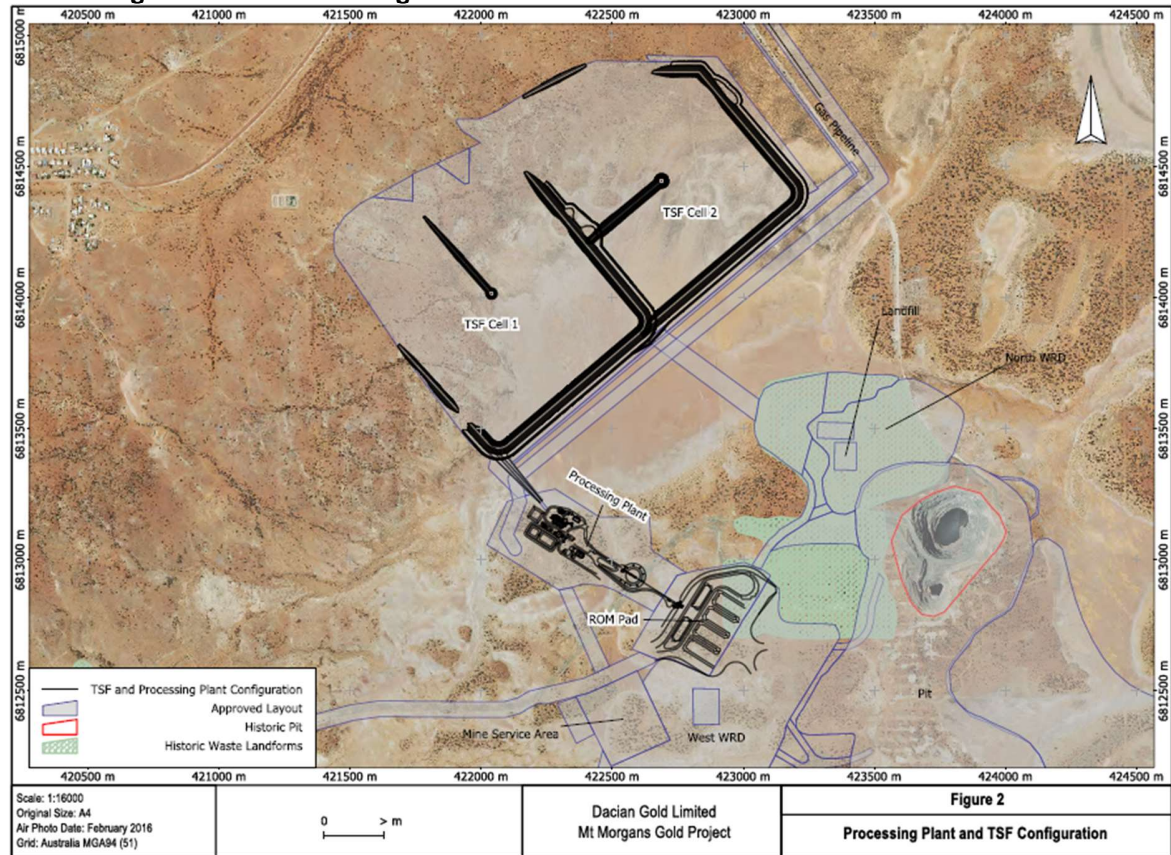


Diagram of the RWTS eco Farmer 200



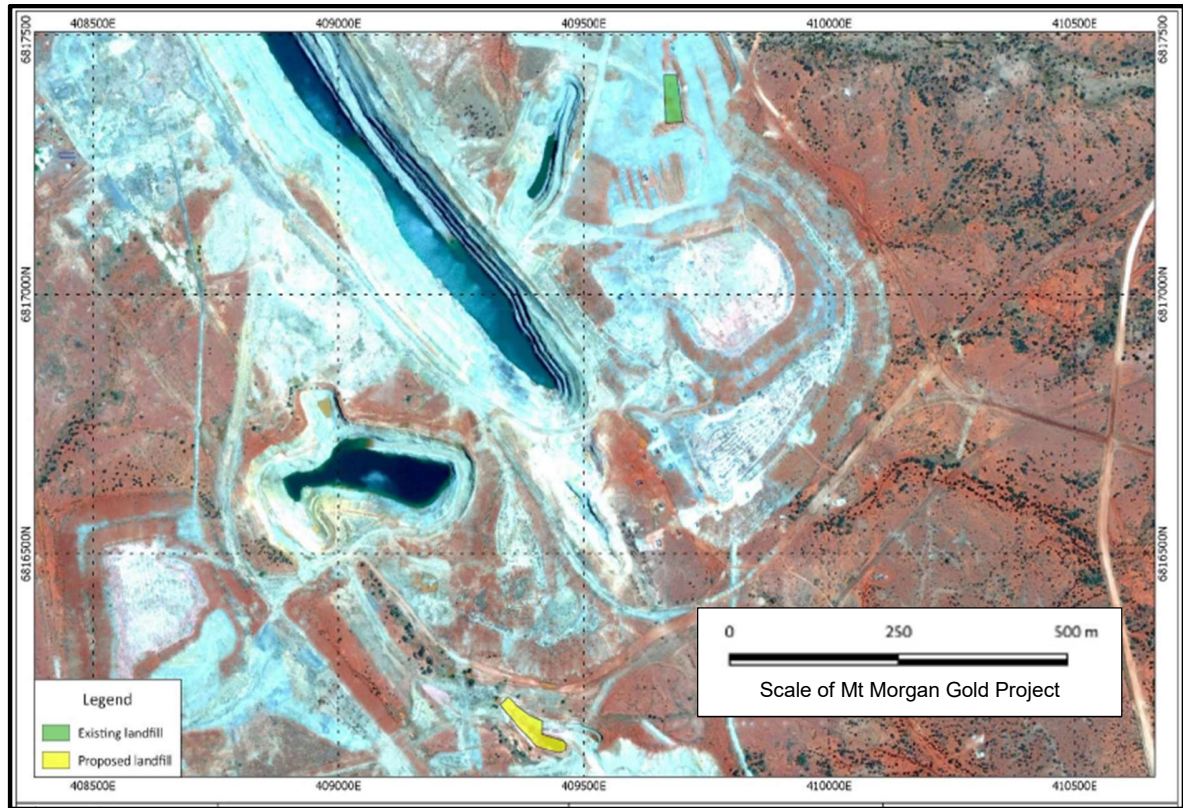


Processing Plant and TSF configuration





Location of Westralia Landfill depicted in green and 'Back'O Beyond' Pit Landfill as depicted in yellow.





References

	Document Title	Availability
1	DER, 2015, <i>Guidance Statement: Regulatory Principles</i> . Department of Environment Regulation, Perth.	These Guidance Statements are available from the website: http://www.dwer.wa.gov.au
2	DER, Sept 2015, <i>Guidance Statement on Setting Conditions</i> . Department of Environment Regulation, Perth.	
3	DER, Nov 2014, <i>Guidance Statement on Licensing Duration</i> . Department of Environment Regulation, Perth.	
4	DER, Sept 2015, <i>Guidance Statement on Licensing and Works Approvals</i> . Department of Environment Regulation, Perth.	
5	Works Approval and Licence supporting documentation October 2016: Dacian Gold Ltd, October 2016, <i>Works Approval and Licence Application – Mt Morgans Gold Project</i> – including all appendices, drawings and attachments	DWER internal – A1186505
6	Dacian Gold Ltd, December 2016, <i>Commissioning Plan – W6008/2016/1 – Mt Morgans Gold Project</i>	DWER internal – A1336543
7	Further information November 2016: Dacian Gold Ltd, 30 November 2016, <i>Response to Request for Information for Mt Morgan Gold Project – Works Approval and Licence Application</i>	DWER internal – A1356269
8	<i>Compliance Report W6008/2016/1 Westralia Landfill Mt Morgans Gold Project</i> prepared by Mt Morgans WA Mining Pty Ltd & Dacian Gold Limited dated 25 May 2017 Version 1	DWER internal – A1438846
9	<i>Compliance Report W6008/2016/1 Westralia Waste Water Treatment Plant Mt Morgans Gold Project</i> prepared by Mt Morgans WA Mining Pty Ltd & Dacian Gold Limited dated 11 July 2017 Version 1.	DWER internal – A1473038
10	<i>Water Quality Protection Note (WQPN 22) Irrigation of nutrient-rich wastewater</i> prepared by Department of Water dated July 2008	Water Quality Protection Note 22 is available from website: https://www.water.wa.gov.au/_data/assets/pdf_file/0013/4045/82324.pdf
11	<i>AS/NZS 1547:2012 - On-site domestic wastewater management</i> – AS/NZS published 2012	AS/NZS 1547:2012 is available from website: https://infostore.saiglobal.com/store/PreviewDoc.aspx?saleItemID=2364733
12	<i>Compliance Report W6008/2016/1 Jupiter Landfill Mt Morgans Gold Project</i> prepared by Mt Morgans WA Mining Pty Ltd & Dacian Gold Limited dated 5 July 2017 Version 1.	DWER internal – A1470158
13	MMGP_Application Form 2017 10 18, submitted 18 October 2017	DWER internal – A1544026



14	Appendix 1_Supporting Document_MMGP Works Approval 2017 10 18, submitted 18 October 2017	DWER internal – A1544026
15	Construction Compliance Report W6008/2016/1 Mt Morgans Gold Project, Processing Plant and Tailings Storage Facility, 25 January 2018	DWER internal – A1602580
16	Compliance Report W6008/2016/1 Jupiter Waste Water Treatment Plant Mt Morgans Gold Project, 6 February 2018	DWER Internal – A1608199
17	Further information – Amendment to Licence, 9 March 2018	DWER Internal – A1631829
18	MMWM Response to DWER Comments – 16 March 2018	DWER Internal – A1636816
19	ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality	ANZECC 2000 Accessed at: http://www.agriculture.gov.au/water/quality/guidelines/volume-1
20	Lemly, A.D. (2002) <i>Selenium Assessment in Aquatic Ecosystems: A Guide for Hazard Evaluation and Water Quality Criteria</i> , Springer-Verlag.	Websearch
21	USEPA (2009) National Primary Drinking Water Regulations	Accessed at: http://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#Inorganic
22	Mt Monger Gold Project Licence amendment application dated signed on 9 October 2018	DWER internal - A1728143
23	MMGP Licence Amendment Supporting documentation dated 9 October 2018	DWER internal – A1728144