



# Decision Document

## *Environmental Protection Act 1986, Part V*

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**Proponent:** **GSM Mining Company Pty Ltd**

**Licence:** **L8435/2010/3**

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**Registered office:** Level 5, 50 Colin Street  
WEST PERTH WA 6005

**ACN:** 165 235 030

**Premises address:** Granny Smith Gold Mine  
Mining tenements M38/18, M38/161, M38/162, M38/167, M38/191,  
M38/205, M38/287, M38/380, M38/389, M39/397, M38/440, M38/532,  
M38/525, M38/690, M38/691, M38/692, M38/725, L38/50, L38/51, L38/79,  
L38/80, L38/87, L38/96, L38/106, L38/144, L38/145, L38/144, L38/146 and  
L38/209  
LAVERTON WA 6440  
as depicted in Schedule 1.

**Issue date:** Thursday, 3 October 2013

**Commencement date:** Monday, 7 October 2013

**Expiry date:** Thursday, 6 October 2018

### **Decision**

Based on the assessment detailed in this document the Department of Environment Regulation (DER), has decided to issue an amended licence. DER 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.

Decision Document prepared by: Fiona Sharpe  
Licensing Officer

Decision Document authorised by: Danielle Eyre  
Delegated Officer



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## 1 Purpose of this document

This Decision Document explains how DER has assessed and determined the application and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER'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 proponent's responsibility to ensure they have all relevant approvals for their Premises.

## 2 Administrative summary

Administrative details		
Application type	Works Approval <input type="checkbox"/> New Licence <input type="checkbox"/> Licence amendment <input checked="" type="checkbox"/> Works Approval amendment <input type="checkbox"/>	
Activities that cause the premises to become prescribed premises	<b>Category number(s)</b>	<b>Assessed design capacity</b>
	5	4 500 000 tonnes per year
	6	10 219 614 kL per year
	33	4 000 tonnes per year
	52	25 MW diesel 24MW LNG
	54	360 m <sup>3</sup> per day
	64	9 500 tonnes per year
	73	3 004 m <sup>3</sup>
Application verified	Date: N/A	
Application fee paid	Date: N/A	
Works Approval has been complied with	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	
Compliance Certificate received	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	
Commercial-in-confidence claim	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
Commercial-in-confidence claim outcome		
Is the proposal a Major Resource Project?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the <i>Environmental Protection Act 1986</i> ?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Referral decision No: Managed under Part V <input type="checkbox"/>



		Assessed under Part IV <input type="checkbox"/>
Is the proposal subject to Ministerial Conditions?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	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 <input type="checkbox"/> No <input checked="" type="checkbox"/>	Department of Water consulted Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Is the Premises within an Environmental Protection Policy (EPP) Area Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If Yes include details of which EPP(s) here.		
Is the Premises subject to any EPP requirements? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If Yes, include details here, eg Site is subject to SO <sub>2</sub> requirements of Kwinana EPP.		

### 3 Executive summary of proposal and assessment

GSM Mining Company Pty Ltd (GSM) currently owns the Granny Smith mine site which is a gold mining and processing operation located in the north-eastern Goldfields region of Western Australia, approximately 23 km south of Laverton. Ore is extracted from the Wallaby underground mine and is processed at the Granny Smith mine processing area. Mining commenced at Granny Smith mine in June 1989 and the life of mine is currently until 2022.

#### Processing

Ore is hauled from the Wallaby underground operation where it is crushed and the gold is extracted using carbon-in-pulp and carbon-in-leach processes using various chemical processes.

#### Mine dewatering

Mine dewatering occurs from the Wallaby operation to Lake Carey. The mine dewatering system comprises of a series of dewatering production bores and a inpit sump. The water from the inpit and production bores is transferred via surface and buried pipelines to a transfer pond prior to discharge to Lake Carey through the southern discharge system. . Nominated production bore water is directly discharged through the western discharge system to assist with recharge of the groundwater levels along the Lake Carey shoreline to the west of Wallaby.

The premises is also subject to conditions set by the Minister for Environment under Part IV of the Environmental Protection Act 1986. The Licensee is required to comply with:

- The requirements of the Ministerial Statement 551; and
- Commitments made in the "Barrick (Granny Smith) Pty Limited Wallaby Environmental Management Plan – Part 1 Hypersaline Management Plan (September 2006)" attached to the Ministerial Statement.

Hypersaline Management Plan Version 3, October 2012, has been assessed by DER as it relates to the underground operations and not the open pit (only the latter is affected by Ministerial Statement 551).

#### Chemical blending or mixing

This is essential for the processing and beneficiation of metallic or non-metallic ore. GSM currently uses cyanide, hydrochloric acid, caustic soda and quick lime in the processing plant for Granny Smith



mine. The use of these chemicals ensures the safe operation of the processing circuit. The site currently uses over 500 tonnes of chemicals in the processing circuit per year.

#### Electric power generation

GSM currently requires diesel fuelled power generation to operate the processing facility, site village, underground operations and any other auxiliary facilities. This ensures the process of gold extraction occurs efficiently and in a safe manner.

#### Sewage facility

A sewage facility is required to service the village and administration office. In 2013, approval was given to divert the Wallaby sewage to the mine waste water treatment plant (WWTP), which resulted in better waste management onsite. Treated wastewater is discharged to a sprayfield under normal operating conditions and two lagoons are available for use in emergency situations. The WWTP is estimated to discharge approximately 99,000L of effluent per day, however, this fluctuates with the site population.

#### Class II or III putrescible landfill

The landfill site at Granny Smith is located approximately 3 km to the north east of the mine village. The landfill is constructed on the existing Goanna waste rock dump, east of the decommissioned Goanna pit. The landfill is designed, managed and maintained in accordance with this Licence.

The landfill located at the Wallaby site is an excavated trench system which is progressively filled with Class II putrescible waste and is covered. The Wallaby site produces approximately 4 500 m<sup>3</sup> of waste per year.

#### Bulk storage of chemicals

The operation at Granny Smith mine requires chemical storage to use in the processing and beneficiation of ore. Bulk primary chemicals used include bulk diesel, liquid cyanide, solid cyanide, caustic soda, lime and hydrochloric acid.

This Licence is the result of an amendment sought by the Licensee to construct and operate a new LNG power station. At this time, it has also been identified that GSM's two licenced premises (Granny Smith – L8435/2010/3 and Wallaby – L7454/2000/9) can be merged into one prescribed premises by redescribing the premises boundary area. Upon issuing of this amended Licence, L7454/2000/9 will be revoked.

The proposed 24 MW gas powered station is classified under Category 52, which is currently listed on the Licence due to the existing diesel power station. Other associated infrastructure with the project includes an underground gas pipeline, power station control system, switchboard, transformers, ablutions, store, carpark, access driveways, workshop, office, potable water tank and buried power cables to connect to site distribution network.

The power station will be constructed on Mining Leases M38/397, M38/440 and L38/144. GSM intend on constructing a new 24 MW gas (natural gas) fired reciprocating engine power station initially comprising 22 double stacked containerized generation units and associated balance of plant. The new power station will replace the two existing diesel fired power stations, however, one of these (23.8 MW) will remain available for the supply of backup power in the event of loss of gas supply.

The construction and operation of the power station will be conducted in a staged approach due to the availability of the desired Cummins gas powered generator units:

- Stage 1 – Works commencing on March 2016 to install a total of 22 generators (Cummins QSK60) which are planned to be operational until 30 June 2016.
- Stage 2 – All 22 containerised generators will be removed and replaced with 18 generators (Cummins QSK60) which have been modified as higher capacity units from 1 July 2016 onwards.



## 4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987*, DEC's Policy Statement - Limits and targets for prescribed premises (2006), and DER'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.

<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number W = Works Approval L= Licence</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
<b>General conditions</b>	L1.2.1 – 1.2.3	General conditions 1.2.1 – 1.2.3 are included in the Licence.	General provisions of the <i>Environmental Protection Act 1986</i>
<b>Premises operation</b>	L1.3.1 – 1.3.13	Conditions 1.3.1 – 1.3.13 replaces conditions A3, W1, W4, W5, W6, W10(b), W11(a), W11(b), W11(d), W16(a), W16(d), W16(e), W18(a), W18(b) and S1 from previous licence. These conditions relate to tailings storage infrastructure, waste water treatment plant and landfill management. These conditions have not been re-assessed as part of this licence amendment, just transferred into REFIRE conditions. Condition 1.3.1 now includes the Wallaby water transfer dam in the containment infrastructure table. This has not been reassessed, but transferred from L7454/2000/9. The water transfer pond and dewatering pipeline have also been included in condition 1.3.6 for daily visual inspections, as per previous licence.	Application supporting documentation  General provisions of the <i>Environmental Protection Act 1986</i>
	L1.3.14 – 1.3.15	Conditions 1.3.14 – 1.3.15 have been included in the most recent amendment to allow construction and commissioning for the new gas fired power station.	
<b>Emissions general</b>	L2.1.1	Descriptive and numerical limits and targets will be set through the licence and therefore a condition regarding recording and investigation of exceedances of limits or targets has been included.	N/A
<b>Point source emissions to air including monitoring</b>	L2.2.1 L3.2.1	DER's assessment and decision making are detailed in Appendix A.	Application supporting documentation



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			General provisions of the <i>Environmental Protection Act 1986</i>
<b>Point source emissions to surface water including monitoring</b>	L2.3.1 – 2.3.2 L3.3.1	<p>Mine dewatering occurs directly into Lake Carey via two discharge points. Conditions have been included in the licence to ensure adequate management of the discharge of hypersaline water into Lake Carey. Prior to discharge water is directed to the Transfer Pond to ensure maximum removal of suspended solids to minimise erosion and scouring. Conditions have been included in the licence to minimise the environmental impacts to Lake Carey including impacts on riparian vegetation communities and micro-fauna. Monitoring conditions and table 3.3.1 have been included to capture surface water and lake sediment quality. GSM has also committed to engage in targeted research into the impacts of hypersaline water on Lake Carey through the continuation of research programs. See Appendix A for further information in regards to the Hypersaline Management Plan Version 3, October 2012.</p> <p>Conditions 2.3.1 and 3.3.1 have been added to the Licence. They have been transferred from L7454/2000/9.</p>	<p>Application supporting documentation</p> <p>General provisions of the <i>Environmental Protection Act 1986</i></p>
<b>Point source emissions to groundwater including monitoring</b>	L2.4.1 – 2.4.2 L3.4.1	DER's assessment and decision making are detailed in Appendix A.	<p>Application supporting documentation</p> <p>General provisions of the <i>Environmental Protection Act 1986</i></p>
<b>Emissions to land including monitoring</b>	L2.5.1 L3.5.1	<p><b>Normal Operation</b> <u>Emission Description</u> <i>Emission:</i> Treated effluent from the WWTP irrigated to land increasing the nutrient content of soil and potentially nearby watercourses.</p>	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
		<p><i>Impact:</i> Storm events may cause nutrient to runoff drainage lines that lead to local catchments such as salt lakes. High nutrient loadings may result in the eutrophication of nearby water courses and the promotion of weed species.</p> <p><i>Controls:</i> Major untreated water will be from the existing SBR tank, where beneficial microbes are established in the wastewater that facilitates the removal of nutrients.</p> <p>Water quality will be maintained as per Granny Smith's commitment and monitored on a quarterly basis. The WWTP is located away from any major aquifer and groundwater level in the project area is 5.5 – 20.64mbgl.</p> <p>GSM have committed to comply with Water Quality Protection Note 22 – Irrigation with nutrient-rich wastewater, 2008 (WQPN 22) to maintain low nutrient loadings.</p> <p>The irrigation area is located within the cyclone fence and a stock fence helps stop any fauna access.</p> <p>The spray fields operate in alternate halves, with each side operated for a week and then rest for a week allowing it to dry out and weeds to die off. Weeds are sprayed when required.</p> <p><u>Risk Assessment</u>  <i>Consequence:</i> Minor  <i>Likelihood:</i> Possible  <i>Risk Rating:</i> Moderate</p> <p><u>Regulatory Controls</u>            GSM are required through condition 3.5.1 to monitor the effluent emissions on a monthly basis. Monitoring conducted will provide confidence that the WWTP is operating effectively and to design specifications. Recent monitoring data from</p>	<p><i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i></p>





<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number W = Works Approval L = Licence</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
		<p>the Annual Environmental Report has shown several breaches of the previous target parameters for discharges to land. Table 2.5.2 now poses limits for the discharge as opposed to targets. Any limit breaches are required to be reported in accordance with the notification conditions.</p> <p>Conditions 1.3.9 and 1.3.10 in the 'premises operation' section of the licence will ensure the irrigation area is managed appropriately to ensure vegetation health is maintained.</p> <p><u>Residual Risk</u>  <i>Consequence:</i> Minor  <i>Likelihood:</i> Unlikely  <i>Risk Rating:</i> Moderate</p>	
<b>Fugitive emissions</b>	N/A	DER has made an administrative change to the conditions in relation to fugitive emissions to air. Where low risk exists, no licence conditions are specified.	General provisions of the <i>Environmental Protection Act 1986</i>
<b>Odour</b>	N/A	Odour conditions have not been re-assessed as part of this licence amendment. No conditions relating to odour were included on the previous licence.	General provisions of the <i>Environmental Protection Act 1986</i>
<b>Noise</b>	N/A	Noise conditions have not been re-assessed as part of this licence amendment. No conditions relating to noise were included on the previous licence.	General provisions of the <i>Environmental Protection Act 1986</i>
<b>Monitoring general</b>	L3.1.1 – 3.1.2	Condition 3.1.1 has been included in the licence to replace existing licence conditions W9 (b) and W9 (c). 3.1.2 has been added to ensure monitoring occurs is undertaken at appropriate intervals.	N/A
<b>Monitoring of inputs and outputs</b>	N/A	Monitoring of inputs and outputs has not been re-assessed as part of this licence amendment. No conditions relating to monitoring of inputs and outputs were included on the previous licence.	N/A





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<b>Works Approval / Licence section</b>	<b>Condition number W = Works Approval L = Licence</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
<b>Process monitoring</b>	L3.6.1	Process monitoring condition 3.6.1 has been included in this licence amendment. This includes monitoring of volumes of seepage discharge from TSF Trench 1 into both Goanna and Granny pits and the pH of this water. The target for pH has been replaced as a limit.	N/A
<b>Ambient quality monitoring</b>	L3.7.1 – 3.7.2	Ambient groundwater quality monitoring condition 3.7.1 replaces monitoring condition from previous licence W9 (a). This monitoring has not been re-assessed as part of this licence amendment. Table 3.7.2 has also been included as part of the Wallaby merge. This is for sediment sampling and replaces condition 3.3.1 from the Wallaby licence.	General provisions of the <i>Environmental Protection Act 1986</i>
<b>Meteorological monitoring</b>	N/A	Meteorological monitoring has not been re-assessed as part of this licence amendment. No meteorological monitoring existed in the previous licence, therefore no conditions have been carried over.	N/A
<b>Improvements</b>	L – no conditions	Improvement condition 4.1.1 has been amended to change the frequency for the reporting of the seepage mitigation update report from biannually to annually. GSM have been submitting the biannual reports since January 2013. In the most recent report, a recommendation was made by URS, to modify the current biannual reporting period to annually in order to utilise a larger dataset and to better align with current quarterly monitoring requirements. URS have suggested the most practical time to complete the TSF Seepage Interception Trench Review is to be done in December of each year following the completion of the November quarterly monitoring period. DER agrees with this recommendation and the reporting requirement has been changed to annually. Consequently, the improvement requirement has been removed and the submission of the report is now a requirement in Table 4.2.1 as part of the Annual Environmental Report.  Improvement Conditions IR1 and IR2 from Wallaby Licence L7454/2000/9 have not been carried over into L8435 as these conditions have been complied with by the required date of completion. DER hydrogeologist was satisfied with GSM's report and recommended the condition can now be removed.	N/A
<b>Information</b>	L4.2.1 – 4.2.3 L4.3.1 – 4.3.5	Condition 4.2.1 has been updated to reflect any amendments to the Licence.	N/A



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number W = Works Approval L = Licence</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
		Notification conditions have been included to ensure that upon completion of construction a compliance certificate must be submitted to the CEO prior to operation.	
<b>Licence Duration</b>	N/A	The duration of the licence has not been re-assessed as part of this amendment.	Guidance Statement on Licence Duration

## 5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
12/08/2013	Application advertised in <i>The West Australian</i> (or other relevant newspaper)	No comments received.	N/A
19/08/2015	Proponent sent a copy of draft amended instrument	Comments received including updated maps, number of new bores and more accurate description for dewatering process.	New maps and bores included, updated dewatering description included.



## 6 Risk Assessment

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

**Table 1: Emissions Risk Matrix**

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Moderate	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Moderate	Moderate	Moderate	High
Rare	Low	Low	Moderate	Moderate	High



# Appendix A

## Point source emissions to air

### Normal Operations

#### Emission Description

*Emission:* The primary pollutants which will be emitted from the proposed gas fired power station are; oxides of nitrogen (NOx), carbon monoxide (CO) and volatile organic compounds (VOC). Particulate matter (PM) emissions are very low from natural gas engines but typically include trace amounts of metals, non-combustible inorganic material and condensable, semi-volatile organics which result from volatilized lubricating oil, engine wear or from products of incomplete combustion.

*Impact:* Reduced air quality as a result of air emissions.

*Controls:* GHG emissions will be minimised using energy efficient gas fired engines rather than diesel powered generators. The following management methods will be implemented by GSM:

- GSM will estimate and report gas emissions as required under National Greenhouse Energy Reporting (NGERS) and NEPM-NPI reporting.
- Construction of elevated exhaust stacks (2.6m), to minimise ground level contaminant concentrations. Aggreko leak detection procedures will be adhered to.
- Continue to investigate ways to improve efficiencies and further reduce GHG and other exhaust emissions.
- Operation of gas engines in accordance with the manufacturers specifications and conduct regular scheduled maintenance, audits and inspections.
- Construction of the power station within an active mining area isolated from environmental sensitive receptors; and
- Construction and operation of the power station in accordance with Aggreko safety standards to protect human health of power station operators and GSM visitors.

The predicted air emissions data for the Cummins GQSK60 engine at 1,500 rpm is shown in the following table:

CUMMINS GQSK60 DATA	CONTINUOUS POWER			75% LOAD		
	g/hp-hr	mg/nm <sup>3*</sup>	ppm	g/hp-hr	mg/nm <sup>3</sup>	ppm
Total Hydrocarbons	3.00	1535	1386	3.16	1524	1415
Non Methane Hydrocarbons	0.64	329	296	0.68	330	304
Oxides of nitrogen	0.95	489	196	1.01	491	202
Carbon Monoxide	1.56	800	473	1.62	783	476
Carbon Dioxide	350	179253	67400	370	179030	69375
Formaldehyde	0.34	174	82	0.36	172	83
Volatile Organic Compounds	0.62	314	282	0.66	315	291
Oxygen (Dry)	9.2%			8.8%		
Brake Specific Fuel Consumption	6084 BTU/hp-hr			6317 BTU/hp-hr		
Exhaust Gas Flow (L/s)	3333			2663		

NOTES:

Sourced from: *Cummins Inc Engine Emissions Data for Generator model GQSK60, 19 March 2015.*

\*mg/nm<sup>3</sup> measured @ 5% O<sub>2</sub>.

Emissions Data Tolerances – Nox, CO, CO<sub>2</sub>, O<sub>2</sub> +/-10% and Hydrocarbons +/-15%.

A comparison of estimated maximum point source emissions against the guideline for stationary reciprocating engines listed in the *NSW Protection of the Environment Operations (Clean Air) Regulations 2010* (used in lieu of specific WA guidance document) is shown in the table below.



Air Impurity	Plant Emissions (mg/m <sup>3</sup> )	Criteria (mg/m <sup>3</sup> )	% of Criteria
Oxides of nitrogen (NO <sub>x</sub> )	489	450	107
Carbon monoxide (CO)	800	125	640
Volatile organic compounds (VOC)	314	40	785

Despite the estimated emission concentrations exceeding those listed in the NSW guidelines, GSM have conducted a risk assessment of the impact of air quality from the new power station with an outcome of low risk to the remote air-shed. The nearest sensitive receptors to the power station are the GSM Wallaby Underground Mine (approximately 5km west), Camp (5.3km north east), GSM processing plant (6.5km east), Lake Carey (3.5km south west) and Laverton Township (24km north east).

GSM are not proposing any additional point source exhaust emission or ambient air monitoring. GSM have also stated that the project has been registered as an Emissions Reduction Fund project under the *Carbon Credits (Carbon Farming Initiative) Act 2011*, due to the significant emission reduction of transferring from diesel to natural gas fired generators.

#### Risk Assessment

*Consequence:* Moderate

*Likelihood:* Possible

*Risk Rating:* Moderate

#### Regulatory Controls

The emissions points will be identified in condition 2.2.1 accompanied by a map in Schedule 1 depicting the location of the power station and of each of the stacks.

Monitoring condition 2.3.1 has been included on the licence to specify emissions testing requirements during commissioning of the new LNG Power Station. Condition 4.3.4 requires the Licensee to submit a Commissioning Report within three months of completion of commissioning and Condition 4.3.5 details the information required to be submitted in the Commissioning Report.

#### Residual Risk

*Consequence:* Moderate

*Likelihood:* Unlikely

*Risk Rating:* Moderate

### **Point source emissions to surface water**

Salt lakes throughout the Goldfields region are periodically (after heavy rainfall events) highly productive ecosystems. They are important for sustaining populations of migratory water birds through episodic population explosions in diatoms, brine shrimps and other macroinvertebrates when the lakes fill with water. Research has indicated that macroinvertebrate biodiversity is significantly lower in salt lakes that receive discharge from mine dewatering by comparison with similar lakes that are unaffected by mine dewatering. Similarly, concentrations of some metals and metalloids can be significantly higher in lakes that receive hypersaline mine dewatering discharge compared with undisturbed lakes. Some metals and metalloids, in particular cadmium and selenium, have the potential to be biomagnified through local food webs and to adversely affect bird reproduction and the health of newly hatched chicks.

An environmental review of the Wallaby operations identified the management of hypersaline groundwater as a key issue to the potential impacts on the Lake Carey ecosystem. A Hypersaline Management Plan (HMP) was prepared by Granny Smith as part of its commitments under Schedule 2 of Ministerial Statement 551. Version 1 of the HMP was prepared in August 2000 as part of Wallaby



operations Environmental Management Program and Management Plans. Since then, knowledge of the receiving environment has increased due to extensive monitoring and research programs. Version 2 was prepared in 2006 following the increase in dewatering volumes to Lake Carey from 80L/sec up to 275L/sec and an additional discharge location was included.

The current version has resulted from the review of version 2 and an increased understanding and research findings, including the February 2011 Lake Carey flood event. Version 3 of the HMP has not been reviewed by OEPA as the dewatering is associated with the underground operations that were not assessed by the Environmental Protection Authority. The current HMP proposes changes in the use of the disused pits during dewatering operations. Previously groundwater has been discharged to the Goanna, Granny and Keringal pits during emergencies and during specific times in the hydrocycle of Lake Carey. The current HMP proposes that Lake Carey is used for the discharge of groundwater at all times.

Version 3 of the HMP was reviewed by a DER principal hydrogeologist. This review concluded that additional information was required to determine whether the current rate of discharge of mine dewatering effluent poses a risk to macroinvertebrates and to bird populations that utilise the lake. It has been recommended that the proponent undertakes further studies. An improvement plan to the HMP, version 3 was outlined in section 4 of the licence, submitted in February 2015.

GSM has committed to current management actions as part of its HMP - Version 3. Control measures include:

- Continuation of water monitoring programme in accordance with the Wallaby and abandoned pit water monitoring procedures;
- Continuous measurement of production bore operation (abstraction) and groundwater discharge through flowmeters;
- Engaging with a specialist consultant to undertake monitoring for impacts to vegetation along the lake margin at select locations annually;
- Engage a specialist consultant to undertake monitoring for vegetation impacts within the draw down cone using transect monitoring annually;
- Monitoring of pipelines to ensure spills of hypersaline water onto surrounding soils and vegetation are minimised;
- Engage a specialist consultant to undertake annual monitoring of sediment for eggs and salt crust development at sites around the Wallaby discharge outlet;
- Monitoring of invertebrate populations at select wetland locations when freestanding water is available;
- Engage a specialist consultant to undertake invertebrate monitoring at sites around the Wallaby discharge outlet following heavy rain events; and
- Continued engagement with specialist consultants/staff to undertake research activities.

As such, the report was submitted to DER and assessed by a DER principal hydrogeologist who was satisfied the condition was compliant. The report concluded that there is minimal risk to the aquatic invertebrates and waterbirds of Lake Carey from metal and trace elements. The improvement condition has now been removed and GSM are required to continue surface water monitoring as per licence conditions.

### **Point source emissions to groundwater**

Surface indications of the seepage from TSF cell three were observed shortly after the TSF was commissioned in 1990. While GSM has been progressively implementing operational and seepage management strategies, mounding of the local water table continues to be an issue in the vicinity of the TSF. To address this issue, a series of seepage interception trenches were planned for construction in a staged manner adjacent to the TSF. To date, only one of the trenches has been implemented. The purpose of the trenches is to collect and return near surface seepage to the process pond for re-use in the CIP plant. Following periods of high rainfall, reduced plant throughput,





plant shutdowns and no longer toll treating third party ore, the rate of seepage recovery exceeds processing requirements. As such, an alternate disposal route is being sought for such periods. GSM is proposing the two hypersaline abandoned pits, Goanna and Granny Smith, for water storage. The pipeline route is from the seepage trench, to the lined transfer pond to the open pits.

**Emission Risk Assessment – Normal operations**

Emission Description

*Emission:* Seepage water from the TSF Cell 3 seepage trenches will be discharged into abandoned pits Granny Smith and Goanna. Abstracted water contains elements such as total cyanide, weak acid dissociable cyanide (WAD CN), arsenic and total dissolved solids (TDS) that will mix with groundwater that intercepts the base of the pits.

*Impact:* The biggest impact from seepage of the discharge water is to cause the standing water levels to rise in the local groundwater aquifer, which can impact on local vegetation due to the groundwater level to rise within the vegetation root zone. Due to the poor water quality of both local groundwater and discharges, immediate impacts on plants can include leaf drop, leaf burn, stunted growth, poor seed germination and tree death. Rising groundwater levels can also affect the health of vegetation communities, as few young plants survive adulthood to replace the previous generation.

There may also be risks to fauna with the presence of both Total and WAD cyanide in the discharge water. Ingestion of WAD cyanide solutions by birds and mammals may cause delayed mortality due to toxicity.

*Controls:* GSM has compared water quality from the seepage trenches to groundwater quality within the abandoned pits, which shows little variation. Total cyanide and WAD cyanide are both higher in the seepage water compared to groundwater in the pits. Total dissolved solids are much higher in the pits than in the seepage water.

Currently pit lake elevations are below the baseline water table elevations and show behaviours of a groundwater sink. Under these current circumstances, there is groundwater flow into the pit-lakes which is evaporated. It is expected once tailings seepage water is discharged, it will have a similar fate. There may be density-coupled attributes of the water in the pit-lakes that promote seepage into the local groundwater which would vary depending on the depths of the pit lake. Over time, this is expected to reverse, given assumptions that evaporation losses are expected to exceed the water available from through flow. GSM has proposed water level limits for the pits which equates to a freeboard of 3 m:

Pit	Low Pit Crest (m RL)	Current Pit Lake Elevation	Proposed Licensed Water Level (m RL)
Granny	418	396.49 m	415.0
Goanna	422	401.30	419.0

Currently the levels of water in the pits are well below pre-mining water table and the 3 m freeboard. During the intense storms of 2011, when well above average rainfall was experienced at Granny Smith, the water levels increased but still remained well below pre-mining levels. Due to evaporation alone, the water levels in the pit will continue to decrease. If the volume of disposal remains below the volume of evaporation, then water levels will remain below pre-mining levels and the pits will continue to act as a sink even if a probable maximum precipitation event were to occur.

GSM currently monitors from bores situated around the perimeter of the pits and are sampled quarterly for SWL as a part of Department of Water’s requirements. GSM has proposed to monitor for the following parameters, once discharging commences, on a quarterly basis: SWL, pH, TDS, major cations and anions and WAD CN.





GSM is an isolated mine site with no nearby sensitive receptors and no beneficial uses for groundwater in the area.

Risk Assessment

*Consequence:* Moderate

*Likelihood:* Possible

*Risk Rating:* Moderate

Regulatory Controls

Monitoring in bores has been implemented through Condition 3.4.1 to ensure any seepage from the pits is detected, through a quarterly monitoring program. A limit of 0.5 mg/L of WAD CN has been imposed, in accordance with the Cyanide Code and 1 mg/L of total cyanide due to the risk to birds and to ensure that cyanide does not accumulate over time. Condition 3.4.1 also includes pit lake elevation monitoring for both pits and pH monitoring for within the pits including a limit of 6-8. Condition 2.4.2 outlines the limits for pit lake elevations (to maintain a freeboard of 3 m).

Daily visual inspections have been included in Condition 1.3.6 (Table 1.3.2) for freeboard capacity and avifauna deaths.

Residual Risk

*Consequence:* Moderate

*Likelihood:* Unlikely

*Risk Rating:* Moderate