Government of **Western Australia**
Department of **Environment Regulation**

Decision Document

Environmental Protection Act 1986, Part V

Proponent: Murrin Murrin Operations Pty Ltd

Licence: L7276/1996/11

Registered office:	Level 10, Alluvion 58 Mounts Bay Road PERTH WA 6000
ACN:	076 717 505
Premises address:	Murrin Murrin Nickel Cobalt Project Mining tenements M39/446, M39/820, L39/81, L39/62, L39/83, M39/299, M39/651, M39/300, M39/301, M39/435, M39/436, M39/421, M39/422, M39/423, M39/424, M39/342 and M39/343 LAVERTON WA 6440
Issue date:	Wednesday, 05 June 2013
Commencement date:	Thursday, 06 June 2013
Expiry date:	Tuesday, 05 June 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 Manager Licensing

Contents

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.

Works approval and licence conditions
DER has three types of conditions that may be imposed on works approvals and licences. They are as follows:

Standard conditions (SC)

DER has standard conditions that are imposed on all works approvals and licences regardless of the activities undertaken on the Premises and the information provided in the application. These are included as the following conditions on works approvals and licences:

Works approval conditions: 1.1.1-1.1.4, 1.2.1, 1.2.2, 5.1.1 and 5.1.2.

Licence conditions: 1.1.1-1.1.4, 1.2.1-1.2.4, 5.1.1-5.1.4 and 5.2.1.

For such conditions, justification within the Decision Document is not provided.

Optional standard conditions (OSC)

In the interests of regulatory consistency DER has a set of optional standard conditions that can be imposed on works approvals and licences. DER will include optional standard conditions as necessary, and are likely to constitute the majority of conditions in any licence. The inclusion of any optional standard conditions is justified in Section 4 of this document.

Non standard conditions (NSC)

Where the proposed activities require conditions outside the standard conditions suite DER will impose one or more non-standard conditions. These include both premises and sector specific conditions, and are likely to occur within few licences. Where used, justification for the application of these conditions will be included in Section 4.

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	5 000 000 tonnes per annual period
	12	1 500 000 tonnes per annual period
	31	1 718 100 tonnes per annual period
	44	55 000 tonnes per annual period
	52	87.5 MW per annual period
	54	300 m^3 per day
	64	5 000 tonnes per annual period
Application verified Application fee paid	Date: 19 March 2013 Date: 19 March 2013	
Works Approval has been complied with Compliance Certificate received	Yes☒ No☐ N/A☐ Yes☒ No☐ N/A☐	
Commercial-in-confidence claim	Yes☐ No☒	
Commercial-in-confidence claim outcome		
Is the proposal a Major Resource Project?	Yes☒ No☐	
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986*?	Yes☒ No☐	Referral decision No: Managed under Part V ☒ Assessed under Part IV ☒
Is the proposal subject to Ministerial Conditions?	Yes☒ No☐	Ministerial statement No: 506 and 444 EPA Report No: 0506 and 1038
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the *Environmental Protection Act 1986*)?	Yes☐ No☒ Department of Water consulted 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

Murrin Murrin Operations Ptd Ltd (MMO) is a Perth based company which operates the Murrin Murrin Nickel Cobalt Project (Murrin Murrin). MMO is a 100% subsidiary of Minara Resources Pty Ltd (Minara). Minara is a 100% subsidiary of Glencore plc.

Murrin Murrin is located approximately 60 kilometres (km) east of Leonora in the shires of Laverton and Leonora. The operation, which was commissioned in 1999, mines and processes approximately 4.1 million tonnes of nickel laterite ore per year to produce about 43 000 tonnes per year of nickel and 3 000 tonnes per year of cobalt.

The operation uses open –pit mining techniques and processes the ore using High Pressure Acid Leaching (HPAL) to recover the nickel and cobalt from the laterite ore.

The current operation at Murrin Murrin consists of:

- Open-pit nickel cobalt mining operations at Murrin Murrin North, Murrin Murrin South and Murrin Murrin East;
- Calcrete quarrying operations at the Windarra Calcrete Quarry;
- Processing plant with associated ancillary plants (eg power generation, sulfuric acid plant, hydrogen sulfide plant and water treatment facilities);
- Tailings storage facilities (TSFs), including above ground and in-pit tailings facilities;
- Heap leach facility;
- Water supply borefields;
- Landfill;
- Wastewater treatment plant (WWTP); and
- Supporting infrastructure such as the accommodation village, airstrip and roads.

Category 5 – Processing plant
Ore from the Murrin Murrin run of mine (ROM) stockpile is fed into the primary crusher (consisting of a ROM bin and sizer) and then slurried in a ball mill with water to produce a feed slurry for the high pressure acid leach (HPAL) circuit.

The HPAL circuit leaches the nickel and cobalt from the ore slurry. The resulting solution is then washed in a counter current decant (CCD) circuit to separate the leach solution from the waste residue. The pregnant liquor solution is then further processed in the refinery area and the waste residue is partially neutralised and discharged to the TSFs.

TSFs at Murrin Murrin consist of five in-pit TSFs and one paddock style TSF consisting of two cells. Supernatant from the TSFs is decanted and discharged to four evaporation ponds.

Category 12 – Screening plant
Murrin Murrin has a calcrete quarry located approximately 45 km from the main processing plant where calcrete is quarried and then fed through a crushing circuit to produce a crushed calcrete product. The crushed product is then transported by road train to the main plant site where it is milled and slurried for use in solution and tailings neutralisation.

Category 31 – Chemical manufacturing
Murrin Murrin has three chemical manufacturing plants on the premises:

- Sulfuric acid plant.
  The sulfuric acid plant is a double absorption acid plant which produces concentrated sulfuric acid.
- Hydrogen Sulfide Plant.

The hydrogen sulfide plant reacts molten sulfur with hydrogen gas to produce hydrogen sulfide gas.

- Hydrogen Plant
  The hydrogen plant produces high purity hydrogen gas using the catalytic steam reforming process of natural gas.

Category 44 – Metal smelting
Murrin Murrin produces nickel and cobalt briquettes by passing the pregnant liquor solution through the mixed sulfides precipitation circuit to produce a mixed nickel and cobalt sulfide precipitate. This sulfide precipitate is then converted to mixed metal sulfate solution where metal impurities are removed. The nickel and cobalt are then separated from the solution using solvent extraction.
The nickel sulfate solution is then passed through the hydrogen reduction circuit to form a nickel precipitate, which is then dried to form a nickel powder. The nickel powder is formed into a briquette, sintered in a furnace and then packaged.

The cobalt sulfate solution from solvent extraction follows a separate processing path which is similar to the nickel processing path but on a smaller scale.

Category 52 – Power generation
Murrin Murrin produces electricity primarily from two sources:

1. Natural gas turbine, which has a capacity of 31.5 MW.
2. Two steam turbines, which have a capacity of 28 MW each (56 MW total).

There are also six diesel generators which provide emergency power. These have a total capacity of 4.8 MW.

Category 54 – Sewage facility
Murrin Murrin treats sewage generated from the plant site and accommodation village using a WWTP which utilises intermittent extended aeration. It consists of four tanks and two sludge drying ponds. Treated effluent is irrigated to one of three irrigation fields located adjacent to the WWTP.

Category 64 – Putrescible landfill
The landfill facility is located on a waste rock landform and consists of an inert trench and a putrescible trench. The entire facility is fenced to prevent fauna access and minimise windblown waste escaping the area.

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.

DECISION TABLE				
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
General conditions	L1.2.5	OSC	OSC 1.2.5 has been transferred from the previous licence (W3) to ensure contaminated stormwater is treated prior to being discharged from the premises.	General provisions of the *Environmental Protection Act 1986.* *Environmental Protection (Unauthorised Discharge) Regulations 2004.*
Premises operation	L1.3.1 – 1.3.11	OSC	Premises operation OSCs 1.3.1 – 1.3.5 and 1.3.8 – 1.3.11 have been included on the Licence to replace conditions W1 – W2(b), W6 – W9(a), W10(a), W13, S1 and S3. These conditions have not been reassessed as part of this amendment. 1.3.6 requires an annual assessment of vegetation within the zone of influence of the TSF. Depending on the outcome of this assessment, it may be necessary for DER to implement Improvement Requirements to ensure the best environmental outcome. 1.3.7 has been included due to on-going seepage associated with the above ground paddock TSF. This condition ensures the proponent continues to manage the seepage in accordance with the Murrin Murrin Operations Paddock Tailings Storage Facility Seepage Mitigation Project. Annual and quarterly updates are required and progress will be closely monitored.	General provisions of the *Environmental Protection Act 1986.*

DECISION TABLE				
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
Emissions general	L2.1.1	OSC	Limits will be set through the emission section of the licence and therefore OSC regarding recording and investigation of exceedances of limits or targets has been included.	General provisions of the *Environmental Protection Act 1986.* *Environmental Protection (Unauthorised Discharge) Regulations 2004.*
Point source emissions to air including monitoring	L1.2.1, L2.2.2, L3.2.1-L3.2.3	OSC	DER's assessment and decision making are detailed in Appendix A. The previous licence required ammonia monitoring, however did not impose any targets or limits for this parameter. Given there are no nearby sensitive receptors in the area and due to the fact that ammonia is only significant for short periods of time, making it difficult to monitor, ammonia monitoring has been removed from the licence. The monitoring data that was being collected is also unreliable due to the process and conditions on site.	Ambient Air Assessment Criteria, National Environmental Protection Measure (Ambient Air Quality) Application supporting documentation
Point source emissions to surface water including monitoring	N/A	N/A	There are no point source emissions to surface water from the premises.	General provisions of the *Environmental Protection Act 1986.*
Point source emissions to groundwater including monitoring	N/A	N/A	There are no point source emissions to groundwater from the premises.	General provisions of the *Environmental Protection Act 1986.*
Emissions to land including monitoring	L2.5.1 L3.5.1	OSC	Emissions to land have not been reassessed as part of this amendment. OSC's 2.5.1 and 3.5.1 have been included to replace conditions W14, W15 and W16 (a-b) of the previous licence.	General provisions of the *Environmental Protection Act 1986.*
Fugitive	L2.6.1	OSC	Fugitive emissions have not been reassessed as part of this	General provisions of the

		previous licence did not impose controls on noise, no specified conditions have been included in this section. The *Environmental Protection (Noise) Regulations 1997* and Standard condition 1.2.1 apply.	*(Noise) Regulations 1997* General provisions of the *Environmental Protection Act 1986.*
	OSC	Optional standard monitoring conditions 3.1.1 – 3.1.5 have been added to the Licence as monitoring of point source air emissions plus ambient quality monitoring is included. These replace previous licence conditions W11(b-c).	Australian Standard AS/NZS 5667.1 – Water Quality Sampling – Guidance on the Design of sampling, programs, sampling techniques and the preservation and handling of samples.
	OSC	Process monitoring has been included in the Licence to ensure the volume of tailings deposited into the TSFs and the volume of water recovered from the TSFs is monitored.	General provisions of the *Environmental Protection Act 1986.*
	N/A	Monitoring requirements have not been reassessed as part of this amendment. As the previous licence did not require process monitoring no specified conditions have been included in this section.	N/A
	OSC	Table 3.8.1 has been included for monitoring of ambient groundwater quality. This replaces previous licence condition W11(a). However, as three new in-pit TSFs have been added to the licence in this	General provisions of the *Environmental Protection Act 1986.*

		Heap Leach Pad bores is detailed in Appendix B.	
	N/A	Monitoring requirements have not been reassessed as part of this amendment. As the previous licence did not require meteorological monitoring no specified conditions have been included in this section.	N/A
	N/A	No improvements are required on the Licence.	N/A
	SC	Standard conditions 5.1.3 and 5.2.1 replace conditions G2 and G3 of the previous licence. Previous licence condition W18 has also been transferred into 5.2.1. 5.3.1 replaces licence limit exceedance reporting conditions G1(a-c).	N/A
	N/A	The Licence duration has been extended through this amendment. The Licence now has an expiry date of 5 June 2018, bringing the duration to five years rather than three.	N/A

5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
25/03/2013	Application advertised in *The West Australian* (or other relevant newspaper)	No comments received	N/A
6/02/2015	Proponent sent a copy of draft amended instrument	Comments received from proponent included: - Minor wording and administrative changes in premises summary and throughout licence; - Removal of condition 2.6.2; - Request to remove bore IP202-3 as it is unable to be sampled; - Request to discuss improvement condition; - Hydrogen sulfide flare circuit should be USEPA method 15 not 18.	Meeting was held between the proponent and DER to discuss proponent comments. Outcomes are as follows: - Minor wording and administrative changes accepted; - Condition 2.6.2 removed, 2.6.1 is considered adequate for dust management at site; - IP202-03 has been removed; - The improvement condition has been removed and a separate condition ensuring quarterly and annual seepage reports has been included in section 1.3. referencing the Seepage Mitigation Project. - USEPA method changed from 18 to 15.

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 including monitoring

Emission Risk Assessment – Normal Operations

Emission Description
Emission: Sulfur dioxide (SO_2) from the cobalt sinter furnace stack and the nickel sintering furnace stack.
Impact: The nearest sensitive receptor is the Murrin Murrin accommodation village, which is located 6.5 km from the plant site. SO_2 can affect human health when inhaled. It can cause breathing or respiratory illness, alterations in pulmonary defences and aggravation of existing cardiovascular disease. SO_2 can also adversely affect the environment in the form of acid rain which increases the acid levels of waterways which can lead to flora and fauna deaths and potential changes to ecosystems.
Controls: The SO_2 emissions from these furnaces are extremely low. Recent monitoring shows the combined emissions from these two furnaces represented 0.15% of the total SO_2 emissions from the premises during normal operating conditions. SO_2 air dispersion modelling for these two point source emissions has not been carried out due to the very low emission rates from these sources and the insignificant impact they have on air quality.

Risk Assessment
Consequence: Insignificant
Likelihood: Rare
Risk Rating: Low

Regulatory Controls
Previous licence conditions included SO_2 limits of 0.2 g/s for the cobalt sinter furnace stack and 1.3 g/s for the nickel sintering furnace stack. Monitoring results from MMO over the immediate past three years have recorded SO_2 levels well below these limits. Due to such low emission rates, the limits have been removed. MMO is however required to continue monitoring these emissions through condition L3.2.1, carried over from previous licence condition A5(a).

Residual Risk
Consequence: Insignificant
Likelihood: Rare
Risk Rating: Low

Normal Operations

Emission Description
Emission: SO_2 from hydrogen sulfide circuit flare
Impact: The nearest sensitive receptor is the Murrin Murrin accommodation village, which is located 6.5 km from the plant site. SO_2 can affect human health when inhaled. It can cause breathing or respiratory illness, alterations in pulmonary defences and aggravation of existing cardiovascular disease. SO_2 can also adversely affect the environment in the form of acid rain which increases the acid levels of waterways which can lead to flora and fauna deaths and potential changes to ecosystems.
Controls: Process controls to manage the operation of the mixed sulfide section of the plant.

Risk Assessment
Consequence: Minor

Likelihood: Unlikely
Risk Rating: Moderate

Regulatory controls
OSC 2.2.2 prescribes a limit for SO_2 emissions from the flare and OSC 3.2.1 includes the H_2S flare in the stack testing monitoring to check compliance with the limit.

Residual Risk
Consequence: Minor
Likelihood: Unlikely
Risk Rating: Moderate

Normal Operations

Emission Description
Emission: SO_2 from Sulfuric Acid Plant (SAP) stack during normal operations.
Impact: SO_2 can affect human health when inhaled. It can cause breathing or respiratory illness, alterations in pulmonary defences and aggravation of existing cardiovascular disease. SO_2 can also adversely affect the environment in the form of acid rain which increases the acid levels of waterways which can lead to flora and fauna deaths and potential changes to ecosystems. The nearest sensitive receptor is the Murrin Murrin accommodation village, which is located 6.5 km from the plant site. The nearest settlements include the Minara Station Homestead located approximately 20 km to the south-west and Mt Margaret Aboriginal Community located approximately 25 km to the east-northeast. Modelling has been carried out to assess the cumulative impacts from SO_2 on the local air quality from the acid plant stack. The model outputs were compared to the National Environmental Protection Measure (NEPM) Ambient Air guideline for SO_2. The modelling scenario based on normal operation conditions was predicted to be 56 ug/m^3, or 11% of the NEPM 1-hour guideline (524 ug/m^3). Quarterly stack testing of the SAP stack recorded exceedances of the SO_2 limit for a period from March 2012 to August 2013 until the October 2013 shutdown when heat exchanger HX19 was replaced. Since the December 2013 quarterly testing period (following the replacement of the heat exchanger in October 2013) MMO has been in compliance.
Controls: Management of the operation of the Acid Plant in order to reduce process interruptions from poor control due to either inadequate maintenance, process control or plant performance.

Risk Assessment
Consequence: Moderate
Likelihood: Possible.
Risk Rating: Moderate

Regulatory controls
A limit on SO_2 emissions from the SAP stack has been retained on the Licence as OSC 2.2.2 and a corresponding monitoring program prescribed as OSC 3.2.1.

Residual Risk
Consequence: Moderate
Likelihood: Unlikely
Risk Rating: Moderate

Abnormal Operations

Emission Description
Emission: SO_2 emission from the Sulfuric Acid Plant Stack during a cold plant start up.

Impact: Increased SO_2 emission during the start up (period of up to 5 hours). The nearest receptor is 6.5 km away at the Murrin Murrin accommodation village.
Controls: No specific controls.

Risk Assessment
Consequence: Moderate
Likelihood: Possible (one cold start-up has occurred in the last 18 months to November 2014).
Risk Rating: Moderate

Regulatory controls
A SO_2 limit is placed on emissions from the SAP stack in the Licence but this limit does not apply for cold plant start-ups. The quarterly monitoring program does not address emissions from cold plant start ups; it is designed to monitor emissions during normal operation.

Residual Risk
Consequence: Moderate
Likelihood: Possible
Risk Rating: Moderate

Appendix B

Monitoring of ambient groundwater quality

Emission Risk Assessment – Normal Operations

Emission Description

Emission: Tailings seepage from the in-pit TSFs (2/2-2/4, 8/4 and 9/2) into surrounding groundwater, potentially causing groundwater mounding. Tailings held in the TSF are a waste product from the process and include contaminants such as lead, mercury and arsenic. Seepage from the TSF into the surrounding groundwater may occur over time as tailings are deposited into the facility. The tailings liquor has a much higher salinity than the surrounding groundwater (approximately 180 000 mg/L TDS) and is acidic (pH ~3).

Impact: The biggest impact from seepage of the tailings liquor is for the salinity levels to rise in the groundwater which can impact on the local vegetation, if groundwater levels rise to within the distance that can be accessed by the root systems of local vegetation. Typically in the Goldfields impacts are detected with groundwater levels at 4 mbgl or above. The immediate impacts of salinity on plants include leaf drop, leaf burn, stunted growth, poor seed germination and tree death. It also affects the health of vegetation communities, as fewer young plants survive to adulthood to replace the previous generation.

Controls: MMO undertook seepage analysis for the in-pit TSFs which included the extent of groundwater mounding over one, two and three year periods with increasing distance from the centre of the pit void along both pit length and width. From the analysis it was determined that the development and propagation of the seepage mound is likely to be minor. This is a result of the low inferred hydraulic conductivity, with mounding greater than 3 m unlikely to occur outside 100 m from each pit over three years of deposition. The risks of significant impacts to groundwater are expected to be minimal based on the hydraulic conductivity and seepage potential of the area. MMO has installed groundwater monitoring bores around the in-pit TSFs to enable ongoing groundwater monitoring. They will be monitored quarterly in accordance with AS/NZS 5667 and in accordance with licence conditions.

Risk Assessment

Consequence: Moderate
Likelihood: Unlikely
Risk Rating: Moderate

Regulatory Controls

OSCs 1.3.1 – 1.3.3 , 1.3.5 and 1.3.6 have been included in the Licence to ensure the TSFs are managed appropriately and operated in accordance with original construction documents. OSC 1.3.7 has also been included to ensure the proponent continues to manage current seepage in accordance with the Murrin Murrin Operations Tailings Storage Facility Seepage Mitigation Project (implemented in 2005). Quarterly updates are required along with an annual summary in the Annual Environmental Report. Monitoring condition 3.8.1 has been added to the Licence in-line with the current monitoring regime. A standing water level limit of 4 mbgl has been added for the three new in-pit TSFs consistent with the Licensee's commitments made in the works approval. A pH limit of >3.5 has also been added in line with the current monitoring regime.

Residual Risk

Consequence: Moderate
Likelihood: Unlikely
Risk Rating: Moderate

Abnormal Operations

Emission Description
Emission: Leachate from the Heap Leach Pad breaching the liner system.
Impact: Increased nickel concentration in groundwater from Heap Leach pad leachate. Testing of leachate from the low grade ore to be processed at the Heap Leach Pad at the time of the Works Approval (2005) indicated that the leachate would meet the ANZECC guideline values for stock water quality with the exception of nickel (predicted to be >1mg/L).
Controls: A liner consisting of a clay base overlain with HDPE, covered by a coarse rock layer was installed for the Heap Leach pad. The pad itself consists of 8 cells on a slight gradient to direct percolate liquor into a pond for transfer back to the Processing Plant via the PLS (pregnant liquor solution) pond.

Risk Assessment
Consequence: Moderate
Likelihood: Possible. There are a number of potential causes of Heap Leach pad liner failure both during construction and over time during operations.
Risk Rating: Moderate

Regulatory controls
Monitoring of nickel has been added to the parameters to be analysed in the ambient groundwater quality monitoring program under OSC 3.8.1 and a target has been added for nickel concentration for the Heap Leach pad bores and the Processing Plant bores.

Residual Risk
Consequence: Moderate
Likelihood: Possible
Risk Rating: Moderate