Government of Western Australia
Department of Environment Regulation

Amendment Notice #1

Licence Number	L8621/2011/1
Licence Holder	Roy Hill Iron Ore Pty Ltd
ACN	123 722 038
Registered business address	5 Whitham Road PERTH AIRPORT WA 6105
Date of amendment	13 January 2017
Prescribed Premises	Category 5 – Processing or beneficiation of metallic or non-metallic ore Category 6 – Mine dewatering Category 12 – Screening, etc. of material Category 54 – Sewage Facility Category 57 – Used tyre storage (general) Category 64 – Class II putrescible landfill site Category 73 – Bulk storage of chemicals, etc.
Premises	Roy Hill Iron Ore Mine M46/518 and M46/519 NEWMAN WA 6753

Amendment

The Chief Executive Officer (CEO) of the Department of Environment Regulation (DER) has amended the above licence in accordance with section 59 of the *Environmental Protection Act 1986* as set out in this Amendment Notice.

Date signed: 13 January 2017

Alana Kidd

Manager Licensing – Resource Industries

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

Amendment Notice

This notice is issued under section 59 of the *Environmental Protection Act 1986* (EP Act) to amend L8621/2011/1, issued under the EP Act for a prescribed premises as set out below. This notice of amendment is given under section 59B(9) of the EP Act.

Amendment Description

On 7 October 2016, Roy Hill Iron Ore Pty Ltd (Licence Holder) (RHIO) submitted an application to DER for an amendment to the RHIO Mine Licence to include the operation of the Tailings Storage Facility (TSF) and commissioning and operation of the evaporation infrastructure (7 evaporators were assessed under W5067/2011/1). The 7 evaporators were installed in Cell 1 (only) on the internal causeway.

The proposed infrastructure and discharge locations are located wholly within M46/518 and M46/519 held by the Licence Holder.

The addition of 7 evaporators to the operating TSF cell in the Licence (hereafter named, the evaporators) will not change the design capacity for category 5 on the existing Licence (65,000,000 tonnes per annual period). When RHIO do the next TSF Cell 1 wall lift, they will move the existing evaporators to Cell 2 (internal causeway) for use there. Only 7 evaporators (maximum) will be used at any one time

Coordinates of the evaporators are detailed in Table 1.

Table 1. GPS locations of individual evaporation points

Description	Figure	Reference	Easting	Northing
Evaporators in TSF Cell 1	Figure 3	1	796510.92	7513248.99
		2	796480.63	7513208.26
		3	796451.39	7513168.58
		4	796421.10	7513127.84
		5	796391.86	7513087.63
		6	796361.05	7513047.43
		7	796331.28	7513007.74
Evaporators in TSF Cell 2	Figure 3	1	797478.86	7512365.57
		2	797448.57	7512324.84
		3	797419.33	7512285.16
		4	797389.04	7512244.42
		5	797359.80	7512204.21
		6	797328.99	7512164.01
		7	797299.23	7512124.32

The location of the evaporators (highlighted in orange) is depicted in the TSF (Figure 1, below) and in greater detail in Figure 2 (yellow dots).

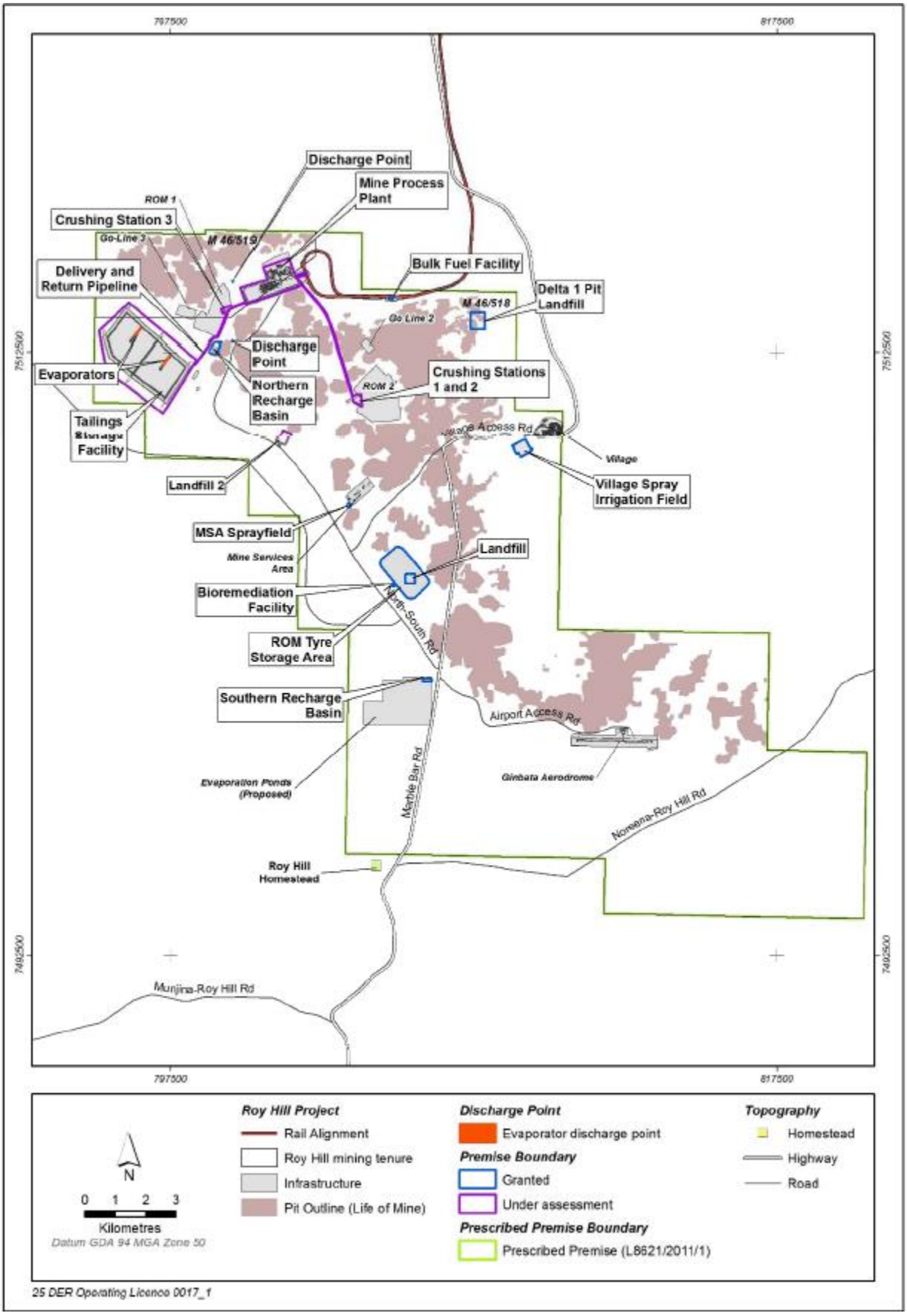


Figure 1. Location of evaporator discharge points within Premises boundary

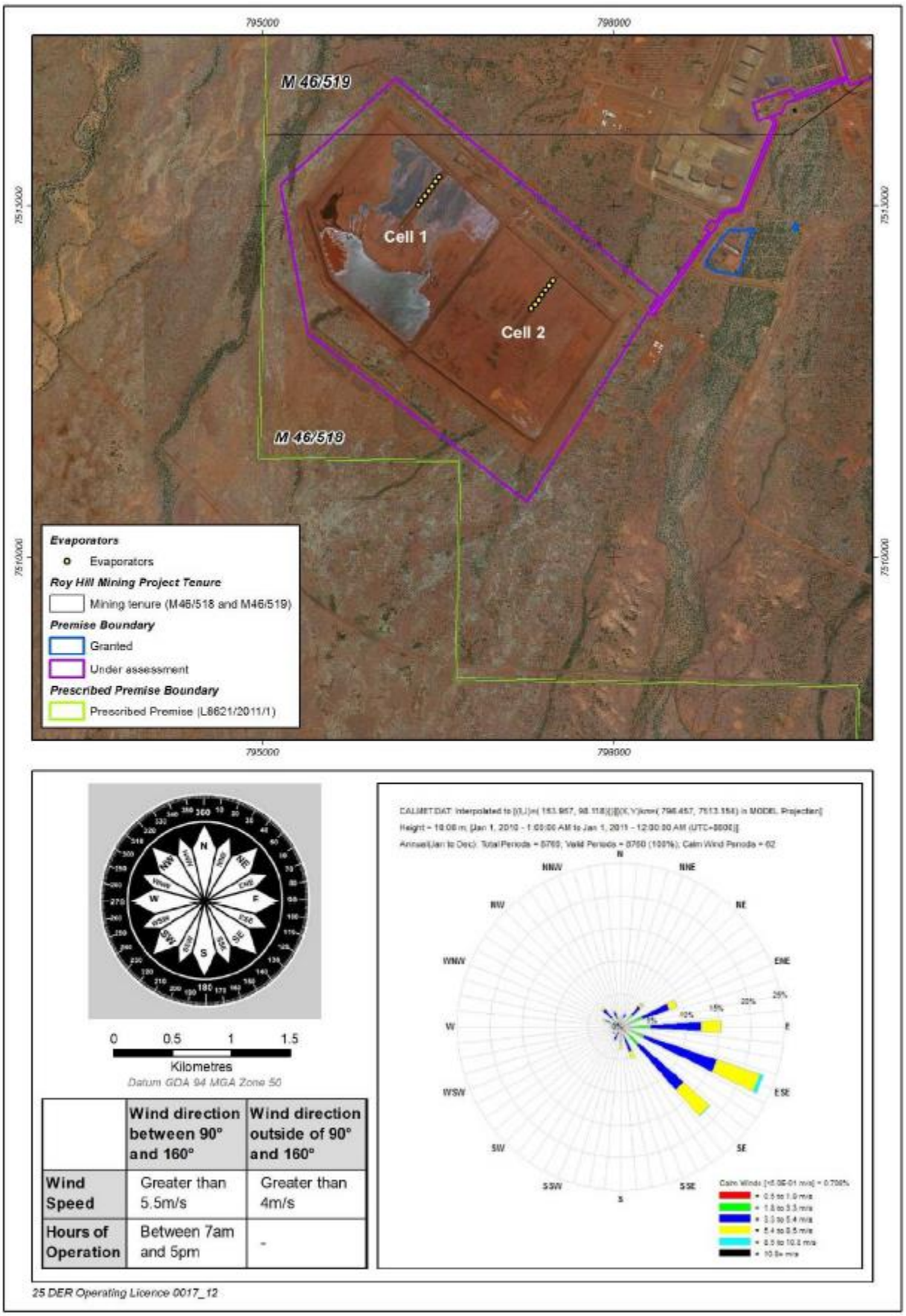


Figure 2. Location of evaporator discharge points within Tailings Storage Facility

Decision

The TSF is not designed as a water storage facility and requires that decant return water is regularly removed. Reuse of the decant water within the processing stream at the RHIO mine has resulted in higher chloride concentrations in the ore, reducing the quality of the shipped ore product. One option for disposal of the decant water was evaporation direct from the TSF. RHIO received the amended works approval to install the evaporators in February 2016 (W5067/2011/1). The evaporators are now installed and require commissioning and operation in order to commence decant water reduction.

Each single evaporator has a water throughput capacity of 25L/s (or 90m^3/hour). The evaporators are positioned to discharge towards the central embankment of the TSF. Other support infrastructure installed includes two suction pumps, weather station, automated Programmable Logic Control (PLC) system – housed within a sea container, HDPE piping, and power via a generator located on the causeway in the centre of each TSF cell. The evaporators and pumps are coated in Rhino Tuff Stuff (polyuria/ polyurethane product, CSIRO tested Class III "Wet Area Membrane") to reduce equipment corrosion. The decant return system shall remain in place and functional. The evaporators will utilise the existing decant pumps and additional pumps may be installed, as required, to feed water to the evaporators.

When weather conditions are not optimal and or during rain events, there may be scenarios that require all seven evaporators (within the 1 operating TSF Cell) to operate to enable disposal of accumulated water and maintain TSF freeboard for each Cell (1& 2) of 1,200mm (sum of operational freeboard of 300mm, plus beach freeboard of 200mm plus 1/10,000 year storm requirement of 700mm). In this case, the evaporators will be operated in accordance with the controlled operating parameters (operational scenarios and capacities) as presented in Table 2.

Table 2. Evaporator Operational and Design Considerations

Number of Units	Evaporator Design Capacity		Operational Considerations				
			Efficiency	Calculated Maximum Daily Discharge	Calculated Maximum Annual Discharge	Estimated 16hr Operational Day Discharge	Estimated 16hr Operational Annual Discharge
	(m³/hour)	(m³/year)	(%)	(m³/day)	(m³/year)	(m³/day)	(m³/year)
1	90	788,400	50*	1,080	394,200	720	262,800
7	630	5,518,800	50*	7,560	2,759,400	5,040	1,839,600
*Estimated based on average climate conditions							

The evaporators function by mechanically producing a mist of small water droplets through a fracturing nozzle. The water is then injected into a high volume ambient air stream that is discharged at a high velocity. The evaporator propels the droplets high into the atmosphere, resulting in increased exposure of the droplet to the ambient air and the potential for evaporation.

The modular design of the system allows for individual units to be operational or on standby, determined by the prevailing weather conditions, volumes of water to be disposed of and to allow for equipment maintenance. The evaporators can function

automatically based on site specific weather criteria or individual evaporators can be manually operated and shut down by the TSF operators. During operations, when the volume of water in the decant pond permits, the evaporators positioned closest to the embankment pond will be shut down.

Modelling conducted on the evaporation and spray drift from the evaporators was based on the assumption that all evaporators were operating at maximum capacity from one location on the TSF causeway, for a year.

National Environmental Protection Measure (NEPM) for Ambient Air Quality do not include values for toxic metals relevant to the model, hence the VIC SEPP standards for ambient air quality were used for the study. There are no Australian guidelines for assessing health and vegetation impacts of individual compounds. As such, the German Federal Government's Technical Instructions on Air Quality Control - TA Luft (1990) were used for the study. The results of the modelling (PEL, 2015) concluded that:

- Confirmation of the weather condition for optimal evaporation efficiency is low humidity and warm to hot ambient temperatures. There was no correlation observed between evaporation efficiency and wind speed. Though wind speed increases the dispersion from the evaporators and decreases deposition.
- Approximately 18% of the droplets deposit immediately into the TSF after emission from the evaporator units.
- Estimated ambient air maximum 1-hour for cadmium and lead and the 3-minute arsenic concentration from the modelled scenario are **below** the criteria stipulated in the Victorian State Environment Protection Policy (SEPP) (Air Quality Management). It is noted that the Victoria criteria was utilised in the assessment as the National Environmental Protection Measure (NEPM) for Ambient Air does not include criteria for cadmium, lead and arsenic.
- Predicted daily deposition concentrations of cadmium and arsenic **exceed** the criteria (German Federal Government Technical Instructions on Air Quality Control, TA Luft 1990) extending 500m and 1.5km (respectively) northwest of the TSF. Daily lead deposition is predicted to be below the criteria.
- Estimated soil chloride concentration of 0.4 mg/kg/day to occur immediately to the north west of the TSF, decreasing to 0.2 mg/kg/day over the un-named watercourse further to the North West.
- Water deposition predicted from the evaporators of greater than 4L/day (or daily rainfall of greater than 4mm) occurs immediately to the northwest of the TSF.
- Estimated chloride concentration in soil from deposition indicates that for 24/7 operation, the toxicity level for woody plants will be reached through accumulation over 1.5 - 3 years immediately downwind of the TSF, while over the nearest watercourse, the toxicity level will be reached over 4 to 20 years assuming no rainfall.
- Modelled restricted operations (e.g. use of evaporators dependent on wind direction) is predicted to influence chloride concentration by decreasing to less than 0.2 mg/kg/day away from the TSF, altering estimated accumulation times to 2.9-6.3 years to reach the toxicity threshold for woody plants and 8.21-41

years is estimated to reach toxicity for wetlands.

Cell 1 of the TSF is located closest to the tenement boundary and riparian vegetation. There is the potential for dispersion of spray drift from the evaporators to migrate and deposit outside of the RHIO tenement boundary.

Operator controls

In order to reduce the likelihood of this occurring, evaporators that are located on the causeway of TSF Cell 1, will be programmed to operate under controlled parameters (restricted operations) determined by the wind direction. For wind direction between 90° and 160° the evaporators will be operated when the wind speed is greater than 5.5 m/s between the hours of 7am and 5 pm. For all other wind directions the evaporators shall operate when the wind speed is greater than 4m/s. The deposition modelling indicates operating under these parameters will lower ground level deposition below the guideline criteria for all modelled parameters and contain it within the tenement boundary. The modelled scenarios indicate that operation of the evaporators from the causeway of TSF Cell 2 does not need to be constrained. From this location the majority of deposition occurs within the embankments of the TSF and the risk of migration outside of the tenement boundary is unlikely.

The evaporators are likely to increase the salinity of decant water, which will reduce evaporation directly from the pond and also evaporative capacity of the evaporators. Over the life of the operation of the evaporators the salinity of the water to be disposed, is also expected to increase.

The evaporator units, pipelines, pumps, values and other support infrastructure will be inspected daily for evidence of corrosion and fatigue.

Other approvals

A Mining Proposal regarding the evaporators was approved by the DMP on the 15th of July 2016, to fulfil RHIO obligations under the *Mining Act 1978*.

The Delegated Officer considers that due to the implementation of controlled parameters employed at TSF Cell 1 in certain wind directions, there is limited potential for non-evaporated spray to exit the Premises boundary. As a result of this, addition of the evaporators to the licence for the purpose of commissioning and operation is considered to present a low risk to human health and the environment.

Risk Assessment

Table 3. Risk assessment for commissioning and operation of the evaporators within the TSF

			Potential Emissions	Potential Receptors	Potential Pathway	Potential Impacts	Material Risk	Reasoning
Source	**Category 5: TSF evaporator system**	**Commissioning** of TSF evaporator system	Saline spray drift	Roy Hill Homestead (~9.3km away)	Air: Transport through air then deposition	Inhalation causing respiratory irritation. Eye irritation	No	The Delegated Officer considers the distance to human receptors to be too great for health impacts to occur. The Roy Hill Homestead is outside the recommended separation distance. In addition, commissioning activities will be of short-term duration. The Delegated Officer considers that impacts on human health will be ***slight*** and would occur only in ***rare*** circumstances. The risk rating for saline spray drift impacts on human health from commissioning activities is therefore ***low***.
				Riparian vegetation along the ephemeral located north west from the TSF	Air: Transport through air then deposition	Smothering and the potential suppression of photosynthetic and respiratory functions of vegetation	No	The Licence Holder has documented in the amendment application that vegetation mapped along the creek from the TSF comprises active floodplains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands and that no species of significant conservation value are present. The Delegated Officer considers that due to the short-term nature of the commissioning activities, and the distance of the closest evaporator to the nearest riparian vegetation is over 900m, that impacts on vegetation will be ***slight*** and ***unlikely*** to occur given the operator controls. The risk rating for saline spray drift impacts to vegetation is therefore ***low***.

			Spray drift containing cadmium, lead, arsenic and chloride	Riparian vegetation along the ephemeral located north west from the TSF	Air: Transport through air then deposition	Smothering and the potential suppression of photosynthetic and respiratory functions of vegetation	No	The Licence Holder has documented in the amendment application that vegetation mapped along the creek from the TSF comprises active floodplains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands and that no species of significant conservation value are present. The Delegated Officer considers that due to the short-term nature of the commissioning activities, and the distance of the closest evaporator to the nearest riparian vegetation is over 900m, that impacts on vegetation will be ***slight*** and ***unlikely*** to occur given the operator controls. The risk rating for spray drift (containing Cd, Pb, As and Cl) impacts to vegetation is therefore ***low***.
Source	**Category 5: TSF evaporator system cont.**	**Operation** of TSF evaporator system	Saline spray drift	Roy Hill Homestead (~9.3km away)	Air: Transport through air then deposition	Inhalation causing respiratory irritation. Eye irritation	No	The Delegated Officer considers the distance to human receptors to be too great for health impacts to occur. The Roy Hill Homestead is outside the recommended separation distance. The Delegated Officer considers that impacts on human health will be ***slight*** and would occur only in ***rare*** circumstances. The risk rating for saline spray drift impacts on human health from operational activities is therefore ***low***.
				Riparian vegetation along the ephemeral located north west from the TSF	Air: Transport through air then deposition	Smothering and the potential suppression of photosynthetic and respiratory functions of vegetation	No	The Licence Holder has documented in the amendment application that vegetation mapped along the creek from the TSF comprises active floodplains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands and that no species of significant conservation value are present. Modelling has also demonstrated that if restricted operations are employed during certain prevailing wind conditions and climatic scenarios, then spray drift build up will be limited and toxicity to vegetation, reduced. The Delegated Officer considers that due to the proposed restricted operational activities within Cell 1, and the distance of the closest evaporator to the nearest riparian vegetation being over 900m, that impacts on vegetation will be ***slight*** and ***unlikely*** to occur with the operator controls in place. The risk rating for saline spray drift impact to vegetation is therefore ***low***.

			Spray drift containing cadmium, lead, arsenic and chloride	Riparian vegetation along the ephemeral located north west from the TSF	Air: Transport through air then deposition	Buildup of chemicals toxic to vegetation health.	No	The Licence Holder has documented in the amendment application that vegetation mapped along the creek from the TSF comprises active floodplains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands and that no species of significant conservation value are present. The Delegated Officer considers that due to the short-term nature of the commissioning activities, and the distance of the closest evaporator to the nearest riparian vegetation is over 900m, that impacts on vegetation will be ***slight*** and ***unlikely*** to occur with the operator controls in place. The risk rating for spray drift (containing Cd, Pb, As and Cl) impacts to vegetation is therefore ***low***.

From a safety and structural integrity perspective, the RHIO mine is regulated by the Department of Mines and Petroleum (DMP) under the *Mines Safety and Inspection Act 1994*.

Amendment History

Instrument	Issued	Amendment
L8621/2011/1	30/05/2013	Amended to include category 89 landfill
L8621/2011/1	19/09/2013	Amendment to include category 12 and upgrade from category 85 to category 54
L8621/2011/1	8/05/2014	Amendment to include the landfill expansion (Category 89)
L8621/2011/1	05/02/2015	Amendment to add category 57, increase category 64 landfill production and design capacity and excise land for a small WWTP
L8621/2011/1	09/04/2015	Administrative amendment
L8621/2011/1	5/11/2015	Amendment to include the MSA WWTP constructed under W5718/2014/1 and update template to version 2.9
L8621/2011/1	7/04/2016	Amendment to include category 6 and 73, construction of the northern recharge basin and southern and northern discharge locations to No-Name Creek, administrative changes and remove the Mankarlyikkakurra Exploration Camp. Expiry date from previous amendment notice was also updated at this time (to 25/03/2034).
L8621/2011/1	24/11/2016	Amendment to include category 5 for the operation of the ore processing plant (Process Plant), and the tailings storage facility (TSF) constructed under W5067/2011/1, the operation of the Mine Process Plant WWTP constructed under W5732/2014/1, operation of the northern and southern recharge basin, and the construction of a new class II landfill.
L8621/2011/1	13/01/2017	Amendment Notice 1 (This notice) Licence amendment to include: • Conditions relating to commissioning and operation of TSF evaporators.

Amendment

1. The Licence is amended by the insertion of the additional rows shown below in bold italics within Condition 1.3.12, Table 1.3.5 – to include inspection and functionality of evaporators, weather station and Automated Programmable Logic Control system.

Table 1.3.5: Inspection of infrastructure		
Scope of inspection	**Type of inspection**	**Frequency of inspection**
Tailings delivery pipelines	Visual integrity	Daily
Tailings return pipelines	Visual integrity	Daily
Embankment freeboard	Visual to confirm required freeboard capacity is available	Daily
Mine dewater pipelines	Visual integrity	Weekly
Tailings facility evaporators	***Visual integrity***	***Daily***
Weather station	***Functionality and calibration***	***Annually***
Automated Programmable Logic Control (PLC) system	***Functionality***	***Monthly***
	Calibration	***Annually***

2. The Licence is amended by the insertion of a new Condition 2.4 Emissions to air – to provide for the restricted evaporator operation within Cell 1 when wind speed and direction meet certain parameters.

2.4 Emissions to air
2.4.1 The Licensee shall ensure that TSF Cell 1 evaporators are operated under conditions outlined in Table 2.4.1.

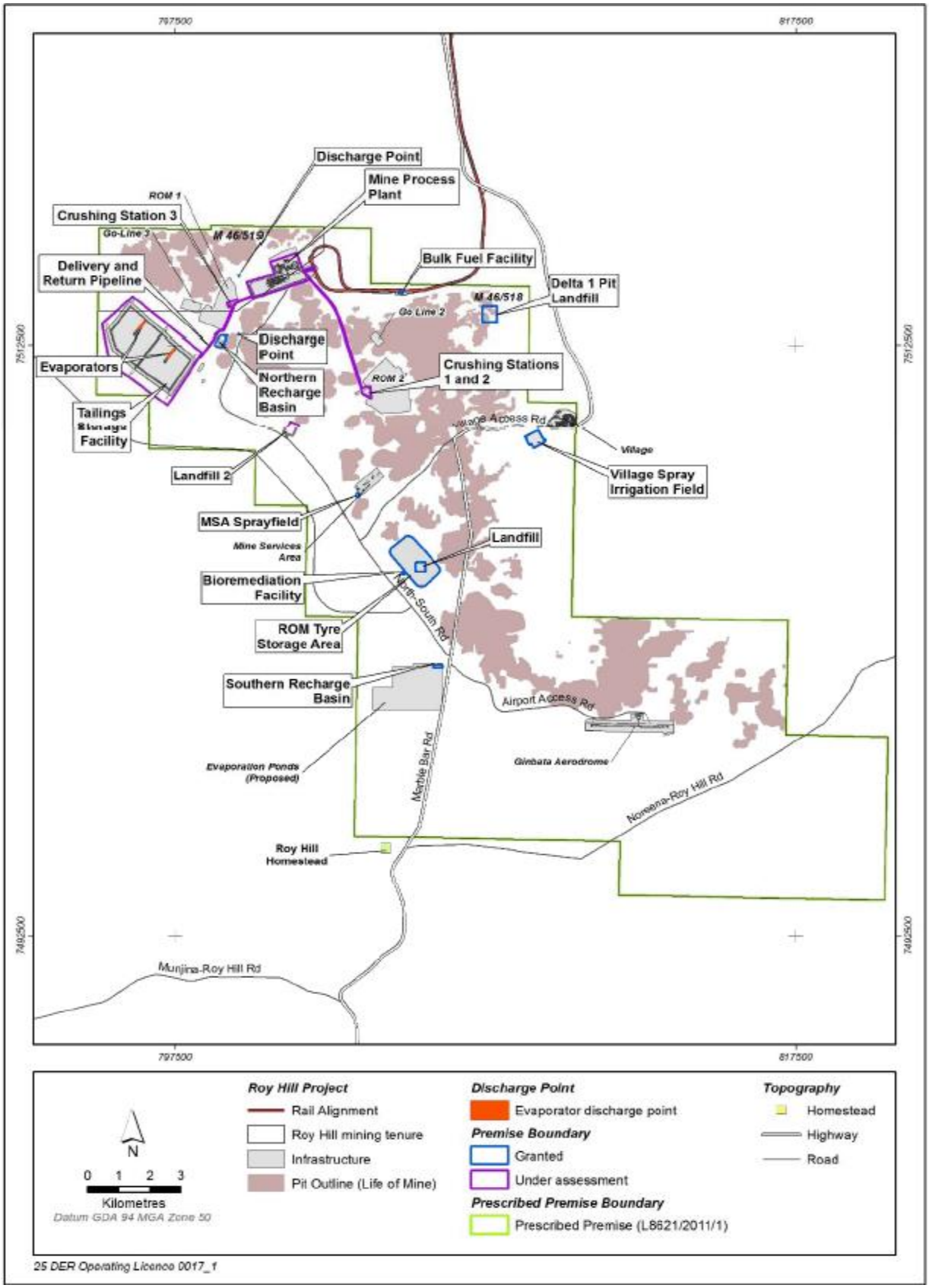
Table 2.4.1: Operation of Tailings Storage Facility Cell 1 Evaporators		
	Wind Direction between 90° and 160°	***Wind Direction outside 90° and 160°***
Wind Speed	*Greater than 5.5m/s*	*Greater than 4m/s*
Hours of operation	*Between 7 am and 5 pm*	*-*

3. The Licence is amended by the insertion of two new rows as shown in bold italics below, to (Condition 4.2 Reporting) Table 4.2.1 regarding condition 1.3.12 and inclusion of compliance to Table 4.2.1.

Table 4.2.1: Annual Environmental Report		
Condition or Table (if relevant)	**Parameter**	**Format or Form**[1]
-	Summary of any failure or malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken	None specified
Tables 1.3.1 and 1.3.7	Actual throughput for the reporting period for approved categories under Schedule 1 of the	None specified

	Environmental Protection Regulations 1987	
Condition 1.3.12	***Summary of any failure or malfunction of any infrastructure listed in Table 1.3.5 and any action taken post inspection.***	***None specified***
Table 2.3.1	An updated description of the irrigation area(s) reporting any decline in health, against previous years, and corrective actions	None specified
Table 2.4.1	***Compliance***	***TSF Cell 1 evaporator use Vs wind direction annual data***
Table 3.2.1	Volumetric flow rate, Duration of discharge, Electrical Conductivity, Total Dissolved Solids	GR1
Table 3.3.1	Monthly records and cumulative volume for each WWTP	None specified
	Biochemical Oxygen Demand, Total Suspended Solids, pH, Total Nitrogen, Total Phosphorus, *E.coli*, Total Dissolved Solids, Total Recoverable Hydrocarbons	LR1
Table 3.5.1	Process monitoring	None specified
3.5.2	Annual water balance of TSF	None specified
Table 3.6.1	Groundwater quality parameters: Standing Water Level, pH, Electrical Conductivity, Total Dissolved Solids, Aluminium (Al), Arsenic (As), Barium (Ba), Boron (B), Cadmium (Cd, Chromium (Cr), Chloride (Cl), Copper (Cu), Iron (Fe), Lead (Pb), Manganese (Mn), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Selenium (Se), Silver (Ag), Sodium (Na), Zinc (Zn), and Total Recoverable Hydrocarbons	AGW1
4.1.2	Compliance	None Specified
4.1.3	Complaints summary	None specified
4.1.4	Records of waste types and quantities received at the site and disposed of at the site	None specified

4. The Licence is amended by the replacement of the Schedule 1 map with the following map. This map includes the evaporators (as highlighted in orange) within the Tailings Storage Facility.


797500
817500
7512500
7492500
Discharge Point
Mine Process Plant
ROM 1
Crushing Station 3
Go-Line 2
M 46/519
Delivery and Return Pipeline
Bulk Fuel Facility
M 46/518
Delta 1 Pit Landfill
Go Line 2
Discharge Point
Evaporators
Northern Recharge Basin
ROM 2
Crushing Stations 1 and 2
Tailings Storage Facility
Village Access Rd
Village
Village Spray Irrigation Field
Landfill 2
MSA Sprayfield
Mine Services Area
Landfill
Bioremediation Facility
North-South Rd
ROM Tyre Storage Area
Southern Recharge Basin
Airport Access Rd
Evaporation Ponds (Proposed)
Marble Bar Rd
Gimbata Aerodrome
Nomeena-Roy Hill Rd
Roy Hill Homestead
Munjina-Roy Hill Rd
Roy Hill Project
Rail Alignment
Roy Hill mining tenure
Infrastructure
Pit Outline (Life of Mine)
Discharge Point
Evaporator discharge point
Premise Boundary
Granted
Under assessment
Prescribed Premise Boundary
Prescribed Premise (L8621/2011/1)
Topography
Homestead
Highway
Road
N
0 1 2 3
Kilometres
Datum GDA 94 MGA Zone 50
25 DER Operating Licence 0017_1

Appendix 1: Key Documents/References

	Document Title	Availability
1	DER Guidance Statement on Licence duration, August 2016	Accessed at https://www.der.wa.gov.au
2	DER Guidance Statement on Decision Making, November 2016	
3	DER Guidance Statement on Environmental Siting, November 2016	
4	DER Guidance Statement on Risk Assessments, November 2016	
5	DER Guidance Statement on Setting Conditions, November 2015	
6	Licence amendment application document 7 October 2016	DER record A1176574
7	Licence amendment supporting documentation received 21 December 2016: Roy Hill Iron Ore Mine Operating Licence Amendment - Evaporators Environment OP-APP-00022 (issue date 23/9/2016)	DER record A1347764
8	TA Luft. (1990). German Federal Government. TA Luft - First Federal Administrative Regulation Pertaining the Federal Immission Control Act. (Technical Instructions on Air Quality Control - TA Luft).	http://www.sviva.gov.il/Arabic/SubjectsEnv/AirQuality/IndustryPollution/Documents/taluft_engl.pdf
9	VIC SEPP - State Environment Protection Policy (Ambient Air Quality) No. S19, Gazette 9/2/1999. (Includes 2016 amendments).	http://www.epa.vic.gov.au/about-us/legislation/air-legislation
10	DER notification of proposed amendment dated 30 December 2016	DER record A1350621
11	RHIO comments on draft 21 day amendment notice received 5 January 2017	DER record A1356429

Appendix 2: Summary of Licence Holder Comments

Comments received	Environmental risk	DER consideration of risk
2.4.1 The Licensee shall ensure that TSF Cell 1 *Evaporators are* only operated under conditions outlined in Table 2.4.1.	As the comments received by the Licence Holder relate to clarification of text and the operation of the evaporators as opposed to the whole TSF, the environmental risk from the proposed text change is considered to be **nil**.	The DER considers there to be no environmental risk of the proposed change. Section 2.4.1 and Table 2.4.1 have been updated to include the Licence Holders comment.