



<b>Licence Number</b>	L8621/2011/1
<b>Licensee</b>	Roy Hill Iron Ore Pty Ltd
<b>ACN</b>	123 722 038
<b>File Number</b>	2011/009784
<b>Premises</b>	Roy Hill Iron Ore Mine M46/518 and M46/519 NEWMAN WA 6753
<b>Prescribed Premises</b>	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 52 - Electric power generation Category 57 – Used tyre storage (general) Category 64 – Class II putrescible landfill site Category 73 – Bulk storage of chemicals, etc.
<b>Date of Amendment</b>	31/05/2018

#### **Amendment**

The Chief Executive Officer (CEO) of the Department of Water and Environmental Regulation (DWER) has amended the above Licence in accordance with section 59 of the *Environmental Protection Act 1986* (EP Act) as set out in this Amendment Notice. This Amendment Notice constitutes written notice of the amendment in accordance with section 59B(9) of the EP Act.

Date signed: 31 May 2018

**Louise Lavery**

**A/ Manager Licensing (Resource Industries)**

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

## Definitions and interpretation

### Definitions

In this Amendment Notice, the terms in Table 1 have the meanings defined.

**Table 1: Definitions**

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
Amendment Notice	refers to this document
AS 4156.6 – 2000	Australian Standard AS 4156.6 – 2000: Determination of Dust/moisture Relationship for Coal.
Category/ Categories/ Cat.	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CEO	means Chief Executive Officer. CEO for the purposes of notification means:  Director General Department Administering the <i>Environmental Protection Act 1986</i> Locked Bag 33 Cloisters Square PERTH WA 6850 <a href="mailto:info@dwer.wa.gov.au">info@dwer.wa.gov.au</a>
CS Act	<i>Contaminated Sites Act 2003 (WA)</i>
Delegated Officer	an officer under section 20 of the EP Act
Department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
EP Regulations	<i>Environmental Protection Regulations 1987 (WA)</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
kW	Kilowatt

Licensee	Roy Hill Iron Ore Pty Ltd
m <sup>3</sup>	cubic metres
Minister	the Minister responsible for the EP Act and associated regulations
MS	Ministerial Statement
mtpa	million tonnes per annum
NEPM	National Environmental Protection Measure
Noise Regulations	<i>Environmental Protection (Noise) Regulations 1997 (WA)</i>
Occupier	has the same meaning given to that term under the EP Act.
PLC	Automated Programmable Logic Control System
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report.
Risk Event	as described in <i>Guidance Statement: Risk Assessment</i>
TSF	Tailings Storage Facility
UDR	<i>Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA)</i>

## Amendment Notice

This amendment is made pursuant to section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the Licence 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 and is limited only to an amendment for Category 5; to install and operate Tailings Storage Facility (TSF) evaporators.

The following guidance statements have informed the decision made on this amendment:

- *Guidance Statement: Regulatory Principles (July 2015)*
- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Decision Making (February 2017)*
- *Guidance Statement: Risk Assessment (February 2017)*

## Amendment description

On 25 October 2017, Roy Hill Iron Ore Pty Ltd (RHIO) (Licensee) submitted an application to DWER for the amendment to the Licensee's operating licence L8621/2011/1. The licence amendment application outlines the Licensee's proposal to operate an additional seven Minetek 90kW evaporators on the site's TSF cells, to remove excess decant water and to maintain freeboard.

In October 2016, the Licensee submitted an amendment to allow for the operation of seven evaporators constructed at the TSF under works approval W5067/2001/1. This amendment allowed the seven Minetek 75kW evaporators to operate on one of the two TSF cells, one at a time, with restrictions on Cell 1. The operations of the 75kW evaporators on Cell 1 are restricted to particular wind speeds and directions under the licence.

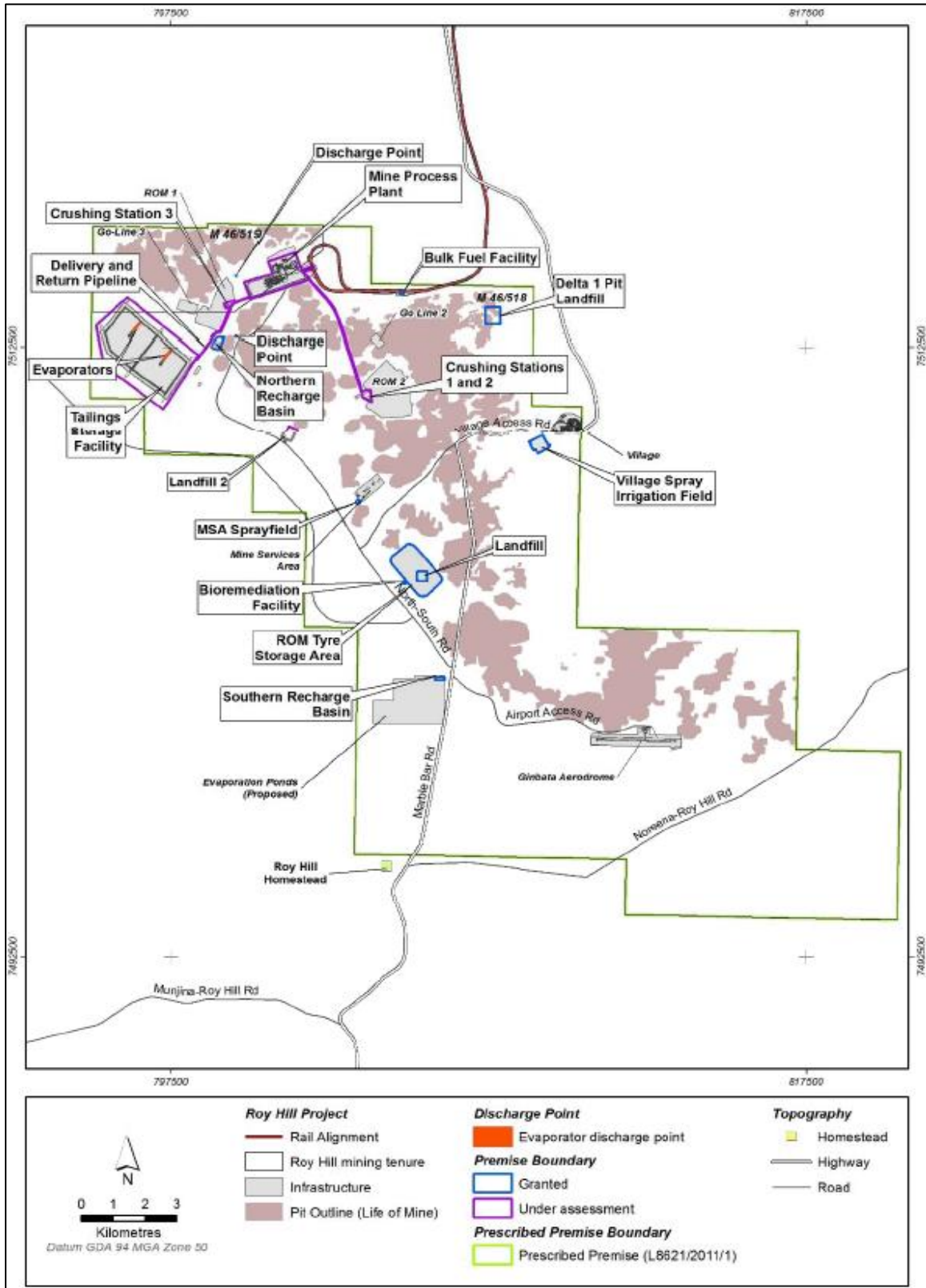
This new amendment application is requesting approval to construct and operate an additional seven 90kW evaporators on Cell 2 of the TSF, with the original seven Minetek 75kW evaporators remaining on Cell 1 (14 evaporator units in total). The Licensee proposes to install the new evaporators units with the same configuration and location (internal causeway) as the existing evaporators. The power to the seven evaporators on Cell 2 will be supplied by four 220KVA diesel generators with 1,000L tank capacity and 110% double banded base to capture spillage from tank failure. The generators will be located on the decant causeway and will be refilled regularly by fuel truck. The generator fill points will have spill collection installed and spill kits will be located at each generator.

The Licensee wishes to operate all 14 evaporators simultaneously in order to remove water from both cells of the TSF, as required to remove excess water from the TSF to maintain TSF freeboard. The additional seven evaporators will not change the design capacity for category 5 on the existing licence (65,000,000 tonnes per annual period). The locations of the existing and proposed evaporators are as shown in Table 2 below.

**Table 2: Coordinates of new and existing evaporators siting**

Description	Figure	Reference	Easting	Northing
Evaporators in TSF Cell 1	2	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	2	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 also depicted in Figure 1 below, and in greater detail in Figure 2 (yellow dots).



**Figure 1: Location of evaporators within the Premises boundary.**



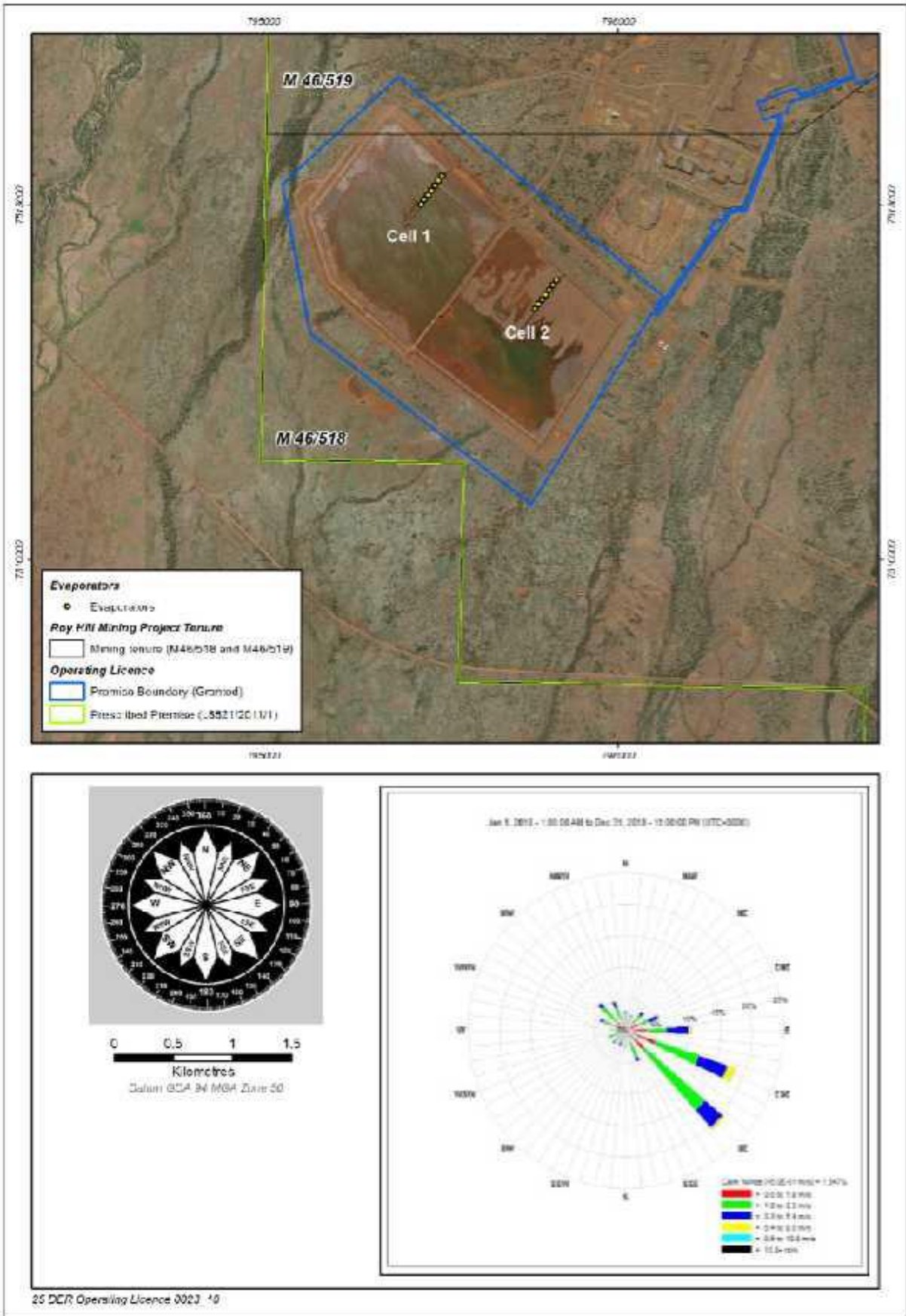


Figure 2: Location of evaporators within the TSF.

## Air quality assessment

The Licensee engaged Minera Mining Technologies to complete an air quality assessment (Minera 2017) of the worst case operating scenario of 14 evaporators operating simultaneously at maximum capacity. This air quality assessment utilised current decant water quality from the TSF (see Table 3). The air quality assessment identified the potential extent of spray drift and deposition of water from the evaporators within the surrounding environment and evaluated need to retain the operational restrictions for the TSF evaporators within Cell 1, currently included in as conditions as listed in Amendment Notice #1 to the operating Licence.

**Table 3: Decant water quality**

Parameter	Average Concentration (mg/L)
Chloride	558
Calcium	158
Magnesium	90
Potassium	26
Arsenic	*0.00025
Cadmium	*0.00052
Lead	*0.00025

\*Reported as below laboratory detection limit (BDL) and were therefore taken as 50% of these values, as a conservative approach (Croghan and Egeghy, 2003). Results are from a TSF decant water sample collected in 2017.

Modelling conducted on the evaporation and spray drift from the evaporators was based on the assumption that all 14 evaporators operate daily between 7am and 5pm (when highest evaporation rates occur) from both TSF causeways (Cell 1 and Cell 2), for a year. The evaporators will not operate during night-time when lower temperature and higher humidity significantly reduces evaporation.

The *National Environmental Protection (Ambient Air Quality) Measure* (NEPM) does not include values for toxic metals relevant to the model, hence the Victorian State Environment Protection Policy (VIC SEPP) Air Quality Management Standards for ambient air quality were used as reference guidance for the air quality assessment. In the absence of Australian guidelines for assessing health and vegetation impacts of individual compounds, the 1990 German Federal Government's Technical Instructions on Air Quality Control by TA Luft were used as a reference for the study. The results of the modelling concluded that:

- Spray droplet sizes are significantly reduced immediately after emission from the evaporator units due to rapid deposition of larger droplets;
- Between 18% and 20% of the droplets deposit immediately into the TSF after emission from the evaporator units;
- Based on the given concentrations within the decant water, maximum 1-hour cadmium, lead and 3-minute arsenic concentrations are within the relevant VIC SEPP criteria. The lead and arsenic concentrations are significantly lower than the results presented in the air assessment report for the original 7 evaporators (PE (2016)). This is due to more recent measurements showing substantially lower lead and arsenic concentration in the TSF decant pond water. Cadmium concentrations, however, are increased from the results presented in PE (2016). This is to be expected given the increased number of evaporator units operating simultaneously; and
- Daily deposition levels of arsenic and lead are below the TA Luft deposition levels. The lead and arsenic deposition is significantly lower than the results presented in PE (2016);
- Daily deposition levels of cadmium exceed the TA Luft deposition level. These exceedances are, however, restricted to a small area within the TSF; and

- Estimated chloride concentration in soil from deposition indicates that the toxicity level for woody plants will be reached through accumulation over 1 - 3 years within the tenement boundary, assuming no rainfall and worst case scenario operating conditions.

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 Prescribed Premises boundary.

### **Licensee's controls**

Evaporators have the potential to deposit moisture, chloride and metals onto the embankments of the TSF and adjacent areas. The operation of the evaporators will be managed by the Licensee's TSF Operation and Maintenance Manual (OP-MAN-00125). The Licensee has made the following commitments in the application to manage the operation of the evaporators and associated emissions:

- All appropriate staff to be trained in the use, management and maintenance actions related to the operation of the evaporators;
- Operational monitoring of the evaporators shall include wind speed, wind direction, spray drift, temperature, relative humidity, water flow, TSF decant pond levels and freeboard;
- Preference to shutdown evaporators closest to the TSF embankments when operational requirements permit;
- If a decline in vegetation health and/or excess moisture deposition on the embankments occurs, the following management actions shall be investigated and implemented, if and where appropriate:
  - Reduce the number of operational evaporators;
  - Shutdown the evaporators; and/or
  - Return water to the process plant via the return decant water pipeline where water quality will meet product specification.
- Daily TSF inspections will include observations of spray drift on the embankments (evidence of moisture or water deposition) and for signs of corrosion of pipelines and equipment;
- Vegetation health and soil monitoring will be undertaken, adjacent to TSF in accordance with the Saline Water Disposal – Vegetation Management Plan (OP-PLN-00072). Any exceedances in the monitoring criteria will require review and implementation of the management actions;
- Identification of a decline in vegetation health attributed to the operation of the evaporators will prompt:
  - Review and amendment of the operational parameters of the evaporators;
- The TSF shall not be utilised as a water storage or retaining structure; and
- Regular operational and maintenance inspections of the evaporators will be undertaken.

### **Other approvals**

The Licensee has provided the following information relating to other approvals as outlined in Table 4.



**Table 4: Relevant approvals**

Legislation	Number	Approval
<i>Environmental Protection and Biodiversity Conservation Act 1999</i>	EPBC No: 2008/4624	Notification of Referral Decision – Not a Controlled Action
<i>Environmental Protection Act 1986</i>	MS824 (stage 1) and MS829 (Stage 2)	Ministerial Statement (MS)
<i>Mining Act 1978</i>	<p>Mining Proposal Years 1 to 5 M46/518 and M46/519- Part A (Reg ID 32525) – includes the MPP and TSF</p> <p>Mining Proposal for Years 1 – 5 M46/518 and M46/519 - Part B (Reg ID 37113) – included amendments to the MPP and TSF footprints.</p> <p>Mining Proposal C for M46/518 and M46/519 (Reg ID56658)</p>	Consultation was undertaken with the DMIRS in regards to the installation of the evaporators at the TSF. A Mining Proposal regarding the evaporators was approved by the DMIRS on 15 July 2016, to fulfil Licensee obligations under the <i>Mining Act 1978</i> . The additional evaporators have been incorporated in the Mining Proposal, submitted to the DMIRS in August 2017, which is currently under assessment

## Amendment history

Table 5 provides the amendment history for L8621/2011/1.

**Table 5: Licence amendments**

Instrument	Issued	Amendment
L8621/2011/1	22/03/2012	New Licence issued approving operation of category 85 (sewage facility)
L8621/2011/1	30/05/2013	Amendment to include category 89 (putrescible landfill)
L8621/2011/1	19/09/2013	Amendment to include category 12 (screening of material) and upgrade from category 85 to category 54 (sewage facility)
L8621/2011/1	8/5/2014	Amendment to incorporate expansion to the landfill (category 89)
L8621/2011/1	5/2/2015	Amendment to add category 57 (used tyre storage), increase category 64 landfill design capacity and excise land for a small sewage facility
L8621/2011/1	9/4/2015	Administrative amendment
L8621/2011/1	5/11/2015	Amendment to include the MSA sewage facility and update licence template
L8621/2011/1	7/4/2016	Amendment to include category 6 (dewatering) and 73 (bulk storage of chemicals), construction of northern recharge basin and southern and northern discharge locations to No-name Creek. Removal of Mankarlykkakurra Exploration Camp.
L8621/2011/1	29/04/2016	Amendment by Notice to extend Licence expiry date to 25/03/2034
L8621/2011/1	24/11/2016	Amendment to include category 5 operations including ore processing plant and Tailings Storage Facility (TSF), additional sewage facility, landfill and dewatering recharge basins. Removal of conditions related to the discharge of dewatering effluent to the southern and northern discharge locations to No Name Creek, and the monitoring of those emissions, due to expiry of OEPA temporary authorisation to discharge.

L8621/2011/1	13/1/2017	Amendment Notice 1 - approved operation of TSF evaporators to enhance water evaporation within TSF.
L8621/2011/1	16/11/2017	Amendment Notice 2 –approved changes to the design and construction of the stage 2 raise of the TSF; addition of groundwater monitoring conditions around TSF, administrative changes.
L8621/2011/1	17/11/2017	Amendment Notice 3 – approved operation of new power station, in-pit tyre disposal areas and additional crushing/screening facilities.
L8621/2011/1	29/05/2018	Amendment Notice 4– addition of three creek discharge points for the purpose of scheduled and unscheduled water dewatering water and Process Dam discharge. Addition of Category 52 to front page of Notice (administrative only as previously assessed under AN#3).
L8621/2011/1	31/05/2018	Amendment Notice 5 (this notice) – addition of 7 new 90kW TSF evaporators to increase water evaporation volumes within the TSF.

## Location and receptors

Table 6 below lists the relevant sensitive land uses in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

**Table 6: Receptors and distance from activity boundary**

Residential and sensitive premises	Distance from Prescribed Premises
Roy Hill Homestead	~17km away from TSF

Table 7 below lists the relevant environmental receptors in the vicinity of the Prescribed Premises which may be receptors relevant to the proposed amendment.

**Table 7: Environmental receptors and distance from activity boundary**

Environmental receptors	Distance from Prescribed Premises
Fortescue River and Marsh – Priority 1 ecological community	<p>The Fortescue River and Marsh are located more than 2km southwest of the Project infrastructure (at the nearest point in the south of the Premises boundary) and ~7.2 km from the TSF.</p> <p>Inflows to the Marsh occur from the Fortescue River (outside the Premise boundary) and other creeks within the region, along with sheet flow after storm events.</p> <p>The Kulbee Creek (and Kulbee Creek west arm) passes through the centre of the Premises, with the Kulkinbah Creek located to the southeast and No Name Creek to the northwest. These ephemeral creeks flow in a southwest direction towards the Fortescue River and Marsh.</p> <p>The TSF is located predominately within the No Name Creek local catchment. No Name Creek and an unnamed creek line run to the east and west of the TSF. The evaporators will be located approximately 1.1km from the unnamed creek and 1.5km from No Name Creek from the nearest operating evaporator locations.</p>
Vegetation	<p>The mining area contains pockets of riparian and potentially groundwater dependent (phreatophytic) vegetation dominated by <i>Eucalyptus victrix</i> (coolibah) and <i>Eucalyptus camaldulensis</i> (river red gum) in the vicinity of major creeks, drainage lines and adjacent floodplains. The closest riparian vegetation is located along a drainage line approximately 900m from TSF Cell 1 (outside of the premises boundary).</p>

	<p>No threatened or priority ecosystems have been identified within the premises boundary or nearby.</p> <p>No Declared Rare Flora has been identified within the Premises.</p>
Groundwater	<p>17 to 20 metres below ground level (mbgl) at the TSF. Alkaline with salinity brackish (1,000 to 3,000 mg/L TDS).</p> <p>No public drinking supply areas within or adjacent to premises. Mine site drinking water is sourced from bore-field located 18km south east of evaporators.</p>

## Risk assessment

Tables 8 and 9 below describe the Risk Events associated with the amendment consistent with the *Guidance Statement: Risk Assessments*. Both tables identify whether the emissions present a material risk to public health or the environment, requiring regulatory controls.

**Table 8: Risk assessment for proposed amendments during construction**

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts				
<b>Cat 5</b> Processing or beneficiation of metallic or non-metallic ore  Cat 85B Water desalination plant	Construction of evaporators	<b>Dust:</b> associated with construction activities	Nearest residential receptor is Roy Hill homestead (~ 17km away from TSF)	<b>Air:</b> Dust	Health and amenity impacts	Slight	Unlikely	<b>Low</b> Given the separation distance to the nearest sensitive receptor (Roy Hill Homestead 17 km away) the risk of impact by dust is considered to be <b>low</b> . No additional regulatory controls are required to mitigate this risk.
		<b>Noise:</b> associated with construction activities	Nearest residential receptor is Roy Hill homestead (~ 17km away from TSF)	<b>Air:</b> Noise	Health and amenity impacts	slight	Unlikely	<b>Low</b> Operating noise will be attenuated by distance (17 km to nearest sensitive receptor).  The risk of impact of noise is considered <b>low</b> . No additional regulatory controls are required to mitigate this risk.

**Table 9: Risk assessment for proposed amendments during operation and commissioning**

Risk Event					Con - sequence rating	Likelihood rating	Risk	Reasoning	
Source/Activities	Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts					
<b>Cat 5</b> Processing or beneficiation of metallic or non-metallic ore	<b>Operation</b> of seven new 90kW Evaporators	<b>Discharge to land:</b> Water spray drift containing salt (chloride) and heavy metals (cadmium, lead and arsenic).	Nearest residential receptor is Roy Hill homestead (~17km away from TSF)	<b>Air:</b> Transport through air then deposition	Health impacts – inhalation causing respiratory irritation  Eye irritation	Slight	Rare	<b>Low</b>	Given the separation distance to the nearest sensitive receptor (Roy Hill Homestead 17km away) the risk of health impact to humans by water vapor / spray is considered to be <b>low</b> . No additional regulatory controls are required to mitigate this risk.
		<b>Discharge to land:</b> Water spray drift containing salt (chloride)	Soils and vegetation adjacent to TSF	<b>Air:</b> Transport through air then deposition	Buildup of toxic levels of salt (Cl) within soils and on leaves adjacent to TSF, causing vegetation stress or death	Minor	Rare	<b>Low</b>	The deposition modelling undertaken by the Licensee indicates that the operation of all 14 evaporators simultaneously has the potential to deposit chloride nearby and on down-wind vegetation and increase the concentrations within the soil adjacent to the TSF.  Estimated chloride concentrations in soil from deposition indicates that the toxicity level for wood plants will be reached through accumulation over 1 – 3 years within the tenement boundary assuming no rainfall. This could lead to vegetation death or a decline in health.  The impact of water spray drift containing salts on soils and vegetation adjacent to the TSF will be 'slight' as toxic levels of chloride will take years to occur and potentially impact vegetation.

									The likelihood of this impact occurring is 'unlikely' due to the Licensees proposed controls (outlined in amendment description section of report). Therefore the risk rating for water spray drift containing salt is <b>Low</b> .
			Riparian vegetation along the ephemeral waterway located approximately 1 km north west from the TSF.	<b>Air:</b> Transport through air then deposition	Buildup of toxic levels of salt (Cl) within soil and on leaves of riparian vegetation causing vegetation stress or death	Minor	Rare	<b>Low</b>	<p>Vegetation has been mapped along the creek near the TSF and no species of significant conservation values are present.</p> <p>The deposition modelling undertaken by the Licensee indicates that the operation of the evaporators has the potential to deposit chloride nearby and on down-wind vegetation.</p> <p>Due to the distance of the closest evaporator to the nearest riparian vegetation being 1 km the impact on soil and riparian vegetation will be Slight and Unlikely to occur due to Applicant controls. The risk rating for spray drift (containing salts) impact to riparian vegetation and soil is therefore <b>Low</b>.</p>
			<b>Discharge to land:</b> Water spray drift containing heavy metals (cadmium, lead and arsenic)	Soils and vegetation adjacent to TSF	<b>Air:</b> Transport through air then deposition	Buildup of heavy metals within soils and on leaves adjacent to TSF, causing vegetation stress or death	Slight	Unlikely	<b>Low</b>



									Due to heavy metal concentrations being below relevant criteria, the impact on soil and vegetation adjacent to the TSF will be Slight and Unlikely to occur. The risk rating for spray drift (containing heavy metals) impact to vegetation and soil adjacent to the TSF is therefore <b>Low</b> .
			Riparian vegetation along the ephemeral waterway located approximately 1 km north west from the TSF.	<b>Air:</b> Transport through air then deposition	Buildup of heavy metals within soil and on leaves of riparian vegetation causing vegetation stress or death	Minor	Rare	<b>Low</b>	<p>Vegetation has been mapped along the creek near the TSF and no species of significant conservation values are present.</p> <p>The dispersion and deposition modelling of cadmium, arsenic and lead were carried out by the License Holder. The results are as follows;</p> <ul style="list-style-type: none"> <li>- Maximum 1-hour cadmium, lead and 3-minute arsenic concentrations well within the relevant VIC SEPP criteria.</li> <li>- Daily deposition levels of arsenic and lead are below the TA Luft deposition levels.</li> <li>- Daily deposition levels of cadmium exceed the TA Luft deposition levels. These exceedances are, however, restricted to a small area over the TSF only.</li> </ul> <p>Due to the distance of the closest evaporator to the nearest riparian vegetation being 1 km and heavy metal concentrations being below relevant criteria, the impact on soil and riparian vegetation will be Slight and Unlikely to occur. The risk rating for spray drift (containing heavy metals) impact to riparian vegetation and soil is therefore <b>Low</b>.</p>

## Decision

The Licensee has requested the removal of the operational restrictions on evaporators located on Cell 1 of the TSF as part of this amendment, and seeks approval to construct and operate an additional 7 evaporators on Cell 2 and to operate all 14 evaporators simultaneously when the need to remove water from the TSF arises.

The operational restrictions currently conditioned on the operational licence require the Licensee to operate evaporators on Cell 1 between 7am and 5pm and only during certain wind conditions to optimise evaporation and reduce the impact spray drift has on soil and vegetation. These restrictions were placed on the licence as previous air quality modelling (PE, 2016) provided to DWER indicated that daily deposition concentrations of cadmium and arsenic exceed the relevant environmental criteria for Cell 1 when using the modelled scenario (seven evaporators operating at maximum capacity from one location on the Cell 1 TSF causeway, for a year).

The updated air quality assessment indicates that ground level deposition during unrestricted operation of the 14 evaporators on both TSF cells simultaneously will be below the relevant environmental guideline criteria for all modelled parameters (no criteria for chlorine (salt)). The reason for this change in modelling results is due to the use of current up to date water quality data that show actual levels of heavy metals to be much lower than the concentrations used in the first modelling assessment. Concentrations for chloride, calcium, magnesium, potassium and cadmium were taken from 2017 sampling of the process plant water supply and concentrations for lead and arsenic were based on samples of TSF decant water taken in September 2017. The data used is also conservative as all parameter concentrations from sampling of the pond and process water were reported as below laboratory detection limits and were therefore taken as 50% greater than these values.

Based on the application supporting documentation, the Delegated Officer has determined that the operation of seven new 90kW Minetek evaporators on Cell 2 of the TSF and their simultaneous operation with the original seven Minetek 75kW evaporators remaining on Cell 1 poses a **low** risk to the environment. As a result it is appropriate to allow for simultaneous operation of all 14 evaporators and to remove the wind speed operating restrictions from the licence. Condition 2.4.1 will be updated to reflect this. The restriction requiring the Licensee to operate evaporators between 7am and 5pm will remain on the licence as the air quality modelling assessment indicates that the highest evaporation rates occur during daylight hours between 7am and 5pm. Night-time lower temperature and higher humidity significantly reduces evaporation resulting in more droplets being present in the water spray resulting in higher deposition rates.

An existing licence condition (1.3.12) requires daily inspections of the TSF evaporators and monthly inspections of the PLC system along with a requirement for the annual calibration of the PLC. It is noted in RHIO's 2017 Annual Environmental Report (AER) that the Licensee did not comply with the requirements of this condition in the last annual period. With this amendment, condition 1.3.12 will apply to the new evaporators and PLC system to ensure inspections and calibration occur for all TSF evaporators.

The deposition modelling undertaken indicates that the operation of the evaporators has the potential to deposit chloride nearby and on down-wind vegetation and increase the concentrations within the soil adjacent to the TSF. There is no relevant environmental guideline or criteria for chloride deposition concentrations; however the air emission assessment indicates an increase in expected chloride concentration in the first 30 cm of the soil than demonstrated in the previous 2016 air quality assessment (due to more evaporators

operating simultaneously). This results in a shorter accumulation time for chloride to reach the toxicity threshold for woody plants at the premises boundary (1-3yrs as opposed to 3-6yrs). A decline in condition of vegetation can occur when salt accumulates in the soil or directly on foliage. It is noted however that this assessment is very conservative, and the impact results in the absence of rainfall. The riparian vegetation is also located in an area not subject to the dominant wind directions, further reducing the likelihood of the vegetation being impacted from overspray.

The Licensee is required to monitor riparian and *A. aneura* (mulga) vegetation (of which 85% of vegetation within the mine area is classified) as a condition of their Ministerial Statements 824 and 829. As a result RHIO has developed a Saline Water Disposal – Vegetation Management Plan which outlines soil and vegetation monitoring, trigger events and management actions to manage the impact saline water spray drift from TSF evaporators have on adjacent vegetation and soil. The monitoring outlined within this plan include; regular landscape monitoring utilising annual multi-spectral imagery and on ground monitoring of community composition, health and condition of vegetation and soil salinity.

As adequate vegetation monitoring around the TSF is already conditioned under a ministerial statement it will not be duplicated within the licence. However condition 4.2.1 will be updated requiring the data from the monitoring outlined in the Saline water disposal – vegetation management plan to be provided to DWER as part of RHIO's Annual Environmental Report (AER).

## Licensee's comments

The Licensee was provided with the draft Amendment Notice on 4 May 2018. No further comments were provided on the draft when it was returned by the Licensee on 17 May 2018.

## Amendment

- Condition 1.3.14, Table 1.3.6 of the licence is amended by the insertion of the bold text shown in underline below.

1.3.14 The Licensee must not depart from the specifications in Table 1.3.6 except:

- where such departure is minor in nature and does not materially change or affect the infrastructure; or
- where such departure improves the functionality of the infrastructure and does not increase risks to public health, public amenity or the environment; and
- all other Conditions in this Licence are still satisfied.

<b>Table 1.3.6: Works specifications</b>	
<b>Column 1</b>	<b>Column 2</b>
Zulu Dewatering Creek Discharge location	<ol style="list-style-type: none"> <li>Construction and placement of the rock rip-rap area in the defined creek bed/channel (at 'Zulu Creek Discharge Point' in Schedule 1: Map of dewatering bore areas and creek discharge points) to minimise erosion and vegetation disturbance.</li> <li>Spreader pipe to disperse flow across the rip-rap area</li> <li>Flow meter near the discharge point to record discharge volumes</li> <li>Pipelines are/will be buried beneath road and creek lines</li> <li>The length (to nearest bore of the pipeline to the discharge point) will be approximately 2.7km.</li> </ol>
Bravo Dewatering Creek Discharge location	<ol style="list-style-type: none"> <li>Construction and placement of rock rip-rap in the defined creek bed/channel (at 'Bravo Creek Discharge Point' in Schedule 1: Map of dewatering bore areas and creek discharge points) to minimise erosion and vegetation disturbance</li> <li>Spreader pipe to disperse flow across the rip-rap area</li> <li>Flow meter near the discharge point to record discharge volumes</li> <li>Pipelines are/will be buried beneath road and creek lines</li> <li>The length (to nearest bore of the pipeline to the discharge point) will be approximately 7.5km.</li> </ol>
Delta Dewatering Creek Discharge location	<ol style="list-style-type: none"> <li>Construction and placement of rock rip-rap in the defined creek bed/channel (at 'Delta Creek Discharge Point' in Schedule 1: Map of dewatering bore areas and creek discharge points) to minimise erosion and vegetation disturbance</li> <li>Spreader pipe to disperse flow across the rip-rap area</li> <li>Flow meter near the discharge point to record discharge volumes</li> <li>Pipelines are/will be buried beneath road and creek lines.</li> <li>The length (to nearest bore of the pipeline to the discharge point) will be approximately 1.7 km.</li> </ol>
Mine Power Station	<ol style="list-style-type: none"> <li>Comprised of: <ul style="list-style-type: none"> <li>56 x Caterpillar 3516B (XQ2000) diesel generators;</li> <li>2 x 110,000L double skinned diesel storage tanks;</li> <li>28 x transformers in self-bunded modules;</li> <li>1 x 27,000L self-bunded lube storage tank; and</li> <li>1 x oil water separator system (OWS), designed to treat stormwater to less than 15mg/L TPH;</li> </ul> </li> <li>Constructed as per Attachment 3 titled "Roy Hill Iron Ore Mine - Power Station Layout"; and</li> <li>Exhaust emissions from each generator via two 0.45m diameter stacks at a height of 2.9m above ground level at a velocity of 34.6m/s</li> </ol>
In-pit tyre disposal area	<ol style="list-style-type: none"> <li>To be located within Delta Mine Pit as per Attachment 4 titled "Roy Hill Iron Ore Mine - In-pit Tyre Disposal Locations"; and</li> <li>Base of tyre disposal area to be at least 3m above original groundwater level</li> </ol>

Stage 2 TSF raise	<ol style="list-style-type: none"> <li>1. Phased removal of relevant Cell (1 or 2) tailings delivery pipelines, decant pipework and associated infrastructure;</li> <li>2. Phased bulk earthworks construction of embankment lifts of relevant Cell (1 or 2) including raising of decant structure, to a design level of 442mRL;</li> <li>3. Re-installation of tailings delivery pipelines, decant pipework and associated infrastructure at relevant Cell prior to commencement of raise on subsequent Cell; and</li> <li>4. Pipelines located around the top of the dam wall are to be constructed of P12 DN450 HDPE and pipelines constructed from the Booster Station to the inflow area on the dam wall, constructed of C12 DN450 Carbon Steel Pipe.</li> </ol>
<b><u>Cell 2 TSF evaporators</u></b>	<ol style="list-style-type: none"> <li>1. <b><u>Installation of seven Minetek 90kW evaporators on Cell 2 decant causeway</u></b></li> <li>2. <b><u>Automated Programmable Logic Control (PLC) System</u></b></li> <li>3. <b><u>Diesel generators that:</u></b> <ul style="list-style-type: none"> <li>• <b><u>have 110% tank capacity spill protection, including a double-bunded base</u></b></li> <li>• <b><u>have hydrocarbon fill-points with adequate spill-collection installed to prevent spills on the decant causeway and into the TSF</u></b></li> <li>• <b><u>are safely accessible for refuelling</u></b></li> <li>• <b><u>spill kits available at each (generator) location</u></b></li> </ul> </li> </ol>

2. Condition 2.4.1 of the Licence is amended by the deletion of the text shown in strikethrough below and the insertion of the bold italics underlined text shown below.

2.4.1 The Licensee shall ensure that TSF Cell 1 evaporators are operated under conditions outlined in Table 2.4.1. **only operate between 7 am and 5 pm.**

**Table 2.4.1: Operation of Tailings Storage Facility Cell 1 Evaporators**

	<b><u>Wind Direction between 90° and 160°</u></b>	<b><u>Wind Direction outside 90° and 160°</u></b>
<del>Wind Speed</del>	<del>Greater than 5.5m/s</del>	<del>Greater than 4m/s</del>
<del>Hours of operation</del>	<del>Between 7 am and 5 pm</del>	-

3. Table 4.2.1 of the Licence is amended by the deletion of text shown in strikethrough and the insertion of text shown in bold italics underlined below.

**Table 4.2.1: Annual Environmental Report**

Condition or Table (if relevant)	Parameter	Format or Form <sup>1</sup>
-	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
:	<b><u>Summary of results from the TSF evaporator vegetation health/soil monitoring program for that annual period, including any exceedance of triggers and management responses, as described within RHIO's Saline Water Disposal Vegetation Management Plan (OP-PLN-00072).</u></b>	<b><u>None specified</u></b>
Tables 1.3.1 and 1.3.7	Actual throughput for the reporting period for approved categories under Schedule 1 of the Environmental Protection Regulations 1987	None specified
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 <b><u>Condition</u></b> 2.4.1	Compliance	TSF Cell 4 evaporator <b><u>hours of</u></b> use <del>vs wind direction annual data</del>
Condition 2.5.3	Summary of reports detailing the reason for discharge – timing of discharge, volume discharged, water quality and comparison to ANZECC / ARMCANZ (2000) Freshwater Guidelines with discussion on elevated results	None specified
Table 2.5.2	Compliance	Table demonstrating daily averaged TDS values (using the hourly data) as recorded during creek discharge events
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, <i>E.coli</i> , Total Dissolved Solids, Total Recoverable Hydrocarbons	LR1
Table 3.5.1	Process monitoring	None specified
Condition 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),	AGW1



	Lead (Pb), Manganese (Mn), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Selenium (Se), Silver (Ag), Sodium (Na), Zinc (Zn), and Total Recoverable Hydrocarbons	
Table 3.6.2	Demonstration of vegetation and stream ecosystem condition	Report providing: <ul style="list-style-type: none"> <li>• GPS location, photographic information and comparison of vegetation and stream ecosystem condition between established photographic points;</li> <li>• Information on annual assessment of vegetation health as per the Roy Hill Vegetation Health Monitoring Program. Specifically: <ul style="list-style-type: none"> <li>- General site condition</li> <li>- Soil surface states</li> <li>- Projected Foliar Cover (PFC), stratum cover dominance and weeds</li> <li>- Recruitment</li> <li>- Sample plants</li> <li>- Quantitative parameters.</li> </ul> </li> <li>• Discussion on the findings of the vegetation assessment in comparison with the Management objectives and strategies found in EPA, 2013 (for 'Zone 3a – Kulbee Alluvial Flank – Natural water regimes)</li> </ul>
Table 3.6.2 and Table 3.7.1	Record of flow distance	Table providing comparison of flow volumes and maximum distance flow has travelled down each creek line for each discharge event
Tables 3.6.1 and 3.7.1	All parameters	Table format providing dates of creek discharge duration, results and comparison of results between groundwater samples from Bores providing water to the discharge points from the Zulu, Bravo and Delta Dewatering Bore Areas (data required in Table 3.6.1) and results from Table 3.7.1.
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

## Appendix 1: Key documents

	Document title	In text ref	Availability
1	Minera mining technologies, 16 October 2017, <i>Air Quality Assessment - Additional Evaporators at RHIO</i> , report prepared for Roy Hill iron ore Pty Ltd.	Minera 2017	Provided by applicant
2.	Addendum report: Roy hill mine – Evaporation and spray drift assessment 2016, Pacific Environment report prepared for Roy Hill Iron Ore PTY Ltd	PE 2016	Provided by applicant
3.	Ministerial Statements 824 Ministerial Statements 829	MS 824 MS 829	accessed at <a href="http://www.dwer.wa.gov.au">www.dwer.wa.gov.au</a>
4.	DER, November 2016. <i>Guidance Statement: Risk Assessments</i> . Department of Environment Regulation, Perth.	DER 2016	accessed at <a href="http://www.dwer.wa.gov.au">www.dwer.wa.gov.au</a>
5.	RHIO Application Supporting Document (OP-APP-00051 dated 24/10/17)	-	Provided by applicant DWER Record A1581737
6.	RHIO provision of additional information in response to DWER Request for Information, dated 23 March 2018	-	Provided by applicant DWER Record A1640527
7.	RHIO provision of information. AN#5 queries from draft - evaporator power supply. Provided 22 May 2018	-	Provided by applicant DWER Record A1680038