Amendment Report

Application for Licence Amendment

Division 3, Part V *Environmental Protection Act 1986*

Licence Number	L8967/2016/1
Applicant	Roy Hill Infrastructure Pty Ltd
ACN	130 249 633
File Number	DER2016/000615-2
Premises	Roy Hill Port Bulk Handling Facility and Screening Plant Part of Lot 370 on Deposited Plan 35619 Certificate of Title Volume LR3118 Folio 753 Reserve 50892: Lots 1199, 1200 and 1301 on Deposited Plan 70562 Part of Lot 372 on Deposited Plan 35620 Certificate of Title Volume LR3118 Folio 755 within coordinates as defined in Schedule 1
Date of Report	11 December 2020
Status of Report	Final

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1. Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
Amendment Application	refers to the amendment application submitted 8 May 2020 and supporting documentation specified in Table 3 to this Amendment Report.
Amendment Report	refers to this document.
Amended Licence	the amended Licence issued under Part V, Division 3 of the EP Act following the finalisation of this Amendment Report.
AS4156.6 – 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
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation As of 1 July 2017, the Department of Environment Regulation (DER), the Office of the Environmental Protection Authority (OEPA) and the Department of Water (DoW) amalgamated to form the Department of Water and Environmental Regulation (DWER). DWER was established under section 35 of the *Public Sector Management Act 1994* and is responsible for the administration of the *Environmental Protection Act 1986* along with other legislation.
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of, and during the assessment undertaken in this Amendment Report.
Licence Holder	Roy Hill Infrastructure Pty Ltd
m^3	cubic metres

Minister	the Minister responsible for the EP Act and associated regulations
MS	Ministerial Statement
MSP	Magnetic Separation Plant
mtpa	million tonnes per annum
NEPM	National Environmental Protection Measure
PM	Particulate Matter
PM_{10}	used to describe particulate matter that is equal to or smaller than 10 microns (µm) in diameter.
$PM_{2.5}$	used to describe particulate matter that is equal to or smaller than 2.5 µm in diameter.
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Amendment Report applies, as specified at the front of this Amendment Report
Risk Event	as described in *Guidance Statement: Risk Assessment*
$\mu g/m^3$	micrograms per cubic metre

2. Decision summary

Licence L8967/2016/1 is held by Roy Hill Infrastructure Pty Ltd (Licence Holder) for the Roy Hill Port Bulk Handling Facility and Screening Plant (the Premises), located in Port Hedland.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed throughput increases and associated emissions and discharges during the operation of the Premises. As a result of this assessment, Amended Licence L8967/2016/1 has been granted.

The Amended Licence issued as a result of this amendment consolidates and supersedes the Existing Licence previously granted in relation to the Premises.

3. Purpose and scope of assessment

This assessment has considered the Licence Holder's activities and infrastructure at the Premises, which fall within the definition of Prescribed Premises Categories 5 and 58 in Schedule 1 to the *Environmental Protection Regulations 1987* (EP Regulations).

On 8 May 2020, the Licence Holder submitted an application to increase throughputs from 60 million tonnes per annum (Mtpa) of iron ore shipped to 70 Mtpa. The increased throughputs will be achieved by utilising existing infrastructure at higher rates. To support the higher annual rates, the Licence Holder has also applied to amend existing reporting conditions on the Licence (L8967/2016/1) to increase the reporting trigger for daily iron ore throughputs from 240,000 wet tonnes to 270,000 wet tonnes.

The Licence Holder also operates an ore rescreening facility that is operated to remove fines material from lump ore product. The Licence Holder has applied for a 5 Mtpa increase to authorised throughputs at the screening plant to enable the proposed increase in lump ore loaded onto vessels at the Premises.

In assessing the application, the Department became aware that there may also be a change in the ore characteristics, particularly in relation to particle size distribution. This is the result of the expansion of the Magnetic Separation Plant (MSP) facility at the Roy Hill Mine, which is designed to increase the capture of a finer product from within the waste stream.

Table 2 lists the prescribed premises categories within the Existing Licence and the proposed changes applied for and relevant to the risk assessment within this Amendment Report.

Table 2: Prescribed Premises Categories in the Existing Licence and proposed throughputs

Classification of Premises	**Description**	***Existing and assessed Premises throughputs***
Category 5	Processing or beneficiation of metallic or non-metallic ore: premises on which — (a) metallic or non-metallic ore is crushed, ground, milled or otherwise processed; or (b) tailings from metallic or non-metallic ore are reprocessed; or (c) tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam.	~~33 million tonnes per annual period~~ *38 million tonnes per annual period*
Category 58	Bulk material loading or unloading: premises on which clinker, coal, ore, ore concentrate or any other bulk	~~60 million tonnes per annual period~~

	granular material (other than salt) is loaded onto or unloaded from vessels by an open materials loading system.	*70 million tonnes per annual period*

The Licence Holder also requests the approval to discharge sediment laden water from belt wash stations to the sedimentation ponds.

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.

Table 3 lists the documents submitted during the assessment process.

Table 3: Documents and information submitted during the assessment process

Document/information description	Date received	DWER reference
Roy Hill Infrastructure – Application Form – Port Operating Licence Increase in Export 2	8 May 2020	DWERDT281469
Roy Hill Infrastructure – Port Operating Licence Amendment Application – Increase in Export OP-APP-00070	8 May 2020	DWERDT281474
Roy Hill Infrastructure – Email response to DWER request for further information titled: “RE: HPE CM: DWER RFI - Roy Hill increase in throughput application”.	13 July 2020	A1913466
Roy Hill Infrastructure – Email response to DWER request for further information titled: “RE: L8967 Roy Hill Port 70Mtpa application – ultra fines product”	23 September 2020	A1937059
Roy Hill Infrastructure – Email response to DWER draft amendment titled: “L8967/2016/1 Roy Hill Licence Amendment”	18 November 2020	

4. Overview of Premises

Iron ore from the Roy Hill Mine, approximately 270km to the south, enters the Premises via train and is unloaded using a rotating car dumper. Ore is then stacked into either lump or fines stockpiles before being reclaimed for outloading.

The two ore streams from the Roy Hill Mine: lump ore (<31.5mm>6.3mm) and fines ore (<6.3mm>2.5µm), are both wet processed at the mine prior to arriving at the Premises. Prior to outload both lump and fines product are processed through the lump re-screening plant, with the lump product entering the screen-house portion of the plant to remove fines generated through ore handling. The fines product is then re-stacked to a fines stockpile before being reclaimed and processed through three fines surge bins for outload (Roy Hill, 2020).

The Licence Holder has the capacity to directly transport iron ore fines from the car dumper to the ship loader although only a small proportion of ore is directly shipped (approximately up to 4,000 tonnes per day) due to differentials between the lower car dumping rates and higher reclaimer and shiploading rates. The remainder of iron ore (lump and fines) is stockpiled before being reclaimed and run through the screenhouse prior to being loaded into the vessel.

The Premises infrastructure, relating to Categories 58 and 5 activities, as well as infrastructure outside the scope of this assessment but within the Premises, is listed in Table 4.

Table 4: Premises facility Categories 5 and 58 infrastructure

	Category 5 and 58 infrastructure	**Figure reference (see Licence)**
1.	Rail loop surrounding stockyard area – raised upon an embankment designed to withstand 1:100 year flood event	Figure 2 – Rail Alignment
2.	Enclosed rail car rotary dumper	Figure 1 – CDU101
3.	Travelling stackers (2)	Figure 3 – STK1 and STK2
4.	Reclaimer	Figure 3 – REC1
5.	Screening plant and bin facility	Figure 3 – Screen and bin facility (LRP)
6.	Conveyors	Figure 3 – CVR104, CVR105, CVR111, CVR113, CVR116, CVR121, CVR122, CVR123, CVR124, CVR161, CVR162, CVR163, CVR164
7.	Transfer stations	Figure 3: TSF041, TSF042, TSF043, TSF104, TSF103, TSF105, TSF106, TSF107, TSF122, TSF123, TSF124, TSF125, TSF161, TSF162, TSF163, TSF164
8.	Stockpiles	Figure 3 – STKWE1, STKWE2, STKWE3, STKWE4
9.	Ship loader and wharf	Figure 3 – SW Creek Berths
10.	Sedimentation ponds (SB1-01 and SB1-02)	Figure 4 - Sedimentation ponds SB1-01and SB1-02
11.	Oily water separators (4)	Figure 4 - Car Dumper OWS, Screening Plant OWS (North & South), Workshop OWS
12.	One way culvert discharge points	Figure 4 – Culvert Drain 1-7
13.	Roads	N/A
14.	Boundary dust monitors	Figure 3 – DM1-DM4
	Other infrastructure	**Figure reference**
15.	Wastewater treatment plants (2)	Figure 4 - Administration WWTP and Lab WWTP
16.	Reverse osmosis plant	Figure 4 – RO Plant

A more detailed overview of background information to the Premises is provided within the Decision Report, published 3 December 2018 and available on the DWER website. This Amendment Report forms an addendum to the initial licence review and relates specifically to the proposed changes in site operations presented in the documents referred to in Table 3.

Where relevant updates to background information have also been provided in this Amendment Report.

4.1.1 Licence history

Table 5 summarises the Licence history for the Premises.

Table 5: Licence history

Instrument	Issued	Nature and extent of works approval, licence or amendment
L8967/2016/1	15 September 2016	Licence Review
L8967/2016/1	3 December 2018	Licence amendment to authorise an increase in throughputs from 55 Mtpa to 60 Mtpa and to incorporate dust conditions.
L8967/2016/1	7 April 2020	Amendments to open area source management conditions
L8967/2016/1	Amended Licence 11 December 2020	Increase in throughputs from 60 Mtpa to 70 Mtpa

5. Port Hedland context

The State Government established the Port Hedland Dust and Noise Management Taskforce (the Taskforce) in May 2009 to review existing reports and develop an integrated dust management plan for Port Hedland. The Taskforce was coordinated by the Department of Jobs, Tourism, Science and Innovation, (DJTSI, formerly Department of State Development) and included a range of industry and government members including DWER.

5.1 Government response to the 2016 Taskforce Report

On 15 October 2018, the McGowan Government released its response to the 2016 Port Hedland Dust Taskforce Report endorsing recommendations made in the Taskforce Report.

In doing so the Government endorsed multiple strategies to both reduce ambient dust impacts and minimise receptor exposure in the West End of Port Hedland. This includes the Government's position that an air guideline value (AGV) of 24-hour PM_{10} of 70 µg/m^3 (excluding natural events) applies where people live on a permanent basis; and that measures should be introduced to cap (and if possible, reduce) the number of permanent residents in dust-affected areas.

The Port Hedland AGV was derived using established human health risk assessment techniques and assumptions and is considered to be protective of the health of a 'general population' within the defined area, provided that the number of permanent residents remains largely unchanged into the future.

For its part, DWER is responsible for implementing two key Government-endorsed recommendations, including:

- Developing and implementing a dust management guideline for bulk handling port premises; and
- Taking over control of the operation and maintenance of the Port Hedland ambient air quality monitoring network.

The second part of the Government's broader position on dust management relates to

proposed planning changes prohibiting new residential development and other sensitive land uses, including aged care and childcare premises, west of Taplin Street.

To give effect to this, Improvement Scheme No. 1 (Figure 1) has been gazette by the McGowan (DJTSI, 2018). The improvement scheme took into consideration the physical, economic, social and environmental factors to determine future land uses for Port Hedland's historic West End precinct and is designed to achieve the land use outcomes of the Taskforce recommendations and (Government of Western Australia, 2020; DJTSI, 2018).

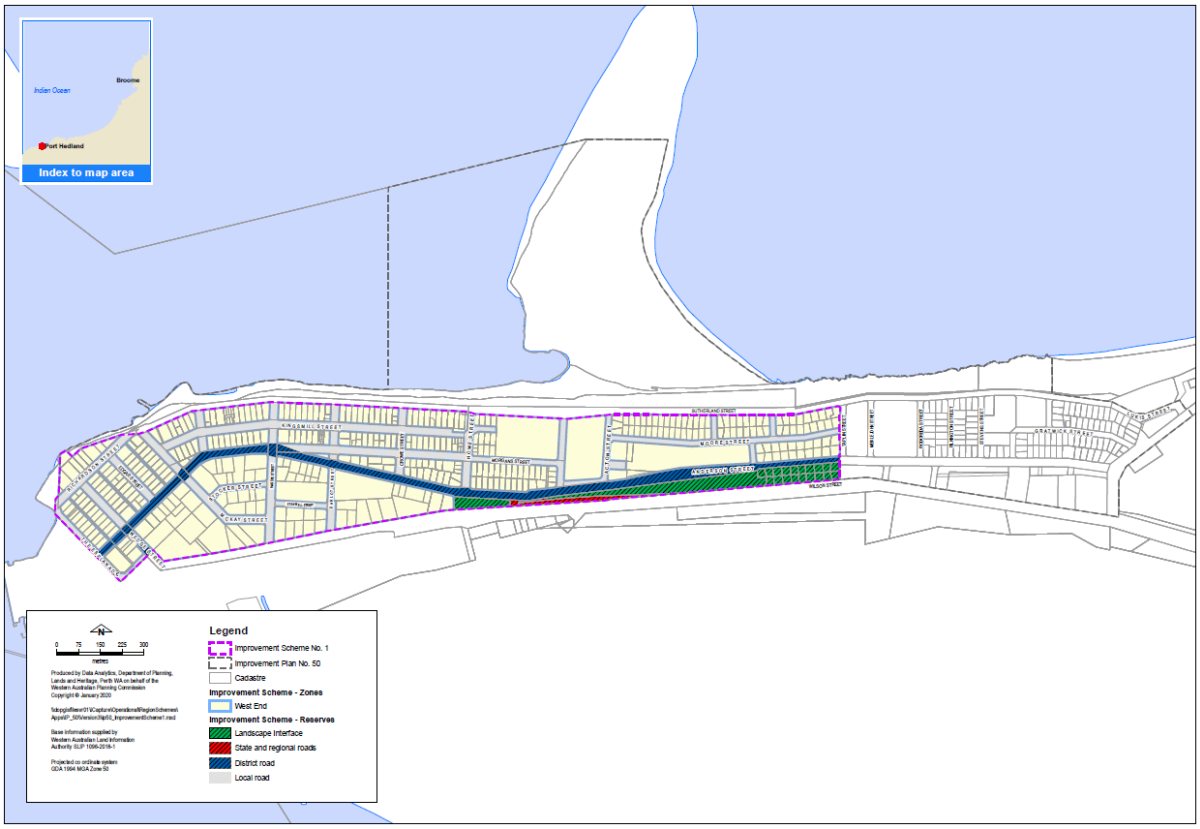

Figure 1: Port Hedland West End Improvement Scheme No. 1 (Source: DPLH 2020)

In August 2019, the Government introduced the concept of an industry-funded voluntary buyback scheme for Port Hedland. The proposed buyback scheme is separate to, but supports the endorsed Taskforce recommendations relating to restricting population growth in the West End of the Port Hedland peninsula. The intention is to provide residents in the West End the opportunity to relocate from areas subject to the improvement plan.

Key findings relevant to DWER's regulation of Category 58 premises (bulk handling) is provided below.

Key findings: The Delegated Officer notes the Government's position that the interim guideline of 24-hour PM_{10} of 70 µg/m^3 (excluding natural events), hereon referred to as the AGV, shall continue to apply to all residential areas of Port Hedland.

DWER will implement the commitments made by the Government in its response to the Taskforce Report. Specifically it will develop a dust management guideline for bulk handling port premises and implement the guidelines through Industry self-assessments and licence reviews.

5.2 Monitoring of emissions to air

Ambient air quality monitoring is undertaken at Port Hedland through a number of monitoring stations within the Town of Port Hedland shown in Figure 2. Monitoring is currently coordinated through the Port Hedland Industries Council (PHIC) and real-time monitoring is reported on the PHIC website.

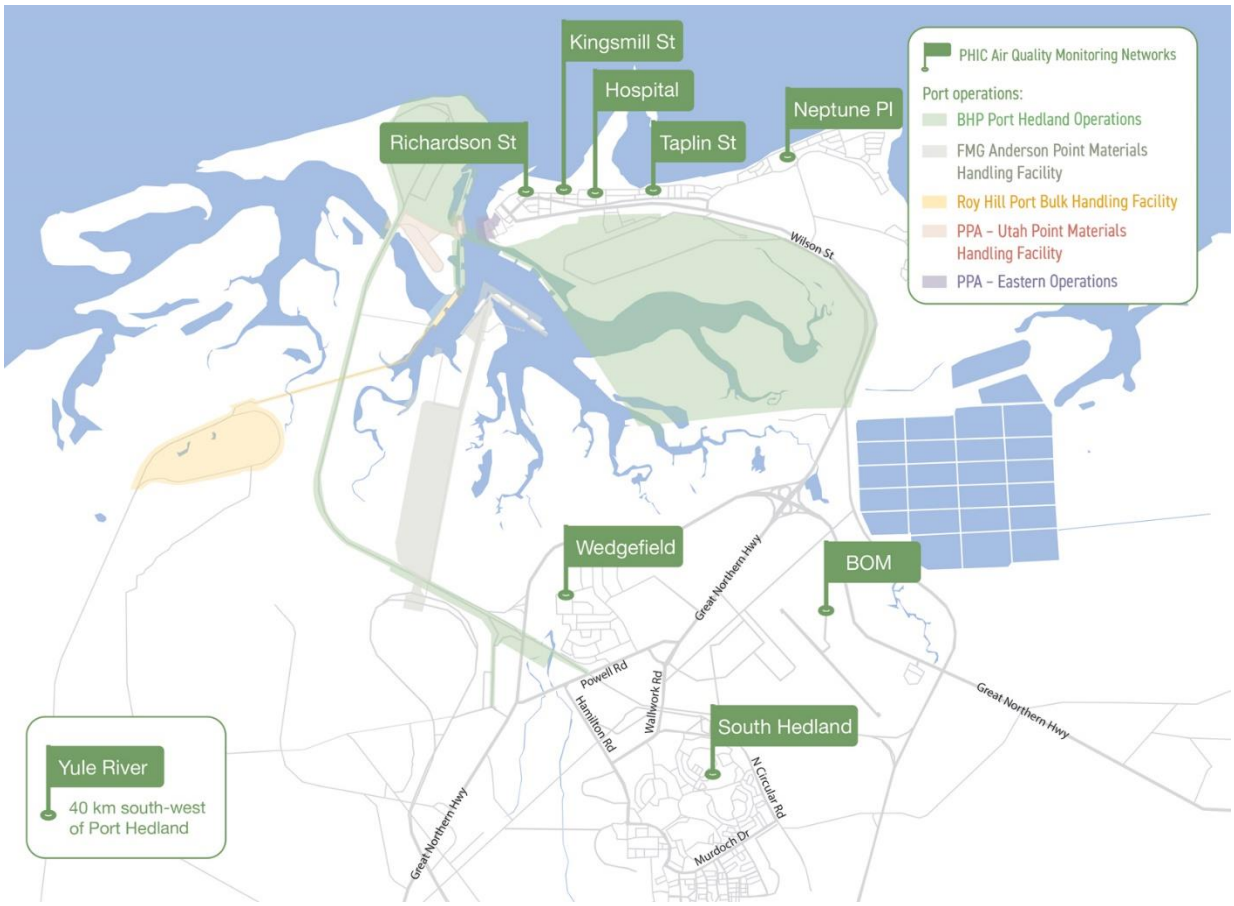

Figure 2: PHIC monitoring locations in Port Hedland

5.2.1 PM_{10} monitoring data

Annual air quality reports are currently commissioned by PHIC and published on its website. In these reports data is presented with a key focus on determining the number of exceedances of the AGV for Port Hedland (24-hour averaged PM_{10} of 70 µg/m^3, calculated from midnight to midnight) over each annual period.

The 2018-2019 period marked the first instance of zero days above the AGV at Taplin Street for a reporting period since the monitor was established. However, monitors both to the west and east of Taplin Street recorded significant increases in the number of days where PM_{10} concentrations exceeded 50µg/m^3 (refer to Table 6). DWER was later advised by PHIC that monitoring data from the Taplin Street monitor during this period was invalid due to equipment fault. PHIC has subsequently expunged the relevant data from its annual report for the 2018/19 reporting period and replaced the faulty monitor.

Table 6:Number of exceedances of NEPM and Port Hedland AGV for PM_{10} recorded by PHIC ambient monitoring network – 2013 to 2019

Monitoring Station	24hr criteria ($\mu g/m^3$)	Days above criteria						
		FY 2012/13	FY 2013/14	FY 2014/15	FY 2015/16	FY 2016/17	FY 2017/18	FY 2018/19
Richardson St	50	74	50	79	39	90	143	167
	70	23	9	11	6	12	30	38
Kingsmill St	50	89	98	156	112	83	103	155
	70	29	19	50	46	23	15	36
Taplin St	50	48	48	55	48	27	65	3
	70	**17**	**6**	**10**	**10**	**3**	**9****	**At least 9****
Neptune Pl	50	25	25	67	43	29	15	102
	70	11	8	14	14	6	0	29
Wedgefield	50	157	148	169	150	99	88	165
	70	82	84	59	50	Unknown*	Unknown*	Unknown*
South Hedland	50	24	13	19	12	8	0	11
	70	8	3	6	5	Unknown*	Unknown*	Unknown*
BoM	50	24	10	17	12	7	4	25
	70	10	3	7	2	Unknown*	Unknown*	7
Yule	50	14	8	18	5	1	8	15
	70	8	3	6	2	0	2	5

* Information not available.

** See key findings in this section for further discussion.

It is noted that the use of Taplin Street alone as a benchmark for air quality impacts due to operations at the Premises is limited. This is owing to the distance of the nearest Premises dust source to the monitor (shiploaders – approximately 3.65km) and the cumulative nature of dust emissions from varying and multiple industrial and non-industrial sources. The dust contribution from the Premises to the overall dust concentration recorded at the Taplin Street monitor is therefore difficult to determine from that monitoring result alone.

Table 6 indicates that over time, South Hedland has also experienced high dust levels albeit with fewer exceedances of 24 hour averaged NEPM (50 $\mu g/m^3$) and the Port Hedland AGV (70 $\mu g/m^3$) than the West End. Based on dominant wind directions in summer months from the north/west, there exists a potential pathway for dust from the Premises adding to the cumulative dust levels in South Hedland. Therefore the risk assessment of dust must also take

into consideration the potential for impacts to South Hedland residents.

Key findings:

1) There has been a universal increase in PM_{10} concentrations across the Port Hedland peninsula in the 2018/19 reporting period, with the single exception of Taplin Street due to the issues noted below.
2) In February 2020 DWER was advised by PHIC that the Taplin Street monitor had been inaccurate and under-reporting actual dust levels from as early as April 2018.
3) PHIC and DWER have separately undertaken analysis of data from the monitoring network over this period, indicating a minimum of nine to thirteen exceedances of the AGV were likely to have occurred at Taplin Street during the period in question.
4) During the 2018/19 reporting period other monitoring stations across the network recorded elevated dust levels, including background monitors and those east of Taplin Street. Over the previous six financial years, the number of exceedances of the air quality guideline at Taplin varied between three and 17 (with an average of nine exceedances).
5) PHIC advised in February 2020 that new monitoring equipment had been installed at Taplin Street in January 2020 and recent monitoring results are now accurate.
6) PHIC has advised DWER that its investigations have identified no errors with monitoring data being captured at other PHIC monitoring locations.
7) PHIC has re-published its *FY2018/19 Port Hedland Ambient Air Quality Monitoring Program Annual Report* omitting the erroneous data from the Taplin St monitor.
8) Operation of the network is not currently a requirement under the provisions of the EP Act and the operation and maintenance of ambient monitors is not the direct responsibility of Licence Holders.

The Department is now focusing on procuring air quality monitoring services, so that it has full control and oversight of the Port Hedland ambient monitoring network as soon as possible to meet the endorsed Taskforce recommendations (see section 5.1) and provide transparent and accurate air quality information to Port Hedland residents.

5.2.2 $PM_{2.5}$ monitoring data

Particulate matter sized 2.5 microns in diameter and smaller ($PM_{2.5}$) are monitored at two ambient locations in the West End (Richardson Street and Taplin Street), and two background reference locations (BoM and Yule River).

Generally, the finer the particle in ambient air, the greater the ability that particle has to enter deeper into the lungs. In increasing concentrations, $PM_{2.5}$ can result in greater risk of respiratory and cardiovascular disease. Many of the exceedances of health guideline values for $PM_{2.5}$ can be explained by bushfire impact in the area although there has been a slow but steady increase in $PM_{2.5}$ concentrations at ambient monitors in Port Hedland in recent times, a trend not recorded at the background monitoring location.

The annual average concentration of $PM_{2.5}$ was above Ambient Air Quality NEPM guideline (24 hour concentration of 8µg/m^3 averaged annually) for monitoring locations in the West End, Taplin and BoM. A comparison of the annual averages of $PM_{2.5}$ from some selected sites are summarised below.

Table 7: Comparison of annual average $PM_{2.5}$ concentrations (µg/m^3) in Port Hedland against larger population centres in Western Australia 2012-2018 (calendar years)

Year	Richardson	Taplin	BoM – Port Hedland	Perth Metro - Caversham	Perth Metro - South Lake	Perth Regional - Bunbury
2012	6.3	5.6	8.5	7.8	8.9	8.6
2013	5.7	6.1	6.6	7.9	8.0	7.8
2014	8.6	9.3	7.9	8.1	8.1	7.8
2015	8.3	12.0	7.5	8.5	8.8	9.3
2016	5.2	11.4	5.9	7.7	8.0	8.4
2017	9.2*	11.0	6.8	8.5	8.7	8.7
2018	12.3	9.6	8.9	8.0	8.4	8.4

* Less than 75% data recovery for the calendar year.

Over the same time period there have not been a significant number of exceedances over the daily NEPM criterion for $PM_{2.5}$ (25µg/m^3) with a range between 0 to 4 daily exceedances at Taplin and Richardson. Since 2013/14, there has been only one exceedance of the 24 hour NEPM criterion for $PM_{2.5}$ at the Yule background monitor with no exceedances recorded at the BoM background monitor.

Key finding: The Delegated Officer notes that:

1) Particles as $PM_{2.5}$, averaged annually and as measured at Taplin Street and Richardson Street monitors, have trended upward slightly since 2012.
2) In recent years $PM_{2.5}$ concentrations in Port Hedland's West End have been greater than those experienced in metropolitan area of Western Australia and have exceeded NEPM guidelines for annual average $PM_{2.5}$ concentrations.
3) It is likely that the composition of finer particulates in Port Hedland is different when compared to urban centres, and this may result in different health outcomes (DOH, 2016).
4) Particles as PM_{10} have formed the basis of DWER's risk assessments as particulate matter sized 10 micron in diameter and smaller (PM_{10}) remains the dominant particle size in Port Hedland's ambient air that presents a risk to human health, noting that $PM_{2.5}$ size fraction of particles is part of the PM_{10} fraction.
5) Ongoing ambient $PM_{2.5}$ monitoring will identify if this is an increasing trend. Should $PM_{2.5}$ continue to exceed NEPM guidelines, the Department will seek Department of Health advice and an overall strategy may be required to potentially address sources from each operation.

5.2.3 Dust source determination

It is possible to characterise ore types based on their composition. A key characteristic of ore types handled at Port Hedland is the differentiation of hematite, goethite and magnetite. Goethite ($FeO{\cdot}OH$), hematite (Fe_2O_3) and magnetite (Fe_3O_4) are iron oxides. Some ores contain mainly haematite or magnetite while others have varying proportions of hematite and goethite. Marra Mamba ores, for example, are characterised by ochreous hematite goethite

mineralogy and occur in the Marra Mamba Iron Formation in the Pilbara. They are surface enriched with a brown colour due to the goethite content. Ores from the eastern area of the Chichester Range deposits, where the Roy Hill Mine is located, are of this type.

If ore types can be clearly distinguished and characterised, dust derived from specific ore types could be assumed to carry the ore type specific signature of composition. A dust speciation analysis would be able to reveal the dust composition and thus identify the source of the dust, specifically the ore type. In a scenario where it is known where specific ore types are handled, at which premises, theoretically dust speciation results could then help identify the source or sources of dust according to those premises.

Whether dust generated from a specific ore type is in its composition identical to the ore type material it is derived from depends on various factors, for instance, dust consists of particulates that can become airborne and travel over a distance. The source material consists of particles of different sizes and weights. Lighter particles are more likely to be lifted off and transported in dust plumes over some distances than heavier particles. For this reason the particle fraction represented in a dust sample may not be identical to the particle composition of the source material and therefore there is less certainty in source identification.

Another complicating factor to consider is the cumulative airshed over Port Hedland in which dust particles from different sources mix, so that the combined dust sample analysed no longer represents only one but multiple sources, which then adds further difficulty to the attribution of dust to specific sources. As most of the iron ore types currently handled at the port contain similar elements, dust speciation as a method of dust attribution is unlikely to be successful in most scenarios. A scenario where dust speciation could be successfully employed for source attribution is one where a distinctive material is being handled at specific premises only, so dust derived from this source can be clearly distinguished from other dust sources at the port.

Currently this is not the case for Marra Mamba ore at Port Hedland, which is handled at multiple operations, including the Premises (MinDat, 2020). Refer to section 8.1 for further information on Premises ore characterisation.

6. Modelling and monitoring data

6.1 Air emissions modelling

In support of the application for increased throughputs, the Licence Holder has submitted dust modelling that demonstrates that dust emissions from the Premises will not increase once controls are implemented, based on assumptions made in the model.

Emission factors used in previous air quality modelling, sourced from the National Pollutant Inventory (NPI), have been replaced with source emission estimates that are based on in-field sampling conducted to measure dust sources. The majority of revised emission estimates were recorded as being below the calculated NPI emission rate, although some sources were above. For example, conveyors CVR121 and CVR122 have an average emission rate above the NPI controlled emission rate.

It was also identified through the modelling review process that dust from the following sources had been inadvertently missed in previous modelling conducted for the application to increase throughputs from 55 Mtpa to 60 Mtpa:

- Conveyors CVR121, CVR122, CVR123, CVR124 and CVR163
- Transfer stations TS10, TS11, TS12, TS13

Total estimated emissions for each scenario are provided in Table 8.

Table 8: Modelled throughput scenarios and estimated emissions (ETA, 2020)

Scenario	Description	Estimated emissions
60 Mtpa modelling submitted for amendment issued 3 December 2018	Model results submitted with the 60 Mtpa application.	458,379 kg/yr
Corrected modelling for the 60 Mtpa base case	Revised model for the 60 Mtpa throughput scenario that includes missing dust sources listed above.	**462,793 kg/yr**
70 Mtpa case (no abatement)	70 Mtpa scenario with all dust sources and no additional abatement.	535,751 kg/yr
70 Mtpa case (with abatement)	70 Mtpa scenario with all dust sources and controls (belt wash station on CVR121).	**457,804 kg/yr**

According to modelling, the number of 24 hour PM_{10} Port Hedland AGV (70µg/m^3) exceedances at Taplin Street is not expected to increase beyond historical trends. Modelling does show a slight increase of 0.1 µg/m^3 in the annual average dust concentrations for modelled locations west of the Hospital monitor under the 70 Mtpa cumulative scenario although these increases are not evident when viewing the Premises' dust output in isolation of other operators. At greater distance to the Premises, contributions from the throughput expansion proposal are not recognised by modelling.

Table 9: Ambient dust concentrations at Taplin Street and Richardson Street base case and 70 Mtpa cumulative and in isolation scenarios (ETA, 2020)

24-hour concentrations of PM10	Taplin Street (in isolation)		Richardson Street (in isolation)		Taplin Street (cumulative)		Richardson Street (cumulative)	
	60 Mtpa	70 Mtpa	60 Mtpa	70 Mtpa	60 Mtpa	70 Mtpa	60 Mtpa	70 Mtpa
Maximum	8	**9**	13	**12**	201	**200**	219	**219**
99th percentile	7	**6**	8	**7**	82	**81**	130	**131**
95th percentile	4	**4**	4	**4**	61	**61**	95	**96**
90th percentile	3	**2**	3	**3**	54	**54**	83	**83**
70th percentile	1	**1**	2	**2**	45	**45**	69	**69**
Annual average	0.94	**0.94**	1.4	**1.5**	36.0	**36.0**	57.4	**57.5**

6.1.1 Limitations to in-field emissions measurements for modelling

Default NPI emission factors are generalised estimates of emission rates for infrastructure typically used in the mining industry and can either underestimate or overestimate the actual emissions from each source. Therefore Port Hedland operators often conduct in-field measurement in an attempt to demonstrate emissions from each source more accurately.

The concentration downwind of the line source is measured, along with the wind speed and

angle between wind direction and line source, to determine the emissions from the line source. It is difficult to subtract downwind concentration from upwind concentration, particularly where only one upwind measurement is taken because of the variability in meteorological conditions and local dust sources.

Downwind measurements may have variation depending on conveyor speeds and ore characterisation, for example ore moisture and fines content. There may also be significant variance where downwind measurements are not positioned in line with the correct angle of the wind to the upwind measurement.

Therefore the accuracy or statistical significance of an emission rate value based on in-field emission measurements is predicated by the number of samples taken and variability in conditions and product when sampling is undertaken. The modelling report acknowledges that further sampling is required at some sources to ensure that the calculated emission rates are statistically valid, for example at the wharf, inload transfer stations and screening plant.

The number of samples collected, by product for each of the line source types (conveyors), is provided in Table 10.

Table 10: In-field samples for line source emissions estimates (RHI, 2020)

Source (conveyor location)	Fines	Lump	Total samples
Incoming transfer stations	7	3	10
Stackers	4	4	8
Reclaimers	4	3	7
Screening plan	7	6	13
Outload transfer stations	7	10	17
Outload overland	4	3	7
Wharf	1	1	2

To give confidence to onsite emissions estimates, multiple traverses using portable monitors for estimation of the mean emissions from the source are required. Emissions estimates are limited by the significant variability in the contribution of dust from other sources, meteorological conditions and characterisation of products transported along each source.

Key finding: The limited number of samples per source significantly increases the uncertainty associated with the site-specific emission rate, which has not been quantified appropriately. Uncertainty within the model may come from three types of uncertainty:

1) *instrument uncertainty*, otherwise known as systematic uncertainty, where two or more instruments used to measure and estimate site-specific emissions to inform the model have differing measurements under similar monitoring scenarios;
2) *measurement uncertainty*, where the number of samples taken affects the accuracy of the assumed standard deviation between sampled results (the larger the number of samples, the smaller the uncertainty);
3) *model uncertainty*, which is the dependency of the relationship established by the model between emissions, wind speeds, ore moisture or other parameters that may affect dust emission rates.

While uncertainty within a model is inevitable, it is necessary to understand the level of

uncertainty within a model to determine its accuracy and therefore likelihood of achieving the objectives it is attempting to demonstrate. In this case, does the model demonstrate 'no net increase' in dust from the Premises with enough certainty?

Given the model calculates a 1.08% reduction in overall dust from the Premises, a similarly low level of calculated uncertainty within the model would need to be demonstrated to give confidence that the objective is being achieved. It is not clear from the information provided what level of certainty the model predicts.

6.1.2 Key dust sources and control effectiveness

Figures 3 and 4 show the top 20 dust sources at the Premises as identified by the Licence Holder both pre- and post-abatement (ETA, 2020).

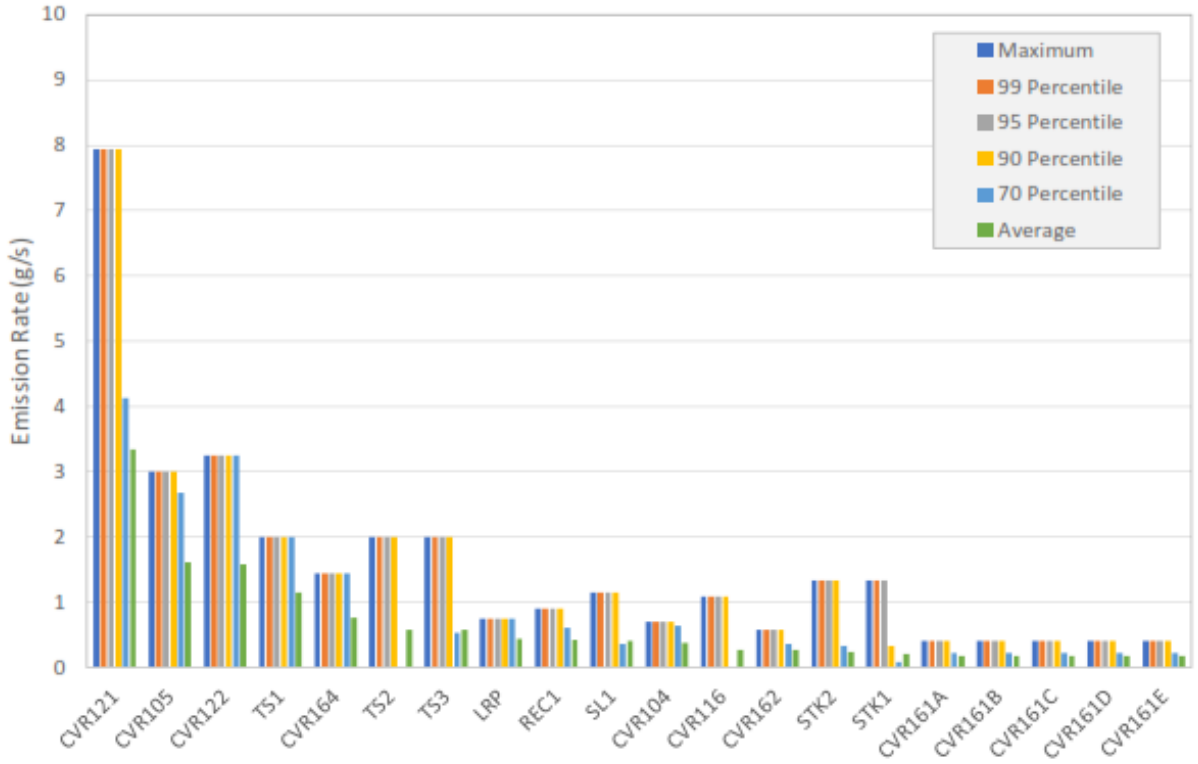

Figure 3: Top 20 dust sources from the 60 Mtpa (base case) scenario

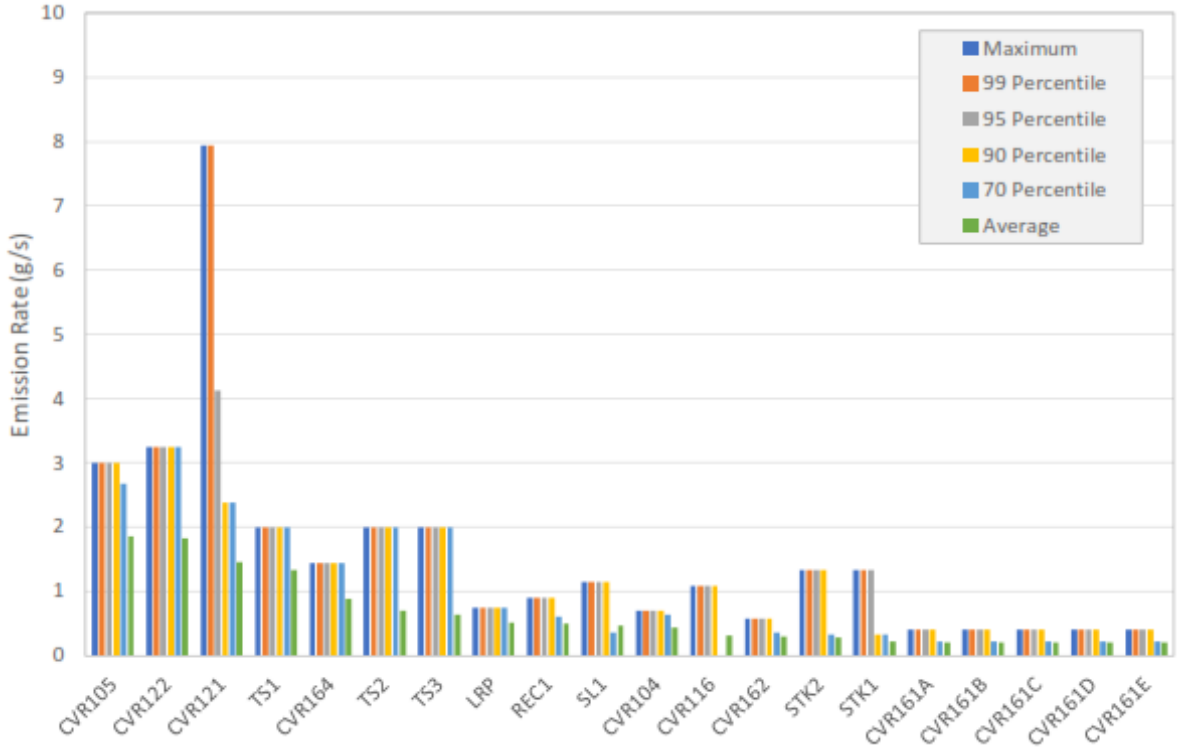

Figure 4: Top 20 dust sources from the 70 Mtpa scenario (with abatement)

It is evident from emissions estimates used in the model that conveyor CVR121 emissions are significantly higher than other single emission sources for the unabated 70Mtpa scenario. There are large decreases in the 95th and 90th percentile emissions from CVR121, based on the installation of an additional belt wash station that has an availability rate of 90%.

Conveyors CVR121 and CVR122 were identified as having an average emission rate above the NPI controlled emission rate with recorded emissions being highly variable during the survey (refer to key findings in section 6.1.1). Prior to the survey, existing dust controls in the form of spray bars and conveyor skirts were upgraded. Monitoring data indicated that the effectiveness of these improvements was dependent on ore type with greater reductions in dust emission rates from CVR122 when handling lump ore (6.1g/s reduction) when compared with fines (2.8 g/s reduction).

Figure 5 shows that most dust sources increase slightly in the annual emissions for the 70Mtpa scenario, with the exception of the two open areas and four stockpiles which show no change; and a very large decrease in emissions at conveyor CVR121.

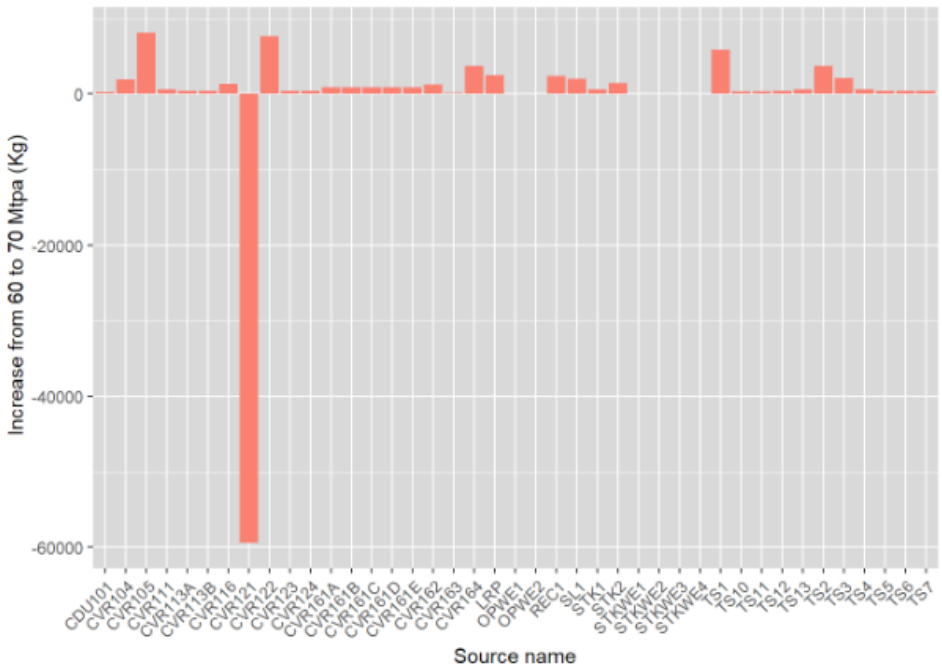

Figure 5: Change in emissions for different sources between the 60 and 70 Mtpa scenarios

When dust control infrastructure is not available, visible dust can be generated despite ore moisture being above the dust extinction moisture level. Field observations also indicated that there is visible dust emanating from the return idlers on CVR105 with the highest emissions observed towards the tail end near the transfer point (ETA, 2020).

Based on emissions factors used in emissions modelling, the most significant source of dust emissions is the screening plant emitting approximately 0.0022 kilograms per tonne (kg/t) when handling lump and 0.0011kg/t for fines. The screening plant includes nine lump bins, three fines bins, vibrating feeders, screens and is equipped with a dust extraction and collections system to contain fugitive dust emissions. The car dumper is also identified through modelling as a significant dust source, emitting an estimated 0.002 kg/t assuming a 99% control factor for the enclosure and dust extraction system. Both screening plant and car dumper emission factors are based on NPI emission factors.

The emissions rates modelled for dust liftoff, as with other models provided to DWER, are wind dependent. In the case of the Licence Holder's model for dust lift off, the threshold wind speed appears to be around 9 metres per second for stockpile STKWE1 (Figure 6). While wind speed threshold for dust lift off can depend on ore type, it is not clear how this assumption has been applied and how this specific dust liftoff threshold was derived.

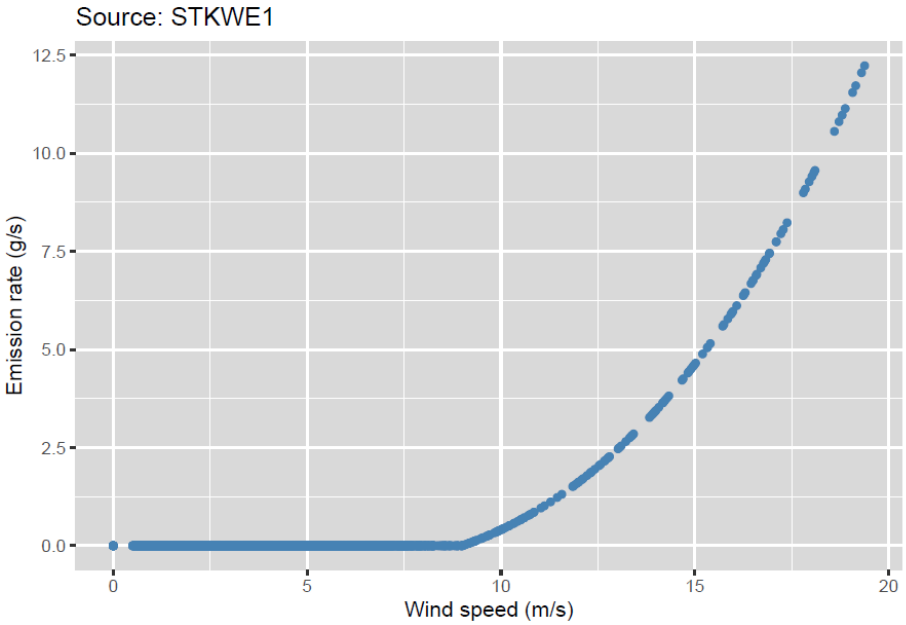

Figure 6: Emissions rate dependency on wind speed for stockpile STKWE1

Key findings: The Department's air quality experts have reviewed emissions estimates, modelling outputs and assumptions used and have identified the following:

1) Modelling results are highly dependent on emissions estimation techniques employed. Insufficient statistical data and evaluation of the in-field sampling data has been provided for DWER to have confidence in the conclusions.
2) Where no site-specific factor could be derived due to "insufficient" or "unfeasible" onsite measurements, as defined by the Licence Holder, NPI factors were adopted for the car dumper, transfer stations, screening plant, and the conveyor at the wharf.
3) NPI emissions estimates may not accurately reflect dust emissions from Premises infrastructure due to the wet nature of ore handled and may therefore be conservative.
4) The clear difference between sources at 60 and 70 Mtpa scenarios is the additional hours of operation for infrastructure under the 70 Mtpa scenario. Increasing the number of hours of operation will not change the emissions rates themselves but may marginally increase overall emissions and the possibility of more frequent peak emissions during worst case meteorological conditions.
5) Modelling identifies that there may be a very slight increase in annual average PM_{10} concentrations in residential areas west of the Hospital monitor following throughput increases to 70 Mtpa and the application of the proposed control.

The Delegated Officer further notes that the identification of additional dust sources in the most recent model does not affect the conclusions made in DWER's decision report of the licence amended 3 December 2018. DWER did not apply a limit on a specified level of dust produced from the Premises as this cannot be accurately quantified. Rather, approval was granted on the grounds that controls, namely the management of dust from open areas, would reduce the risk of dust emissions from the Premises to acceptable levels.

For the purpose of assessing the current Application, the Delegated Officer notes that:

- baseline modelling (base case) has been corrected to ensure that 60 Mtpa and 70 Mtpa throughput scenarios are comparative; and

- results from modelling provide an indication of potential changes from one scenario to another and cannot be used as definitive assessments for impacts to air quality.

7. Consultation

DWER referred the amendment application to a number of community stakeholders and government agencies on 20 July 2020. The application was also publicly advertised in The Northwest Telegraph newspaper on 22 July 2020. The Application was made available for review at the Department's website.

Submissions and DWER responses are summarised in Appendix 2.

8. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guidance Statement: Risk Assessments* (DER 2017).

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

8.1 Dust

8.1.1 Ore characterisation

Ore handled at the Premises is extracted from the Marra Mamba Iron Formation on which the Roy Hill Mine is situated. The Marra Mamba iron ore deposit has a high ochreous goethite content and is friable in nature (Lascelles, 2000). This is particularly true for the Licence Holder's lump product, which can break up into finer particles during transport from the mine and through handling processes at the Premises where ore drops from height.

All ore at the Roy Hill Mine is wet processed and therefore the ore typically arrives at the Premises in a wet condition above the dust extinction moisture (DEM) level (refer to section 8.1.2). Ore characterisation is represented in Table 10 below.

A MSP has been constructed at the Roy Hill Mine to capture ultra-fine high grade iron ore material from the final tailings waste stream, prior to tailings deposition at the mine's Tailings Storage Facility. The MSP is currently designed to recover approximately 4 Mtpa ultra-fine iron ore for addition to the fines product delivered to the Premises (port), which equates to approximately 10 to 11% of the overall fines product. The Licence Holder proposes to expand the MSP with total recovery of up to 9 Mtpa by the end of 2021, which will result in up to 25% of shipped fines containing the MSP ultra-fines product.

Table 11: Ore characteristics under the 70Mtpa scenario (Roy Hill, 2020)

Characteristic	Fines	Lump
Typical product size[1]	<6.3mm >2.5µm	<31.5mm >6.3mm
Proportion of fines <10micron	10-15%	<5%
Proportion of fines <2.5micron[2]	10%	<3%

DEM level	4.8% w/w	3.5% w/w
Transportable Moisture Level[3]	11.5% w/w	NA
Proposed shipping rates	42Mtpa (60%)	28Mtpa (40%)

Note 1: Product particle sizes are indicative and may have finer fractions due to comminution during handling and approximately 10-11% of ultra-fines from the Roy Hill Mine MSP.
Note 2: Particles sized less than 10 micron includes those particles less than 2.5 micron in diameter.
Note 3: Transportable moisture limit (TML) for Roy Hilll fines product is currently 11.5% and reviewed and updated on a regular basis, but will always remain above DEM. TML is not applicable to lump product.

Modelling undertaken did not take into account the up to 9Mtpa of ultra-fine product from the Roy Hill Mine MSP being added to the overall fines product. This amounts to an increase in fines smaller than 150 µm as a proportion of all ore product, from 10-11% to up to approximately 30% as a result of the MSP plant expansion.

Key finding: The Delegated Officer notes that only two iron ore products were considered in dust modelling: lump ore and fines ore currently handled at the Premises, which includes 10-11% of blended ultra-fines. The increasing proportion of ultra-fines up to approximately 30% of the final fines product has not been considered in the modelling, further increasing uncertainty in modelling outputs (refer to key findings in section 6.1.1).

Although modelling assumed that lump ore has a higher dust potential than fines, it is possible that the finer particles from the MSP will have a greater propensity to stick to the underside of the conveyor belts when wet (carryback).

Therefore dust from carryback may have a disproportionately high ultrafines content compared to the total proportion of ultrafines within the overall product that enters the Premises (up to approximately 30%). These finer particles have a greater potential to travel further distance than coarser, heavier particles, which settle more rapidly.

8.1.2 Ore moisture

The moisture content of ore is measured at the Roy Hill Mine with data provided to the Licence Holder ahead of receipt and to inform management. Ore moisture is then measured at inload on the conveyor exiting the car dumper at a frequency of every train rake, which is approximately 16,000 tonnes. Moisture at this location is measured using a microwave analyser that measures changes in the microwave signal that passes through the ore on the belt. The instrument is capable of providing constant real-time moisture readings that can inform the Licence Holder of how to handle the ore at the Premises.

Using the same moisture analysis technique, ore moisture is again measured at a transfer chute between CVR122 and CVR161, which is effectively the “point of outload” for the purpose of moisture analysis. A sample cut of outload ore is also taken for moisture analysis at the Port Laboratory using oven drying techniques in accordance with Australian Technical Specification *ATS5621-2013 Iron ores – rapid moisture determination*.

Dust extinction moisture (DEM) levels of the Licence Holder’s two product streams are determined annually in accordance with Australian Standard *AS4156.6-2000 Coal preparation, Part 6: Determination of Dust/moisture Relationship for Coal*. There is no standard available specific for iron ore DEM level determination.

Figures 7 and 8 show that all ore received at, and outloaded from the Premises between September 2018 and April 2020 had a moisture content above the DEM level, based on online

moisture analyser readings. These readings were subsequently validated by samples analysed from the automated sample station.

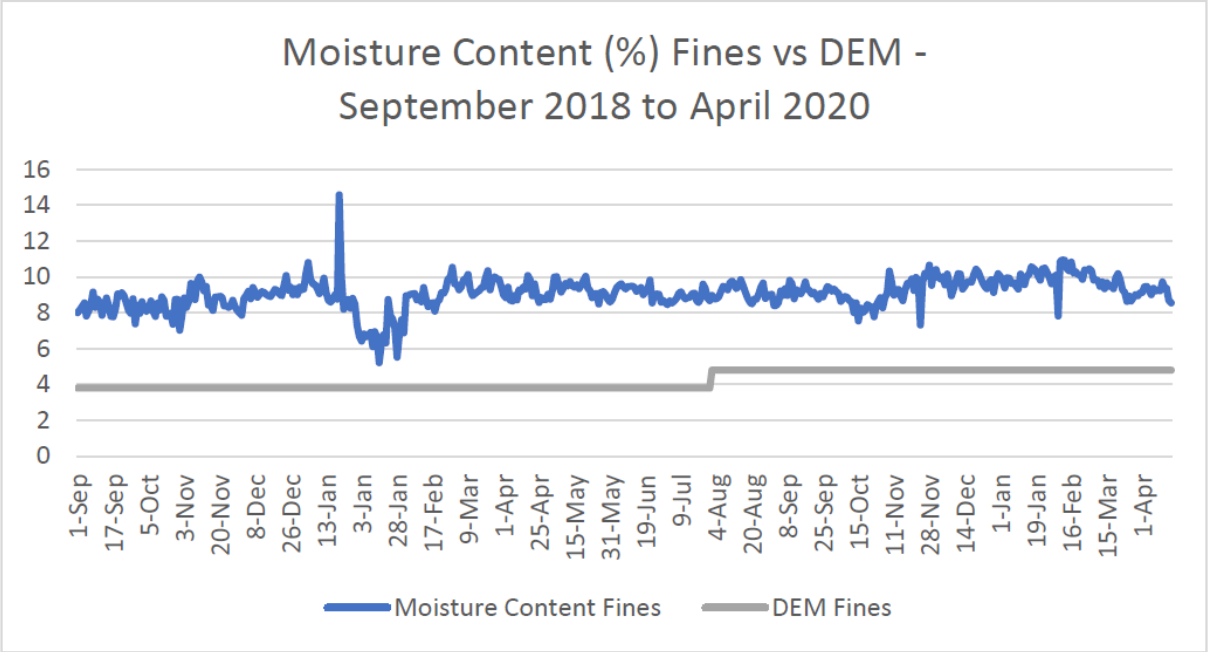

Figure 7: Moisture content of fines ore against DEM (Application)

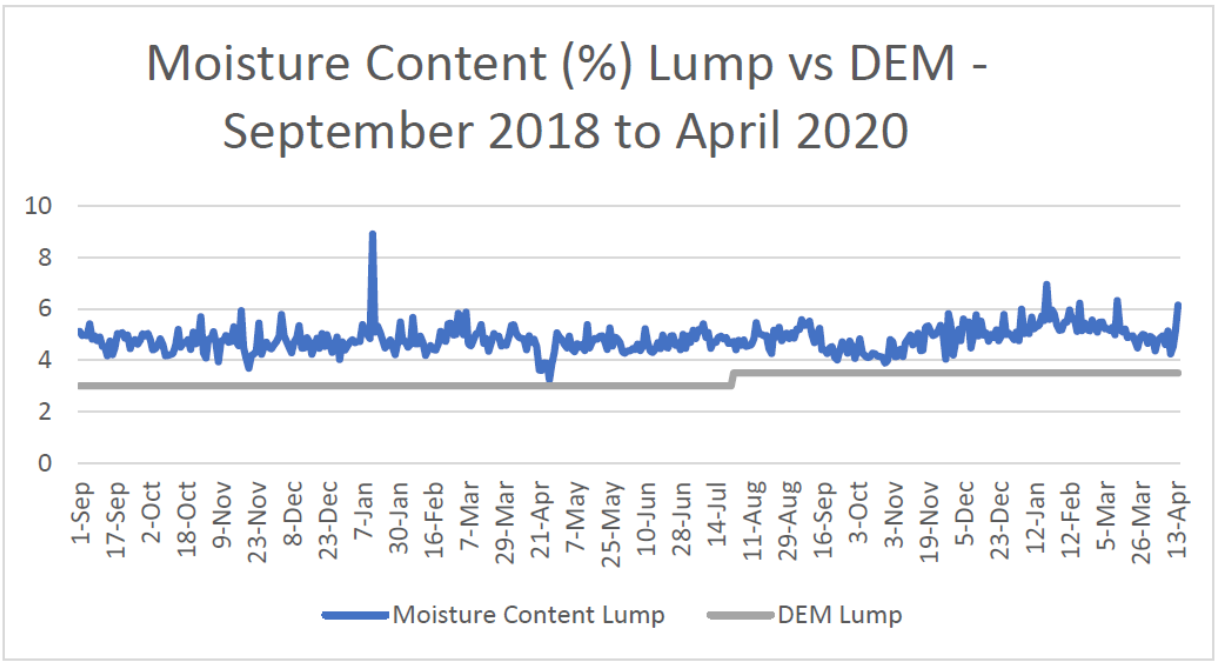

Figure 8: Moisture content of lump ore against DEM (Application)

While ore moisture remaining above DEM level is a key control for the management of dust emissions when handling and stockpiling iron ore, there remains the potential for dust emissions from the Premises. As discussed in section 8.1.1, ores handled at the Premises have a high friability, generating finer particles that have the potential to stick to conveyors. Product stuck to the underside of returning conveyor belts can then drop off and dry, presenting an alternate source of dust.

The Licence Holder describes the product as "free draining" due material properties and the

already high moisture content of ore as it enters the Premises and slight amount of drainage from fines during stockpiling. Ore is wet at outload conveyors to enable transport into the vessel and reduce sticking to conveyors and reduce carry-back from conveyors. This requires water to be pumped out of the base of the vessel hold by the ship operator.

8.1.3 Existing controls

This assessment has reviewed the controls set out in Table 12 below.

Table 12: Licence Holder controls for dust emissions

Site infrastructure	Description	Operation details	Reference to issued licence plan (Attachment 1)
Controls for dust			
Stockyard	Two stackers One reclaimer	Water sprays fitted to the conveyor boom of the stackers and on the reclaimer wheel bucket. Drop height from the stacker to the stockpile is minimised.	Figure 3: Stacker; Reclaimer
	Stockpiles	Water cannons activated by wind anemometer and manual override only.	Not specified
Car dumper	In-loading of iron ore material	Partially enclosed within a negative pressure shed. Baghouse collector operated to remove dust[1].	Figure 2: Car dumper
Rescreening Plant	Removal of fines from lump ore using vibrating feeders and screens	Dust laden air is extracted to a baghouse[1]. Fitted with dust covers.	Figure 3: Re-screening Plant Screen House
Conveyors	Transport of ore from the car dumper to the stockyard and then to the ship loading facility	Elevated overland conveyors (approximately 8.5 m) are covered to reduce exposure to winds. Fitted with belt scrapers on return belts at transfer stations and at the head end of the stackers and shiploading boom conveyor. Belt wash stations on overland conveyors.	Figure 3 and Figure 4: Conveyor
Transfer stations	Transport of ore from one conveyor to another	Fully enclosed with seals on chutes and inspection doors. Misting sprays fitted to the transfer chute exit.	Figure 3: Transfer Station

Site infrastructure	Description	Operation details	Reference to issued licence plan (Attachment 1)
Ship loader	Transfer of ore from stockpiles to the vessel via surge bins	Ore is transported to the ship via surge bins to reduce inconsistencies in flow at the ship loader. Head chute deflector plate in place during loading.	Figure 4: Ship Loader
Internal roads	Vehicle movements over unsealed roads or sealed roads where dust/spills are deposited	Vehicle speed restrictions on unsealed roadways. Use of a water cart as required to minimise dust lift off from minor roads and access tracks. Heavily trafficked roads are bitumen sealed.	Not specified
Cleared areas (unsealed)	Wind erosion from non-trafficable areas	Chemical binding treatment applied to prevent dust and reduce water usage	Not specified
Mobile equipment	Collection of spilt material and deposited dust	Accumulated dust and ore spillage removed using a road sweeper, front end loader and/or other mobile equipment.	N/A – mobile
Dust monitors	Continuous real time monitoring conducted at the Premises boundary using Beta Attenuation Monitors (BAMs). BAMs used at the Premises have the ability to monitor PM_{10} over 10-minute intervals. Meteorological forecasting used to instigate proactive dust mitigation measures, for example the activation of stockyard water sprays prior to windy events. The Licence Holder applies short-term and medium-term trigger levels at boundary monitors to instigate further investigation and management actions for the following criteria (refer to section 8.1.5).		

Note 1: The bag house unit described in Table 12 utilises a filtration circuit. Polyester based sleeves fit into a set of cartridges that are pulsed with compressed air on a regular basis, causing the dust to fall into a collection chamber. This allows the filter to remain clean and avoids the requirement for regular replacement. The pressure across this filtration circuit is monitored to ensure it continues to function effectively.

Open area dust management

On 3 December 2018, DWER issued an amendment to Licence L8967/2016/1 authorising an increase in throughput from 55Mtpa to 60Mtpa. To support the expansion proposal the Licence Holder committed to addressing dust emissions through a revegetation program targeted at a former construction laydown areas that were left exposed. Earlier efforts to revegetate an initial trial revegetation area (Port Loop Stage 2 Area – Figure 9) were unsuccessful with the Licence Holder reporting high salt levels in the underlying clays to be the cause.

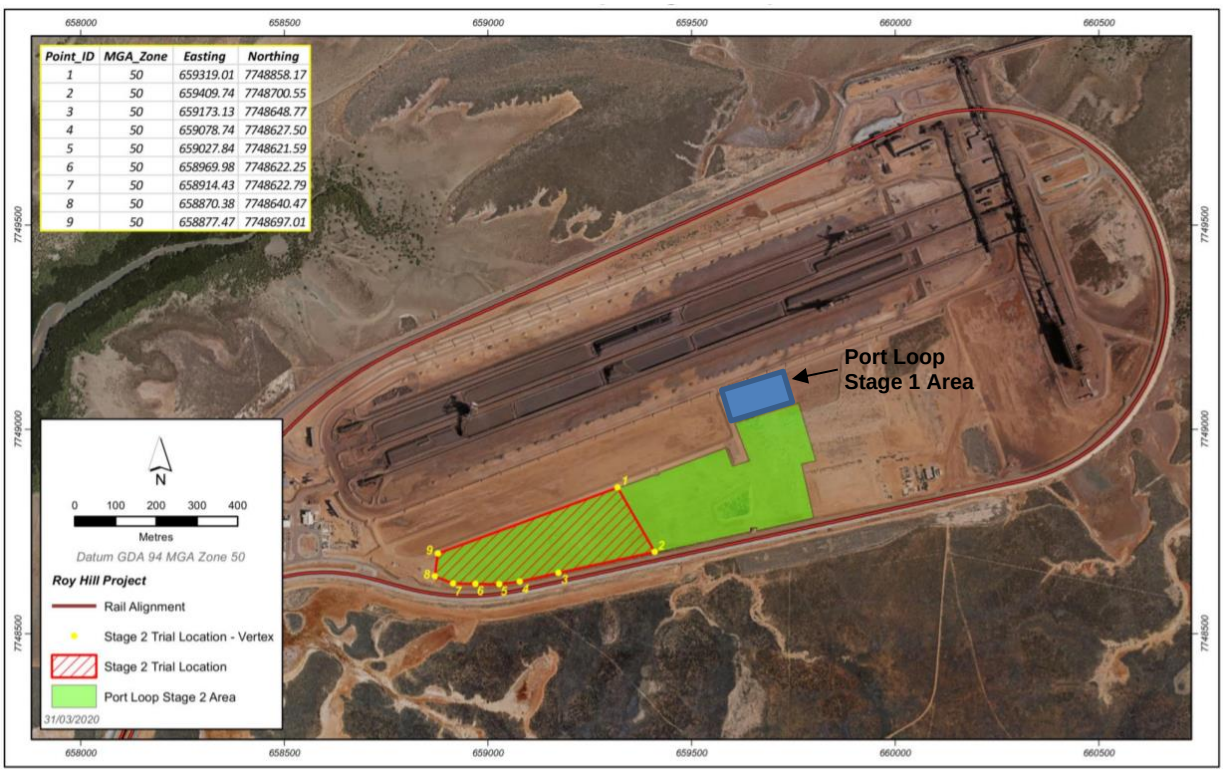

Figure 9: Areas for surface binding treatment (green area) and Stage 2 Trial rehabilitation (red striped area)

A review of vegetation mapping of the rehabilitation area revealed that approximately 85% of the Port Loop Stage 1 Area and 40% of the Stage 2 Area consisted of low sparse Chenopod Shrubland on brown-red clays on tidal zones. Approximately 15% of Stage 1 and 60% of Stage 2 was vegetated with occasional mid and low isolated Acacia shrub species of low hummock grasslands on red sand to sandy loam (Roy Hill, 2020a).

Although vegetation density was sparce to mid isolated pre-disturbance, unvegetated soils were typically high in salt resulting in surface crust when not inundated by tidal surface water and/or were protected from wind erosion by the shrub species present. Soil samples taken in the disturbance areas at the Premises identified uniform high salt concentrations and sodicity, creating an unsuitable environment for plant growth (Roy Hill, 2020a).

Following the failed trial in 2018/19, a further amendment was made to the Licence to allow for the application of a surface binding treatment to the larger Port Loop Stage 2 Area (Figure 9). The Licence Holder observed mixed results for surface binding treatments with good crusting over clay soils and poor binding over sandy areas. Fortnightly inspections of the binding treatment are conducted to ensure that dust from open areas is minimised.

The Licence Holder has committed to continuing to trial alternative rehabilitation methods and binding treatments in accordance with Licence conditions for the purpose of minimising dust emissions from large open areas within the Premises.

There also exists large areas of dredge spoil grounds to the northeast that are likely to present significant sources of dust emissions near to, but beyond the Premises.

Boundary monitoring and management

The Licence Holder operates six boundary monitors that measure particulates as PM_{10} (DM1 to DM6). Of these, DM1 to DM4 are Beta Attenuation Monitors (BAMs) that measure PM_{10} using Australian Standards. The Licence Holder also operates two E-samplers for campaign dust monitoring and source identification as well as a meteorological station. Maintenance of

these monitoring stations is conducted every two months and equipment faults resolved to achieve the required data recovery rate of greater than 90%.

Management trigger and Reportable Event criteria have been applied to the Licence to require the Licence Holder to initiate additional dust management and, in the case of Reportable Event criteria, submit detailed reporting information to DWER. Management trigger and Reportable Event criteria for dust at boundary monitors under the current Licence are presented in Table 13.

Table 13: Management trigger and Reportable Event criteria for dust at boundary monitors under the Existing Licence

Column 1	Column 2	Column 3
Monitoring location	**Management trigger criteria**	**Reportable Event Criteria**
DM2, DM3, DM4 and/or DM5	≥300 µg/m^3 PM_{10} (rolling 1 hour average) when wind direction is between 215 and 250° for three or more ten minute periods during the hour, as measured at the Port AWS. Unless where, BOM or Yule River monitoring stations[1] have recorded ≥100 µg/m^3 PM_{10} (rolling 1 hour average) within 3 hours prior to the trigger event.	120 µg/m^3 PM_{10} (rolling 24-hour average) when wind is direction is between 215° and 250° for 12 or more hours (cumulative) over the rolling 24-hour averaging period.
DM3 and/or DM4	≥300 µg/m^3 PM_{10} (rolling 1 hour average) when wind direction is averaged between 295 and 325° for three or more ten minute periods during the hour, as measured at the Port AWS. Unless where, BOM or Yule River monitoring stations[1] have recorded ≥100 µg/m^3 PM_{10} (rolling 1 hour average) within 3 hours prior to the trigger event.	120 µg/m^3 PM_{10} (rolling 24-hour average) when wind is direction is between 295° and 325° for 12 or more hours (cumulative) over the rolling 24-hour averaging period.
Taplin Street[1]	≥100 µg/m^3 PM_{10} (rolling 1 hour average) when wind direction is between 230 and 250° for three or more ten minute periods during the hour, as measured at the Port AWS. Unless where, BOM or Yule River monitoring stations[1] have recorded ≥100 µg/m^3 PM_{10} (rolling 1 hour average) within 3 hours prior to the trigger event.	N/A

Since criteria have been placed as a requirement on the Licence, the Licence Holder has not recorded any Reportable Events related to boundary monitoring.

Key finding:

The Delegated Officer has reviewed Reportable Event criteria under the Existing Licence and notes that they may not be suitable to identify what common activities that may be the cause of peak emissions, and therefore contributory to high dust levels, for the following reasons:

1) 24 hour averages may not identify peak emissions that occur over a shorter time period;
2) Wind arcs are too narrow – wind direction is not constant over the averaging period and the arc of influence must incorporate the fluctuations in wind direction during the travel time between source and receptor. The likelihood of these wind arcs being triggered over a 24-hour period is very low;

Further review of boundary monitoring information is required to determine appropriate Reportable Events that are able to identify a connection between high dust levels at the boundary and those instances where high dust is also recorded at ambient monitors. The appropriate management response to peak emissions recorded at boundary monitors may be considered for inclusion in the Dust Management Guidelines.

Between the period of 3 December 2018, when trigger criteria were first placed on the Licence, and 31 May 2020, a total of 39 trigger events were recorded and additional management actions applied. Of these events, no visible dust was identified on 21 occasions. Further investigations revealed that the majority of high dust levels at boundary monitors may have been contributed to by dust generated at the outload circuit (13), wind erosion of open and unsealed areas (9) and the reclaiming of “dead” stockpiles (7). Dead stockpiles are described as those stockpiles that cannot be reclaimed by the reclaimer and must be removed by mobile equipment.

The AGV was exceeded at Taplin Street on two of the 39 events where high dust levels were elevated above trigger levels at boundary monitors. However as discussed in section 5.2.1, the failure of the Taplin Street monitor between as early as April 2018 and January 2020 highlights the importance to also review dust concentrations at other ambient and boundary monitors in Port Hedland when assessing dust risks. Eighteen of the 39 high boundary dust level events were on days where exceedances of the AGV were also recorded at Richardson and/or Kingsmill monitors, which are in closer proximity to key Premises dust sources.

In each event between December 2018 and May 2020, the Licence Holder undertook further actions to address potential dust sources. These included additional water cart and water cannon operations, reduced speeds on mobile equipment and on one event, the temporary suspension of dead stockpile reclaiming.

Key findings: Following a review of management trigger event data between December 2018 and May 2020, and comparison against ambient air quality, the Delegated Officer notes that:

1) trigger events occurred on approximately 17% of total days where Richardson Street recorded exceedances of the AGV and 13% of total days where exceedances occurred at Kingsmill Street;
2) the Premises’ shiploader is located approximately 2km from the nearest zoned residential receptor with the outload circuit approximately 5.8km away. In addition, there exist other significant dust sources that are much closer to the ambient monitors in the West End, as depicted in Figure 2, that may also contribute to exceedances of the AGV at these monitoring locations;
3) controls identified in the Application appear to target the most common source of dust identified by the Licence Holder through investigation of boundary exceedances and emissions estimates – ore carryback along outload conveyors. In addition, the management of dust from open areas as required by current conditions of the Licence target the second most common cause of management trigger events;
4) there remains some discrepancy between the dust sources modelled and those identified as the cause of peak emissions during boundary trigger events. For

example, open areas were not identified as a significant source through modelling;

5) the reclamation of dead stockpiles presents a potentially significant source of dust due to the increased vehicle movement over unsealed areas; and

6) management trigger criteria is based on narrow wind direction sectors (between 20 and 35 degrees). There are a range of meteorological factors that will influence the variability of short-term wind directions and dust plumes may not track in a straight line.

8.1.4 Licence Holder proposed controls

To support the application for an increase in throughput and demonstrate that there will be 'no net increase' in dust emissions from the Premises, the Licence Holder has proposed the installation of a belt wash station on outloading conveyor CVR121. The Licence Holder has assumed a 70% dust reduction rate from this equipment in the dust model. However, and as discussed in sections 6.1.1 and 6.1.2, there is a high level of measurement uncertainty associated with this assumed effectiveness.

The Licence Holder has proposed additional hygiene activities including more frequent sweeping, washdown and cleanup of conveyors when product builds up and removal of fallen product from the underside of belts. Hygiene activities are already expected of the Licence Holder as standard operating/housekeeping practices and have not been considered as part of this risk assessment.

Ongoing, it is anticipated that existing requirements to trial rehabilitation methods and trial and maintain chemical binding treatments will result in improved dust control of open areas.

Key determinations: Following review of the information presented in the Application, including modelling information, the Delegated Officer has determined that:

1) The air quality assessment of a 'no net increase' in dust emissions from the Premises is contingent on substantial emissions reductions from the installation of a belt wash station on CVR121. If these reductions reflect real world conditions (i.e. on a day to day basis), then it would be reasonable to conclude that total site emissions will not increase as a result of the planned throughput increase.

2) It is unclear how the Licence Holder has confidently determined that the installation of a belt wash station would reduce dust emissions from conveyor CVR121 by 70%, as input into the dust model. While it is recognised that belt wash stations can reduce emissions, an assessment of uncertainty is required to determine the likely statistical reductions that would be achieved.

3) There is sufficient uncertainty in the effectiveness of the proposed control to determine that 'no net increase' in dust emissions from the Premises will be achieved. Therefore additional controls on the Licence are justified.

Refer to section 6.1.1 for further discussion on the level of uncertainty in the model.

8.2 Noise

Noise modelling provided with the original application for the Licence issued 15 September 2016 assumed the continuous operation of port infrastructure during worst case meteorological conditions. No additional infrastructure is proposed to allow for throughput increases and therefore there are no increases to worst case noise emissions.

Throughput increases will be achieved through longer operation of existing infrastructure, which the model has already been taken into consideration. Based on the above, there are no

changes made to the risk assessment for noise in this Amendment Report as a result of the application to increase throughputs to 70 Mtpa.

Noise model validation monitoring was conducted in 2017 confirming that modelled noise emissions were accurate to within 1.8dB.

The key emissions and associated actual or likely pathway during premises operation which have been considered in this Decision Report are detailed in Table 14 below. Table 14 also details the control measures the applicant has to assist in controlling these emissions, where necessary.

Table 14: Proposed applicant controls

Control	Description
Engineering	Screening plant is fitted with isolation frames to prevent excessive vibration. Low noise idlers installed on conveyors and tripper.

8.3 Wash water discharges to land

It is anticipated that each of the two new belt wash stations described in section 8.1.4 would require a minimum of 3.2m^3 of water per hour. As existing sumps have not been designed to hold this volume of water the Licence Holder has requested that belt wash water be captured and discharged to sedimentation basin. Discharges have the potential to contaminate soil at the point of discharge and may result in future dust emissions as sediment laden water dries out and particles are resuspended.

To verify that land will not be contaminated from this activity, the Licence Holder took samples from existing belt wash stations to determine the likely presence of hydrocarbons within the wash water. Analysis of these samples has identified that concentrations of hydrocarbons are below laboratory detection.

Based on the volumes of belt wash water entering the sedimentation pond, the Licence Holder argues that it is unlikely that the basin would dry out to allow for suspension of material. However, the Licence Holder has committed to the regular clean out of solids from the sedimentation basin and place back into the stockpile area.

8.4 Receptors

In accordance with the *Guidance Statement: Risk Assessment* (DER 2017), the Delegated Officer has excluded employees, visitors and contractors of the applicant's from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 15 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises *(Guidance Statement: Environmental Siting* (DER 2016)).

Table 15: Receptors and distance from prescribed activity

Residential and sensitive premises	Distance from Prescribed activity
Esplanade and Pier Hotels (zoned Town Centre – retail/commercial in Town of Port Hedland Planning Scheme No.5)	Approximately 1,400m north-east of the ship loading area and 5,200m north-east of the nearest boundary of the stockyard area.

Closest residential zoned premises – Port Hedland (zoned Residential in Town of Port Hedland Planning Scheme No. 5)	Approximately 2,000m north-east of the ship loading area and 5,800m north-east of the nearest boundary of the stockyard area
Closest residential zoned premises – South Hedland (zoned Residential in Town of Port Hedland Planning Scheme No. 5)	Approximately 8,400m south-east of the ship loading area and 8,000m south-east of the nearest boundary of the stockyard area.

8.5 Determination of emission, pathway and receptor

Risk ratings have been assessed in accordance with the *Guidance Statement: Risk Assessments* (DER 2017) for those emission sources which are proposed to change and takes into account potential source-pathway and receptor linkages as identified in sections 8.1 and 8.3. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the Licence Holder has proposed mitigation measures/controls (as detailed in Section 8.1.2), these have been considered when determining the final risk rating. Where the Delegated Officer considers the Licence Holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the Licence as regulatory controls.

Additional regulatory controls may be imposed where the Licence Holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 16.

Table 16: Identification of emissions, pathway and receptors during operation

Risk Events					Risk rating C = consequence L = likelihood	Applicant controls sufficient?	Conditions of licence	Justification for additional regulatory controls
Sources/Activities	**Potential emissions**	**Potential receptors**	**Potential pathway and impact**	**Applicant controls**				
Category 5: **Processing or beneficiation of metallic or non-metallic ore** **Category 5 – Processing or beneficiation of metallic or non-metallic ore**: Lump ore rescreening at the screening plant. **Category 58 – Bulk material loading or unloading:** Ore is stockpiled, handled and moved at multiple times in the process at the car dumper, stackers, reclaimer, surge bins, conveyors, transfer points and the shiploaders. The Licence Holder operates at the premises 24 hours a day.	Dust	Residents in Port Hedland and South Hedland. Esplanade and Pier Hotels in Port Hedland town centre.	Air / wind dispersion	Improved belt cleaning on outloading circuit conveyor CVR121.	**High** C = Major L = Possible	No	*Condition (proposed):* Requiring the construction of a belt wash station on conveyor CVR121 prior to increasing throughputs. Validation of dust control effectiveness. Regular removal of sediment from sedimentation basin. *Additional regulatory controls:* Installation of additional belt wash station prior to increasing throughputs beyond 65Mtpa and up to 70Mtpa. Additional dust control infrastructure required in the event that validation does not identify the same level of effectiveness as presented in dust modelling. Amendments to management trigger criteria for dust recorded at the Premises boundary. Management of "dead" stockpiles.	As discussed in sections 6.1.1 and 6.1.2, there is a significant level of uncertainty associated with assumed emissions reduction estimates as a result of belt wash system installation at conveyor CVR121. This subsequently reduces DWER's confidence in the size of the assumed reduction in emissions. Therefore it is necessary for the Licence Holder to install additional infrastructure and validate the effectiveness of these dust controls, and subsequently address any shortcomings in control effectiveness by implementing further controls. Additional controls have been selected based on Licence Holder-identified high dust sources. The management of dead stockpiles and improvements to existing dust management trigger criteria is required to ensure emissions are maintained at acceptable levels in the immediate term. Refer to section 8.5 for further justification.
		Nearby industry (Wedgefield and FMG)		As above.	N/A – Protection of employees involves different exposure risks and management strategies that are regulated under other State legislation.			
		Mangrove habitat		As above.	N/A – Potential suppression of photosynthetic and respiratory functions resulting in impacts to mangrove health is managed under Ministerial Statement MS858.			
	Noise	Residents in Port Hedland and South Hedland. Esplanade and Pier Hotels in Port Hedland town centre.		None	**Medium** C = Moderate L = Possible	Yes	No additional noise sources are proposed through this amendment. No additional conditions applied due to no increase in assessed risk.	Noise modelling assumes that all equipment operates at the same time, representing worst case scenarios.
	Discharges to land	Contamination of soils	Direct discharge	None	**Low** C = Slight L = Rare	Yes	No further conditions proposed or added.	There are no sources of contaminants on scrapers or sprays at belt wash stations. Analysis of water samples taken from existing belt wash stations indicate no/negligible presence of hydrocarbons.

8.6 Licence controls

8.6.1 Throughput limits

The Licence Holder is authorised to increase shiploading throughputs from 60Mtpa to 70Mtpa following construction of additional dust control infrastructure and equipment.

Screening throughputs have also increased from 33Mtpa to 38Mtpa.

Note: Rescreening limits have not been increased by 10Mtpa as not all throughputs above 60Mtpa will consist of lump ore that requires rescreening.

Throughput limit conditions have been amended to restrict the source of iron ore to that from the Roy Hill Mine.

Rescreening limits are consistent with that applied for by the Licence Holder.

Grounds: The risk assessment has been based on the dust potential from handling iron ore from the Roy Hill Mine where all ore is wet processed before being transported to Port Hedland. Existing and proposed ore characteristics, including hazards, form the basis of the risk assessment to authorise 70Mtpa at the Premises. A change to the ore characteristics beyond that proposed following the expansion of the MSP would require reassessment through a formal amendment process.

8.6.2 Dust infrastructure and equipment

The Licence Holder will be required to install a belt wash station at conveyor CVR121 as proposed in the Application. The Licence Holder must also install an additional belt wash station on a second conveyor and demonstrate that the equivalent of at least 70% emissions reduction at CVR121 can be achieved, based on the implementation of two belt wash stations.

In the event that dust control validation monitoring identifies that the two belt wash stations do not achieve the required emissions reduction, the Licence Holder will be required to install a third belt wash station on a high dust source conveyor.

Note: In addition to Licence Holder-proposed controls the Licence Holder will be required to install a second belt wash station. These two belt wash stations will be required to remain available for at least 90% of the time when ore is handled along each conveyor, consistent with conditions of the Existing Licence. An exception to this is when belt wash stations are turned off for the purpose of conducting dust control validation studies.

Dust control validation must be based on a statistically rigorous monitoring exercise and give consideration to uncertainty (refer to section 8.5.4). The experimental design of the validation study should consider but not be limited to the following aspects:

- Monitoring setup appropriate for the type of emission source and pollutant type, for example linear (conveyor), averaging period, meteorological monitoring.
- Controlled conditions to observe effects of control status (on/off).
- Data evaluation to include dust data, materials data (eg ore type and moisture levels), meteorological data and operational data (equipment and infrastructure status).
- Evaluation of uncertainty and significance of results using a statistically sound approach.

Should the Licence Holder determine that belt wash stations would negatively interfere with the movement of ore along outload conveyors, these controls may be interchanged with conveyor shielding and containment that is capable of minimising dust emissions from ore carryback.

Grounds: Through the emissions monitoring conducted for the determination of emissions estimates, and sources of dust identified by the Licence Holder through high dust level investigations, outloading conveyors have been identified as the most significant source of dust.

The greater proportion of ultra-fines content within the fines product was not considered through dust modelling presented in the application. This variation in product may result in greater emissions than estimated by the Licence Holder as a result of increased ore carryback on conveyors that do not have adequate under-belt cleaning systems and from the potential for finer particles to travel further making it more likely to impact sensitive receptors. In addition, emissions estimates used to inform modelling outputs are based on a very limited number of samples at each emission source. Therefore DWER has limited confidence in the modelling outputs and has applied a precautionary approach to the granting of the Amended Licence, incorporating more stringent controls for the management of dust.

As there remains significant uncertainty in the air quality modelling (refer to section 6.1.1), the requirement for a third belt wash station/conveyor cover at CVR105 will be contingent on the Licence Holder demonstrating that the installation and operation of the two required belt wash stations will result in an equivalent or greater reduction in dust emissions as a 70% reduction in emissions from conveyor CVR121.

Other significant sources of dust such as that from open areas are expected to be addressed through the ongoing application of chemical binding treatments and revegetation trials, per existing Licence conditions.

8.6.3 Specified actions

Conditions have been placed on the Amended Licence that place restrictions on the operation of mobile reclaiming equipment on “dead ore” stockpiles when wind conditions place residents potentially downwind of reclaiming activities.

Amendments have been made to the trigger criteria for dust management at the Premises.

Note: Dead ore stockpiles are those that cannot be reclaimed by the bucketwheel reclaimer. Conditions for the management of dead ore stockpiles aligns with stated controls already applied by the Licence Holder. Additional requirements have been added for dead ore stockpile reclamation to cease under strong wind conditions, which are defined as winds greater than 14 metres per second.

Wind arcs at boundary dust monitors have been widened to increase the frequency of additional dust management being implemented and reduce the likelihood of high dust events in the West End that are contributed to by the Premises. Similar management response will be required where visible dust is identified along the SW Creek Berths and wind direction places West End residents generally downwind. Management involving the operation of stockyard cannons and water carts is not required in the event of dust from the wharf potentially being transported to the West End.

No changes have been made to trigger criteria for the concentration of PM_{10} at boundary monitors.

Grounds: Wind arcs specified in the Existing Licence appear to be protective of all West End residents from dust emissions from the stockyard and assuming the wind direction remains consistent. However, and as discussed in section 8.1.3, wind direction is not constant over the averaging period and the arc of influence must incorporate the fluctuations in wind direction during the travel time between source and receptor.

Management trigger criteria under the Existing Licence are less protective of Port Hedland residents in the western sections of the West End, particularly for emissions generated along the wharf and shiploader which are the closest dust sources to residents. As there is no

current monitor on or near to the South West Creek Berths, trigger criteria can only be based on visible dust generation.

DWER has determined a 'High' dust risk associated with Premises activities and notes the potential for greater concentrations of finer dust particles being emitted from the Premises as a direct result of throughput expansions at the Roy Hill Mine MSP. Additional management action is required to reduce impacts to West End residents from dust peaks and has been determined by the Delegated Officer as a necessary control based on uncertainties identified in the review of the dust model.

There have been no changes to the wind arcs for South Hedland receptors due to the distance between Premises dust sources and the receptors reducing the likelihood of Premises dust significantly contributing to high dust levels in that location.

8.6.4 Monitoring requirements

The averaging periods for moisture content monitoring have been reduced from every vessel to every vessel hold at outload. At inload, moisture content is to be averaged for each product on each train.

Note: There are no monitoring or management trigger criteria associated with $PM_{2.5}$ dust.

The request to amend existing reporting conditions on the Licence to increase the reporting trigger for daily iron ore throughputs from 240,000 wet tonnes to 270,000 wet tonnes has not been amended.

Monitors DM5 and DM6 have been relocated by the Licence Holder. Although this was not authorised by DWER, the revised locations of these monitors allow for greater determination of dust generation from open areas.

The relocation of monitors from positions specified in the Licence is not permitted without express authorisation from DWER through licence amendment.

Grounds: Controls applied to the Amended Licence are expected to address total dust emissions, including $PM_{2.5}$, PM_{10} and Total Suspended Particulates. As discussed in section 5.2.2, particles as PM_{10} have formed the basis of DWER's risk assessments, noting that $PM_{2.5}$ size fraction of particles is part of the PM_{10} fraction. A review of boundary monitoring data provided as part of the Dust Control Validation Report (see section 8.5.5) is expected to assist in the determination of effectiveness for managing all dust.

To improve the accuracy of moisture content determination per tonne of ore handled at the Premises, averaging periods have been reduced. Ore moisture is not consistent throughout the product meaning that there may be dry patches that have a higher dust potential. It is possible for each vessel and/or train load to contain two product streams that are separated by rake or vessel hold.

Reporting and management triggers in the Amended Licence are designed to be iterative for the purpose of enhancing the identification of high dust events that are likely to be significantly contributed to by Premises activities. Therefore reporting requirements against throughputs have not been amended.

8.6.5 Dust control validation reporting

The Licence Holder must submit a Dust Control Validation Report to DWER following the installation of two belt wash stations for the purpose of verifying the assumption of 'no net increase' in dust from the Premises.

Note: To reduce the uncertainty identified in modelling, validation monitoring must be statistically rigorous. To be statistically rigorous, multiple measurements must be taken for all ore types handled at the Premises with comparable moisture contents for each ore when

monitored; handling methods and conveyor run rates.

Failure to demonstrate ‘no net increase’ following the introduction of controls will result in the requirement for the Licence Holder to install a third belt wash station.

Grounds: Modelling submitted by the Licence Holder identified that a 70% reduction in dust emissions from conveyor CVR121 was required to achieve ‘no net increase’ in emissions from the Premises when handling up to 70mtpa. Based on the significant uncertainty identified during review of the emissions estimates the validation of the required dust controls, including the installation of a belt wash station at an additional conveyor, is necessary to ensure that DWER’s regulatory objective is being met.

There exist statistical techniques for assessing whether the results of changes to experimental controls are statistically significant or could be explained by chance. The intention of uncertainty assessments is not to dispute the validity of the estimates/validation measurements, but to assist in prioritising efforts to improve the accuracy of estimates, and guide decisions on methodological choice (Hiraishi and Nyemzi, 2001).

8.6.6 Boundary monitoring data review

Boundary monitoring has several important functions. It can be used to measure dust concentrations at the premises, trend data over time, compare data from different locations at the premises in relation to operational dust source emissions, offsite dust emissions entering the premises and background dust levels. The data is also useful to compare with dust concentrations recorded at ambient monitors to explore the relationship between dust levels at the premises and at sensitive receptors. While understanding the limitations of such data analyses, data can provide important insights to inform on site dust management, evaluate the effectiveness of dust controls and to review and optimise current practices of management trigger response protocols.

Conditions have been added to the Licence to include the review of boundary dust monitoring data through a boundary monitoring data review report. The report will examine PM_{10} data from the boundary monitors specified in the Amended Licence over an extended time period which includes pre-, during and post- throughput increase.

Grounds: The boundary dust monitoring data reporting is required to demonstrate that dust controls are effective and that emissions from the premises are not increasing due to the authorised increased throughput. Dust control effectiveness also relies on ongoing maintenance, meaning that a once-off validation of each introduced control is not sufficient to confirm its long term effectiveness.

The information will also verify the setup and location of the monitors with regards to their effectiveness in providing data capturing premises’ dust source emissions, capturing the effects of dust control actions following elevated dust concentration readings and its usefulness for evaluating premises dust contributions to ambient levels.

In addition the review of the monitoring data will support the evaluation of appropriate trigger levels as action criteria and reportable event criteria (see key findings in section 8.1.3).

8.6.7 Administrative amendments

The Licence Holder has complied with conditions requiring the initial application of chemical binding treatments and the submission of the first Revegetation Plan. Therefore redundant conditions have either been removed or, in the case of submitting a Revegetation Plan, amended to require updated plans to be submitted at least three months prior to the commencements of new revegetation trials.

Further reporting requirements have been placed in Schedule 4 for quarterly reporting.

Note: The Licence Holder will be required to continue revegetation trials until rehabilitation of the disused cleared areas is achieved.

Grounds: Additional reporting requirements will further assist with the interpretation of potential dust sources and impacts during high dust risk events as recorded at boundary monitors.

9. Applicant's comments

The Licence Holder was provided with the draft Amendment Report and draft issued Amended Licence on 26 October 2020. The Licence Holder provided comments on 18 November 2020 which are summarised, along with DWER's response, in Appendix 3.

10. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

Based on this assessment, it has been determined that the Amended Licence will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

James Milne

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James Milne
A/ Senior Manager
Industry Regulation (Process Industries)

Delegated Officer
under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text ref	Availability
1.	DER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth.	DER 2015	Available online: www.dwer.wa.gov.au
2.	DER, November 2016. *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.	DER 2016	
3.	Environmental Technologies & Analytics, 2020, Roy Hill 70Mtpa Throughput Increase: Air Quality Modelling Assessment, Version 2. Prepared for Roy Hill, April 2020.	ETA, 2020	DWER records (DWERDT281474)
4.	Government of Western Australia, 2020, Improvement scheme signals new era for Port Hedland's West End, Media Statement from Minister for Planning, Hon Rita Saffioti MLA, 18 September 2020.	Government of Western Australia, 2020	Available online: https://www.mediastatements.wa.gov.au/Pages/McGowan/2020/09/Improvement-scheme-signals-new-era-for-Port-Hedlands-West-End.aspx
5.	Hiraishi and Nyemzi, 2001, IPCC Good Practice Guidance and Uncertainty Management in National Greehnhouse Gas Inventories. Quantifying Uncertainties in Practice.	Hiraishi and Nyemzi, 2001	Available online: https://www.ipcc-nggip.iges.or.jp/public/gp/english/
6.	Lascelles, D., 2000, Marra Mamba Iron Formation Stratigraphy in the Eastern Chichester Range, Western Australia. Published in the Australian Journal of Earth Sciences, August 2000.	Lascelles, 2000	Available online: https://www.researchgate.net/publication/252603420
7.	MinDat, 2020, Roy Hill Mine.	MinDat, 2020	Available online: https://www.mindat.org/loc-247458.html.
8.	Roy Hill Infrastructure Pty Ltd., 2020, Roy Hill Infrastructure – Port Operating Licence Amendment Application – Increase in Export, submitted 8 April 2020.	The Application	DWER records (DWERDT281474)

9.	Roy Hill Infrastructure Pty Ltd., 2020, Email correspondence titled: DWER RFI – Roy Hill increase in throughput application, sent 10 July 2020.	RHI, 2020	DWER records (DWERDT306484)
10.	Roy Hill Infrastructure Pty Ltd., 2020, Revegetation Trial Plan – Port Loop Stage 1 and Stage 2, June 2020.	RHI, 2020a	DWER records (A1933982)
11.	Roy Hill, 2020, Port.	Roy Hill, 2020	Available online: https://www.royhill.com.au/overview/port/
12.	US Environmental Protection Agency, 2007, Emissions Factor Uncertainty Assessment. Office of Air Quality Planning and Standards, February 2007.	USEPA, 2007	Available online: https://www3.epa.gov/ttn/chief/efpac/documents/ef_uncertainty_assess_draft0207s.pdf

Appendix 2: Summary of public authority and stakeholder comment

Submitter	Summary of comment	Department response
Department of Health	The DOH understands that the increase in current capacity will be small, with minimal, if any, increased impact. The DOH supports the requested increase to 70 Mtpa on this occasion given the recommendations of the taskforce are being implemented. Please not that support or approval for future incremental increases will depend on the effectiveness of exposure reduction and dust mitigation strategies.	Noted.
Pilbara Development Commission	Following consideration of the application, the Commission provides its support, subject to there being no net increase in the environmental impacts (including PM10, PM2.5, or noise) on the residential community of Hedland (including residents in Port Hedland, South Hedland, Redbank, Wedgefield) and other surrounding areas.	Noted.
Town of Port Hedland	The Application is supported by Council.	Noted.
Department of Planning, Lands and Heritage	The Department of Planning, Lands and Heritage raise no objections to the proposal subject to Roy Hill complying with all environmental approvals in Port Hedland granted under the *Environmental Protection Act 1986*, in particular, the company's ongoing responsibilities to manage emissions.	Noted.
Public stakeholder submitter #1 and 2 (summarised)	Iron ore exports from Port Hedland have generated significant dust since the commencement of operations in the 60s and 70s. Export volumes have increased more than thirty-fold since then.	Export tonnages through Port Hedland have increased significantly over the previous decade. However, a clear correlation between the amount of materials exported and ambient PM_{10} concentrations is not evident from the available monitoring data. This may be in part due to the ongoing improvements to ore handling methods and

Submitter	Summary of comment	Department response
		additional dust controls implemented by port operators since the commencement of operations. DWER notes that the 2018/19 period was a high dust year for all ambient monitors, including background monitors. Due to a range of other contributing factors, such as seasonal conditions and multiple, variable non-industrial sources, the level of dust recorded at each monitoring station will fluctuate over time. These fluctuations make clear source attribution difficult to determine.
	The data of the HRA are out of date and inaccurate as studies did not consider human safety. The AGV is set at the wrong location and targets have been arbitrarily set.	DWER looks to the Department of Health for advice on appropriate health guideline values as the lead agency for public health matters in Western Australia. The Department of Health's Port Hedland Air Quality Health Risk Assessment for Particulate Matter concluded that the nominated air guideline value for particulate matter (PM_{10}) of 70 µg/m^3, averaged over 24 hours, was appropriate based on the composition of dust, the size of particles and the population size. Note that the air guideline value of 24-hour PM_{10} of 70 µg/m^3 (excluding natural events) continues to apply to all residential areas of Port Hedland.
	Reports to date have had no focus beyond potential health issues. Impacts to amenity have not been considered.	Controls applied to the Amended Licence for the protection of human health based on a risk assessment against the air guideline value of 24-hour PM_{10} of 70 µg/m^3, are also expected to be protective of amenity. Noting the subjective nature of amenity values, the department considers public health to be of higher sensitivity than amenity values.
	If current dust levels cannot be controlled how can an increase in production which will ultimately lead to an increase in toxic emissions be authorised?	It is the Department's position that applicants wishing to expand their operations will need to demonstrate that emissions and discharges have not increased as a result of their proposal, and the current risk is not increased.

Submitter	Summary of comment	Department response
		While the Licence Holder has demonstrated this through modelling, additional controls have been placed on the Amended Licence to address any uncertainty identified within this Decision Report and ensure no net increase in dust from the Premises is achieved.
	Applications need to be suspended until all stakeholders which includes all property owners in Port Hedland are fully aware of the missing data to dust readings for the West End regarding the compromised Taplin Street monitoring station.	The detailed analysis and interpretation of ambient monitoring data needs to be by a suitably qualified professional in the field of air quality science. The monitoring station at Taplin St is only one measure of dust impacting Port Hedland and other monitoring stations must also be analysed to determine the true levels of dust throughout the township. DWER is progressing with the takeover the ambient air quality monitoring network in Port Hedland.
	Rezoning land and the Port Hedland Voluntary Buy-back Scheme are not appropriate solutions to an environmental or health issue.	The Department of Water and Environmental Regulation has two key roles in the strategy, being the takeover of the ambient air quality monitoring network and the development of a dust management guideline for bulk or handling in Port Hedland. Both of these initiatives are well progressed. The Department's community updates page has further detail of our role in Port Hedland (www.dwer.wa.gov.au/port-hedland). The State Government is committed to ensuring that potential environmental impacts on the health of the Port Hedland community are managed, while balancing the interests of industry, business and other landowners. Implementation of the draft Port Hedland West End Improvement Scheme No. 1, the Port Hedland Voluntary Buyback Scheme and the ongoing environmental regulation of port industries are all complementary strategies as part of industry and government responsibility for environmental management.
	There is increased noise from additional helicopters.	Noise from helicopters, trains and emergency/safety alarms are excluded from the Noise Regulations and therefore beyond the scope of this assessment.

Appendix 3: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of Licence Holder Comment	DWER Response
2b	Roy Hill believe this condition is not worded appropriately and doesn't meet the intent of the condition. It should be updated to reflect that the Licence Holder is permitted to load up to a maximum 70mtpa only after the infrastructure has been installed.	Noted. Wording amended to note that the Licence Holder is authorised to load up to 60Mtpa currently, and up to 65Mtpa and 70Mtpa only after the installation of one additional belt wash station with each throughput increase per Licence Holder comments below.
4	Roy Hill request that the reporting limit is increased to 270,000 tonnes to align with the increase to 70mtpa. Retaining the limit at 240,000 wet tonnes of Iron Ore per day will inadvertently require a higher level of reporting which would be considered unnecessary on the basis of the modelling and impact assessment respectively completed by Roy Hill and DWER.	Noted. The intent of this reporting requirement is to improve the understanding of how days of greater throughput may be impacting dust emissions from the premises. Current reporting rates are not frequent enough to assist with achieving this intent. Over time it may be determined that Roy Hill's daily throughput rates are not correlated to dust impacts, at which time this reporting requirement may be reconsidered. This condition is a reporting condition only and does not impact production. No changes made.
8, Table 2, Row 1	Roy Hill only record average moisture content per train and not per rake. However, should the train carry both a lump and fines cargo, an average moisture content for each cargo will be provided. As such, Roy Hill requests Column 3 of this row, remain "Averaged for each train".	Noted. Condition amended to acknowledge that there may be two ore types per train load.

8, Table 2, Row 2	Roy Hill does not currently record moisture data from moisture analyser against vessel hold loaded. Averaged moisture data from specific vessel hold should not be different to averaged moisture data from ships as product loaded onto a vessel comes from the same (one) stockpile (as opposed to other sites whereby ships are loaded from different ore types coming from different stockpiles). Where a single ship is loaded with both lump and fines product, Roy Hill will record the average moisture content of both products. Roy Hill requests column 2 of Table 2 to be reworded to allow data from the automated sample station to be used instead of the moisture analyser as this is currently recorded against each vessel hold and achieves the intent of the proposed condition.	Noted. Measuring ore moisture per ship load does not allow for the identification of variation in moisture content, which is evident based on online moisture analysis at inload. To improve confidence that all ore has a moisture content above the DEM level, the averaging period has been shortened to per vessel hold loaded. This is an increase in frequency of the averaging period, to the current approved licence which is per ship loaded.

13, 17	Section 8.1.4 of the decision report indicates '*It is unclear how the Licence Holder has confidently determined that the installation of a belt wash station would reduce dust emissions from conveyor CVR121 by 70%, as input into the dust model*"; however, within its application Roy Hill provided reference to previous studies undertaken by PHIC recommending an 80% reduction from belt wash stations. See page 13 of Appendix 5 of the application for details. Since the recommended reduction is based on studies undertaken in similar iron ore handling facilities it is reasonable to expect the same level of reductions. Notwithstanding this information, Roy Hill has considered a conservative assumption for emissions estimations of 70%. Additionally, a recent DWER decision report from September 2020 for licence L8194/2007/3 acknowledges that belt wash stations can achieve dust reductions between 66% and 97% based on field investigations undertaken at an iron ore handling facility in Port Hedland. In this circumstance we understand that the proponent's modelling assumed that a 75% reduction could be achieved by a belt wash station. Based on investigations undertaken by third parties and DWER's recent assessment and approval of a similar operation in Port Hedland, Roy Hill is confident that the 70% reduction represents a conservative approach. Figure 3 of the Decision Report shows that the current dust emissions of conveyor CVR162 (conveyor currently installed with a BWS) are consistent with the expected reductions from CVR121, following installation of the BWS. In addition, Roy Hill currently has a Belt Wash Station installed on CVR122. Further, the levels of dust emissions from both CVR122 (Current) and CVR121 (with BWS) are consistent with the modelled emissions from conveyors with BWS proposed to be installed on licence L8194/2007/3. Nevertheless, Roy Hill requests that Table 3 in condition 13 is amended to require one belt wash station at CVR121 to be installed to reach a throughput of up to 65mtpa; and a second belt wash station to be installed on an additional conveyor that does not yet have a belt wash station installed prior to exceeding 65mtpa and up to 70mtpa throughput.	Noted. Roy Hill's modelling predicted that installing a belt wash station on only CVR121 could achieve a 70% reduction in dust emissions from that conveyor, DWER considers that there is a significant degree of uncertainty around this assumption and consequently requires the installation of a second belt wash station to achieve the equivalent of a 70% reduction at CVR121, through combined emission reduction from installing a belt wash stations on two conveyors (CVR121 plus one other). Condition 17 has been amended to require demonstration of an equivalent of 70% reduction in the dust emissions from CVR121, by installing two belt wash stations in accordance with Condition 13, rather than a 35% reduction at each. As discussed in the Decision Report for L8194/2007/3, while it is known that belt wash stations can be effective at reducing dust emissions, the extent of their effectiveness has not been verified. DWER has never been provided with the data to verify claims made by Port Hedland port operators. *"Based on the limited availability of data related to how the model was produced, DWER was not able to replicate calculations and therefore could not verify, with confidence, the conclusions of the model."* Similar conclusions have been made within this Decision Report and are elaborated upon within section 8.1.4. The requirement to install a belt wash station at conveyor CVR122 has been removed, with the Licence Holder now required to select a second conveyor at which to install further dust controls. The Licence Holder should target a

	In addition, Roy Hill requests that row 2 in Table 3 be amended to require a belt wash station be installed on an alternative conveyor that does not yet have a belt wash station installed. Also condition 18 should be amended to reflect updated CVR numbers as follows: *In the event that the Dust Control Validation Report required by Condition 17 does not identify a calculated average of at least 35% reduction in dust emissions from each of CVR121 and* ***an additional alternative conveyor*** *following operation of belt wash stations, the Licence Holder must install a belt wash station* ***on an additional conveyor that does not yet have a belt wash station installed*** *within 6 months of the date of submission of the report.*	conveyor that has elevated dust emissions, for example conveyor CVR105.
20	Averaging data from DM1, DM2, DM3 and DM4 over 10 minute periods is not possible using BAM1020 data since this monitor measures data every hour only. Roy Hill would need to use data from the real time module sensors installed in these monitors to meet the 10 minute averaging period; however, this data does not comply with methods specified in column 5 of Table 4. Roy Hill request that DWER update this condition to either use 10 minute averaging	Agreed. As real time module sensors (10-minute) attached to BAM1020 monitors do not have a recognised monitoring standard associated with their operation, the suggested amendments have been made.

	period and remove the methods specified, or apply one hour average period and retain the methodology specified.	
21 – Table 5	Row 2 – Reportable Events Criteria wind direction (between 205° and 250°) doesn't match the Row 2 Management trigger criteria (between 210° and 250°). Also, no justification has been provided in the decision report for the addition of DM1 to Table 5. Roy Hill requests to remove DM1 (remove Row 2) as there is no wind arc relevant to the port facility that would require Roy Hill to undertake management actions. Row 4 – Roy Hill believe this is not a practical management trigger criteria as wind direction information is not available to port personnel for each ten minute period when they are at the wharf. In addition, should visible dust be identified, minimal additional management measures could be applied at this location. As such, this condition will be difficult to comply with and have little additional value. In addition, the proposed wind arc is not aligned with other wind arcs proposed in Table 5. As such, Roy Hill requests this be removed from the table and condition 22 updated accordingly. Footnote "Note 1" of Table 20 should be updated to reflect how this data would be received upon handover of the management of the monitors from PHIC to DWER.	Noted. Trigger events against DM1 have been removed due to its location beyond the pathway between the Premises and receptors. DWER does not accept that the Licence Holder does not have the ability to control visible dust from the berth when generated. The South West Creek Berths are the closest source of dust to Port Hedland receptors and the Licence Holder must therefore respond to high dust events at this location. Proposed wind arcs for dust identified at the South West Creek Berths have been set based on the larger arc of influence associated with being closer to the Port Hedland receptors. No changes made to this row for the reasons stated. A footnote has been inserted to acknowledge that data will be obtained from DWER once in control of the ambient monitoring network.

29, 30	Roy Hill believe that this condition is unnecessarily confusing and does not acknowledge work completed in accordance with this condition under the previous licence amendment. Roy Hill submitted a Revegetation Plan on 5 June 2020 noting that upon determination of the successful trial treatment Roy Hill will implement the chosen rehabilitation technique over the Stage 1 and Stage 2 areas in consultation with DWER and submit a revised Revegetation Plan. Roy Hill proposes that current condition 28 and 29 be replaced with a condition such as: "*submit a revised revegetation plan once the outcomes of the trails described with the Plan submitted on 5 June 2020 are understood and the most appropriate methodology for rehabilitation of the remaining Stage 1 and Stage 2 areas is confirmed.*"	Noted. DWER notes the works undertaken to rehabilitate the Stage 1 and 2 areas. Conditions have been amended to remove ambiguity around the expected information to be provided to DWER. Proposed conditioning does not satisfy the requirements of DWER's published *Guidance Statement: Condition Setting*, requiring conditions to be clear, final and certain. No changes made.
32	Roy Hill kindly request the removal of "or" as the wind direction could be within the specified arc; however, at a very low speed, in which case works could continue with no risk of impact to sensitive receptors. As per below: *The Licence Holder must cease all reclamation of Dead Ore Stockpiles during Strong Wind Conditions and~~/or~~ where average wind directions are between 180^{o} and 300^{o} for three or more ten minute periods during the hour.*	Noted. DWER notes that the risk of dust from port operations impacting receptors can be greater during low wind conditions due to the limited ability for dust to disperse. However, DWER acknowledges the difficulty in determining the true wind direction at low wind speeds and has therefore amended the condition to acknowledge that wind speeds must be greater than 4 m/s for the condition to apply.
Definitions – Dead Ore Stockpile	This definition has been updated to "*any stockpile that is not reclaimed by the bucketwheel reclaimer REC1*". Roy Hill request that this be refer to "*any iron stockpile greater than 50,000m3 and/or 12 metres in height above ground level that has been stacked and not reclaimed by the bucketwheel reclaimer REC1.*" This would ensure consistency with other bulk handling licences in Port Hedland.	Noted. The key difference between static stockpiles and dead ore stockpiles is the method of handling. The use of mobile reclaiming equipment is likely to generate greater dust when compared to a fixed reclaimer. DWER notes that condition 32 matches commitments made be the Licence Holder in its application. Note that the definition for "Static Stockpiles" has been amended to be consistent with other bulk handling licences located at similar distance to sensitive receptors.

Definitions – Vessel Hold	Condition 8 refers to vessel hold; however, no definition is provided for this term. Roy Hill request the following definition be included in the licence: *Internal Compartment where cargo, prescribed goods or otherwise, can be stowed and carried*	Accepted.
Definitions – Annual Period	Roy Hill respectfully request this annual period be changed to 1 January to 31 December each year. This will reduce confusion across the business with different licence periods whilst also ensuring consistency with other Roy Hill licences and other Port Hedland bulk handling licences (i.e. L8194/2007/1).	Accepted. The next annual report will need to cover the full annual period 1 January to 31 December 2020, meaning that some overlap will exist with the report submitted September of this year.
Schedule 2, Table 9, Row 3	Roy Hill respectfully requests an update to stockyard infrastructure to reflect the following: *"Stockyard including 2 live stockyard canyons (STKWE 2 and STKWE 3) and 2 dead stockyard canyons 9STKWE1 and STKWE 4).* Suggest removal of reference to 14 stockpiles of 230,000 tonnes as number of stockpiles and capacity may change due to operational needs. Row 4 should be updated to state only rail mounted stackers (STK1 and STK2).	Noted. The addition of new stockpiles is not authorised as this would result in additional dust sources without risk assessment and subsequent licence amendment in accordance with s.53(1) of the EP Act. DWER has removed reference to the approximate tonnage per stockpile as this may increase under this amendment for throughput expansion. Note that additional stockpiles was not a consideration of modelling provided. Row 4 amended.
Schedule 3, Table 10, Row 1 and 2	Roy Hill respectfully request that DWER update column 3 to state "Sprays operated as required during Iron Ore stacking/reclaiming to reduce visible dust". Due to the already very high moisture content of Roy Hill ore, the use of sprays during stacking and reclaiming can just add moisture and result in a stickier ore product and bring the ore moisture closer to the transportable moisture limit (TML). We refer DWER to the data presented during our recent virtual tour and subsequent site visit which confirms the excessively wet nature of our product. Due to the high moisture of our product minimal dust is generated from stacking and reclaiming.	Noted and partially accepted. While fines ore does consistently have a moisture content above the DEM level, as demonstrated in Figure 7 of this Decision Report, lump ore does not exceed this benchmark as significantly. In addition, lump ore has the ability to break up and generate dust as witnessed by DWER officers during a site visit on 19 October 2020. Therefore Table 10, column 3 conditions have been changed to require the operation of sprays at stackers and reclaimers only when lump ore is handled.

Schedule 3, Table 10, Row 10	Column 4 states “DM5 and DM6 (not shown as they are mobile)”; however, they are depicted in Figure 2. Kindly ask DM5 and DM6 be removed from Figure 2.	Noted. As DM5 and DM6 are appropriately located to determine the contribution of key dust sources (open areas) at the Premises, these have not been removed from the Licence. Dust monitors DM5 and DM6 also have management triggers associated.
Schedule 3, Table 10, Row 11	Roy Hill request the approval to discharge sediment laden water from belt wash stations to the sedimentation ponds. Due to the proposed installation of two new belt wash stations, disposal of water to the sedimentation basins provides a relatively consistent water source to these open areas. Roy Hill will regularly clean out the solids from the sedimentation basin and place back into the stockpile area. It is expected that each of the two new belt wash stations would require a minimum of 3.2m^3 of water per hour. Given the volume of water to be disposed to the sedimentation basin, it is unlikely the basin would approach the “point of drying”. This will ensure that these locations are unlikely to provide an additional dust source from our operation. The risk of hydrocarbon contamination of this water is negligible since there are no sources of hydrocarbons on the scrapers or sprays. Results from sampling of existing BWS have been undertaken and are attached.	Noted and accepted based on additional information provided demonstrating negligible hydrocarbon content of belt wash water and the Licence Holder’s proposal to address any potential future dust source by regularly removing sediment build up.
Section 8.1.2 from Decision Report	Roy Hill can confirm that the moisture content readings from September 2018 to April 2020 were based on online moisture analyser readings, which were subsequently validated by samples analysed from the automated sample station.	Noted.
Section 8.1.2 from Decision Report	Roy Hill clarifies that ore is wet at outload conveyors to reduce material handling issues caused by stickiness of product (due to high moisture content) and reduce carryback from conveyors. Roy Hill does not pump water out of the base of vessel hold, this is undertaken by Roy Hill customers.	Noted. Clarifying words added to state that this is undertaken by the ship operator.
Section 8.1.3 from	Roy Hill’s dust extraction unit utilises a filtration circuit. Polyester based sleeves fit into a set of cartridges that are pulsed with compressed air on a regular basis, causing the dust to fall into a collection chamber. The pressure across this	Noted. Clarifying text added.

Decision Report	filtration circuit is monitored to ensure it continues to function effectively. The filter media does not typically require replacement as it is rejuvenated by the pulse cleaning system. The nomenclature utilised by the vendor of the unit is a “Reverse Pulse Bag Filter Dust Collector”.	

Attachment 1: Amended Licence L8967/2016/1