Amendment Report

Application for Licence Amendment

Part V Division 3 of the *Environmental Protection Act 1986*

Licence Number	L4513/1969/18
Licence Holder	BHP Iron Ore Pty Ltd
ACN	008 700 981
File Number	DER2013/001083
Premises	BHP Iron Ore Port Operations Nelson Point and Finucane Island Nelson Point Lease LGEI123403, Goldsworthy Rail Lease LGE J998591, Finucane Island Loop LGE I126342, Finucane Island Lease LGE J998595, PACE Wharf Lease K693809L, Utah Jild Lease K693814L, Harriet Point Lease K693808, Nelson Point Wharf Lease LGE I123400, Under Harbour Tunnel Lease K693815L, Finucane Island Substation Lease LGE G946533 PORT HEDLAND WA 6721 As defined by the coordinates in Schedule 1 of the Revised Licence
Date of Report	6 September 2021
Decision	Revised licence granted

Ed Schuller

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Ed Schuller
Director, Industry Regulation

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

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1. Decision summary

Licence L4513/1969/18 is held by BHP Billiton Iron Ore Pty Ltd, now BHP Iron Ore Pty Ltd (Licence Holder) for the BHP Iron Ore Port Operations (the Premises), located at Nelson Point and Finucane Island, Port Hedland.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during the operation of the Premises. As a result of this assessment, Amended Licence L4513/1969/18 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this Amendment Report, the department has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary

On 18 June 2020, the Licence Holder submitted an application to the department to amend Licence L4513/1969/18 under sections 59 and 59B of the *Environmental Protection Act 1986* (EP Act). This amendment is limited only to an increase in authorised throughputs for category 58 activities from 290 million tonnes per annual period (Mtpa) to 330Mtpa. No changes to other provisions of the existing Licence relating to Categories 5, 54, 61 and 73 have been requested by the Licence Holder (Table 1).

Table 1: Approved design or throughput capacity under the Reviewed Licence

Classification of Premises	Description	***Requested premises design capacity or throughput***
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.	155 million tonnes per annual period (no change)
Category 54	Sewage facility: premises — (a) on which sewage is treated (excluding septic tanks); or (b) from which treated sewage is discharged onto land or into waters.	260.9 cubic metres per day (no change)
Category 58	Bulk material loading or unloading: premises on which clinker, coal, ore, ore concentrate or any other bulk granular material (other than salt) is loaded onto or unloaded from vessels by an open materials loading system.	***330 million tonnes per annual period*** ~~290 million tonnes per annual period~~

Category 61	Liquid waste facility: premises on which liquid waste produced on other premises (other than sewerage waste) is stored, reprocessed, treated or irrigated.	8,000 tonnes per annual period (no change)
Category 73	Bulk storage of chemicals etc.: premises on which acids, alkalis or chemicals that — (a) contain at least one carbon to carbon bond; and 1 000 m^3 in aggregate (b) are liquid at STP (standard temperature and pressure), are stored.	63,336 cubic metres in aggregate (no change)

2.2.1 Proposed infrastructure changes

New infrastructure and infrastructure upgrades will be required to increase throughput capacity to 330Mtpa. These include route upgrades and productivity initiatives to allow for greater throughputs through existing ore transport routes.

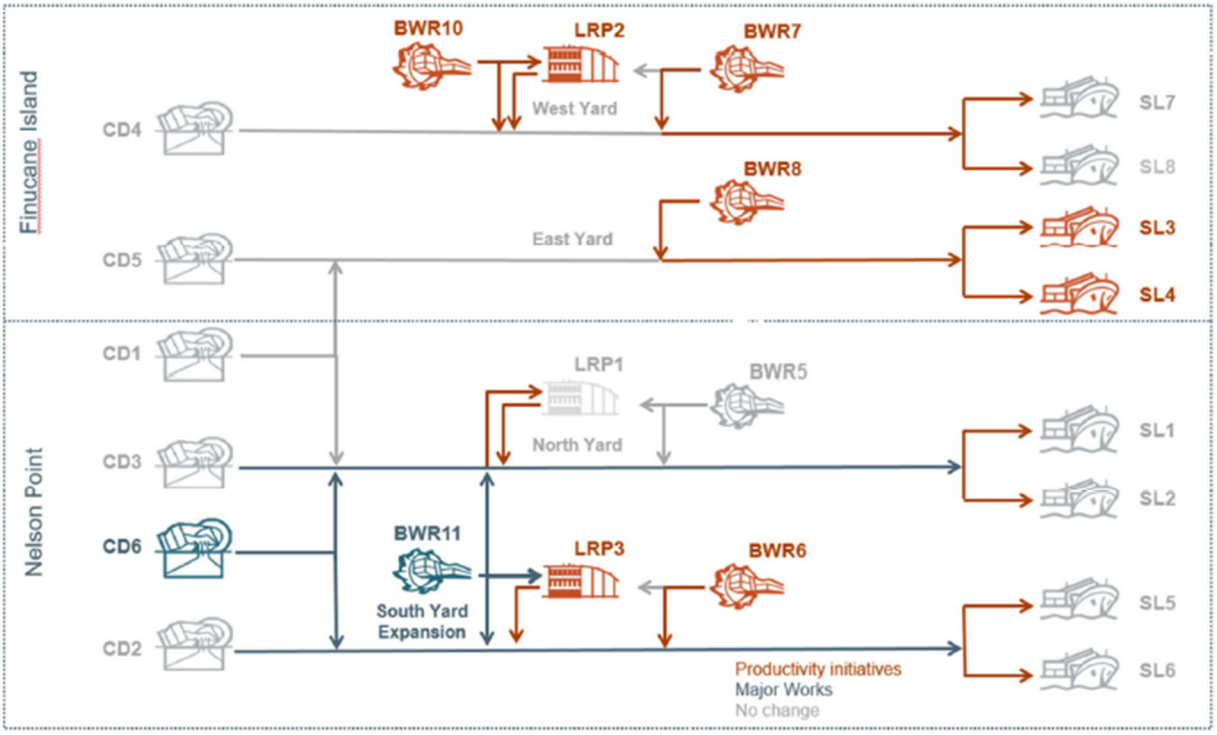


Figure 1: Overview of proposed infrastructure changes

Productivity initiatives at Finucane Island and Nelson Point are largely derived from increases to conveyor drive sizes to improve belt speeds at bucketwheel reclaimers and along shiploading routes, Lump Rescreening Plant 2 upgrades and replacement of Ship Loader 3. Specifically, works include:

- Bucket Wheel Reclaimer 6 (BWR6) Hydraulic Drive and Route upgrades (Nelson Point);
- Upgrade to Ship Loader (SL) 5&6 at 13,500 tonnes per hour (tph) (Nelson Point);
- BWR7 Hydraulic Drive and Route Upgrade to SL7&8 (13,500tph) (Finucane Island);
- BWR8 Hydraulic Drive and Route Upgrade to SL3&4 (13,500 tph) (Finucane Island);
- Upgrade route BWR10 to SL7 and SL8 (via LRP2 to 18,000tph) (Finucane Island);
- LRP 2 upgrades to 18,000tph (Finucane Island);

- Upgrade route from CD3 to SL1 and SL2 (via P730) to 15,400tph (Nelson Point);
- Replacement of Ship Loader 3 (Finucane Island);
- Upgrade DTS route to SL3 to 13,500tph (Finucane Island); and
- Upgrade route from BWR8 to SL3 to 13,500tph (Finucane Island).

Major works proposed at Nelson Point to enable throughput capacity increase are presented in Table 2.

Table 2: Summary of works at Nelson Point

Project/Location	Summary of works
Major Works South Yard Expansion – Stage 1 (SYE1)	• New stockpile (F area) in South Yard at Nelson Point • New reclaimer 11 (BWR11) at 15,400 (tph) to SL5 & 6 • New reclaimer 11 (BWR11) at 14,500tph feed rate to LRP3 • New reclaimer yard conveyor (P773 and Transfer Stations) • Upgrade existing Stacker (ST6) to 16,000tph • Upgrade inflow conveyors from car dumper 2 (CD2) and CD3 to STK6 to 16,000tph • Upgrade LRP3 to 14,500tph feed rate from BWR11 • Upgrade LRP3 feed conveyors to 14,500tph
Major Works South Yard Expansion - Stage 2 (SYE2)	• New stockpile (X area) in South Yard at Nelson Point • New Stacker (STK14) at 20,000tph • New conveyors and associated transfer stations from CD2 and CD3 to new STK14 • LRP 3 upgrades to 18,000tph
Major Works Car Dumper 6 (CD6)	• New Car Dumper 6 • CD6 to Stackers SY (STK6, STK7, STK14) • CD6 to Stackers NY (STK5, STK8) • CD6 via conveyor P238 to SL1, SL2 • New Sample station for P238 (SS238)
Major Works SYE2 & CD6 shared scope	• New route from CD2, CD3 and CD6 to SL5 & SL6 (P218) • New sample station for P218 route (SS218) • New route connection (P729 & P774) from BWR11 to SL1, SL2, SL5 & SL6 via P218, P238 & P730 conveyors • Modify and upgrade A & B berth conveyors and SL1 & SL2

2.3 Previous upgrade works

In 2015 the Licence Holder was granted a works approval (W5792/2015/1) to implement the Inner Harbour Debottlenecking Project comprising of a number of route upgrades and capital

works to increase the Premises throughput capacity from 270 Mtpa to 290 Mtpa. Certain major capital works proposed under the works approval were deferred in favour of additional productivity based initiatives, in addition to minor capital works, to support the increase in throughput capacity up to 290 Mtpa. The remaining works that were to be executed under the works approval were completed in May 2020.

2.4 Port Hedland Dust and Noise Management Taskforce

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.

2.4.1 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 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 to all residential areas in Port Hedland; 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 the four key Government-endorsed recommendations summarised below:

- Reviewing all port premises licences, applying a consistent and risk-based approach to the regulation of dust for each premises;
- Developing and implementing a dust management guideline for bulk handling port premises;
- Taking over control of the operation and maintenance of the Port Hedland ambient air quality monitoring network; and
- Working with industry to explore the feasibility of approvals under Regulation 17 of the *Environmental Protection (Noise) Regulations 1997*, where the prescribed noise standard cannot be met by individual premises.

The second part of the Government's broader position on dust management relates to 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 2) has been gazetted by the McGowan Government (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 to prohibit sensitive land uses and restrict population growth (Government of Western Australia, 2020; DJTSI, 2018).

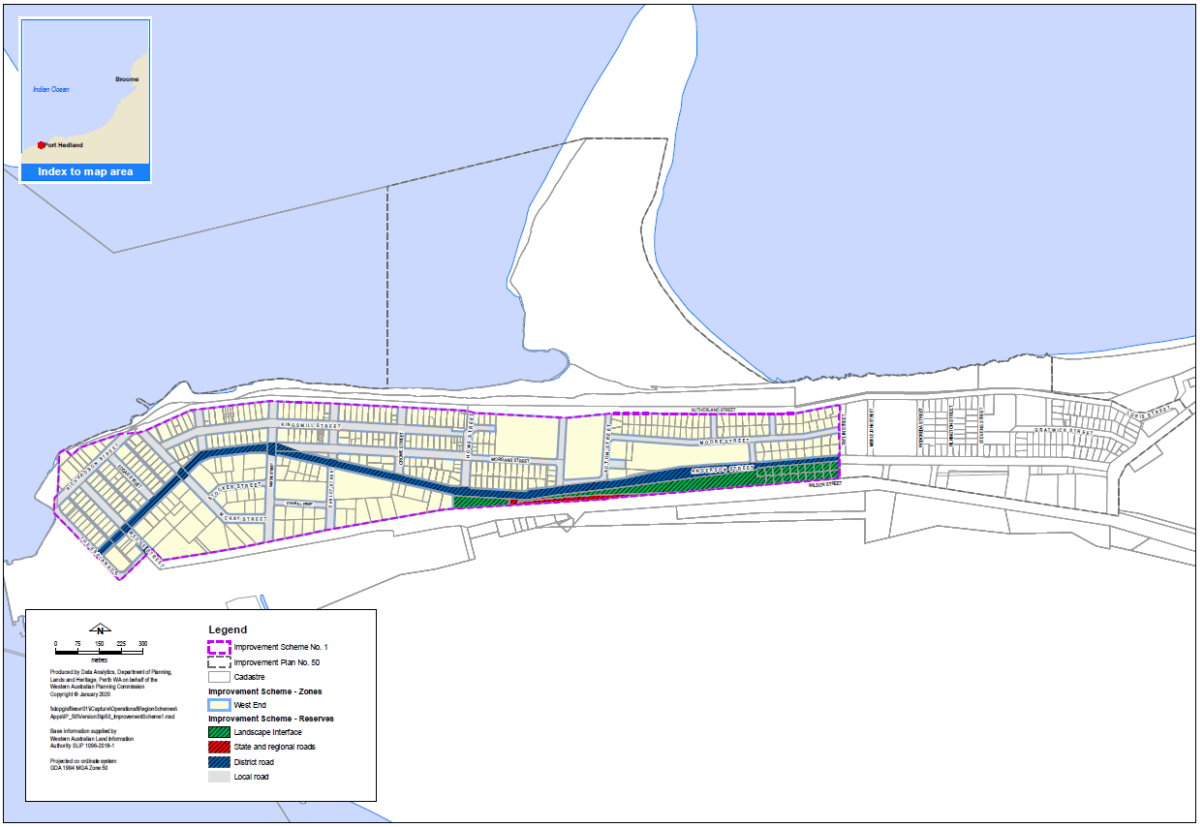


Figure 2: Port Hedland West End Improvement Scheme No. 1 (Source: DPLH 2020)

In August 2019, the Government introduced the concept of an industry-funded voluntary buyback scheme for Port Hedland. The 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 Scheme. The Port Hedland Voluntary Buyback Scheme is administered by the Hedland Maritime Initiative.

2.4.2 Port Hedland Regulatory Strategy

In May 2021, the Department released its Port Hedland Regulatory Strategy. The Strategy outlines how the Department will regulate in the context of Port Hedland and implement the Government's response to the 2016 Port Hedland Dust Taskforce Report.

The Department's stated objective is to:

> ***"Ensure that dust emissions from premises licensed under the EP Act are not increased in the short term. And, that following the introduction of dust management controls from the Dust Management Guideline, impacts are reduced to the lowest practicable level across the whole Port Hedland peninsula to at a minimum meet the air guideline at and to the east of the Taplin Street monitor"***

The Department will attempt to achieve this objective via the use of both short- and medium-term strategies. In the short term:

- *The department expects industry to achieve reductions in prescribed premises dust emissions, which will in turn produce measurable reductions in ambient dust levels (not simply reduce the number of air guideline value exceedances) across the entire Port Hedland peninsula, and in particular the West End.*

- *The department, by virtue of the transfer of the ambient monitoring network, will display clear and transparent information relating to ambient dust levels in real time. As per the current situation, a detailed analysis of the dust impacts in the greater Port Hedland area will be published on an annual basis by the department.*

- *The Dust Management Guideline Review will inform future decisions on the ongoing effectiveness of industry regulation for consideration by government.*

- *The department will have adequate information about both the emissions (from port operators) and impacts to the environment and community to inform government direction on the ongoing approach in Port Hedland.*

Ahead of the implementation of the Dust Management Guideline, the Department has set a clear position for port operators, 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 (as defined in Guideline: Risk Assessments) is not increased.

The position will allow the introduction of the Dust Management Guideline to potentially reduce the impacts of dust in the short-term timeframe. The Port Hedland Dust Management Strategy is a critical outline of the Department's approach to regulating dust in Port Hedland and should be read alongside this decision.

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

Key findings: The Delegated Officer notes that:

- DWER has published the Port Hedland Regulatory Strategy to provide a clear and concise overview of the Department's regulatory approach in Port Hedland.
- The Delegated Officer notes the Regulatory Strategy provides clear direction on how the Department will utilise the 24-hour PM_{10} target of 70 $\mu g/m^3$ (excluding natural events), hereafter referred to as the AGV, in the context of its assessment.
- 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.
- The Delegated Officer notes 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.

3. Consultation

On 20 July 2020, DWER advertised the Application in *The West Australian* newspaper and in the *North West Telegraph* on 22 July 2020. DWER also notified public authorities that are actively involved in the implementation of Government-endorsed recommendations and direct interest parties that have been identified through previous correspondence with the department.

Following stakeholder requests the consultation period was extended from 10 August 2020 to 2 November 2020. A summary of comments and DWER responses is provided in Appendix 2 to this Amendment Report.

4. Air quality

4.1 Ambient air quality monitoring

Ambient air quality monitoring is undertaken at Port Hedland through a number of monitoring stations within the Town of Port Hedland shown in Figure 3. Monitoring is currently coordinated through the Port Hedland Industries Council (PHIC) and real-time monitoring is reported on PHIC's website. The AGV (PM_{10} - 70 µg/m^3 with a 24 hour averaging period, calculated from midnight to midnight) applies to all residential areas of Port Hedland. Previously, the AGV was applied to Taplin St, located on the eastern border of Port Hedland's West End, as the 2016 Taskforce Report concluded that was the most appropriate boundary for limiting residential land use.

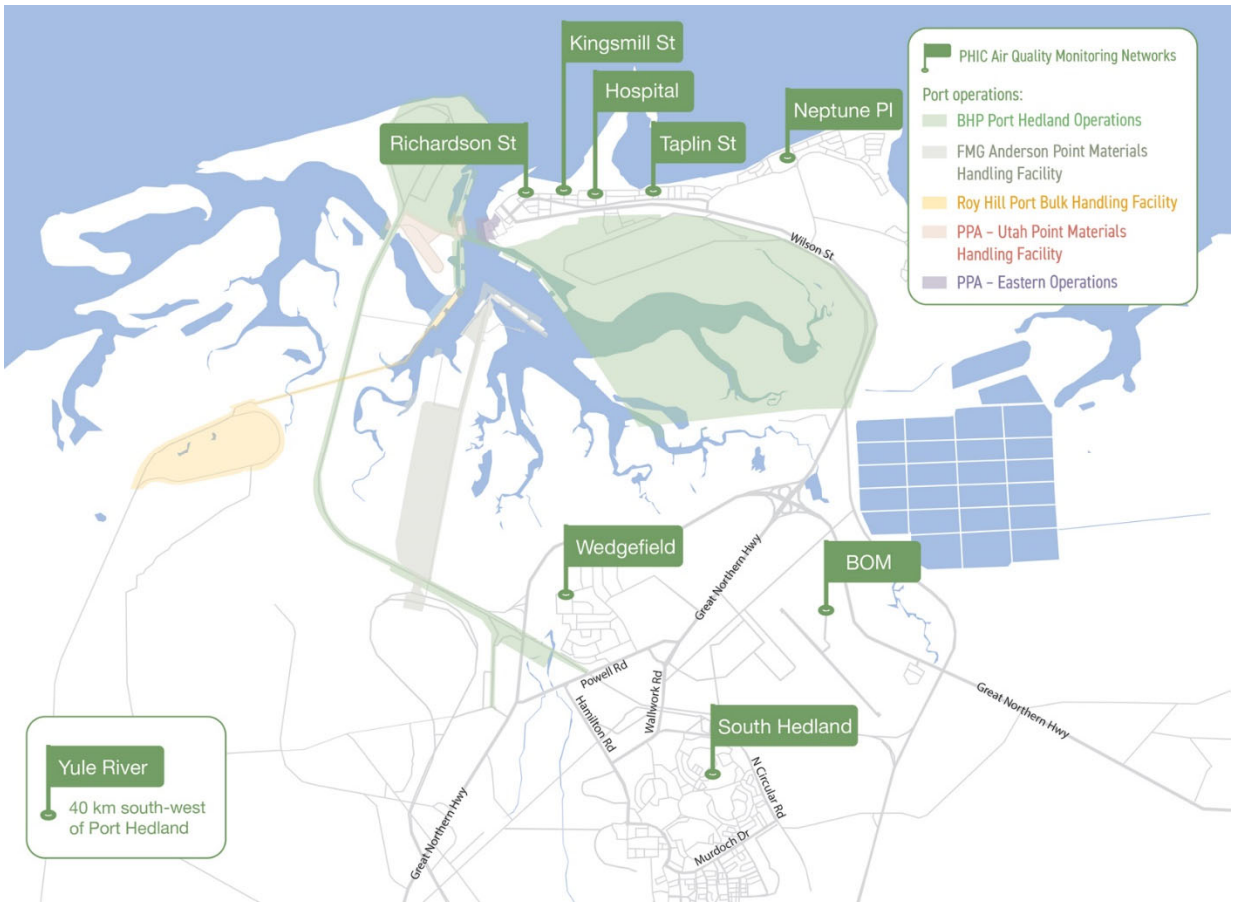


Figure 3: Ambient monitoring network

The PHIC annual report containing the monitoring data for the 2018/19 period was submitted to DWER on 13 November 2019. The report claimed that for the first time since monitoring commenced there were no exceedances of the AGV at Taplin St. However, monitors both west and east of Taplin St reported an increase in the concentrations of PM_{10} and exceedances of the AGV during the 2018/19 period while a large reduction in concentrations at Taplin St were recorded.

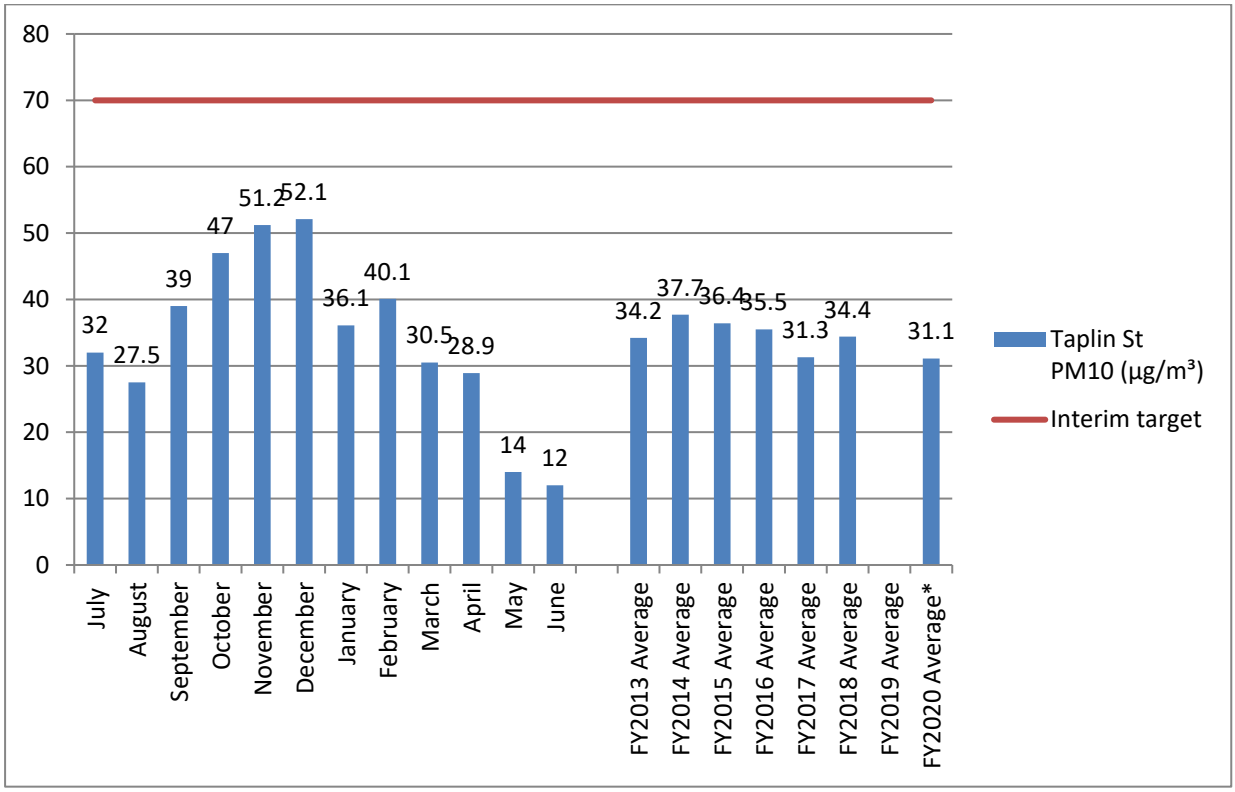
On the 3 February 2020, PHIC confirmed that the Taplin St monitor was likely to contain equipment faults. DWER's analysis confirmed that the Taplin St monitor had been recording inaccurately and under-reporting actual dust levels and that data is likely to have been affected from April 2018.

PHIC has subsequently re-published its 2018/19 annual report, retracting all references to Taplin St data. The monitor was replaced in January 2020 and PHIC has advised that the

monitor is now considered to be recording accurately.

4.1.1 Seasonal variation

In order to demonstrate seasonal variation of average daily PM_{10} concentration at Taplin Street each month, the 2017/18 annual period is shown in Figure 4. Monthly data from the Taplin Street monitor for 2018/19 was reported as being 23.8 µg/m^3 in PHIC's annual report. This was later identified as inaccurate due to equipment fault (see section 4.1.2). Taplin Street data from the 2018/19 period is not presented in any of the figures below.



* FY2020 average data is based only on that collected between 1 January 2020 and 30 June 2020

Figure 4: Average daily PM_{10} concentration at Taplin Street (BHP 2018; PHIC 2020)

As shown in Figure 4 there is a wide seasonal variation over the 2017-18 annual period for dust concentrations. The lowest daily averages for PM_{10} are typically recorded in the months May to August, and the highest recorded in summer months (November to March). The FY2020 average 24 hour PM_{10} concentrations represented in Figure 4 are based on data from the months of January to June and may not accurately represent the annual average.

While average dust concentrations recorded at the faulty Taplin Street monitor decreased significantly, this trend was not observed at other ambient monitors in Port Hedland, including those located further away from key industrial sources. All other sites recorded an annual PM_{10} concentration increase of 31% from the previous year while a 29% decrease was recorded at Taplin Street. Based on data trends recorded from monitors further away from industrial sources, it is probable that the Taplin Street location also experienced higher PM_{10} concentrations on the previous years.

4.1.2 Ambient air quality exceedances

A summary of Taplin Street AGV exceedances for annual periods based on available data are provided below.

- 2012-2013 period – 17 exceedances of AGV at Taplin Street monitoring station with two reported to be attributed to industry;

- 2013-2014 period – 6 exceedances of AGV at Taplin Street with three reported to be attributed to industry;
- 2014-2015 period – 10 exceedances of AGV at Taplin Street with seven reported to be attributed to industry;
- 2015-2016 period – 10 exceedances of AGV at Taplin Street with five reported to be attributed to industry;
- 2016-2017 period – 1 exceedance of AGV at Taplin Street reported to be attributed to natural events and/or third parties;
- 2017-2018 period – 9 exceedances of AGV at Taplin Street with eight reported to be attributed to industry;
- 2018-2019 period – no data available although as per Key Findings below, data interpolation indicated that there is likely to have been between 10 and 27 exceedance; and
- 2019-2020 period – 3 exceedances of AGV at Taplin Street based only on valid data recorded between 1 January 2020 and 30 June 2020. Two of these exceedances on 9 and 10 January were associated with Tropical Cyclone Blake. The third event on 18 May 2020 was attributed to a local industry source.

The HRA found that the number of exceedances of the AGV increased with proximity to the western edge of the West End and that there are also seasonal influences on exceedances. Figure 5 depicts the number of AGV exceedances at each ambient monitor located at increasing distance from the West End between 2013 and 2019 annual periods.

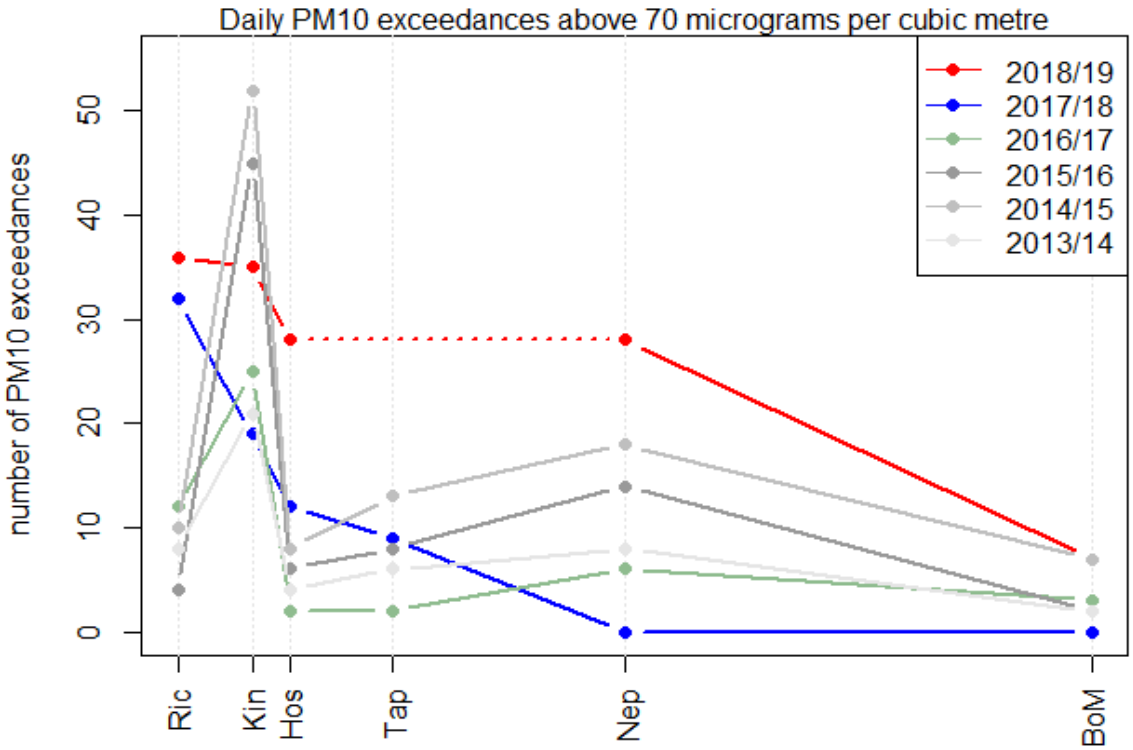


Figure 5: Plots showing exceedance at each monitoring site of the HRA guideline over each financial year.

Since 2013, PHIC has reported annual monitoring data from all ambient and background monitors within the network shown in Figure 3. In each report PHIC has identified the number

of incidences at each monitor where PM_{10} concentrations exceeded 50µg/m^3 and the Port Hedland AGV, as detailed in

Table 3.

Table 3: Number of days exceeding 50µg/m^3 and the Port Hedland AGV for PM_{10} recorded by PHIC ambient monitoring network – 2013 to 2019

Monitoring Station	24hr criteria (µg/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	FY 2019/20
Richardson St	50	74	50	79	39	90	143	167	173
	70	23	9	11	6	NR*	NR*	NR*	NR*
Kingsmill St	50	89	98	156	112	83	103	155	148
	70	29	19	50	46	NR*	NR*	NR*	NR*
Taplin St	50	48	48	55	48	27	65	3**	10**
	70	**17**	**6**	**10**	**10**	**3**	**9**	**0****	**3****
Neptune Pl	50	25	25	67	43	29	15	102	66
	70	11	8	14	14	NR*	NR*	NR*	NR*
Wedgefield	50	157	148	169	150	99	88	165	159
	70	82	84	59	50	NR*	NR*	NR*	NR*
South Hedland	50	24	13	19	12	8	0	11	22
	70	8	3	6	5	NR*	NR*	NR*	NR*
BoM	50	24	10	17	12	7	4	25	33
	70	10	3	7	2	NR*	NR*	NR*	NR*
Yule	50	14	8	18	5	1	8	15	15
	70	8	3	6	2	NR*	NR*	NR*	NR*

* Not Reported. PHIC ceased reporting of exceedances of AGV in its 2016/17 annual report for all monitors with the exception of Taplin Street. Note that NEPM does not apply to residential areas of Port Hedland for reasons detailed in section 2.4.1.

** Data capture insufficient. See key findings in this section for further discussion.

Based on the monitoring data provided in

Table 3, it is evident that PM_{10} concentrations in Port Hedland area (inclusive of South Hedland and Wedgefield) are greatest at Wedgefield and in the West End. There are significantly fewer 24-hour periods where PM_{10} exceeds 50µg/m^3 in South Hedland compared to the West End and Wedgefield.

A site visit conducted by DWER officers in July 2016 identified a number of dust generating sources in the Wedgefield Industrial Area. Although roads in the Wedgefield Industrial Estate

are sealed, the large number of truck movements result in substantial volumes of dust being mobilised from the road's soft shoulders. Potentially significant contributors to fugitive dust within Wedgefield include the scrap metal yard, two asphalt plants, sand blasting operators and a number of operators that move equipment on bare earth hardstands. Most of these sites are not prescribed premises and are not regulated by DWER under Part V of the EP Act.

A proportion of exceedances of 24 hour criteria at Wedgefield may be attributed to the siting of the monitor. A review of monitoring data collected during the LiDAR campaign (refer to section 4.3) identified that dust from Wedgefield did not appear to move across to the West End in significant concentrations when compared to Category 58 operations in Port Hedland. However, Wedgefield may have a more significant impact on ambient air quality on South Hedland just 1.5km to the south.

Key Findings: The Delegated Officer notes that:

- The Taplin Street monitor was inaccurate and under-reporting actual dust levels between April 2018 and January 2020.
- PHIC and DWER have separately undertaken analysis of data from the monitoring network over this period, with PHIC's analysis indicating between nine to 13 exceedances of the AGV at Taplin Street during the annual reporting period 1 July 2018 to 30 June 2019. DWER's analysis suggests this estimate is at the lowest end of the possible range of exceedances.
- 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).
- It is critical that industry measure their dust control performance against the extensive monitoring network that exists across the Premises boundary and at those monitors representative of ambient conditions across Port Hedland, including in the West End.
- 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 2.4.1) and provide transparent and accurate ambient air quality information for Port Hedland.

4.1.3 Correlation of Port Hedland Port throughput and ambient dust levels

DWER has undertaken a review of annual ambient air quality at Port Hedland and cumulative throughputs of material exported from Port Hedland to determine whether there is any correlation between the two factors. The data in Figure 5 and Figure 6 do not clearly demonstrate a direct correlation between iron ore throughputs at Port Hedland increasing over the years, and more dust in the Port Hedland airshed. Export tonnages through Port Hedland have increased significantly over the previous decade. However, PM_{10} concentrations measured at Taplin St over the same period have not trended in the same way with the number of exceedances of 70 µg/m^3 (averaged over a 24-hours) remaining relatively stable. This is in part be due to the following factors:

- Data recorded from the Taplin St monitor from April 2018 until January 2020 is unreliable and therefore does not provide an accurate representation of the number of exceedances of the HRA guideline occurring at Taplin St during this period.
- The department's ongoing risk-based regulation of dust has seen the introduction of

more rigorous controls for dust management being mandated through Part V licence conditions.

- Increases in throughput have been largely achieved through the operation of existing infrastructure, meaning that the creation of new dust sources, such as stockyards, has been avoided.
- Many of the additional tonnages from operations near to the West End are directly shipped from car dumpers at the point of in-loading, avoiding the double handling of ore through stockpiling and reclaiming.
- The monitoring station at Taplin Street is only one measure of dust impacting Port Hedland and other monitoring stations must also be analysed to determine the overall levels of dust throughout the township.

Therefore, a correlation between increasing throughputs and PM_{10} concentrations recorded at Port Hedland monitoring locations is not clear based on current data available to the department. 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.

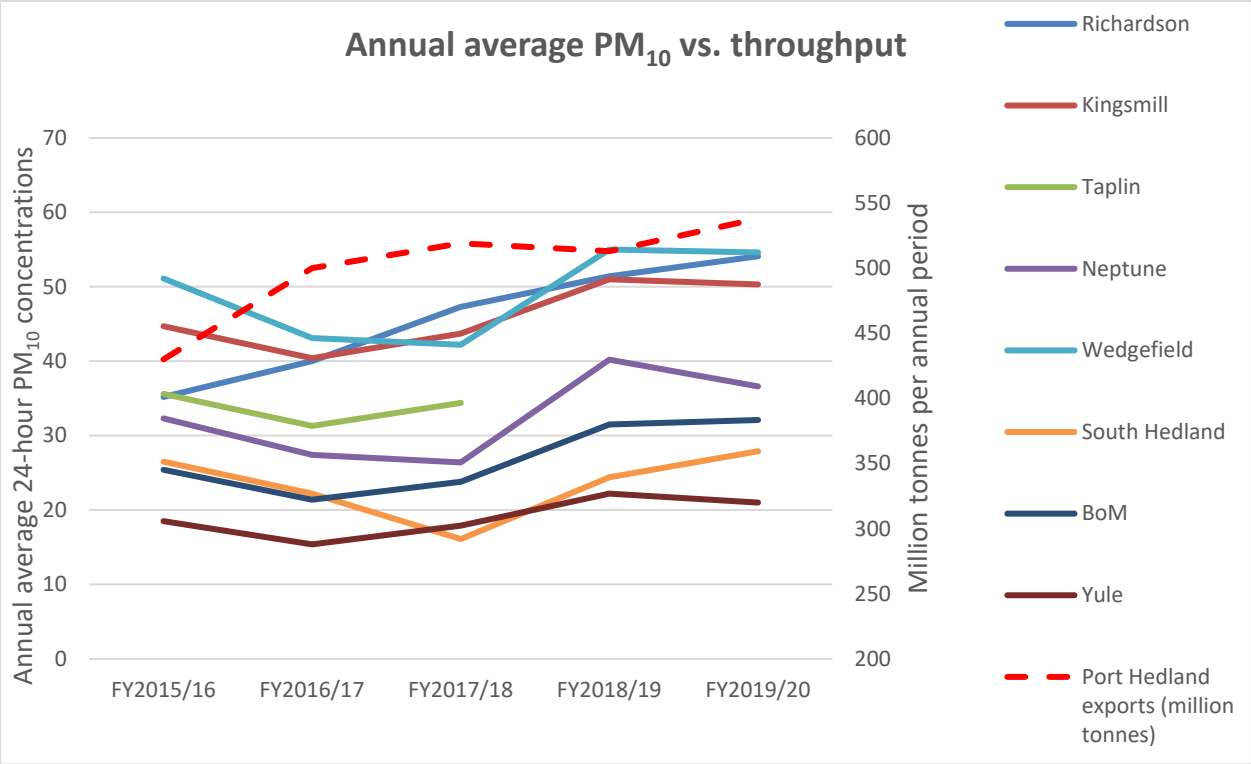


Figure 6: Annual average 24-hour PM_{10} concentrations vs throughput from FY2015/16 to FY2018/19

Key findings: The Delegated Officer notes that:

- Increases in averaged ore moisture at inload and improvements to dust management practices are likely to have helped offset some of the expected increases in dust from increasing throughput at Port Hedland.
- Implementation of the Dust Management Guideline, as per the Government endorsed recommendations of the Port Hedland Dust Taskforce, can be expected to drive further improvements.

4.1.4 $PM_{2.5}$ 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 recent times.

The annual average concentration of $PM_{2.5}$ was above the *National Environment (Ambient Air Quality) Protection Measure* (NEPM) standard for monitoring locations in the West End, Taplin and BoM consistently between the 2014 calendar year and the 2019 financial year. In FY2019/20 annual average $PM_{2.5}$ at the same monitors dropped to below the NEPM standard. A comparison of the annual averages of $PM_{2.5}$ from some selected sites are summarised below.

Table 4: Comparison of annual average $PM_{2.5}$ concentrations in Port Hedland against larger population centres in Western Australia

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[1]	12.3	9.6	8.9	8.0	8.4	8.4
2019[1]	7.1	7.7*	7.9	7.4	7.8	7.3

* Less than 75% data recovery for the calendar year.
Note 1: 2018 and 2019 Port Hedland data is based on data for the 2018/19 and 2019/20 annual periods respectively (PHIC 2019; PHIC 2020)

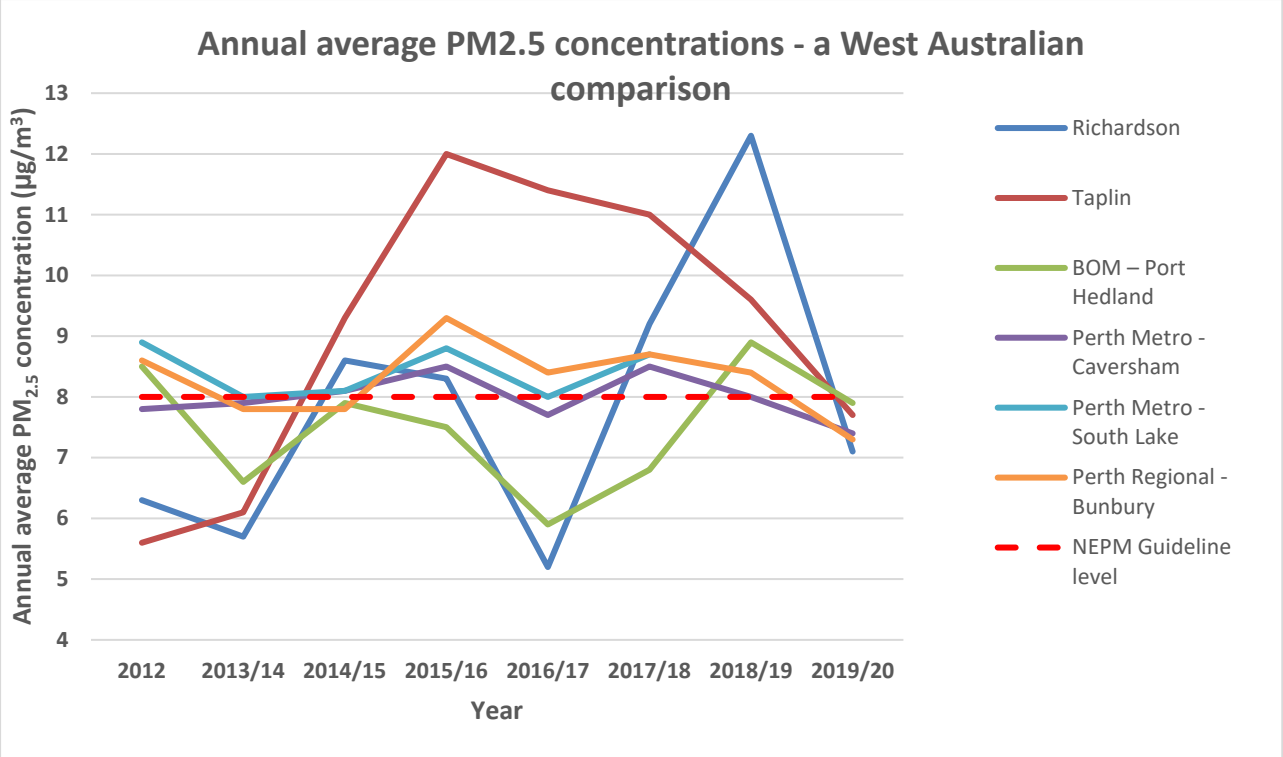


Figure 7: Comparison of $PM_{2.5}$ concentrations in Port Hedland against larger population centres in Western Australia

Table 4 and Figure 7 demonstrate that in recent years annual averaged $PM_{2.5}$ concentrations in Port Hedland's West End have been greater than those experienced in metropolitan areas of Western Australia, however it is noted that levels have decreases FY2019/20. The cause of this decrease is not known nor is it clear whether or not the annualised figure marks the beginning of a downward trend in $PM_{2.5}$ concentrations, or is anomalous.

Possible sources of fine particulates in Port Hedland may include:

- industry sources, including from the handling and stockpiling of ores at port operations and other local industry;
- combustion sources, which include diesel particulates from as ship and truck emissions;
- crustal sources arising from the disturbance and erosion of soil; and
- bushfires.

Between 2007 (calendar year) and 2019/20 (financial year) annual shipping movements have gradually increased from 925 vessel visits to 3,097 (PPA, 2020). Truck movements through the West End for the delivery of concentrate to the PPA's Eastern Operations have increased from 2015/16 when 2,892 truck deliveries were recorded to over 5,000 truck deliveries in 2019/20. However, throughputs at Eastern Operations and therefore truck delivery numbers have fluctuated significantly since 2013 and 2019/20 truck visits were similar to those recorded during that calendar year. Additional shipping and truck movements may contribute to increased fines particulates through diesel combustion.

Review of another indicator of contribution from diesel particulates, indicates that there has been no trending increase in nitrogen dioxide (NO_2) concentrations since 2012, as recorded at the Taplin Street monitor with all recorded concentrations remaining well below NEPM standards (PHIC reports). By comparison, NO_2 concentrations monitored in South Hedland and at the BOM monitoring location at Port Hedland Airport, when monitored, were slightly lower than concentrations recorded at Taplin Street monitor.

Taplin Street monitor is approximately 2.8km east of the nearest shiploader and 210m north of the Wilson Street trucking route. To achieve the final throughput rate of 330Mtpa it is anticipated that approximately 250 to 300 additional vessel visits will be required when compared to current production rates. Further shipping movements required to support throughput increases from Licence Holder operations and those of others operating in Port Hedland may contribute to increased $PM_{2.5}$ concentrations in the West End.

Key finding: The Delegated Officer notes that:

- Particles as $PM_{2.5}$, averaged annually and as measured at Taplin Street and Richardson Street monitors, have trended upward since 2012 to above the annual NEPM guideline level, with the exception of the most recent (2019/20) annualised period.
- The Department will require further monitoring of $PM_{2.5}$ when it takes over the monitoring network, allowing the department to keep a close watch on the impacts of $PM_{2.5}$, and inform future licensing decisions.
- PM10 remains the dominant particle size in Port Hedland's ambient air that presents a risk to human health.
- Conditions of the Licence targeted toward reducing PM_{10} dust emissions are expected to subsequently manage $PM_{2.5}$ emissions from the Premises.

4.2 Boundary monitoring

The Licence Holder operates a series of monitors at the locations illustrated in Figure 2 of the Amended Licence to record the concentrations of dust at the Premises boundary. The objective of boundary dust monitoring is to provide real time data to assist with the identification and management of dust emissions from the Licence Holder's Premises and to identify background sources that may contribute to high ambient dust concentrations in Port Hedland.

Figure 8: Boundary monitor locations.

4.2.1 Management and reporting trigger analysis

Trigger levels have been developed under the Existing Licence to prompt management action in the event of elevated dust levels being measured. “Management trigger criteria” are based on rolling 1 hour average PM_{10} concentrations and provide early indication of short term dust events that may result in potential dust exceedances in Port Hedland.

Exceedance of the management trigger criteria prompts immediate dust mitigation including the operation of bulk ore conditioning sprays on all conveyors and setting stockpile cannons to run on deluge cycles.

The Licence Holder is also required to undertake an initial investigation to identify potential sources of the trigger exceedance and apply additional dust controls where the source is identified to be within the Premises.

“Reportable Event Criteria” are based on rolling 24 hour average PM_{10} concentrations and indicate persistent dust events that are more likely to result in exceedances of the AGV. Exceedance of the “Reportable Event Criteria” requires application of additional dust controls as well as further investigation and reporting to DWER.

Between 16 February 2018 and 31 March 2020, the Licence Holder reported 34 instances where the “Reportable Event Criteria” were exceeded over a 24 hour period (nine at Finucane Island and 25 at Nelson Point). For the purposes of this assessment, each 24 hour period where the Reportable Event Criteria was exceeded was considered as an “event”.

Where there is an exceedance of the Reportable Event Criteria, the Licence Holder undertakes an assessment of dust concentrations at Taplin St as an indicator of potential impacts on Port Hedland. Of the 34 reported events, only three recorded dust concentrations at Taplin St above the HRA guideline. The Licence Holder determined that the Premises operations may have contributed to one of these events but that high winds resulting in regional dust was the major

contributing factor for the remaining two. Given that data from Taplin St collected between April 2018 and December 2019 was potentially under reporting dust concentrations (refer to section 4.1), elevated dust at Taplin St and industry contributions cannot be verified.

The Licence Holder reported that the majority of events were associated with moderate to high wind speeds resulting in high levels of dust lift off from within the Premises (i.e. from stockpiles and open areas).

During high wind events high levels of background dust from offsite sources also contribute to elevated dust levels at the Premises boundary. The Licence Holder's operations are the closest source to residents and the largest ore handling operation in Port Hedland.

Other operational factors that were considered by the Licence Holder to contribute to dust events include:

- low direct shipping rates (24 hour rolling average period);
- dust control equipment availability below the required rolling monthly average of 90%;
- high traffic in areas close to the boundary associated with maintenance works;
- activities not related to iron ore handling such as remediation works that involved abrasive blasting of rails in the North Yard resulting in localised dust.

In response to exceedances of the Reportable Event Criteria, the Licence Holder implemented various dust mitigation strategies (in addition to actions required in response to exceedance of the "Management trigger criteria") including:

- Activating street sweepers and water carts to manage lift off from roads and open areas (33 events);
- Running berm canons on a manual cycle (13 events) ;
- Ensured shiploader was loading as tight as possible to vessel to minimise drop height (9);
- Activating chute sprays to remove dust build up and remove future dust sources (7);
- Limiting plant operation such as closing of ore handling routes, ceasing operation of car dumpers and screening plants or running minimal plant onsite (6 events);
- Water sprays at select transfer stations using mobile sprays (5 events); and
- Utilising direct ore shipping as much as possible, based on decisions made ahead of known likely high dust condition periods (4 events – pre-emptive measure).

The Licence Holder has also reported since October 2018 specified limits relating to the percentage of direct ship ore and dust equipment availability have been achieved as a result of various improvements implemented at the Premises.

During all reportable events the moisture content of all out-loaded ore was reported to be above the relevant dust extinction moisture (DEM) level.

Other Port Hedland operators have not recorded any Reportable Events at boundary monitors during the same reporting periods. This may be attributed to the location of other operators further from Port Hedland, the wind arcs and particulate triggers that define the individual Reportable Event Criteria, the volume of ore handled at each Premises and the level of controls applied. The location of the BHP site is also a major consideration, noting that cumulative emissions pass through the site in the pathway towards monitoring stations.

Key findings: The Delegated Officer notes that:

- The reporting and management criteria were likely to be underutilised as a result of the failure of the Taplin Street monitor operated by PHIC. However, during the same

period, the Licence Holder continued to initiate additional dust control responses to management triggers being exceeded at the Premises boundary, having the likely effect of reducing PM_{10} concentrations in residential areas;

- Reportable Events are largely occurring during strong wind conditions when wind direction is less variable; and
- High dust events can occur during very low wind speed conditions where dust is not readily dispersed. However, under these conditions, wind direction may be variable and fail to satisfy criteria that would trigger the Reportable Event.

4.2.1 Dust extinction moisture monitoring

As a requirement of the Existing Licence, online moisture analysers were installed at Car Dumpers 1 to 5 to measure the moisture content of all incoming iron ore. Installation was required by 31 December 2018.

Moisture content of all incoming and out-loaded ore is measured and compared to the DEM level developed for each ore type. The DEM level for particular ore types is determined by laboratory analysis and updated on a quarterly basis to reflect changes in the ore properties as mining progresses through the ore body.

The current Licence requires the Licence Holder to ensure that 95% of all out-loaded ore has a moisture content at or above the corresponding DEM level and that by 31 December 2020, 90% of all in-loaded ore is at or above the corresponding DEM level as averaged over each train load and calendar month. Ore moisture is measured using near infrared (NIR) moisture analysers located at the conveyor exit point of each car dumper.

For the period of 1 July 2018 to 30 June 2019, 87.03% of in-loaded ore was above the required DEM level. In the following annual period (2019/20), in-loaded ore moisture rates above the DEM level improved to 93.3% as an annual average.

From 16 February 2018 to 30 June 2020, 100% of out loaded ore was above the required DEM level (BHP, 2020). Table 5 below represents the average moisture content of in-loaded and out-loaded ore over the period of January 2020 to July 2020 and does not represent monthly averages.

Table 5: Ore moisture contents as measured at the mine site, inload and outload January 2020 to July 2020 (BHP 2020)

Product	DEM Level	Average moisture at inload as measured at the mine of origin (%)	Average moisture at inload as measured at the Premises (%)	Average moisture at outload (%)
JMBL	2.62	2.71	4.76	N/A
MACL	2.71	3.17	4.87	N/A
NHGL	2.71	3.42	4.31	N/A
NBLL[1]	2.46	N/A	N/A	4.35
NBLLU	2.98	N/A	N/A	4.87
JMBF	4.99	5.63	8.17	7.69
MACF	4.97	5.78	8.08	8.04
NHGF	4.5	6.27	8.04	8.18
YNDF	5.89	9.1	9.14	9.34

Note 1: Newman Blended Lump (NBLL) includes a blend of lump ores from Mining Area C (MACL), Jimblebar (JMBL) and Newman (NHGL).

It has been observed by the Licence Holder from moisture monitoring data presented in Table

5, that the moisture content of ore as measured at the mine site using accredited analytical methods is lower than ore moisture recorded at the Premises using real-time NIR moisture analysers.

Ore at the mine site is sampled ahead of train loadout (prior to stockpiling, reclaiming, train load out and rail transport). Although there is opportunity for additional water to be applied thereafter via yard canons, during reclaiming and prior to loadout, it is possible that moisture content will vary between analytical methods (NIR versus oven drying techniques) and between measurement at the mine compared to moisture content measured at the Premises.

Key findings: The Delegated Officer notes the following:

- While moisture content remains a key control for the prevention of dust emissions, other controls are required.
- The Licence Holder is further investigating the correlation between ore moisture measured at the mine and that received at the Premises using recognised standards to refine the accuracy of moisture calculations.
- The Licence Holder has experienced technical difficulties with the real-time NIR moisture analysers, when measuring lump iron ore products specifically.
- The licence holder will improve the quality of understanding by reviewing the methodology and approach to measurement and estimation techniques in the near future.

4.2.2 Direct shipping

Condition 5 of the Existing Licence requires that the Licence Holder must maintain a Direct Ship component (that is ore is transferred directly from the car dumper to the ship loader without stacking, stockpiling or reclaiming) of no less than 45% of the total amount of ore exported from the Premises. The limit applied over a rolling twelve month period until:

- 31 December 2020; or
- ore moisture monitoring is in place as required by the Existing Licence and compliance with the DEM level for 90% for all in-loaded ore is achieved.

The Annual Environmental Report (AER) submitted by the Licence Holder for the 2018-2019 reporting period (1 July 2018 to 30 June 2019) indicates that the percentage of ore directly shipped from the Premises was above 45% (Figure 9).

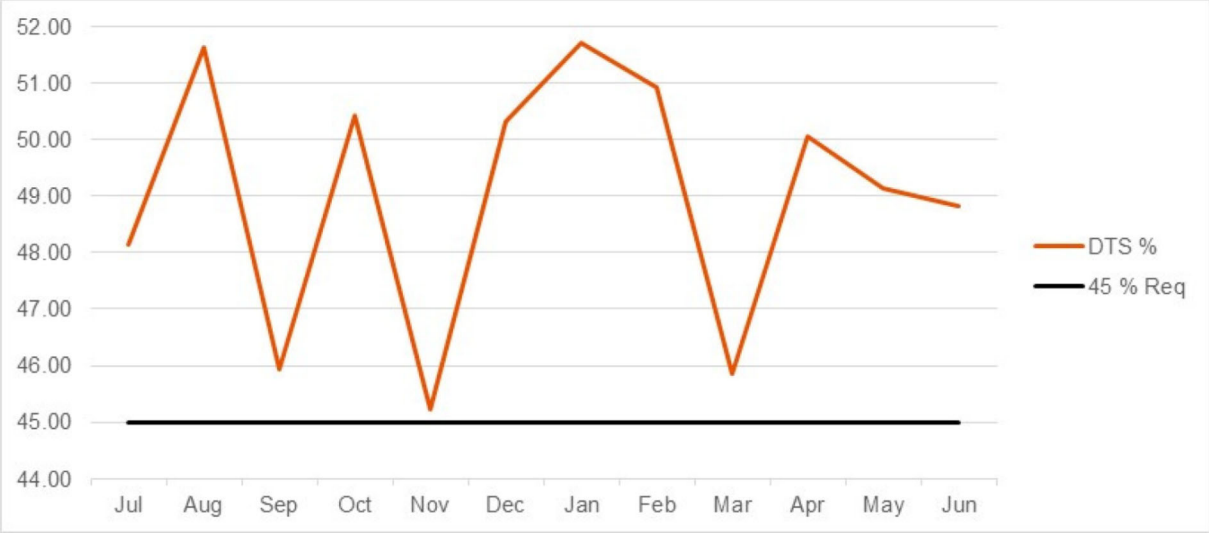


Figure 9: Rolling annual average Direct Ship tonnage (BHP 2019)

Key Findings: The Delegated Officer notes that:

- The licence holder has complied with the requirement for direct shipping levels, as required under licence condition, and achieved the necessary moisture content rates at inload.
- At the same time ore moisture content, the primary control for minimising dust generation (refer to section 4.2.2), has consistently exceeded the minimum DEM level for each respective ore.
- Direct shipment of ore is prioritised by licence holder on the basis of increased efficiency in their operations.
- Dust lift off from stockpiles and open areas appears to be a key source of dust contributing to dust exceedance events. Material handling equipment (i.e. conveyors, transfer stations, ship loaders, etc.) are also considered to be significant sources of dust.
- There is a low correlation between high throughput days and AGV exceedances in the West End suggesting dust events are more closely linked to dust control availability, ore moisture and meteorological conditions.

4.3 Light Detection and Ranging (LiDAR) monitoring

The department carried out a five-month dust monitoring campaign in Port Hedland from February 2017 to June 2017. The campaign was undertaken using conventional monitoring methods for particles as PM_{10} as well as a Light Detection and Ranging (LiDAR) instrument, which works by emitting a light beam and measuring the backscatter from particles or dust in the air.

The objective of the campaign was to determine the origins and movement of dust contributing to impacts experienced in and around Port Hedland and to assess the suitability of applying LiDAR technology.

Key dust sources identified during the LiDAR campaign include locations at ore handling points where ore is dropped from height, for example, transfer stations, reclaimers and stackers.

LiDAR investigations, when viewed alongside boundary monitoring data, did not identify significant emissions from stockpiles when reviewing total cumulative dust, compared with other

dust sources.

Since the completion of the LiDAR campaign the Licence Holder has implemented improvements to site operations for the purpose of dust control. This primarily includes improvements to ore moisture content as it arrives to site but also improved systems for the rapid identification of dust control equipment that is not operating optimally.

4.4 Dust modelling

In support of the application to increase throughputs to 330Mtpa, the Licence Holder has submitted dust modelling which predicts ground level concentrations of dust associated with the proposed change in throughput capacity and associated implementation of dust controls on the premises. Four operating scenarios were modelled:

- Current scenario of 290Mtpa in isolation (without background);
- Proposed upgrade (330Mtpa) in isolation; and
- Cumulative scenarios for capturing emissions from the 290Mtpa scenario and 330Mtpa increased throughput as well as including emissions from third party operators (existing and proposed).

Key dust emission sources and site-specific dust emission rates were used in the dispersion model. Emission estimates were updated from previous modelling studies as a result of work carried out by the Licence Holder to validate and improve the 290Mtpa baseline model.

Model validation included:

- updating operating conditions considered in the model reflective of implementation of existing licence conditions and associated DEM and moisture profile adjustments; and
- revising emission estimates based on results of inverse modelling.

An inverse model was developed using historical dust monitoring data (collected at boundary and town monitors) to identify potential emission sources at the Premises. The study enabled better understanding of the contribution of specific groups of dust generating equipment, or processes, to improve emission estimations for input into the baseline model.

Results identified stockpiles as the most significant dust source compared to previous predictions and that emissions from stockpiles have potentially been underestimated. Empirical formula previously used for estimating emissions from stockpiles were revisited and updated for input into the revised baseline model.

Emission calculations for open areas were also revised. Emission estimates for all other dust sources, which were developed through a series of dust measurement programs undertaken at the Premises since 2001, remained consistent with the previous dispersion model estimates.

The baseline 290 Mtpa model was rerun using the modified emission estimates for stockpiles and open areas and showed that estimated total annual emissions have increased significantly (by approximately five times) as a result of the revised stockpile emission calculations (Table 6). A comparison of the estimated total annual emissions in the original baseline model versus the revised figures are presented in Table 6.

Table 6: Comparison of estimated emissions from original and revised 290 Mtpa baseline models (BHP, 2020a)

Scenario	Estimated emissions (total)	Estimated emissions (stockpiles)	Estimated emissions (open areas)
290 Mtpa modelling submitted for amendment	712,215 kg/yr	80,491 kg/yr	30,923 kg/yr

issued 16 February 2018			
Corrected modelling for the 290 Mtpa base case	**1,137,680 kg/yr**	**767,157 kg/yr**	**13,628 kg/yr**

Figure 10 and Figure 11 show the top 20 emission sources identified in the 290 Mtpa and 330 Mtpa modelled scenarios as a result of the revised emission estimation highlighting the significance of stockpiles as emission sources.

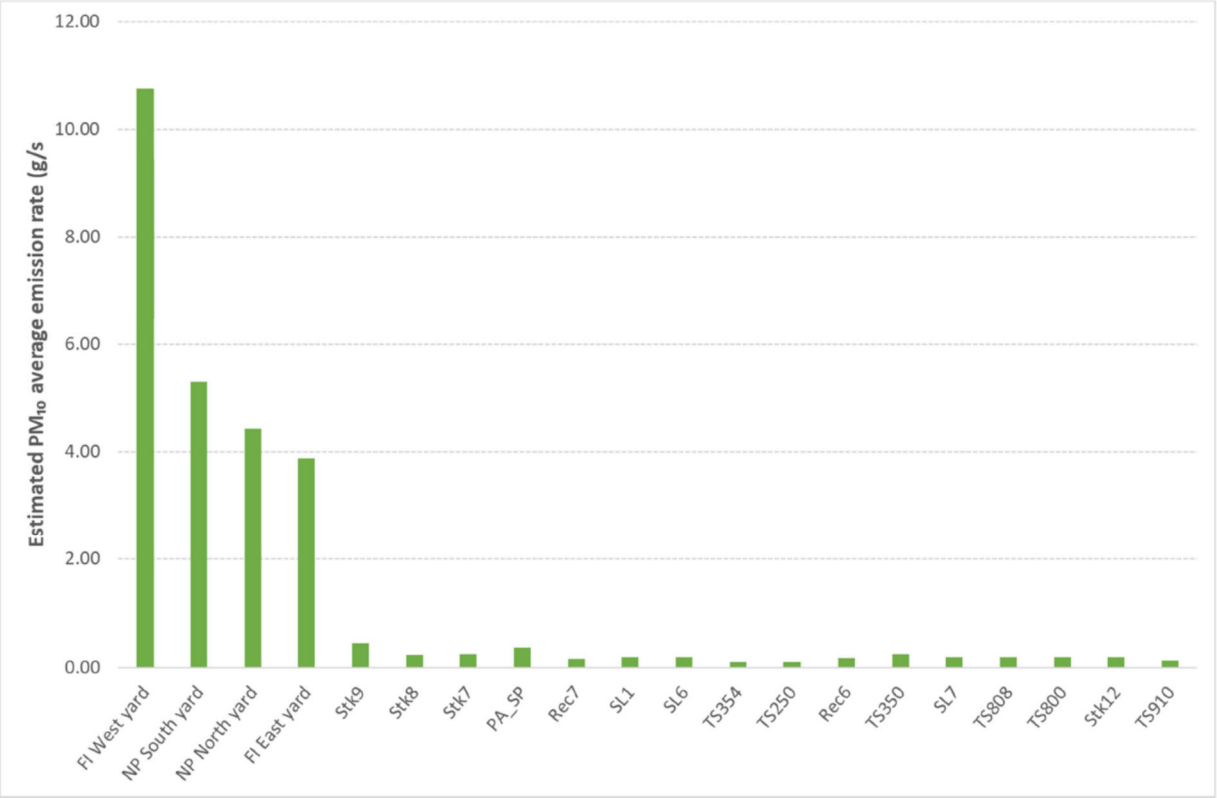


Figure 10: Estimated average PM_{10} emission rates for top 20 sources for 290 Mtpa base case.

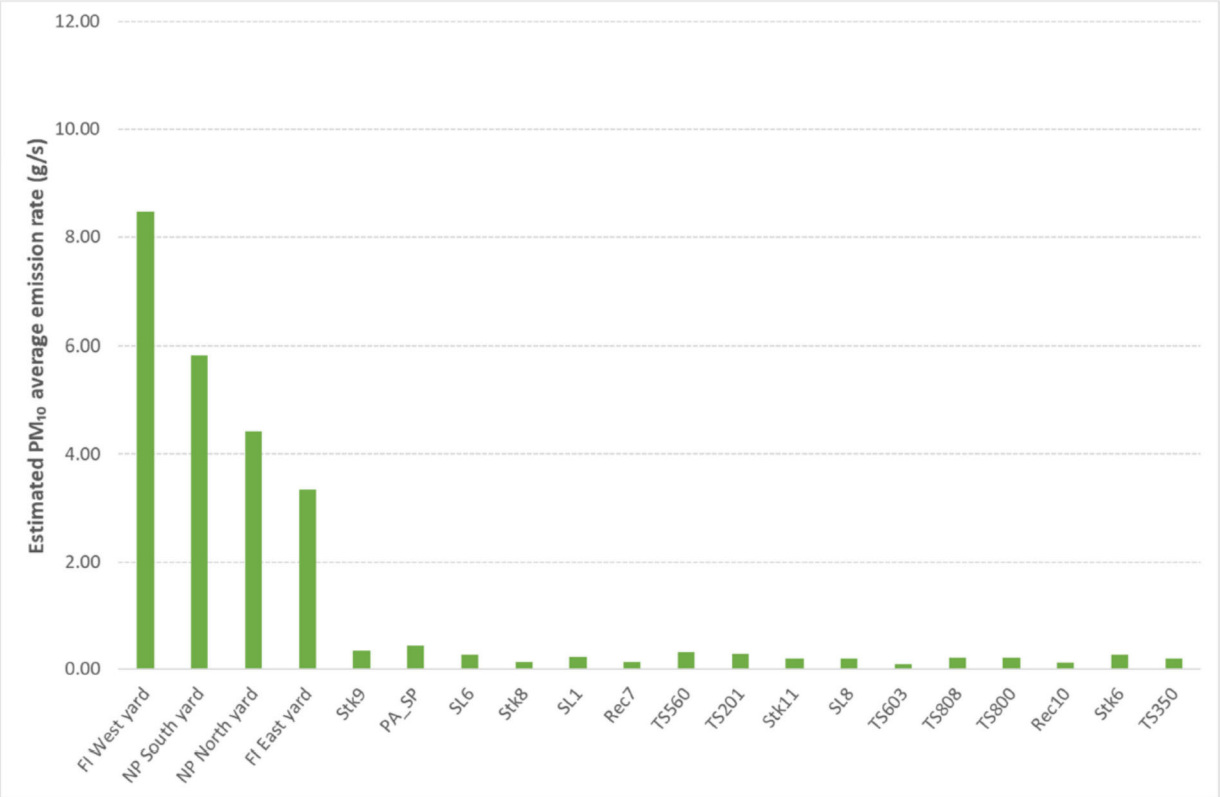


Figure 11: Estimated average PM_{10} emission rates for top 20 sources for 330 Mtpa expansion.

The revised baseline model was used for comparison with the 330 Mtpa operating scenario to assess changes in ambient dust concentrations associated with the proposed expansion and increased throughput. According to modelling, the number of 24 hour PM_{10} Port Hedland AGV (70µg/m^3) exceedances at Taplin Street is expected to decrease with the implementation of the increase in throughput capacity (and associated dust controls) from 290Mtpa to 330Mtpa (Table 7).

When considering the proposal in isolation, the modelling predicts that the proposed dust control package will result in a reduction of the Premises' contribution to annual dust concentrations by 16% at Taplin St (Figure 12). The cumulative assessment predicted a reduction in the annual average dust concentrations at Taplin St of 1µg/m^3.

Table 7: Ambient dust concentrations at Taplin Street base case (290mtpa) and 330mtpa cumulative and in isolation (GHD, 2020)

24-hour concentrations of PM_{10}	**In isolation (µg/m^3)**		**Cumulative (µg/m^3)**	
	290 Mtpa	**330 Mtpa**	**290 Mtpa**	**330 Mtpa**
Maximum	68	**52**	202	**202**
99th percentile	18	**14**	80	**77**
95th percentile	12	**11**	63	**62**
90th percentile	11	**9**	53	**52**
70th percentile	8	**6**	45	**43**

Annual average	5.8	**4.9**	36.5	**35.5**
Days >70µg/m^3	0	**0**	9	**7**

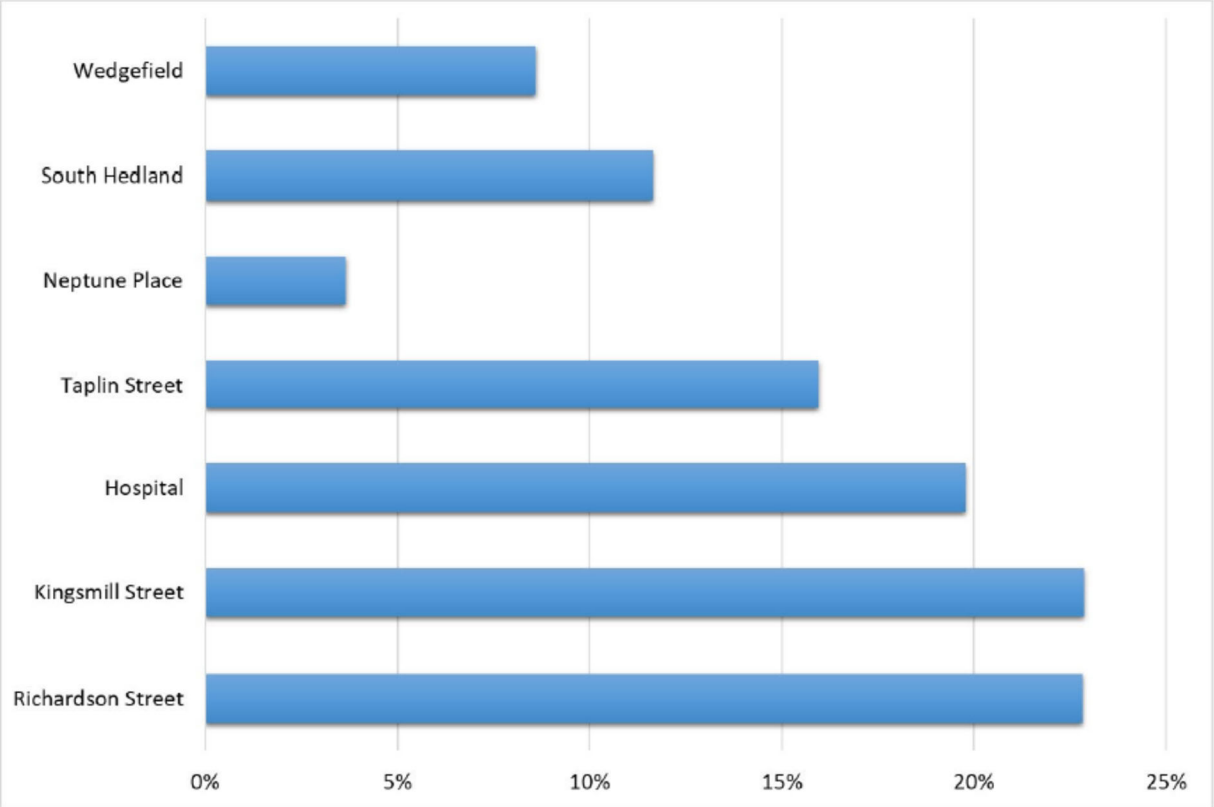


Figure 12: Reduction in modelled annual average PM_{10} contribution (BHP only) at receptors in Port Hedland (290 Mtpa vs 330 Mtpa).

Key findings: The Delegated Officer notes that:

- The air quality model used for the Premises (AERMOD) was subject to a validation investigation undertaken by PHIC in 2013 and while it has limitations these are understood.
- The approach to using "inverse modelling" was a new approach to determining emission estimates, and hence the Department sought to have the work peer reviewed.
- The review identified in summary that the inverse modelling was "a reasonable attempt to infer emissions of aerosol in a small region" (Rayner, 2021). The Peer reviewer further concluded that "Inverse models do seem a viable technique for doing this and the reasonable and somewhat robust results support this" (Rayner, 2021).
- Notwithstanding the peer reviewer's support, as with all models there remains a level of uncertainty which needs to be balanced in the context of all information.
- The inverse modelling increased the emission estimates from the stockpiles which is inconsistent with other information which suggests that ore handling equipment (i.e. stackers, reclaimers, transfer stations, etc.) may be higher.
- Given the uncertainties identified, verification will be required to demonstrate the effectiveness of controls and the assumed emission reductions for each expansion stage in order to demonstrate that a 'no net increase' in dust emissions from the

Premises is achievable.

4.4.1 Key dust sources and control effectiveness

Wind erosion from stockpiles was identified through inverse modelling as the most significant dust source compared to other sources such as stackers, reclaimers, ship loaders and transfer stations (Figure 10 and Figure 11).

The primary cause of dust emissions from stockpiles is dust lift off during high wind conditions. The Licence Holder proposes the installation of wind fences at Nelson Point and Finucane Island targeted at reducing emissions from wind dependent sources, primarily stockpiles, by reducing the wind speed downwind of the wind fence. The proposed wind fences are predicted to be capable of reducing wind speed by between 0% for areas further removed, and 54% closer to the wind fence.

Modelling predicts that installation of the wind fence will significantly reduce emissions from stockpiles, particularly at Finucane Island where it is predicted that there will be a 21% and 14% reduction at the West and East Yards respectively (Figure 13). There will however be little wind reduction under NNW and SW winds for Finucane Island at the East Yard and Wharf, and at the Nelson Point proposed extension areas F and X and the Buffer Zone.

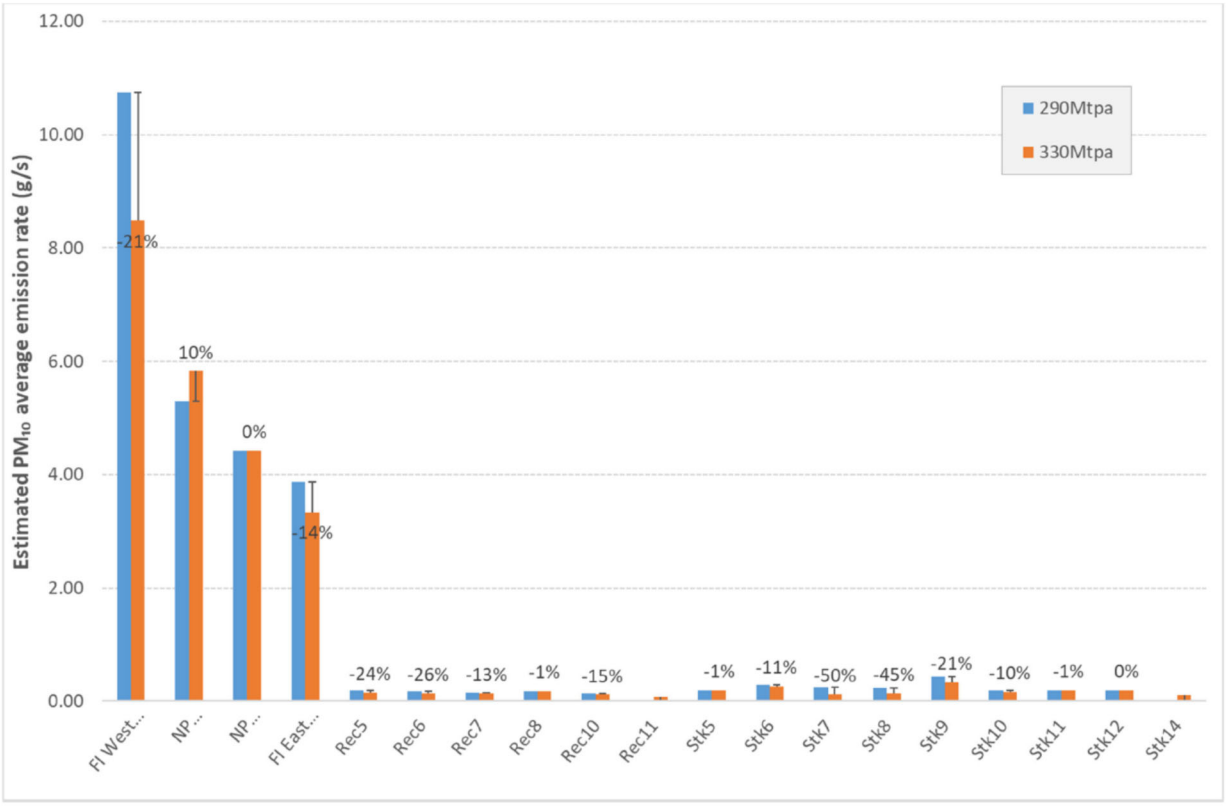


Figure 13: Estimated average PM_{10} emission rates with dust abatement for 290 Mtpa and 330 Mtpa, showing percentage change in average emission rate.

Transfer stations within the conveyor network area in the North Yard (Spaghetti Junction) have been identified, and confirmed by monitoring, as key dust sources. In particular, high dust levels were detected around the locations of TS1, TS2/TS354, TS3, TS4 and TS604.

Similarly, high dust levels were identified near to transfer station TS730 near to B Berth. Although many conveyors in these areas are equipped with belt wash stations each area experiences high levels of dust.

With the exception of TS354, it is noted that the above listed transfer stations were not

recognised in the top 20 emission sources for either modelled scenario (Figure 10 and Figure 11).

Ship loaders 1 and 6 were both identified as key dust sources by the variable emissions file used to input into the model (section 4.4) and DWER's LiDAR investigations (section 4.3), indicated that some correlation exists between the two studies.

Current dust control equipment on ship loaders is limited to boom sprays located at the end of the ship loading conveyors and the ability for ship loaders to minimise drop height while ship loading.

Dust control at ship loaders remains a challenge for all Port Hedland port operators as there is limited ability to apply additional or more effective control equipment; for example water sprays on every ship that enters Port Hedland. It is possible that innovative controls will be identified through the future dust management guidelines to better manage dust from ship loading. With limited controls available, management of ore moisture content above DEM Level is key in controlling dust during ship loading activities.

While the proposed wind fences are targeted at reducing emissions from wind dependent sources, primarily stockpiles, the Licence Holder also expects a reduction of emissions from other sources down-stream of the wind fence including ore handling equipment mentioned above (specified in Table 8).

Table 8: Dust sources expected to experience reduction in emissions as a result of installation of wind fence (GHD, 2020).

Location	Equipment description
Finucane Island	West Yard area – Stacker 9, Stacker 10, Reclaimer 7, Reclaimer 10, Transfer Station 801, Transfer Station 807, Transfer Station 981 and Stockpile Groups M, L and K East Yard area – Stacker 11, Stacker 12, Reclaimer 8 and Stockpile Groups S and R Wharf area – Ship loader 3, Ship Loader 4, Transfer Station 810 and Transfer Station 811
Nelson Point	Existing South Yard area – Stacker 7, Reclaimer 6 and Stockpile Groups G And H Proposed Extension area – Stacker 6, Stacker 14, Reclaimer 11 and Stockpile Groups F And X

Key determinations: Following review of information relating to key dust sources and controls presented in the Application, including modelling information submitted by the Applicant, the Delegated Officer has noted that:

- The air quality assessment of a 'no net increase' in dust emissions from the Premises is contingent on the proposed controls being implemented and their efficacy under various weather conditions.
- Wind fencing is an effective dust control for wind erosion from stockpiles however is unlikely to be an effective abatement for mechanical equipment activities and material handling, which are also significant dust sources. Reduction of wind speed is likely to result in less dust dispersion and it is unclear whether this will impact emissions from materials handling and ambient air quality in residential areas.
- The inverse modelling approach challenges some of the assumptions made in

emission rates used within previous models and the LiDAR study outcomes. The Department undertook an external peer review which supported the approach.

- Given the relative uncertainty in the approaches, the Department will require the licence holder to validate the emission estimates and require suitable remediation plans, should the verification fail to substantiate the modelling.
- Should the proposed controls not be effective in demonstrating 'no net increase' in dust emissions from the Premises additional controls relating to materials handling sources will be required to achieve this.
- Further improvements in dust control, particularly associated with ore handling equipment, will be addressed through the development and implementation of the dust management guidelines.

5. 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.

5.1 Source – Dust

Key to the identification of the potential dust sources and therefore the identification of risk from premises activities is an analysis of the ore handling methods and iron ore product characteristics.

The Licence Holder has analysed each ore for its dust potential properties including particle size distribution, DEM and historical data on average moisture content of ore upon arrival to the Premises (Table 5).

5.1.1 Handling methods

Ore is transported to the Premises via rail and transferred either directly from rail car dumpers or reclaimed from the stockpiles at both Nelson Point and Finucane Island to iron ore ships by a large conveyor and ship loading system. The two ports; Nelson Point and Finucane Island, are linked by an underwater tunnel which allows ore to be transferred from Nelson Point to Finucane Island via a conveyor system. Oversize ore may also be rescreened via three rescreening plants; two located at Nelson Point and one at Finucane Island.

The throughput upgrades will provide capacity for up to 330 Mtpa to be loaded using these open systems each year. Upgrades primarily consist of route upgrades allowing higher rates of ore handling in addition to installation of additional infrastructure (refer to section 2.2.1) increasing the overall potential for dust generation from new and existing dust sources.

Direct shipped ore

Direct shipping eliminates a number of key dust sources including stackers, reclaimers and stockpiles by avoiding the double handling of ores and loading them into the vessel directly from car dumpers via a series of transfers and conveyors. All existing iron ore products are able to be direct shipped however direct shipping is driven by market conditions and customer requirements that require the Licence Holder to blend and/or rescreen ores.

Existing Licence conditions for minimum direct shipping rates at 45% were applicable up to 31 December 2020, when it was assumed that the Licence Holder would improve the moisture

condition of in-loaded material. From this date, rates of direct shipped ore has consistently remained above the minimum rate previously required by the Existing Licence. Table 9 provides forecasted direct shipping rates for the proposed staged expansion up to 330 Mtpa. “Mid case” forecasts were included within the air quality modelling assumptions.

Table 9: Forecasted direct shipping rates

	Direct shipped amount (%)		
	295 Mtpa	**303 Mtpa**	**330 Mtpa**
Mid case (likely)	48	47	46
Low case	31	30	30

Stockpiled ore

Ore is currently stockpiled in four separate stock yards: the North and South Yards at Nelson Point and the East and West Yards at Finucane Island with approximately 51% of ore stockpiled at Finucane Island and 49% at Nelson Point. Figure 14 shows that the Premises currently has capacity to stockpile approximately 5.34 million tonnes of ore at any one time with the majority of stockpiling capacity located at Finucane Island (3.18 million tonnes capacity compared to 2.16 million tonnes at Nelson Point). The proposed upgrades will more than double storage capacity at the South Yard in Nelson Point and include an increase in potential capacity of the existing North Yard which is the stockyard located closest to receptors in Port Hedland (Table 10). Overall the potential storage capacity of Nelson Point will increase by approximately 70% above current capacity.

Table 10: Current and proposed stockyard capacities

	Nelson Point capacity (tonnes)			Finucane Island (tonnes)	
	North Yard	**South Yard (existing rows)**	**South Yard (new rows)**	**East Yard**	**West Yard**
Current	839,500	1,325,000	N/A	1,115,000	2,065,000
Proposed	967,059	1,325,000	1,427,625	1,115,000	2,065,000
Extra	127,559	N/A	1,427,625	N/A	N/A

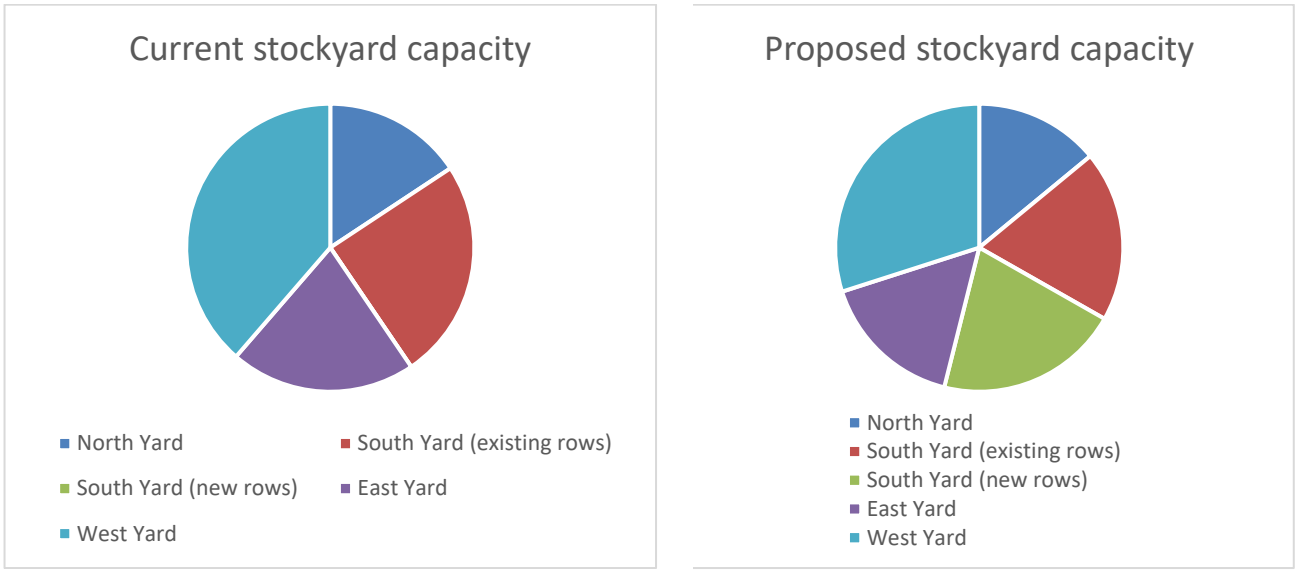


Figure 14: Current and proposed stockyard capacity

Figure 15 depicts the fluctuation of ore types stockpiled between the 2016 and 2020 annual periods. From Figure 15 it can be seen that the stockpiling of Yandi Fines (YNDF) has increased

while Newman High Grade Fines (NHGF) and Mining Area C Lump (MACL) have steadily declined. However, all ore types are expected to increase under a 330 Mtpa scenario, with the exception of Yandi fines. The Licence Holder has also flagged the potential for a new mine site to supply the Premises.

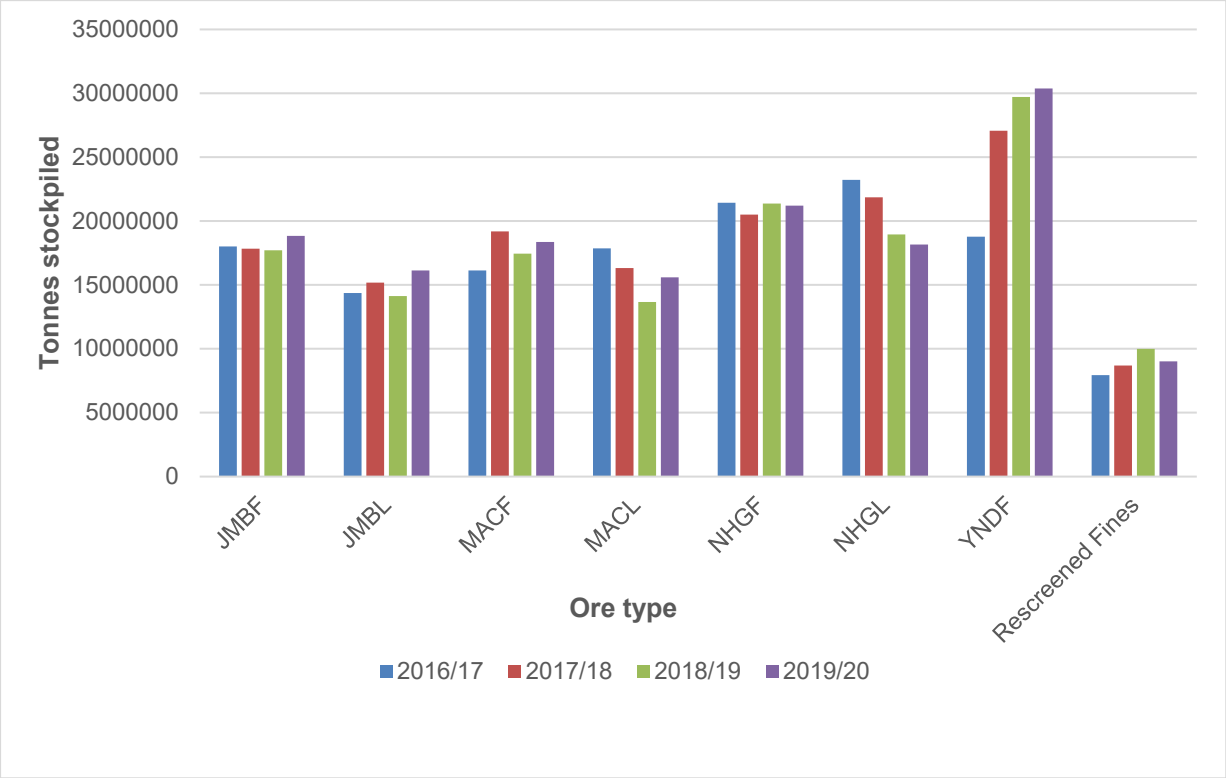


Figure 15: Stockpiled ore (by ore type) from 2016/17 to 2019/20

Static stockpiles are defined in the Licence as those stockpiles that have remained in the stockyard for six weeks or longer. To manage wind erosion from static stockpiles that may have reduced moisture content as a result of remaining static, the Licence Holder applies a chemical surfactant and/or watercart.

Mobile rescreening

Mobile rescreening is operated to process recovered material from transfer stations, yard belts, stockpiles, wharf, conveyors and sumps. Once recovered, ore is rescreened and fed back into the ore handling process.

Recovery of this ore is a continuous process and accounted for approximately 50,000 tonnes of ore handled in the 2020 annual period.

5.1.2 Ore characterisation

Certain ore types are known to have a greater dust potential than others based on their characteristics and typical moisture content as received at the Premises. Some ores handled by the Licence Holder are friable and can break up during handling and rail transport (Lascelles, 2000). Investigations into various ore types at the Licence Holder's mines identified that Marra Mamba ores had a greater percentage of fines and that the ore type was observed to have greater erosion rates when compared to the typical Brockman Iron Formation ore types (BHP, 2013).

Although Marra Mamba typically has a high combined water, increasing the moisture content of these ores is not expected to significantly increase the cohesiveness and the ore may continue to break during handling (Okazaki et. al, 2006).

Therefore the ore moisture measured at mine may not accurately reflect the surface moisture of ore as it arrives to the Premises. Similarly the particle size distribution of Marra Mamba ores, as measured at the mine, may not be reflective of the iron ore product as it is handled at the Premises. The Licence Holder's Mining Area C, Eastern Ridge, Mount Whaleback and South Flank mines extract ore from Marra Mamba ore bodies in the East Pilbara.

All ores are blended either at the Premises or at the mining operations prior to delivery to the Premises. Therefore any ore stored at the Premises could have a varying mix of Brockman, Marra Mamba and Channel Iron Deposits depending on customer requirements, which change over time. Blending also evens out the particle size distribution and moisture content across each stockpile.

As discussed in section 4.2.1, the Licence Holder is currently achieving a moisture content greater than the DEM level for all outbound ores from the Premises and greater than 90% of all inbound ore with a moisture content above the DEM level.

However, there remains concern from both DWER and the Licence Holder that monitoring data from the NIR moisture analysers at inload do not accurately record ore moisture. The Licence Holder is investigating alternatives to determining ore moisture, including investigations into calculating ore moisture at the mine of origin using recognised moisture determination standards and developing more accurate calculations for moisture loss and addition of the ore prior to the ores arrival to the Premises.

Particle size distribution

The risk to public health from the dust generated at the Premises is largely dependent on the particle size and its ability to enter the lungs, whereas coarser particles are more likely to present nuisance (amenity) impacts. Finer particulates have greater potential to be carried by wind and may be transported larger distances to receptors than coarse particles.

The Licence Holder uses laser diffraction sizing to determine particle size distribution for each ore from 38 micron (µm) to 2.5 µm. Particle size distribution data provided by the Licence Holder for ores handled at the Premises indicates that up to 15% of the ore is comprised of particles with a diameter of 10 µm or smaller. Marra Mamba ores typically display a high proportion of fines due to the ore's friability (Hyunh et. al, 2018). This is evidenced by the Licence Holder's NHGF which has the highest proportion of particles sized less than 10 micron in diameter.

Respirable silica

Crystalline silica is present in a large number of commodities and is abundant in the environment. All ores handled by the Licence Holder at the Premises contain silica dioxide (SiO_2) within a range of approximately 1 to 6.5% although not all is of a size fraction that is respirable (Intertek Genalysis, 2020).

Respirable crystalline silica is that measured at under 4 microns in diameter and has the potential to cause lung irritation and silicosis in humans exposed at occupational levels over many years.

The Licence Holder has commissioned analysis of each iron ore product that enters the Premises for respirable silica content (Table 11). Silica in this respirable fraction is only found in concentrations much less than 1% of each iron ore product (of total material) handled at the Premises, which does not require a Specific Target Organ Systemic Toxicity (STOT) rating according to the Global Harmonisation System (IMA Europe, 2014). Concentrations above 1% are classified as STOT Category 1 (concentrations greater than 10%) or Category 2 (concentrations between 1% and 10%).

Table 11: Percentage of respirable crystalline silica within in-loaded iron ore products (Curtin, 2019; BHP, 2021)

Product	% of respirable crystalline silica within respirable mass fraction
MACF	0.00032
NBLL	0.00039
NBLLU	0.00021
JMBF	0.00051
YDNF	0.00008
NHGF	0.00006

Asbestiform fibres

An analysis of asbestos fibres within each ore sample was conducted using a polarized light microscopy dispersion staining technique in accordance with Australian Standard *AS4964-2004 – Method for qualitative identification of asbestos in bulk samples*. This analysis failed to identify any asbestos, noting a limit of detection of 0.1g/kg (Bureau Veritas Minerals, 2020).

5.1.3 Existing controls

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

Table 12: Licence Holder's current controls for fugitive dust emissions

Site Infrastructure	Description	Operation details
Controls for dust		
Ship loader	Conveyor booms capable of loading up to 290 Mtpa	Water spray system operated at the tripper chute and at the end of the conveyor boom. A deflector surrounds the discharge point for the conveyor boom.
Stockyard	Boom sprays and dust hoods on all stackers	Sprays operated depending on ore type and its potential for dust generation[1]. Stacker lowered to reduce the drop height to the stockpile.
	Stockpile cannons located along stockpile rows spaced at intervals that ensure full coverage of the stockpile surface with water.	Routinely operated. Operated depending on ore type and its potential for dust generation[1]. Operated during high dust events when visible dust is being generated.
	Water sprays on all Bucketwheel Reclaimers	Sprays operating whenever the Bucketwheel Reclaimers are in operation. Sprays are strategically located around each Bucketwheel Reclaimer.
	Stockpiles	Chemical surfactant is applied to static stockpiles and open areas as required.

Site Infrastructure	Description	Operation details
Conveyor	Open Bulk ore conditioning sprays operated at inflow and outflow systems	Sprays are turned on incrementally depending on the route selected and the ore type. Fitted with a belt scraper and washer to prevent carry-back ore on the underside of the conveyor belt.
Transfer stations	Enclosed	Dust laden air is removed to a wet scrubber. Rubber curtains used at the entry of head chutes and exit point of the impact area. A rubber skirt is also fitted to the rear of the impact area to form a seal.
	Fog systems	Operated at entry and exit points of conveyor chutes, close to where dust is produced. In-chute fogging systems located on select transfers stations
	Extraction	Select transfer stations have dust extraction systems (wet scrubbers) for capturing particulate matter (TS26, TS201, TS350, TS560)
Lump Rescreening Plants (LRP)	Rescreening of Lump ore	Dust laden air is removed to a wet scrubber when operational. Sealed doors on conveyor access chutes. Dust covers placed over screen housings. Pre-screening lump iron ore products on Finucane Island during forecast High or Extreme Dust Risk Periods is avoided.
Mobile rescreening plant	Screening of stockpiled material	Operated during daytime hours to reduce the impact of prevailing wind conditions on sensitive receptors. Fitted with dust skirts on hoppers and transfer points. Weather conditions are monitored via the daily weather reports and dashboards prior to and during mobile rescreening along with monitoring of boundary monitoring data.
Car dumpers	Partially enclosed	Dust laden air is removed to a wet scrubber.
Sealed roads	Sealed	Road sweepers operate on trafficable areas including roads, turn around points and berths.
Unsealed roads and open areas	Unsealed	Use of water carts or dust suppressing chemicals. Vehicle speed restrictions set at 40 km/hr
Monitoring		
Dust monitors	Real time boundary dust monitoring network	Continuous monitoring. High dust alarms are triggered when readings at the Taplin St betta attenuation monitors (BAM monitors) record elevated dust levels and the monitor is downwind of Licence Holder activities. These alarms currently trigger a visual review of Premises activities to see if dust is being emitted.
Controls for fugitive dust		

Site Infrastructure	Description	Operation details
Moisture content of material	Ore moisture is targeted above DEM where possible. Iron ore product moisture analysis conducted at sampling stations prior to ship loading. Mine production moisture data supplied with each train load.	
Spilt material	High pressure hoses are used to clean spillage build ups in difficult to reach areas such as transfer stations and chutes. Vacuum trucks are used to remove spilt material from operating equipment where water cleaning cannot occur. Skid steers are used to remove larger amounts of spilt material where front end loaders cannot safely operate.	

Note 1: The potential for dust generation is currently determined by visual observation of dust lift-off at the mine site.

5.1.4 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 the dust controls outlined in Table 13.

Table 13: Proposed Licence Holder controls (from Application)

Column 1	Column 2	Column 3	Column 4
Stage of works	**Infrastructure and equipment**	**Requirements**	**Location**
Stage 1A	Conveyors	Install belt wash stations at the return end of conveyors to minimise the carry back of ore.	South Yard conveyors (existing conveyors at Nelson Point): P503 and P505 as depicted in Figure 5 of Schedule 1.
	Car dumpers	Install fogging units at the conveyor of car dumpers to minimise the escape of dust emissions from the car dumper.	Nelson Point: Car Dumper 1 (P2) Car Dumper 2 (P201) Car Dumper 3 (P350) as depicted in Figure 3 of Schedule 1.
	Road and open area sealing – Phase 1	Sealing of open areas for the prevention of dust lift off from traffic movement and wind erosion.	Finucane Island Phase 1: ROA1, ROA2, ROA3 Nelson Point Phase 1: ROA4, ROA5, ROA6 as depicted in Figure 7 of Schedule 1.
	Road and open area sealing –	Sealing of open areas for the prevention of dust lift off from	Finucane Island Phase 2: ROA8, ROA9, ROA10,

	Phase 2	traffic movement and wind erosion.	RAO11 Nelson Point Phase 2: ROA12, ROA13, ROA14, RAO15, RAO16 as depicted in Figure 7 of Schedule 1.
Stage 1B	Wind fence	Erect FI Type A wind fence as depicted in Figure 8 of Schedule 1, with a height no less than 20m above the base of the stockyard and with a mesh aerodynamic porosity no greater than 50%. Erect FI Type B wind fence as depicted in Figure 8 of Schedule 1, with a height no less than 20m above the base of the stockyard and with a mesh aerodynamic porosity no greater than 50%.	Finucane Island (West Yard): WY Wind fences as depicted in Figure 8 of Schedule 1.
Stage 2A	Conveyors and conveyor drives	Install belt wash stations at the return end of conveyor to minimise the carry back of ore.	South Yard conveyor (Nelson Point extension): P773 as depicted in Figure 5 of Schedule 1.
	Wind fence	Erect Nelson Point South Yard Fence as depicted in Figure 8 of Schedule 1, wind fence with a mesh aerodynamic porosity no greater than 50%. The height of western section of the Nelson Point South Yard Fence must be no less than 15 m above the base of the stockyard and the eastern length with a height no less than 20m above the base of the stockyard.	Nelson Point (South Yard): SY Wind fence as depicted in Figure 8 of Schedule 1.
	Reclaimer	Construct reclaimer fitted with boom sprays designed to direct water toward the stockpile surface and reclaiming buckets.	South Yard reclaimer (Nelson Point extension): Reclaimer 11 as depicted in Figure 5 of Schedule 1.
	Stockpile water cannons	Stockpile cannons located along stockpile rows spaced at intervals that ensure full coverage of the	South Yard stockpiles (Nelson Point extension):

		stockpile surface with water.	F area as depicted in Figure 5 of Schedule 1.
Stage 2B	Conveyors and conveyor drives	Install belt wash stations at the return end of conveyor to minimise the carry back of ore.	South Yard conveyor (Nelson Point extension): P770 North Yard conveyors (Nelson Point extension): P218, P238 as depicted in Figure 5 of Schedule 1.
	Stockpile water cannons	Stockpile cannons located along stockpile rows spaced at intervals that ensure full coverage of the stockpile surface with water.	South Yard stockpiles (Nelson Point extension): X area as depicted in Figure 5 of Schedule 1.
	Stacker	Stacker designed to luff to minimise the height between stacker and stockpile. Fitted with dust hood and head sprays designed to minimise dust at the stockpile as ore is deposited.	South Yard stacker (Nelson Point extension): Stacker 14 as depicted in Figure 5 of Schedule 1.
Stage 2C Car dumper and Spaghetti Junction transfer stations	Car dumper and exit conveyor	Partially enclosed (open train entry and exit points only) and equipped with wet scrubber extraction and collection system.	South Yard car dumper (Nelson Point extension): Car Dumper 6 as depicted in Figure 5 of Schedule 1.
		Install fogging unit at the conveyor of car dumper to minimise the escape of dust emissions from the car dumper.	South Yard car dumper (Nelson Point extension): Car Dumper 6 exit conveyor (P236) as depicted in Figure 5 of Schedule 1.
		Install belt wash station at the return end of conveyors to minimise the carry back of ore.	South Yard conveyors (Nelson Point extension): P236 (Car Dumper 6 exit conveyor) as depicted in Figure 5 of Schedule 1.
	Spaghetti Junction transfer stations	Install control that is consistent with DWER's Dust Management Guideline for bulk-handling port premises, to achieve a minimum	Transfer Stations: TS2, TS3 and TS354 as depicted in Figure 5 of

		40% reduction in dust emissions. Must be installed within 5 years from the date of amendment, as specified at the front of this Licence.	Schedule 1.

The Licence Holder is also proposing to seal select open areas to reduce potential for dust emissions via wind erosion and vehicle traffic. Sealing will occur in two phases as part of the 330 Mtpa upgrade as shown in Figure 16. Although sealing of open areas can significantly reduce the potential for dust generation from those areas, maintenance such as sweeping and/or washing is required to ensure effectiveness as resuspension of dust deposited may occur if not removed. An 85% reduction in dust emissions was assumed in the modelling.

Figure 16: Open area sealing (Phase 1 and 2)

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

- The air quality assessment of a 'no net increase' in dust emissions from the Premises is contingent on the above controls, primarily consisting of the proposed wind fences, being implemented and their efficacy.
- There is sufficient uncertainty in the understanding of the wind fences which warrant staged production increases, coupled with additional controls on the Licence requiring the Licence Holder to demonstrate control efficiency through validation monitoring.
- Where no net increase cannot be demonstrated, the implementation of additional dust controls will be required through future licence amendment.
- The Licence Holder blends ores to meet customer demands on iron ore product

specifications. Ore blending does not remove the risk of dust being generated from handling ores containing a high percentage of fine and/or friable material but rather disperses the leading source of dust generation across the Premises as a less concentrated dust source.

- The Licence Holder will commit to installing additional controls at transfer stations TS2, TS3 and TS354, located at Spaghetti Junction within five years from issue of the Amended Licence (refer to section 4.4.1). The nature of these controls will be informed by the Department's Dust Management Guidelines for Bulk Handling Port Premises, currently in development, and designed to achieve a minimum 40% reduction in dust emissions (BHP, 2021).

5.2 Source – Noise

Noise is generated from normal operations at the Premises including noise from rail car movements (including car dumping), reclaimers, front end loaders, screening and from iron ore product movement through conveyors, stackers and reverse alarms. Additional noise will be generated from new infrastructure to be installed as a result of the proposal. There is also the potential for changes in noise emissions from existing sources as a result of route upgrades that involve alteration of existing ore handling equipment and the application of additional noise controls.

Wheel squeal and shunting from train movements may also contribute to noise generated from the Premises although noise from trains is not covered under the Noise Regulations. Therefore, rail operations have not been considered as a source of noise for the purposes of this risk assessment.

Regulation 13 of the Noise Regulations specifies requirements for construction. A Construction Noise Management Plan will be developed by the Licence Holder and submitted to the Town of Port Hedland, if required, in accordance with Regulation 13 of the Noise Regulations.

Key Findings: The Delegated Officer notes:

- The Noise Regulations exclude noise emissions from train movements (Regulation 3) and therefore these have not been considered in this assessment.
- The Noise Regulations specially deal with construction noise (Regulation 13) and therefore noise from construction has not been considered in this assessment.

5.2.1 Licence Holder controls

The Licence Holder manages noise emissions at the Premises in accordance with an Environmental Noise Reduction Management Plan (ENRMP) which aims to:

- reduce noise to as low as reasonably practicable, acknowledging growth, and, where reasonably practicable, comply with the requirements of the Noise Regulations (including seeking an exemption, if necessary);
- where it is impracticable to comply with Noise Regulations, ensure continuous improvement is facilitated through this ENRMP;
- ensure that new plant and infrastructure planned for the Port facilities particularly Prescribed activities (as defined by the EP Act), complies with the Noise Regulations, where land use planning constraints allow; and
- comply with the Western Australian Planning Commission's State Planning Policy 5.4, Road and Rail Transport Noise and Freight Considerations in Land Use Planning where land use planning constraints allow.

The ENRMP identifies the hierarchical principles of noise minimisation (Table 14), which are used to identify where and how noise sources are designed, managed and monitored.

Table 14: Noise minimising strategy

Controls	Description
Siting	Equipment that is known to emit noise predominately in one direction shall, where possible, be orientated so that the noise is directed away from noise-sensitive areas.
Engineering	Implementation of engineering designs and controls to reduce operational noise including enclosing, shielding, installing low noise equipment and performing regular maintenance on equipment. Cladding is also used to dampen noise from equipment.
Mobile plant equipment	Regular maintenance of mobile equipment. Where machines are fitted with engine covers, these are kept closed when the machine is in use.
Monitoring	An ongoing noise monitoring program is undertaken with monitoring taking place biannually around March and September each year.

5.2.2 Identification of priority noise sources

The selection of noise controls considers the principles outlined in the ENRMP (Table 9) with the aim of addressing the noise sources from within the Premises that have the greatest impact on sensitive receptors to achieve maximum noise reduction.

The Licence Holder has developed a noise model (section 5.2.4) for their port operations which acts as a tool for predicting and managing noise emissions from the Premises. Biannual monitoring is carried out by the Licence Holder at noise sources and receptors to validate the noise model and assist with the identification of priority noise sources (i.e. those with the highest contribution to noise received at receptors). The current top 20 priority noise sources identified by the Licence Holder are set out in Table 15.

Table 15: Top 20 ranked noise sources for existing operations (BHP, 2020)

Rank	Noise source	Rank	Noise source
1	P354	11	P2
2	Drive P353 N	12	Drive P351
3	P513	13	P701
4	P730	14	Drive P11
5	P351	15	WY P862
6	P352	16	P621
7	P350	17	P12

8	P32 Reclaimer 5 Drive	18	P563
9	P14	19	CD1
10	P201	20	P353

5.2.3 Proposed controls

The location of Port Hedland's West End in close proximity to heavy industry has resulted in ambient noise not meeting the Assigned Noise Levels specified in the Noise Regulations. Recognising this, the noise management objective for any new significant proposal in Port Hedland is to achieve a no net increase in noise received at sensitive receptors.

To support the application for an increase in throughput and demonstrate that there will be 'no net increase' in noise emissions from the Premises, the Licence Holder has proposed the implementation of the noise controls listed in Table 16 to be applied to both new and existing infrastructure.

Table 16: Proposed Licence Holder controls for each stage of the proposal

Stage of works	Proposed control	Equipment (refer to Figures 4 and 6 of the Amended Licence)
Existing infrastructure (not linked to any growth)	Hybrid ultra-low noise idlers	P2, P10, P15, P26, P32, P119, P352, P353, P355, P502, P503, P504, P505, P506, P509, P510, P511, P512, P562, P602, P621, P701, P775
Route Upgrades	Drive shields	P510, P511 and P512
South Yard Expansion (Stage 1)	Hybrid ultra-low noise idlers	P772 Reclaimer 11, P773 and P780
	Drive shields	P14N, P16N, P206, P353N, P501, P505N, P505S, P773A and P773B
	Replacement drive shields	P503N and P503S
South Yard Expansion (Stage 2)	Hybrid ultra-low noise idlers	P201 extension, P350 extension, P770, P771 Stacker 14 and P777
	Drive shields	P201N, P201S, P516, P552, P560, P730, P770A, P770B and P777
Car Dumper 6	Hybrid ultra-low noise idlers	P218, P219, P236, P237, P238, P25 extension, P701 extension, P118 extension, P774, P778 and P729
	Drive shields	P218A, P218B, P219, P236A, P236B, P237, P351, P774 and P778
	CD5 designed to direct noise away from residential receptors. Car indexers located close to shed walls that consist of noise	CD6

	panels lined with vinyl acoustic coverings.	
	Dust extraction and ventilation to be fitted with: • Inline exhaust silencers • Noise panels for shielding • Low noise blades Dust extraction located and oriented to minimise noise transport to the community.	CD6

In determining what noise controls are to be applied, the Licence Holder has taken into consideration the principles of ALARP (as low as reasonably practicable) which assess noise attenuation options against criteria such as noise abatement potential, safety, reliability, maintainability, operability and cost.

Proposed noise controls have been applied to the majority of priority sources identified in section 5.2.2 in addition to a significant number of other noise sources. Only four of the top 20 priority sources identified are not planned to have additional noise controls applied due to:

- controls already being in place (WY P862 now has ultra-low noise idlers installed);
- the equipment being scheduled for future refurbishment works that may include additional noise mitigation (CD1); or
- the ALARP assessment identifying that implementation of additional controls is not practicable (Reclaimer 5 and Drive P11).

Maintenance of idlers

The Licence Holder undertakes regular inspections (weekly for high use areas such as car dumpers, and fortnightly or monthly for lower use areas) to assess condition of idlers and determine maintenance requirements. Idler replacement is based on these inspections and categorised based on severity which determines the timeframes for replacement

- Severity 1 – action within 24 hours;
- Severity 2 – Inspect regularly and action within 1 week;
- Severity 3 – raise a notification and action before next shutdown or plan into the next shutdown for Severity 3; and
- Severity 3/4 – notification and action before next shutdown or plan into the next shutdown for

Ongoing maintenance is critical in ensuring that the efficiency of noise control equipment is maintained and that noise emissions do not increase significantly over time.

Monitoring

Following completion of the upgrades the Licence Holder will continue to undertake biennial (twice yearly) noise monitoring to ensure that sound power levels are consistent with levels applied in the noise model. The noise monitoring program involves measuring night-time noise within the community and source measurements of equipment within the Premises. Source measurements are used to determine the acoustic energy that each equipment item is generating and to quantify any change in noise emissions since the previous measurement.

Key Findings: The Delegated Officer notes:

- The Licence Holder has proposed a number of noise controls for new and existing equipment that are predicted to result in a 'no net increase' of noise received at sensitive receptors.
- The selection of noise controls mostly appears to prioritise and address those sources that impact most greatly on receptors, including those that appear in the top 20 priority noise sources.

5.2.4 Noise modelling – 330Mtpa

As part of the Licence Holder's application to increase throughput to 330Mtpa, noise modelling was provided to demonstrate the potential impacts of operations on sensitive receptors in Port Hedland and South Hedland. Modelling assumes worst case meteorological conditions and that all equipment is operating simultaneously to predict worst case noise emissions.

Sound power levels applied through modelling were based on the results of validation monitoring of the same roller type (hybrid ultra-low noise idlers) trialled on existing conveyors following 12 months of operation. Therefore modelled sound power levels are conservatively based on the operation of worn conveyors.

The following three scenarios were modelled to compare the noise levels experienced at receptors:

- In isolation case: Implementation of the proposal in insolation (i.e. only new equipment and infrastructure) with no new noise mitigation;
- Cumulative case: Operation of existing facilities in addition to all in-isolation changes with no new noise mitigation; and
- Cumulative case (Noise controls): Operation of existing facilities in addition to all in-isolation changes and with new noise mitigation measures applied.

Modelling predicts that new infrastructure will increase the overall noise emissions at receptors by between 0.4 – 2.2 dB(A) without the application of any new noise controls, however the application of additional noise controls would achieve a "no net increase" (Table 17).

Table 17: Predicted worst case received noise levels (L_{A10}) against Assigned Levels

Sensitive receptor	In isolation scenario (Without noise control) - dB(A)			Cumulative scenario - dB(A)				
				Base Case	Without noise control		With noise control	
	Assigned Level	Model result	Exceedance in dB		Model result	Increase in dB	Model result	Increase in dB
Brearly Street	32	48.4	16.4	49.7	51.9	2.2	49.7	0
Hospital	32	53.2	21.2	57.2	58.5	1.3	57.2	0
Police Station	47	51.6	4.6	60.6	61	0.4	60.6	0
Pretty Pool	30	29.9	0	33.2	35	1.8	33.2	0
South	30	20.3	0	26.3	27.7	1.4	26.3	0

Hedland								

Key Findings: The Delegated Officer notes:

- Cumulative noise levels in Port Hedland currently exceed the Noise Regulations.
- Noise modelling is based on worst case meteorological and operating conditions.
- Noise levels from the proposal in isolation are greater than the Assigned Noise Levels specified in the Noise Regulations at Brearley Street, Hospital and Police Station locations.
- The Premises is a significant contributor to cumulative noise in the West End of Port Hedland, as defined by regulation 7(2) of the Noise Regulations.
- Implementation of the proposal without any additional noise controls is predicted to increase existing cumulative noise levels by between 0.4 and 2.2 dB(A), which is below the perceivable level of noise increase for humans.
- For such a large scale operation, it is almost not possible nor practicable to model an exact 0.0 dB change as what is calculated in the model provided. However, conclusions of the modelling are considered reasonable based on new infrastructure being expected to have a much lower noise output than would otherwise be generated by similar existing infrastructure.
- Results of modelling are reliant on the assumption that the proposed noise controls are properly installed and appropriately maintained to achieve design noise criteria. Therefore, additional licence conditions ensuring that equipment is maintained are justified to ensure noise emissions do not increase beyond what was predicted.

5.3 Receptors

In accordance with the *Guidance Statement: Risk Assessment* (DER 2017), the Delegated Officer has excluded employees, visitors and contractors of the Licence Holder'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 18 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emissions and discharges from the prescribed premises *(Guidance Statement: Environmental Siting* (DER 2016)).

Table 18: Receptors and distance from prescribed activity

Residential and sensitive premises	Distance from Prescribed activity
Closest residential premises to prescribed activities (North Yard)	Approximately 500m
Closest resident to shiploaders	Approximately 900m
Esplanade and Pier Hotels	Distance from nearest stockyard – approximately 760m Distance from nearest ship loader – approximately 490m
Taplin Street (ambient monitoring site)	Distance from nearest stockyard – approximately 940 m north

	Distance from nearest ship loader – approximately 2,600m

Guests at short stay accommodation, for example at the Esplanade or Pier Hotels, are classed sensitive receptors. However, it is important to note that as with industrial and commercial receptors the sensitivity of short stay visitors is lower than residential receptors due to the limited assumed duration of exposure to dust concentrations. The *Port Hedland West End Improvement Scheme No. 1* (WAPC, 2020) limits the permitted duration of a short stay guest in the West End to three months in any 12 month period.

Areas within the Improvement Scheme are not zoned residential. However, part 17(1) of the Improvement Scheme states that the *"Scheme does not prevent the continued use of any land, or any structure or building on land, for the purpose for which it was being lawfully used immediately before the commencement of this Scheme."* (WAPC, 2020).

5.4 Risk ratings

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. 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 5.1), 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 19.

The Revised Licence L4513/1969/18 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises.

The conditions in the Revised Licence have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 19. Risk assessment of potential emissions and discharges from the Premises during construction and operation

Risk Events					Risk rating C = consequence L = likelihood[1]	Applicant controls sufficient?	Conditions of licence	Justification for additional regulatory controls/no additional controls
Sources/Activities	**Potential emissions**	**Potential receptors**	**Potential pathway and impact**	**Applicant controls**				
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	Wind fences along the West Yard (Finucane Island) and South Yard (Nelson Point). Belt wash stations on all new and some existing conveyors in the South Yard. Sealing of open areas (Phase 1 and Phase 2). Fogging units installed in Car Dumpers CD1, CD2 and CD3. Boom sprays fitted to Reclaimer 11 and Stacker 14; stockpile water cannons at F and X Areas; wet scrubber extraction system and fogging unit at Car Dumper 6 (new infrastructure).	**High** C = Major L = Likely	Yes	*Condition (proposed):* Installation of all proposed dust controls for new and existing infrastructure. Staged throughput increases linked to implementation of controls and validation of effectiveness. *Additional regulatory controls:* Amendments to management trigger criteria for dust recorded at the Premises boundary. General housekeeping conditions for the clean-up of material removed at belt wash stations. Restrictions to dust generating construction activities during high risk meteorological conditions. Installation of additional dust controls at three transfer stations identified in section 4.4.1 as high dust generating materials handling infrastructure. Validation of dust control effectiveness. Validation of 'no net increase' from the Premises. Implementation of additional dust controls if proposed controls are unable to achieve no net increase in dust emissions.	As discussed in further detail in sections 4.1.1 and 5.1, proposed controls largely target those dust sources that are wind dependent. However, significant levels of dust can be generated independent of meteorological conditions. Further infrastructure controls will be required at points of ore handling, and if the Licence Holder's controls are demonstrated to not be effective in achieving 'no net increase' through validation and ongoing monitoring. A common downfall of air quality modelling is that there remains a level of uncertainty associated with assumed emissions reduction estimates as a result of implementing controls such as wind fences, road sealing and other infrastructure controls. This subsequently reduces DWER's confidence in the size of the assumed reduction in emissions. Therefore it is necessary for the Licence Holder to validate the effectiveness of dust controls. The Licence Holder will be required to address any shortcomings in control effectiveness by implementing further controls. In addition to validating dust control effectiveness, the Licence Holder should be able to demonstrate that increased throughputs do not result in further impacts at sensitive receptor locations. Refer to section 6.1 for further justification.
		Ecological receptors e.g. Mangrove habitat and turtle nesting grounds		As above.	**High** C = Major L = Possible	Yes	As above.	Controls for the management of dust for the protection of public health are also expected to reduce risks to ecological receptors.
	Noise	Residents in the West End of Port Hedland. Esplanade and Pier Hotels in Port Hedland town centre.		Hybrid Ultra Low Noise Idlers (ULNI-H) installed along all new conveyors and conveyors in the north yard. Drive shielding. Noise controls integrated into the design of Car Dumper 6.	**Medium** C = Moderate L = Possible	Yes	Installation of proposed noise controls required by licence conditions. No additional controls placed on the licence.	New equipment including conveyors, Car Dumper 6, Stacker 14 and Reclaimer 11 are each expected to have a lower noise output than similar older equipment. In addition, new equipment is predominantly in the South Yard and at greater distance to receptors than existing noise sources. Noise output from both proposed and existing infrastructure at the Premises, without control, is expected to increase by between 0.4 and 2.2dB, which is below the perceivable level of noise increase for humans. However, with additional controls applied there is expected to be no net increase in noise as received by nearest sensitive receptors.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guidance Statement: Risk Assessments* (DER 2017).

6. Conclusion

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a Revised Licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

6.1 Licence controls

6.1.1 Throughput limits

The Licence Holder is authorised to increase shiploading throughputs from 290Mtpa to 330Mtpa in a staged approach following installation of additional dust and noise controls relevant to each stage of the increase. Authorisation to increase throughput is dependent upon the implementation of the specified noise and dust controls.

Note: Consistent with other port licences issued under Part V in Western Australia, throughput limits are to be calculated based on “wet tonnes” shipped, that is the total tonnes of as-shipped product. No calculation to remove water content within shipped iron ore products is permitted.

Subsequent demonstration that the dust controls have been effective in achieving no net increase in dust emissions at the increased throughput through a Dust Control Validation Report is not connected with authorisations for throughput increases. However, in the event that the Licence Holder cannot demonstrate that Premises activities are not achieving the objective of no net increase in overall dust emissions, DWER will look to implement a proportionate and reasonable response.

The purpose of the Dust Control Validation Report is to assess the effectiveness of specific controls in comparison to assumed effectiveness in the model.

Grounds: The authorisation of additional throughputs is based on the implementation of dust and noise controls, rather than route upgrades which may occur at any time and not in sequential order. This allows flexibility for the Licence Holder while ensuring that regulatory controls are proportionate to the risk of dust and/or noise.

Throughput increases are likely to result in increased dust emissions from the Premises if controls do not adequately reduce emissions from key dust sources. As there is uncertainty regarding the effectiveness of the proposed dust controls, and DWER has determined a ‘High’ dust risk associated with Premises activities, throughput increases are contingent upon the implementation of further controls. In the event that the Licence Holder cannot demonstrate the ability of controls to achieve no net increase in dust emissions based on the conclusions and DWER-analysis of inputs to a Dust Control Validation Report, further improvements may be required through DWER-initiated licence amendment.

When assessing future applications for throughput increases or changes to iron ore characteristics that may increase the dust risk from the Premises, due consideration will be given to dust concentrations recorded at the Premises boundary with a focus on determining if no net increase has been achieved following previously authorised increases to throughputs. That is, the Licence Holder will be required to demonstrate no net increase in dust from the Premises.

6.1.2 Materials handling specifications

New ore deposits

This Amendment Report, which informs the conditions of the Amended Licence, has assessed a level of risk based only on those iron ore products currently handled/accepted at the Premises, and those iron ores with a similar risk profile.

Any iron ore (magnetite, goethite or hematite product) from an alternate mine site to those

currently supplying the Premises and assessed through this Amendment Report may present a lower or greater hazard to public health. In the event that any ore brought to the Premises results in a heightened dust risk from that which has been assessed, the Licence Holder will be required to seek approval from DWER to remain compliant with the EP Act.

Note: Section 53 of the EP Act states that:

(1) "Subject to this Act, the occupier of any prescribed premises who, if to do so may cause an emission, or alter the nature or volume of the waste, noise, odour or electromagnetic radiation emitted, from the prescribed premises —

(c) alters the type of materials or products used or produced in any trade carried on at the prescribed premises;

commits an offence unless he does so —

(f) in accordance with —

(i) a works approval; or

(ii) a licence…"

Any potential or future risk arising from increases in the presence of hazards from new iron ore products handled would trigger the requirement for the Licence Holder to notify DWER ahead of accepting that ore type. This includes notification for the increase in presence and/or proportion of the following hazards identified through this Amendment Report:

- asbestiform fibres;
- respirable crystalline silica; and
- fines fractions within the ore 2.5 micron or finer.

Conditions of the Licence for maintaining moisture content of ore above the measured DEM level will continue to apply for the general control of overall dust emissions from ore handling and stockpiling.

Grounds: The Licence Holder has indicated that there is potential for the development of new iron deposits resulting in the introduction of new iron ore products that have not been assessed through this Amendment Report. While moisture content is a key control for the management of dust from iron ore handling, maintaining moisture above the DEM level does not prevent the emission of dust from that iron ore product. Therefore an increase to the key hazards assessed in this Amendment Report is expected to increase the risk of dust impacts.

The determination of risks associated with dust in this Amendment Report has been assessed against the characteristics of the iron ore products handled currently or is known to be handled at the Premises in future. Therefore, any significant change in ore characteristics could result in a change to the risks to environment and/or public health from Premises operations.

This Amendment Report has considered those iron ores currently handled as being representative of future products that will enter the Premises. Hazards associated with existing iron ores handled or known to be handled at the Premises are provided in section 5.1.2.

Authorised works

Conditions have been included on the Amended Licence authorising works for the proposed route upgrades, productivity initiatives and expansion as well to require implementation of the noise and dust controls which have been proposed by the Licence Holder in order to achieve 'no net increase' in noise or dust emissions from the Premises.

The Licence Holder is required to verify the controls have been implemented in accordance with requirements of the Licence through submission of an Environmental Compliance Report at each stage of works is completed.

Following the staged installation of dust control equipment the Licence Holder must also submit a series of Dust Control Validation Reports to the department, which demonstrates that each stage of controls has resulted in the required level of abatement that ensure no net increase from the Premises at the relevant increased throughput. For the final stage, which involves the installation of major ore handling infrastructure, the Licence Holder will also be required to demonstrate that emissions from that infrastructure are consistent with assumptions presented in the Application.

Note: Validation of dust control equipment is only required for new equipment or infrastructure that has not previously been monitored for effectiveness as a dust control (wind fences), new infrastructure (new car dumper foggers) and road sealing works. As the complexity is greater for the required monitoring campaign to determine the effectiveness of wind fences as a dust control, when compared for example with car dumper foggers, an extended reporting submission date is provided for through licence conditions.

Dust control validation monitoring is expected to provide theoretical evidence of whether or not proposed controls will result in dust reductions assumed through modelling. Further monitoring is required to demonstrate that 'no net increase' is achieved at the Premises boundary and as actual throughputs increase (refer to section 6.1.7).

Grounds: DWER has determined a 'High' dust risk associated with Premises activities and notes the potential for greater concentrations of dust being emitted from the Premises as a direct result of throughput increases. While the Licence Holder's modelling predicts the proposed controls will sufficiently reduce emissions from key sources such that there will be 'no net increase' in dust emissions, the assessed High dust risk from the proposal and level of uncertainty identified in the review warrant detailed verification to demonstrate the effectiveness of the controls when operating at each stage of higher throughput.

Where the Dust Control Validation Report is unable to demonstrate the Premises has achieved no net increase in dust emissions following the installation of the specified controls, the Licence Holder will be required to submit an improvement plan that identifies further controls. The improvement plan will be required to demonstrate how no net increase will be achieved when operating at a throughput rate of up to 330Mtpa.

Additional dust control at Spaghetti Junction

The Licence Holder has committed to installing additional dust control equipment at three transfer stations identified has being significant dust emitters through modelling (TS2, TS3 and TS354). Existing dust control availability requirements will apply to all existing and new dust control equipment.

Note: The type of dust control equipment has not been specified as the Licence Holder has proposed to await the publication of DWER's Dust Management Guideline to determine the most suitable control type. The minimum required effectiveness of these controls is therefore specified to both allow flexibility in dust control equipment selection and ensure that the potential for increased dust through Spaghetti Junction is suitably addressed through the implementation of these controls.

Dust controls at Spaghetti Junction are in addition to those proposed through the Application and modelled. Therefore the implementation of these controls has not been initially connected to throughput increases to 330Mtpa. However, based on this risk assessment these controls are necessary to address dust sources from materials handling areas located at distance to wind fence controls. The Licence Holder must install these controls within five years from the date of issuing the Amended Licence. Failure to do so would result in a reduced authorised rate of throughput back to 303Mtpa, as authorised following Stage 1B dust control implementation.

Grounds: As evident through the LiDAR study (refer to section 4.3), Spaghetti Junction is a known significant dust source that contributes to peak dust events.

Management actions

Conditions have been placed on the Amended Licence to cease earthmoving and construction activities associated with wind fence construction, where visible dust is identified and under specified meteorological conditions that place West End receptors downwind of the Premises. The requirement will be triggered during strong wind conditions (when winds are greater than 14 m/s) and when wind speeds are averaged within the relevant wind vector and greater than 4 m/s for 3 or more 10 minute periods.

Note: The Licence Holder will also be required to manage dust from other construction activities following the exceedance of management trigger criteria that already exist on the licence, as measured at boundary monitors.

The implementation of additional management controls for dust may be required to avoid delays to construction.

Grounds: Some construction activities will generate dust which may impact on downwind receptors under certain meteorological conditions. Due to the High dust risk associated with the Premises generally, a specific control relating to construction activities is required to ensure the activities do not increase the risk of impact to downwind receptors.

Management trigger criteria is measured against monitors at the boundary closest to residential receptors at both Finucane Island and Nelson Point. The nearest PM_{10} monitor used for the purpose of triggering reactive dust control measures are located approximately 700m from the wind fence on Finucane Island and over 1,100 m from the wind fence on Nelson Point. The distance between these monitors and the potential source of high dust levels crossing the Premises boundary toward residential receptors is too great to allow for timely management of dust based on boundary monitoring triggers, particularly in low wind speed conditions. Therefore conditions restricting dust-generating construction activities are valid and risk-based in accordance with DWER published guidance.

6.1.3 Maintenance and operation requirements

Maintenance requirements

The operation and maintenance requirements (Schedule 4) for premises infrastructure have been updated to include operation of new noise and dust controls which will be established as part of the proposed route upgrades, productivity initiatives and expansion. Additional controls have also been added including;

- General hygiene conditions - requiring clean up under conveyors, street sweepers and managing open areas to minimise dust lift off from spillage and open areas
- Application of dust suppressant to unsealed trafficked areas
- Maintenance of low noise idlers to ensure performance

Operation requirements – mobile screening plant

An additional operating condition has been included requiring operation of mobile screening plant to cease following the exceedance of management trigger criteria that already exist on the licence.

Note: Mobile rescreening activities must only occur during the daytime to improve visual observations of dust. The Licence Holder is expected to act accordingly to manage dust from the mobile rescreening plant to ensure that its operation does not significantly contribute to dust crossing the Premises boundary.

Grounds: Operation of mobile screening plant and associated front end loading operations will generate dust which has the potential to impact on downwind receptors under certain meteorological conditions. Due to the High dust risk associated with the Premises a specific control relating to operation of mobile plant is required to ensure the activities do not increase

the risk of impact to downwind receptors during high dust conditions.

6.1.4 Moisture monitoring

In load moisture monitoring

The requirement to achieve relevant DEM Levels for 90% of all iron ore in-loaded and accepted on the Premises as averaged over each calendar month has been retained.

The Licence Holder has requested that moisture analysis requirements against DEM level be able to be transitioned to allow for future determination of moisture content at the mine. The Licence Holder currently uses real time NIR analysers to measure the moisture content of ore received at the Premises to determine compliance with corresponding DEM Levels. Collection of real-time moisture data is key to dust management as it allows for immediate response to low moisture content prior to further ore handling that may generate dust.

Note: The Delegated Officer recognises that there are technical issues and uncertainties associated with the application of NIR analysers suggesting that the analysers may not be recording accurate data; particularly for high volume conveyors and lump iron ore products. Conditions requiring ore moisture content to be measured using current NIR analysers available have been retained.

It is also recognised that minimum rates of ore moisture content remaining above the DEM level are below that required of some other Port Hedland port operators through their Part V licences.

Grounds: Managing moisture content is critical in controlling dust emissions from ore as it arrives on site. However, unlike other Port Hedland operations the Licence Holder has the ability to directly ship ore from its train unloading infrastructure (car dumpers). Direct shipping removes key dust generating activities such as stacking, storage and reclaiming, and is expected to remain at similar levels ongoing, justifying a reduced moisture content availability rate. Stackers and reclaimers have been identified through the modelling and LiDAR study as being a significant dust source.

In addition, the Delegated Officer understands that many of the ores received at the Premises are mined from above the groundwater level and that achieving 100% of ore having a moisture content above DEM level is not practical. However, the Licence Holder has equipment for the purpose of increasing ore moisture at its ore blending operations in Newman.

Determination of moisture content of ore at the mine is measured prior to stockpiling, reclaiming, train load out and rail transport suggesting that ore is likely to have a different moisture content upon arrival at the Premises due to moisture loss associated with evaporation. This has been investigated by the Licence Holder to estimate the rate of moisture loss and addition to enable accurate calculation of ore moisture content on receipt at the Premises.

Potential bias associated with ore sampling at the mine has also been investigated to verify sample accuracy. Results show that there is a level of negative bias in moisture content measurements at the mine indicating that moisture content is potentially under reported. Initial tests for Jimblebar Fines indicate an average bias of -1.14% (ranging from -0.67% to -1.56%) however bias calculations for all ore types has not been completed and further investigation is required.

The Delegated Officer notes the uncertainties regarding NIR accuracy and recognises work carried out by the Licence Holder in developing an alternative method to NIR analysis. However further validation of assumptions for moisture loss and addition are required prior to accepting the proposed moisture determination method for the purpose of regulating moisture content. DWER may consider amending the moisture analysis requirements in the future once reliable methods are determined and validated.

Outload moisture monitoring

The requirement to achieve relevant DEM Levels for 95% of all iron ore out-loaded from the

Premises has been amended to remove the requirements for compliance to be averaged over each calendar month, instead requiring the 95% moisture content compliance to be averaged annually and for each product.

The Licence Holder will be required to average outloaded iron ore moisture for each product per shipload calculated from iron ore product cuts taken approximately every 10,000 tonnes and measured at a sampling station. This means that for every 100 averaged outloaded product samples for moisture content, there may be no more than five that have an averaged moisture content below the respective DEM level for each product.

Grounds: The Licence Holder has demonstrated improvement with ore moisture as it arrives to the Premises. This change is consistent with other licences in Port Hedland and ensures a higher rate of compliance with the DEM for products that are typically drier in nature. By focusing on a compliance rate across all ore types and blends, as opposed to overall outloaded product compliance, the condition requires the Licence Holder to apply greater attention to achieving a higher moisture content for those products that may otherwise bring the overall moisture content compliance averages down when measuring across all ore/blend types. The intent is to therefore reduce the number of “dry patches” of short term high dust events at shiploaders.

Shiploaders have been identified through the modelling and LiDAR study as being a significant dust source. With limited ability to apply dust control equipment, managing moisture content is critical in controlling dust emissions. The intent of this control is to encourage greater management of iron ore moisture upstream from the shiploader to achieve dust reductions across the Premises.

6.1.5 Boundary air quality monitoring

Reference to Australian Standard AS3580.9.11. has been removed from conditions. Peak PM_{10} monitoring stations at the Premises will still be required to comply with the following siting standards as specified in Australian Standards (AS3580.1.1):

- Height above ground to probe is at least 1.5m and up to 15m.
- Unrestricted air flow of 180° around sample inlet with no obstruction between the major source and the sample inlet.
- No extraneous sources nearby.
- 2 m from a road.
- 10 m from any object with a height exceeding 2 m below the height of the sample inlet. For trees, the distance shall be measured from the dripline.
- Co-located high volume samplers 2-4m apart.
- No trees between sampling inlet and source.

Following an audit of monitors in 2020, the Licence Holder identified that the Cargill monitor was not able to fully comply with these standards.

Note: DWER acknowledges that while it is sometimes not possible to have monitors fully comply with Australian Standards for siting (AS3580.1.1) data obtained from non-compliant monitors may remain useful provided that limitations on siting are fully understood by the person interpreting data. The Cargill monitor is permitted to operate in partial compliance with AS3580.1.1.

The Licence Holder has also advised DWER of its intent to relocate the E Berth monitor. This monitor provides valuable data on nearby sources and if relocated, must be moved to a location that is representative of nearby dust sources and maintain a better, or similar level of compliance with Australian Standards for siting.

Grounds: The real time modules placed on the BAM monitors used for boundary monitoring do

not have an Australian Standard associated with them. However, they continue to supply valuable data over a 10-minute averaging period, which allows for greater responsiveness to high dust events. This change is administrative and aligns with requirements to calculate 1-hour rolling averages based on 10 minute data.

6.1.6 Management trigger criteria

Amendments have been made to existing conditions that trigger management actions for dust control in response to elevated short-term PM_{10} concentrations at Taplin Street where the Premises may be a contributing source. Amendments align the conditions consistent with other ports operating in Port Hedland.

Wind arcs

Wind arcs used to inform trigger management at Nelson Point are greater than for other port operators due to the scale of the site and its proximity to receptors.

It is worth noting that management criteria set against averaged wind arcs are not a perfect solution to responding to Premises impacts on receptors. For example, this method may limit the recording of, and response to dust events occurring at receptors during wind directions beyond the 'arc of influence'. This may occur where dust from the Premises moves in an arcing fashion as wind direction swings. Therefore additional conditions for the ongoing management and avoidance of dust are required.

It is also possible that during high dust events at other operations may contribute to high dust levels under the specified wind arcs. In the absence of less limited monitoring trigger management options, the use of these conditions in combination with the prescription of dust control infrastructure and consistent operational dust management strategies on all port operating licences works to reduce impacts to receptors from high risk events, and the likelihood that the Licence Holder will be responding to dust from another port operator. As the Licence Holder operates in a cumulative air shed where risks associated with dust are assessed as 'high', all contributions to dust concentrations generated by the premises activities in that wind arc must be addressed.

Averaging periods

It has become clear to DWER that the historic application of management triggers by the Licence Holder has not aligned with the original intent of the Licence condition – to be measured against a 1-hour rolling average that relies on the use of 10-minute data collected by nephelometers located at each licensed boundary monitor. On this basis, DWER has clarified the condition consistent with other port operator conditions that apply the same principles.

BAMs typically measure PM_{10} on an hourly averaging period, presenting data for the previous hour meaning that data received may not accurately represent the ambient air quality in real time. Using the current condition structure, this could result in the Licence Holder being alerted to a high dust event at minimum 1 hour after the event and then responding 1 hour, 20 minutes after the high dust event. If a short term dust event intersects two 1 hour averaging periods, the Licence Holder may not be alerted to the high dust event at all.

The nephelometers located at the Premises boundary adjacent to BAMs are capable of measuring PM_{10} over 10 minute intervals through real time modules. The use of 10-muinute data to inform trigger alerts allows the Licence Holder to react to high ambient dust levels at the Premises boundary in near-real time.

Note: The frequency of management criteria must be triggered on both Existing and Amended Licences is based on a rolling 1-hour average, which relies on 10-minute data capture from real time modules (nephelometers) applied to PM_{10} monitors. DWER acknowledges that nephelometers do not have an associated Australian Standard for measurement methodology and can, from time-to-time, overestimate dust concentrations.

For the reasons above, trigger concentrations have been increased to 10% greater than 24-hour reportable event concentration criteria to focus trigger events on those significant dust events.

To avoid requiring the Licence Holder to conduct multiple trigger investigations for the same dust event and at the same monitor location and within a three-hour period, the Licence Holder may interpret the exceedance to be a single event. In such cases, it is allowable for the Licence Holder to conduct (a minimum of) one trigger investigation where a single dust event has occurred.

Revised management trigger criteria are intended to be a process of continuous improvement, designed to ensure that incidence of high dust at the boundary is responded to effectively and in a timely manner. Any future changes to trigger criteria at any port operator in Port Hedland will be informed by historical ambient and boundary monitoring data, and feedback from operators on the frequency and implementation of management actions against the criteria.

Grounds: An unintended consequence of increasing the frequency of management triggers due to a shift to the use of 10-minute data (from 1-hour BAM data) may be that there is a heightened risk of 'alert fatigue' at an operational level, which could result in reduced response on the ground. Consistent with other port operation licences in Port Hedland the management trigger concentrations have been increased to above the 24-hour reportable event criteria. It is intended that this will ensure that the focus on high dust events is for there to be faster response times.

By authorising the Licence Holder to consider multiple management trigger exceedances from the same monitor within a three-hour period avoids the requirement to conduct multiple trigger investigations in close succession where the likely source has not changed. This condition does not limit the Licence Holder from conducting further internal investigations in the event of a possible change to the source of dust. Management actions must continue for the duration that trigger criteria is exceeded, irrespective of how many investigations have been carried out.

Management trigger criteria are targeted at reducing dust from Premises operations that may be contributing to elevated dust concentrations at receptors in the West End. Trigger value concentrations of PM_{10} remain lower than for other operators on the grounds that the site is closer to receptors, meaning that there is less opportunity for particulates to drop out prior to reaching sensitive receptors.

The Licence Holder has demonstrated to DWER that the overall number of trigger exceedances and alerts will not decrease (they will likely increase) as a result of changes to management trigger criteria.

To allow the Licence Holder to update their automated alert systems to achieve compliance with the clarified management trigger criteria, a 10 month lead-in period has been applied. In the meantime, the Licence Holder will be required to continue applying management triggers as previously interpreted, which is from a 1-hour average recorded from BAMs.

Management actions that are responsive to high dust concentrations at the boundary serve to reduce the likelihood of longer-term (24-hour) exposure to elevated PM_{10} concentrations at receptor locations.

Management action

Investigative actions in response to the trigger levels being exceeded have not changed and where the cause can be identified, the Licence Holder will continue to be required to address the exceedance by acting to mitigate the source of dust, until PM_{10} concentrations reduce to below trigger levels. Where the cause remains unknown and background monitors (BOM and Yule) are not recording elevated PM_{10} concentrations, additional general site controls for the abatement of dust are required and are stipulated on the Licence. This includes ceasing all mobile rescreening activities and associated operation of front end loaders, operation of available BOC sprays on routes that are currently handling ore, operation of targeted stockpile

cannons on Deluge Cycle, additional water cart operation, and the activation of dust suppression equipment along operational routes at either Finucane Island or Nelson Point operations.

To avoid the unnecessary use of water resources on stockpiles and transfer stations that are likely to not be contributing to high dust events, amendments have been made to only require the initiation of additional dust suppression through water application at stockpiles and transfer stations within the area of the wind arc that caused the trigger criteria to be exceeded.

Note: Management actions will only be triggered where the averaged wind direction places the Premises upwind of West End. Similar conditions are applied for the management of dust during construction activities (refer to section **Error! Reference source not found.**).

The Licence currently includes trigger levels for boundary monitoring requiring immediate management action to be undertaken to ensure that the Premises does not contribute to high dust levels where sensitive receptors may be impacted. Site wide control is only required where the source of dust cannot be identified within the investigation period.

6.1.7 Reporting

Dust Control Validation Report

A requirement to submit Dust Monitoring Reports has been included on the Amended Licence with information required in the report specified in the schedule. The report will examine meteorological data and PM_{10} data from a point source monitoring devices and/or boundary monitors located near to installed infrastructure/handling activities.

Note: Preparation of the Dust Monitoring Report will be triggered by the completion of installing and constructing key dust controls and once the Licence Holder is capable of achieving the final authorised throughputs of 330Mtpa of iron ore based on equipment upgrades and new infrastructure.

The Delegated Officer notes that point source monitoring campaigns for model validation provide an indication of dust control effectiveness. Each monitoring campaign needs to be carefully designed to ensure that variability in meteorology, throughputs, iron ore products handled, moisture content, longer term dust control equipment operation and effectiveness and background sources are suitably considered and understood prior to reaching conclusions of effectiveness.

Dust control validation will need to take measurements at different throughput rates and when different ore types are being handled. Ore moisture content as compared against the DEM level for each ore will need to be recorded for further analysis of dust control effectiveness.

Careful consideration will also be required to determine the monitor setup and campaign duration appropriate for the type of emission source, control and pollutant type.

An evaluation of uncertainty and significance of results will need to be demonstrated through each campaign.

Grounds: The purpose of this report is to validate the emission rates assumed through modelling to demonstrate no net increase in dust emissions post-throughput increases and the introduction of additional dust controls.

Short-term dust validation monitoring campaigns are typically subject to a wide range of variables that can reduce the statistical certainty of results. For example, there is significant difference in the dust behaviour of each ore and ore blend handled at the Premises depending on its characterisation (refer to section 5.1.2). Therefore it is necessary for validation monitoring to be conducted for high and low dust-risk ores.

All possible variables will need to be considered to better understand the overall “true” and more accurate effectiveness of each control at the Premises.

Dust Monitoring Report

Submission of a Dust Monitoring Report will be required within 15 months following the completion of installation and compliance reporting for the final stage of works associated with achieving a Premises design capacity of 330Mtpa (Car Dumper CD6). The purpose of this report is to ensure that the risk of dust impacting sensitive receptors in Port Hedland is not increased by the overall prescribed activities at the Premises.

Note: The information will Dust Monitoring Report will 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.

In the event that 'no net increase' cannot be demonstrated, DWER will further investigate data to determine an appropriate and proportionate regulatory response, which may include the requirement for additional and focused dust controls at the Premises through an amended licence. Where DWER determines that there is insufficient evidence that higher dust levels at the boundary are attributable to Premises operations, more frequent tracking/overview of boundary monitoring data against the no net increase objective may be required.

Refer to the section below for further discussion on the determination of 'no net 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.

In addition, dust control validation monitoring has a narrow focus on dust emissions relating to a specific control and the source that it targets. Given the size of the Premises this may lead to other dust sources not being adequately considered. For example, a validation campaign for the effectiveness of wind fences in the South Yard does not provide information on the anticipated increase in dust emissions in the North Yard, which is expanding in capacity (refer to Table 10).

Quarterly reporting

Reporting requirements against high daily throughput rates (over 1,012,000 tonnes in a 24 hour period) have been removed in the Amended Licence as high throughput days have not been represented by correlation with high dust events.

To support DWER in its analysis of the Premises contribution to overall PM_{10} concentrations in Port Hedland, quarterly reporting conditions of the Licence have been amended to require the provision of all boundary monitoring data to DWER. This will also assist the department to analyse possible sources and contributing factors to high dust events periodically.

Dust scatter plots, otherwise known as dust roses, must be provided for Reportable Events to assist in the identification of the directional source of the high dust emissions.

For each Reportable Event the Licence Holder is also required to provide a comparison of boundary monitoring data with that recorded at ambient monitors in the Port Hedland community to determine possible impacts.

Annual reporting

Average Monthly Availability rates of dust control infrastructure must be reported within the annual report.

No net increase

No net increase has not been defined in the Amended Licence.

Defining the triggers and methods for determining no net increase will need to be complete before the Licence Holder's final stage of works is complete. These are often site specific and based on the location of operations and monitoring.

Generally, satisfying the term 'no net increase' requires the Licence Holder to demonstrate that PM_{10} concentrations have not increased from the Premises based on source and/or validated, long term boundary monitoring data. Meteorological conditions and dust levels from beyond the Premises boundary, as recorded by upwind boundary monitors and/or background monitors, must be taken into consideration when calculating the Premises' overall contribution to dust at the boundary.

Grounds: In 2018, the DWER first published its position on encouraging applicants to demonstrate no net increase in dust in residential areas of Port Hedland. This position was later confirmed in the publication of DWER's Port Hedland Regulatory Strategy which states:

"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."

Due to annual and seasonal fluctuations it is not appropriate to use PM_{10} averages from the 2018 calendar year alone as this year may have been representative of a high or low dust year, or even a year where monitors were not suitably located to be an accurate representation of dust crossing the boundary into residential areas of Port Hedland.

It is intended for a consistent approach to be applied to all Port Hedland operators. A baseline will be derived for each Port Hedland premises on a site specific basis that is representative of baseline dust levels at the inception of the regulatory approach of 'no net increase' (in 2018), taking into account annual throughput and regional dust fluctuations from year to year.

Trigger criteria for determining 'no net increase' will be designed to be representative of typical long term and short term dust conditions, taking into consideration annual and peak dust concentrations.

Consistent with DWER's published Port Hedland Regulatory Strategy, exceedances of the measure would result in an appropriate and proportionate regulatory response aimed at returning air quality to an acceptable level.

Administrative amendments

The Licence Holder has previously been required to maintain direct shipping rates of 45% until 31 December 2020 or it could be demonstrated that ore moisture content rates could be achieved. This condition ceased on 1 January 2021 and has not been reinstated.

The Decision Report for the Licence amendment authorising throughput increases from 270 to 290 Mtpa concluded that:

"Minimum direct shipping requirements have been set to 31 December 2020 only. Following this date it is anticipated that the Licence Holder will be in the position to accurately monitor the moisture content of iron ore as it arrives to site and achieve a minimum 90% compliance rate for moisture to be at, or above the DEM level for each product…"

Note: The Licence Holder will be required to continue to report on direct shipping rates ongoing and any reduction below 45% will be investigated to identify potential changes to boundary and ambient PM_{10} data.

Grounds: The Licence Holder has demonstrated compliance with ore moisture remaining above the DEM level for 90% of ores entering the Premises as measured at NIR monitors and averaged over each calendar month.

Although the Licence Holder has demonstrated compliance, the success of improved ore

conditioning is unclear based on boundary and ambient monitoring data. In addition, further analysis of monitoring data has identified materials handling as the primary source of dust in low wind conditions. This is despite high ongoing compliance rates of ore moisture exceeding the DEM level for each iron ore product.

The ability to directly ship ore once unloaded at the car dumpers bypasses the requirement to stack, stockpile and reclaim ore thereby eliminating major dust sources. Therefore ongoing reporting and monitoring of this control is required.

Definitions of terms and acronyms

Term	Definition
AACR	Annual Audit Compliance Report
AER	Annual Environmental Report
Annual period	The inclusive period from 1 July until 30 June in the following year (as defined in the Existing Licence)
Assigned Noise Levels	refers to the noise levels determined under regulation 8 of the Noise Regulations
Category/Categories (Cat.)	categories of prescribed premises as set out in Schedule 1 of the EP Regulations
dB	decibel, a unit of measurement of sound level
dB(A)	A-weighted decibel, a unit of measurement of sound level weighted to reflect the frequency response of the human ear
Decision Report	this document
Delegated Officer	An officer under section 20 of the EP Act.
DEM	Dust Extinction Moisture
DWER	Department of Water and Environmental Regulation
DoH	Department of Health
ENRMP	Environmental Noise Reduction Management Plan
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EPBC	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
HRA	Port Hedland Air Quality Health Risk Assessment for Particulate Matter (published by DoH, January 2016)
JMBF	Jimblebar Fines
JMBL	Jimblebar Lump
L_{A10}	A sound level exceeded for 10% of the time period over which the level is determined.
Licence Holder	BHP Iron Ore Pty Ltd
MACF	Mining Area C Fines
MACL	Mining Area C Lump
m^3	cubic metres
mbgl	metres below ground level
Minister	the Minister responsible for the EP Act and associated regulations
MS	Ministerial Statement
Mtpa	million tonnes per annum
NEPM	National Environmental Protection Measure
NBLL	Newman Blended Lump
NBLLU	Newman Blended Lump Unscreened
NHGF	Newman High Grade Fines
NHGL	Newman High Grade Lump
Noise Regulations	*Environmental Protection (Noise) Regulations 1997* (WA)

OEPA	Office of the Environment Protection Authority
PM	Particulate Matter
PM_{10}	particulate matter with an equivalent aerodynamic diameter of 10 micrometres (µm) or less.
Prescribed Premises	Premises prescribed under Schedule 1 to the EP Regulations
Premises	BHP Iron Ore Port Hedland Operations
Primary Activities	As defined in DWER's *Guidance Statement: Risk Assessments* to include the primary activities which fall within the description of the category of prescribed premises in Schedule 1 to the EP Regulations.
Review	This review of licence L4513/1969/18 for the BHP Iron Ore Port Hedland Operations
Risk Event	As described in *Guidance Statement: Risk Assessment*
TSP	Total Suspended Particulates
UD Regulations	*Environmental Protection (Unauthorised Discharges) Regulations 2004*
$\mu g/m^3$	micrograms per cubic metre
WWTP	Wastewater treatment plant
YNDF	Yandi Fines

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7. Appendix 1: Summary of Licence Holder's comments on risk assessment and draft conditions

Condition summary	Summary of Licence Holder's comment	Department's response
Comments on draft licence – received 2 July 2021 (BHP, 2021)		
Limits on hazards that may be present in ore received at the Premises, including asbestos, respirable crystalline silica and high fines fractions within products received.	BHP does not foresee any change in risk that could not be addressed by ore moisture content. BHP have advised that it "will comply with its obligations under the EP Act, including in the context of section 53" in the event that the risk profile of the ore increases above what has been assessed by DWER in this application.	Accepted. The condition has been removed on the basis of BHP's confirmation that if risk changes BHP "will comply with its obligations under the EP Act, including in the context of section 53." Section 53 of the EP Act can be summarised as: *(1) Subject to this Act, the occupier of any prescribed premises who, if to do so may cause an emission, or alter the nature or volume of the waste, noise, odour or electromagnetic radiation emitted, from the prescribed premises —* *(c) Alters the type of materials or products used or produced in any trade carried on a at the prescribed premises;* *…commits an offence unless he does so… in accordance with a licence…* DWER has identified that maintaining moisture content above the DEM level for each ore does not eliminate dust. Therefore any increase in the concentration of key hazards identified in the risk assessment may be interpreted as an increase in risk and not subject to defences afforded by the Amended Licence. This includes asbestiform fibres, respirable silica and the proportion of fine

Condition summary	Summary of Licence Holder's comment	Department's response
		ore particles as compared against existing products handled.
Limits on the handling of ore through Spaghetti Junction to no more than 116.1 Mtpa	The introduction of this condition has the potential to create scheduling and operational complexity, which restricts the flexibility required to achieve the proposed throughput amounts. The Licence Holder notes that there have been improvements to ore moisture and dust control equipment availability since October 2018 and following the LiDAR monitoring campaign. Spaghetti Junction infrastructure specifically has the following proven dust controls already installed and operating: • Transfer chutes are enclosed, TS350 and TS1 are fitted with wet scrubber systems and TS775 is fitted with a fogging unit. • Conveyors are fitted with belt scrapers and/or plough to prevent the carry back of dust. • Bulk ore conditioning (BOC) sprays installed along the conveyor system use spray nozzles to add moisture to the ore. • Rubber skirts are installed at ore transfer points to minimise dust emissions. • Belt wash stations are installed on conveyors P350, P354, P353, P351, P11, P10, P2, P501. The Licence Holder advises that additional controls will be informed by DWER's best practice guideline.	Noted and accepted. DWER has identified through boundary monitoring data, LiDAR monitoring campaign and visual observation during site inspections that the handling of ore at Spaghetti Junction is a significant source of dust. Improved ore moisture and dust control equipment availability since the LiDAR campaign is acknowledged. To address the risk of increased throughput resulting in higher emissions from Spaghetti Junction, the proposed introduction of controls at key ore handling infrastructure is acceptable. The Licence Holder will be required to analyse 12 months of boundary monitoring data to determine that the objective of no net increase from proposed expansions is achieved. In the event that the Licence Holder cannot demonstrate no net increase ongoing, DWER will look to take a proportionate regulatory response aimed at returning air quality to an acceptable level.
Limiting the stockpiling of Marra Mamba ores in the Northern Yard	All ore products railed to the Premises are blends of Marra Mamba and Brockman formation ores. The Licence Holder's operating methods make it impossible to separate ore that has been railed to port into separate formation types such as Marra Mamba. Significant changes to its infrastructure will be required under this condition with additional connections required to be constructed from South Yard to North Yard. A condition preventing the stockpiling of products containing Marra	Noted. As above, the inclusion of dust controls at conveyor infrastructure identified in Spaghetti Junction justifies the removal of this condition. In addition the ongoing requirement to demonstrate 'no net increase' through the Dust Monitoring Report. Exceedances of the measure would result in an appropriate and proportionate regulatory response aimed at returning air quality to an acceptable level.

Condition summary	Summary of Licence Holder's comment	Department's response
	Mamba ore railed from its mines in North Yard could have up to a 24Mtpa impact on overall Premises production for no environmental benefit.	
Specifying minimum direct shipping requirements at rates equal to, or greater than historic 45% licence requirements.	The Licence Holder considers these conditions not applicable and redundant for the reasons below. The Decision Report for the 290 Mtpa Licence details the intent of the DTS condition was to set a minimum DTS percentage until the Licence Holder achieves a minimum 90% compliance rate for moisture (at, or above the DEM), by 31 December 2020 (or until the Licence Holder met ore moisture conditions). The Licence Holder has now achieved and is consistently maintaining the minimum 90% compliance rate required for in-load ore moisture.	Accepted. DWER acknowledges that previous conditions for minimum direct shipping ceased from 31 December 2020/when the Licence Holder satisfied ore moisture conditions. Through its reassessment DWER has identified that maintaining moisture above the DEM level does not prevent the emission of dust from that ore. However, DWER maintains that moisture content is a key control for the management of dust from iron ore handling and stockpiling. Acknowledging that the Licence Holder seeks to maintain high direct shipping rates to improve operational costs, DWER will require ongoing reporting of direct shipping rates. A significant reduction in direct shipping rates will trigger further investigation into potential dust risks associated with reduced rates of direct shipping.
Conditions requiring the cessation of dust generating construction activities, front end loader operation and mobile screening activities during high dust-risk meteorological conditions.	This condition is impracticable as this condition would require the Licence Holder to stop earth moving irrespective of whether the activities are actually impacting the sensitive receptor. Meteorological data from 2016 to 2020 shows that "strong wind conditions" predominantly occur during Tropical Low or Cyclone weather events, as such draft conditions will be triggered after construction activities have ceased due to safety requirements. The frequent trigger of condition 18(b) and 18(c) significantly delays infrastructure upgrades, key dust abatements and routine plant maintenance, as the wind vector is wide (180º) and wind speeds of 4m/s are common in Port Hedland. For example, the trigger of 18(b) for the South Yard Expansion, is expected to add minimum 50 days to the	Accepted in part. Front end loader operation and mobile screening activities are now connected to dust trigger events. However, changes have not been made to high dust-risk construction activities including earth moving and clearing. Boundary monitors are located approximately 1.1km and 800m from Nelson Point and Finucane Island wind fence construction locations respectively. Therefore it could take up to approximately 4.5 minutes for dust from known high dust producing activities to reach boundary monitors and then a further 10 minutes for a trigger alert to be generated. In

Condition summary	Summary of Licence Holder's comment	Department's response
	construction schedule and would impact the critical path to first ore, equating to a 1.44MT impact on production, with no additional environmental benefit.	addition, a narrow plume may miss boundary monitors entirely (refer to section 4.3). Cessation of activities associated with the construction of wind fences is triggered only when visible dust occurs.
Management trigger criteria and reportable events where the source cannot be identified following trigger investigation	The Licence Holder requests this condition is not included on the licence, as appropriate management actions are already required under another condition. While chute sprays and water sprays mentioned in the Amendment Report have been utilised occasionally during high dust events, they are not designed for dust suppression or product conditioning. They both cannot be used continuously on products nor all product types due to structural integrity impacts to infrastructure and material handling issues. Concern was raised that the requirement for stockpile water cannons to operate on Deluge Cycle during high dust events may present issues around water availability and pumping capabilities. This process cannot be addressed immediately. Request for the term 'immediately' be replaced with 'upon notification of'. Rerouting of product destination is based on yard design, availability of conveyor systems, equipment, stockpiles and cargo assignment required by the Vessel cargo nomination.	Noted. This condition is only required where the Licence Holder cannot determine the source of dust, be it onsite or offsite. Refer to section 6.1.6 for further discussion. The term "immediately" is in reference to conducting an investigation into the potential source of the trigger event and once identified, immediately take action to reduce the source of dust. Also note that in response to two appeals on recent licence amendments for operations in Port Hedland, the Minister for Environment determined that management trigger and response conditions should remain consistent across similar operations, where appropriate.
Frequency of moisture content analysis at outload and moisture content compliance averaging period	The draft Licence has amended the averaging period for moisture content compliance from a monthly average to an ongoing moisture content average based on analysis of each vessel loaded and all ore in-loaded.	Noted. Monthly averaging periods have not been carried over in the Amended Licence. Refer to section 6.1.4 for further discussion.
Particulate monitoring equipment averaging periods and compliance with Australian Standards	BAM units measurement cycle time is 1 hour and as such 10 minute averages are not measured by the BAM unit. As discussed above the Licence Holder uses nephelometers to measure 10 minute averages at its BAM monitoring units.	Agreed. As the Amended Licence specifies the operation of the nephelometers and the BAM units, Australian Standards cannot be specified in the same table as the nephelometer is not able to comply with those standards.

Condition summary	Summary of Licence Holder's comment	Department's response
	The Australian AS/NZS 3580.9.11:2016 sets out the method for the determination of suspended particulate matter in ambient air using a BAM. There is currently no Australian Standard for nephelometers. As such BHP consider that nephelometers only be used for operational purposes to track general dust trends and not for measuring against trigger management criteria or reportable criteria.	Hourly PM_{10} data from BAM units must be validated and from units that are operated in accordance with AS3580.9.11.
	The Licence Holder raises concern regarding utilisation of 10 minute nephelometer data to determine management triggers and reportable events: • They do not meet National Environmental Protection (Ambient Air Quality) Measure Regulation, Schedule 3; • Data is calibrated hourly against the BAM data where a k factor is produced based on the difference in the dataset. This means that for rolling averages, there may be partially calibrated data and raw data drawing upon two different kinds of monitoring methodologies. BHP has concerns with combining two sets of data – the RTM data is calibrated against BAM data every hour. Therefore, for the rolling hour average there is a potential to have 50% of the data based on a different coefficient as compared with the other 50%. The Licence Holder also refers to the appeals received on the 290Mtpa Licence Amendment. BHP notes that appellants had requested for 10 minute averages to be conditioned, however this ground of appeal was dismissed by the Minister for Environment based on recommendations of the Appeals Convenor. The Licence Holder notes inconsistencies with other Port operator licences on wind arcs and management trigger thresholds.	Noted. Refer to section 6.1.6 for further discussion.
Schedules for reporting: Quarterly Reporting, Dust Control Validation and Dust Monitoring Report	The Licence Holder requests the removal of the requirement to submit a Dust Monitoring Report due duplication with the Dust Control Validation Report.	Noted. Further discussion has been placed in section 6.1.7 to clarify the differences between the two investigations. In summary, the Dust Control Validation Report is for the validation of the effectiveness of specific controls proposed to achieve no net increase. This is for the purpose of

Condition summary	Summary of Licence Holder's comment	Department's response
		confirming that the effectiveness of individual controls matches the assumptions of the model (emissions estimates). The Dust Monitoring Report is to determine, using longer term monitoring data, if Premises activities are resulting in an overall increase in dust.
Definition for 'no net increase'	The Licence Holder requests that further clarity is provided around the term 'no net increase' to better understand the measure by which it will be regulated. Suggested definition below: *"means no increase in the annual average modelled dust emissions between the modelled 290Mtpa base case and the modelled 303Mtpa and 330Mtpa cases (as submitted with the 330Mtpa Amendment Application), when updated with the dust control efficiencies derived in accordance with dust validation requirements of condition 16."*	Noted. DWER accepts that greater clarity is required in relation to regulating toward 'no net increase'. DWER is working toward drafting a definition and will engage with the Licence Holder through the Port Hedland Industry Working Group to identify an appropriate definition. In developing a definition, consideration will need to be given to monitoring data to identify changes to both long term and short term impacts. It is not possible to confirm 'no net increase' based solely on modelling due to the inherent uncertainties associated with modelling, primarily due to emissions estimate uncertainty.
Comments on draft licence – received 6 August 2021 (BHP, 2021a)		
Dust management triggers	BHP requests a period of 12 months to transition into compliance with conditions 24 (boundary management triggers) and Schedule 5 (quarterly reporting). These conditions will require changes to current systems, tools and processes including with third party provided platforms e.g. Envirosuite and Ecotech. This will be a progressive process throughout the 12 month period and the updated capabilities will be used by Operations as they become available. BHP is confident the controls in place under the current licence will remain effective in identifying and managing dust emission from the premises whilst these changes are embedded.	Noted. A 10 month transition period is provided to allow transition systems. Within that period, the Licence Holder will be required to continue applying management triggers in accordance with current application of the condition.
	BHP has further investigated the use of the 10-min data and how it	Noted. Refer to section 6.1.6 for further discussion.

Condition summary	Summary of Licence Holder's comment	Department's response
	could be incorporated into the operational response triggers on-site. Application of nephelometer data to response triggers will increase dust alarms approximately 5-fold.	
Staged throughput increases	BHP has requested that condition 3 (d) is amended so that the Spaghetti Junction controls are a stand-alone requirement under further works and not linked to throughput. The other proposed abatement under the licence is tied to stages of tonnage uplift and an associated emissions/abatement profile (as indicated through the dust modelling). The Spaghetti Junction controls are to be applied to existing potential sources and not specifically to address future growth. As previously discussed, BHP is requesting up to 5 years to implement the controls. As 303Mtpa may be achieved sooner than 5 years, this timing would not be adequate to align the type of control with DWER's best practice guideline, which we understand is at least 6-12 months away, and then complete the necessary design and installation. BHP notes that the best practice implementation may require a further licence amendment where adjustments to the installation timeframes of controls may need to be reviewed based on the outcomes of the Industry self-assessment process.	Noted. Additional controls applied to Spaghetti Junction are considered necessary to justify the increase in authorised throughputs to 330Mtpa. DWER understands the constraints of installing this infrastructure around operating equipment and has amended the condition to separate these controls from initially achieving 330Mtpa. However, in the event that these controls are not installed within a suitable time (5 years), authorised throughputs will be reduced back to 303Mtpa.
Dust monitoring report (no net increase)	BHP has requested this requirement is linked to reaching 330Mtpa rather than CD6 installation. BHP may opt to construct CD6 earlier than the last stage of works or not all. BHP has requested that this activity is conducted initially as a one-off exercise, and applied across all Port operators in a consistent manner which is aligned with the objectives/timeframes of DWER's Regulatory Strategy for Port Hedland.	Noted. Licence Holder will be required to investigate the achievement of 'no net increase' once the Premises design capacity achieves 330Mtpa. DWER may determine at a later date to conduct an additional study to track the progress of the Licence Holder.
Quarterly Reports	Quarterly Event Reporting. BHP requests changes to clarify this only applies to reportable events and not management triggers, as this would significantly increase in reporting workload/data without any value.	Confirmed. The scope of quarterly reporting is restricted to 24-hour Reportable Events.

Condition summary	Summary of Licence Holder's comment	Department's response
Comments on draft licence – received 1 September 2021 (BHP, 2021b)		
Construction activities – management during high dust risk events	BHP requests that the wind directions are updated to between 180º and 360º to ensure it is clear which arc is being referred to.	Noted. Wind arc has been amended to align with the intent of identifying meteorological conditions that place Port Hedland receptors downwind of Premises activities.
Management trigger criteria	BHP interprets the term averaged [wind direction] when used in these conditions, to refer to the average wind direction as recorded by the instrument over the relevant 10-min period.	Confirmed. This is the intended interpretation of the wording.
Schedule 4: Infrastructure and Equipment	BHP requests that areas that are undergoing rehabilitation/ revegetation onsite are explicitly excluded from this requirement i.e., Apply dust suppressant chemicals at least every two months on unsealed non-trafficable areas, excluding areas undergoing rehabilitation /revegetation.	Accepted. The intent of this condition is to reduce the risk of dust from open areas. Rehabilitation with vegetation satisfies this intent.
	Request for captured stormwater requirements to apply unless during high rainfall events, which are defined as greater than, or equal to 20mm in a 24 hour period. Stormwater from area workshops, light vehicle refuelling areas, washdown bays and fuel farm drains to respective oily wastewater system for treatment or are transferred to the NP OWWS for treatment before distribution to the FWRP and/ or FWRP settlement ponds. Licence point for NP OWW treatment is L3 (NP FWRP).	Accepted based on the low risk as assessed in the Decision Report associated with Licence L4513/1969/18, issued February 2018.
Schedule 5: Quarterly reporting	BHP requires a period of up to 6 months to develop the necessary capability/internal reporting systems to comply with the changes under these three reporting requirements outlined in Schedule 5. This timing would align with the Q3 FY22 reporting period. BHP requests that this is reflected in the licence conditions.	Accepted. Requested changes are report-based only and do not present an increased risk to public health or environment.
Schedule 8: File format for monitoring data	BHP understands in order to demonstrate compliance with monitoring in accordance with Australian Standards, the proponent must confirm that the validation of data has been completed in accordance with the	Confirmed. Certification that monitoring data was collected in accordance with the relevant Australian Standards is an appropriate method to

Condition summary	Summary of Licence Holder's comment	Department's response
	relevant Australian Standards.	declare compliance.
General	Minor administrative amendments and clerical corrections.	Accepted.

Appendix 2: Summary of public authority and stakeholder comment

Theme	Submitter	Summary of comment	Department response
Planning matters and the Port Hedland Voluntary Buyback Scheme	Direct interest submitter #1	Depopulating West Hedland at low cost to polluters is inequitable, unfair and ineffective. Zoning has no positive impact on the marine and coastal environment. The Port operator and/or exporters should pay a fair share of the costs borne by others, I'm referring to compensation for those who wish to stay and a buy-out price to remedy the devaluation occurred due to the port users pollution. DoH put warnings on titles in the West End in 2012, this is the year valuations need to represent.	The Port Hedland Voluntary Buyback Scheme is managed by the Hedland Maritime Initiative and is beyond the scope of this assessment. The 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 voluntary buyback scheme may assist to address the potential impact on local residential property values caused by the introduction of rezoning related to the Port Hedland West End Improvement Scheme No. 1.
Invalid monitoring network	Port Hedland Community Progress Association	Despite assurances by DWER of accurate, transparent, independent air monitoring prior to any increases in export operations, the Licence Holder and PHIC are still in charge of air quality monitoring, with many proven episodes of inaccurate results.	Noted. PHIC replaced the faulty monitor on 15 January 2020 and has advised DWER that the new monitor is delivering consistent datasets. DWER will take over the ambient monitoring network and oversee its ongoing operation, with cost recovery from port operators in Port Hedland (as currently represented by the Port Hedland Industries Council). Tender submissions have been evaluated and the department has appointed, Ecotech, a monitoring service provider to support the operation of the network. The full takeover of the network is expected to be completed between July and September 2021.
	Direct interest submitter #2	We are now being informed the data from Taplin St has been compromised as far back as April 2018. How can you seriously entertain a license expansion request without an accurate monitoring system to the West End not to mention free and impartial. Also placed in a fair location not at the end of the precinct. Submitter asserts that until a reliable monitoring network is in place, the proposed expansion should not be granted.	
	Direct interest	When DWER are going to take over the atmospheric	

Theme	Submitter	Summary of comment	Department response
	submitter #3	monitoring from PHIC?	The current ambient monitoring network consists of nine PM_{10} monitors located across the Port Hedland peninsula, including in the West End, South Hedland, Wedgefield Industrial Area and at two background locations. DWER will prepare an annual report on the ambient air quality monitoring results, including analysis of trends and discussion of meteorological conditions when exceedances of relevant air guideline values are recorded.
	Direct interest submitter #1	It is ridiculous to use a dust monitor which is at the other end of the West End to show dust levels. It is incorrect to suggest that measuring at Taplin Street is relevant to the "true" West End when ship loading is close to three kilometres to the west of Taplin Street. The results speak for themselves – deposition levels exceeding national standards every third day.	
Amenity	Direct interest submitter #1	Monitoring does not deal with the issue of amenity or the "use of the environment for public benefit, public safety, or aesthetic enjoyment" as defined by the EPA. PM10 is invisible. It is the suspended particulate matter which impacts on the amenity. The dust impact that is beyond scientific debate is centred on the real costs, reduction in quality of life and social amenity suffered by the wider community seeking to live and do business in West Hedland.	Noted. The Delegated Officer considers that there may be a high level of impact to amenity experienced by residents and businesses in the West End as a result of dust levels. However, when viewing the amenity criteria of other environmental regulators around the world it is evident that there is significant variability in criteria. There exist no site specific amenity criteria established or adopted for Port Hedland or for the coastal Pilbara region of Western Australia. 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 $\mu g/m^3$, 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.
Regulatory controls	Direct interest submitter #1	The use by regulators of rolling 24-hour averages ignores the effect of the plumes of dust which frequently hit the West End in certain wind conditions. These plumes cause a significant spike in the dust levels which are lost in a 24-hour average. These plumes cause substantial environmental damage.	Noted. Short term (1-hour) rolling averages have been applied to the Licence as triggers for management action by the Licence Holder, which may include ceasing or changing handling activities for the purpose of eliminating the dust source.

Theme	Submitter	Summary of comment	Department response
Air guideline value	Direct interest submitter #1	It is possible to track dust from operations in the West End. DER Lidar images of dust pollution, reveal crisis levels of emissions over the West End as clearly emanating from specific Port operating areas, the Port Hedland Industry Council's online data reveals many peak exceedances of over 100 ug/m³ at the Harbour monitoring station.	Noted. A review of all available information including LiDAR campaign, historical boundary and ambient monitoring data and modelling data was used to inform the risk assessment in this Amendment Report. DWER acknowledges that the risk of dust impacts is high and port operations have been authorised to date, subject to multiple regulatory controls. Conditions of the Amended Licence are considered appropriate and proportionate to the risk associated with operations at the Premises.
Consultative processes	Port Hedland Community Progress Association	A proposal of this nature needs to be referred to the Lead Agency, with a full Environment and Social Impact Assessment including the Environment Protection and Biodiversity Conservation Act requirements.	Noted. DWER is the department responsible for assessing and authorising changes to production tonnages at port operations under Part V of the EP Act.
	Port Hedland Community Progress Association	The proposal covers several departmental areas such as infrastructure including Redbank Bridge, the environment, noise, air quality, health, social economic or heritage impact on regional communities including Newman, which is still subject to an approval the state agreement act.	Noted. The issuing of the Amended Licence is separate to any approvals for the Licence Holder's operations in Newman and is not restricted by any other legislation.
	Port Hedland Community Progress Association	Concern and confusion with the differing dates for submissions to be lodged.	Noted. Following multiple stakeholder requests the consultation period was extended from 10 August 2020 to 2 November 2020. All submissions during this period were accepted and are recorded in this table.
Health	Port Hedland Community Progress Association	Health concerns identified in the Health Risk Assessment 2009 - 2012 as a result of industry emissions have still not been addressed in the community, and are acute in Newman, where there does not appear to been a Health Risk Assessment.	The State Government has set out a framework for reducing the exposure of residential receptors to dust in Port Hedland. Dust levels in Newman are beyond the scope of this assessment.
	Direct interest submitter #1	The target set ten years ago for the PM10 levels is higher than Australian standards – it was an interim measure based	Noted.

Theme	Submitter	Summary of comment	Department response
		on the technology which existed at that time and because the Australian (NEPM) standards could not be met.	DWER considers the Department of Health (DOH) to be the primary agency for public health matters in Western Australia. DWER will refer to DOH advice and recommendations when determining the appropriate criteria for assessing health risk.
Noise	Direct interest submitter #1	The helicopters have gone from approximately 3-5 trips per day to now flying non-stop day and night, now they are twin engine helicopters which are sheer torture to someone who is trying to sleep as they take off and land.	Noted. The consideration of noise risks is restricted to the assessment of those sources regulated under the Noise Regulations. The Noise Regulations do not apply to certain key noise sources present in Port Hedland, including noise from aircraft, trains and engines on vessels.
Social impacts	Port Hedland Community Progress Association	There is no social impact assessment with the application, which is considered a significant proposal, critical to the advancement of the state of WA based on Environmental, Health, Social, Economic and Heritage conditions.	Noted. The focus of this assessment is on emissions and discharges that may present a risk to public health, amenity or the environment. Conditions have been applied to the Amended Licence in proportion to the level of risk (likelihood and consequence) that the proposed throughput expansions pose to public health and the environment. Controls applied for the protection of health are also expected to be protective of amenity.
Support/No objection	PHIC	On the premise that individual port user environmental licence conditions continue to be met, PHIC supports the principle of allowing all Port users to continue to grow their businesses. This support extends to the Licence Holder's current licence amendment application to increase capacity from 290 million tonnes per annum (Mtpa) to 330Mta to be permitted for export through the Port of Port Hedland.	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.	

Theme	Submitter	Summary of comment	Department response
	Town of Port Hedland	The Application is supported by Council.	
	Department of Planning, Lands and Heritage	The Department of Planning, Lands and Heritage raise no objections to the proposal subject to the Licence Holder 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.	
	Direct interest submitter #4	Provided general support for the proposal.	