Dust Management Plan

Iron Ore Mine and Downstream Processing, Cape Preston, Western Australia

Mineralogy Pty Ltd
June 2005
Dust Management Plan

Prepared for

Mineralogy Pty Ltd

Prepared by

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Prepared by    Jamie Shaw
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Revision History

<table>
<thead>
<tr>
<th>Revision</th>
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<th>Details</th>
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<tr>
<td>A</td>
<td>26/06/2004</td>
<td>First Draft for client review</td>
<td>Paul Holmes Principal Environmental Planner</td>
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<tr>
<td>B</td>
<td>16/12/2004</td>
<td>Final Draft client review</td>
<td>Paul Holmes Principal Environmental Planner</td>
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<tr>
<td>C</td>
<td>25/02/2005</td>
<td>Final draft for submission to EPA</td>
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<tr>
<td>D</td>
<td>31/05/2005</td>
<td>Final incorporating comments from Department of Environment</td>
<td>Paul Holmes Environmental Manager</td>
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</table>
1.0 Introduction

1.1 Background

Mineralogy Pty Ltd (the proponent), proposes the development of an iron ore mine and downstream processing facilities at Cape Preston, 80km south west of Karratha.

In response to project environmental impact assessment requirements as determined by the Environmental Protection Authority (EPA), a Public Environmental Review (PER) was submitted to the Authority in December 2000 (HGM, 2000). The PER was supplemented with a Supplementary Environmental Review (SER) in February 2002 to address changes to the project design being sought by the proponent (HGM, 2002). Under the proposal assessed by the EPA pursuant to the PER and SER, and a subsequent successful application for a non-substantial change to the assessed project pursuant to Section 45(c) of the Environmental Protection Act 1986, the project would entail an annual mining rate of approximately 67.4 Mt and annual production of the following:

- Concentrate – approximately 19.6 Mt;
- Pellets – approximately 13.8 Mt; and
- Direct reduced/hot briquetted iron – approximately 4.7 Mt.

Through the Section 45 (C) process seeking Ministerial approval for a non-substantial change to the assessed project, it was made clear that the stockpiling and export of concentrate was intended and in this regard, it should be noted that the Minister’s approval of the proposed change was unconditional.

The Ministerial Statement for the project was issued in October 2003, subject to a number of Conditions and the Proponent’s Commitments. One of these Commitments was for the preparation of a Dust Management Plan for the construction phase of the project.

1.2 Relevant Legislation and Guidelines

<table>
<thead>
<tr>
<th>State Government Legislation</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Protection Act, 1986</td>
<td>PER assessment and Ministerial approval process, and Section 45 (C) non substantial change</td>
</tr>
<tr>
<td>Iron Ore Processing (Mineralogy Pty Ltd)</td>
<td>Act under which the project is developed</td>
</tr>
<tr>
<td>Agreement Act, 2002</td>
<td></td>
</tr>
<tr>
<td>Occupational Health, Safety and Welfare Act, 1984</td>
<td>Sets workplace limits for air quality</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State Government Guidelines</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Development Sites and Impacts on Air Quality</td>
<td>Management of on-site air quality issues during construction</td>
</tr>
<tr>
<td>Ambient Air Quality Guidelines</td>
<td>Prescription of acceptable air pollutant concentrations</td>
</tr>
</tbody>
</table>
1.3 Purpose of this Document

The purpose of this document is to satisfy the conditions set down by the Minister for the Environment in Condition 10.4 of the Ministerial Statement No. 000635 (Minister for the Environment, 2003). Ministerial Condition 10.4 requires that:

Prior to commencement of construction of the DRI plant, the proponent shall prepare a Dust Management Plan which:
1. incorporates baseline and ongoing monitoring;
2. details management measures to minimise dust during construction;
3. demonstrates best practice and details the methods to be used for all point and fugitive sources;
4. incorporates monitoring to determine the size and composition of particulates;
5. incorporates further investigations into reactive DRI dust and details measures to minimise impacts;
6. provides for continuous improvements in dust management; and
7. details complaint response procedures;

to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority.

1.4 Objectives of this Document

The objective of this Dust Management Plan is to manage dust emissions generated within the project area, so that the appropriate dust criteria is met during both the construction and operational stages of the project. This management plan should be read in conjunction with the project Environmental Management System and Construction Environmental Management Plan.

1.5 Responsibilities and Reporting

Overall responsibility for ensuring that site environmental management requirements are met during the construction phase of the project will rest with the proponent’s Construction Manager. During the operational phase, this responsibility will rest with the Environmental Manager. In respect of this Dust Management Plan, this responsibility will include:

- ensuring that all construction and operational personnel, both the proponent’s workforce and contract personnel, conform with requirements pursuant to the Management Plan;
- ensuring that contractor staff are fully inducted and aware of their environmental responsibilities and obligations;
- ensuring that monitoring requirements are being met.

Contracting companies undertaking construction or operational roles will be required to appoint an environmental representative. The key responsibilities of this representative will be to:

- maintain routine contact with the proponent’s Construction and / or Environmental Manager to ensure that environmental objectives of this plan are being met;
• provide monthly reports to the proponent’s Construction and / or Environmental Manager on environmental issues and conduct regular audits; and
• ensure that all management aims and monitoring requirements of this Dust Management Plan are being met.

1.6 Consultation

Pursuant to Environmental Impact Assessment requirements under the Environmental Protection Act (1986), Comprehensive consultation with stakeholders and members of the community has been undertaken. The outcomes of these negotiations were used to develop the commitments provided by Mineralogy and presented in the Public and Supplementary Environmental Review documents (HGM 2000, 2002) and, ultimately, in the development of this environmental management plan.
2.0 Project Description

2.1 Project Outline

The proponent plans to mine the George Palmer Orebody, which is located approximately 80km south west of Karratha and 25 km south of Cape Preston in the Pilbara region of Western Australia. A stockyard and laydown area will be constructed at Cape Preston. Preston Island is the intended location for the port facilities. Figure 1 depicts the location of the site in a regional context. The major components of the project are:

- open pit mine;
- desalination plant;
- HBI (Hot Briquetted Iron) plant;
- DRI (Direct Reduced Iron) plant;
- pellet plant;
- concentrator plant;
- tailings dam;
- waste dumps;
- system of conveyors and a service road to Cape Preston;
- product stockpile (HBI, DRI, pellets, concentrate) and adjacent general laydown areas at Cape Preston
- causeway to Preston Island;
- jetty to the load out / port facilities;
- port facilities; and
- accommodation for employees and construction staff.
2.1.1 Climate

The climate of the Pilbara is classified as arid tropical with two distinct seasons: a hot summer extending from October to April and a mild winter from May to September. High evaporation rates are largely responsible for the arid climate with rates of evaporation often exceeding mean annual rainfall figures.

Rainfall in the Pilbara region is spatially and temporally variable, largely due to the random nature of tropical cyclones passing through the region and, to a lesser extent, localised thunderstorms. The majority of rainfall occurs between December and March as a result of tropical cyclones originating from the north. A lesser proportion of rainfall occurs between May and June from cold fronts moving across the south of the state in an easterly direction, which occasionally extend into the Pilbara. The northern and eastern areas of the Pilbara (Port Hedland/Marble Bar) receive most of their rain in the summer months and the southern and western areas (Onslow) experience winter rains (Ruprecht, 1996). Droughts, or long periods of low rainfall are common in the Pilbara and may be localised in one area. Rainfall occurrence, wind strength and wind direction have direct impacts on dust issues and hence, have been canvassed within this section.

Meteorological data sourced from the recording station located at Mardie Homestead (Met. Stn 005008), situated approximately 20km south of the George Palmer Ore Body, is provided in full in Appendix A and is summarised in Figure 2. Monthly wind roses calculated for 3 hourly intervals between 6am and 6pm are also provided in Appendix A.

Rainfall records have been collected at Mardie Homestead for 115 years, and temperature for the past 46. Mean annual rainfall is 271.2mm from an average of 22 rain days, with the majority of rainfall experienced between January and June. Large temperature ranges typical of the Pilbara region occur at Mardie where mean monthly temperatures range from 27.7°C in July to 38.1°C in March (mean 33.9°C), whilst mean monthly minimum temperatures range from 11.7°C in July to 25.2°C in February (BOM 2005). Records indicate temperature ranges from a record July low of 2.9°C to a February high 50.5°C.

Wind roses using available data between 1957 and 2004 from Mardie Homestead indicate that, in general, morning winds blow from the south west between October and February, shifting to the east between April to August. Afternoon winds are generally from the west between September and March, shifting to the north west between April and August and becoming more northerly during June and July. Wind strengths are generally light during the morning throughout the year and in the afternoon between April and September, significantly increasing in intensity during the months of October to January.
2.2 Definitions

Dust is considered to be any particle suspended within the atmosphere. Particles can range in size from as small as a few nanometres to 100 microns (µm) and can become airborne through the action of wind turbulence, by mechanical disturbance of fine materials or through the release of particulate rich gaseous emissions. Most mine originated dust is chemically inert, however there is the potential for more harmful and persistent particulate contamination to occur from mining ore containing or associated with certain products, such as asbestos, radioactive materials or heavy metals. Emissions from operating machinery not included as greenhouse gasses can also be classed as dust particulates.

Dust is measured using a variety of methods, the most common being Total Suspended Particulates (TSP), which nominally measures up to 50µm, and PM$_{10}$ or PM$_{2.5}$ (particulate matter less than 10µm or 2.5µm in size, respectively). Deposited matter measures the mass of any particulate falling out of suspension expressed in mass per area per time, and is the least commonly used in determining dust concentrations (Environment Australia, 1998).

- **Land Development Site** – sites larger than 2000m$^2$ on which the clearing of vegetation and/or topsoil, recontouring (bulk earthworks), trenching and/or road construction is undertaken to develop the land for any use.

- **Nuisance Dust** – describes dust particles ranging in size from 1mm to 50µm, which reduce environmental amenity without necessarily resulting in material environmental harm. This form of dust generally originates from mining processes (among others) and is often the form of dust that affects neighbouring land users.
• **Fugitive Dust** – refers to dust derived from a mixture of sources or a source not easily defined and includes dust generated from vehicular traffic on unpaved roads, materials transport and handling and un-vegetated soils and surfaces. Mine dust is commonly derived from such non-point sources.

• **DRI Dust** – is very reactive, particularly with moisture, is exothermic and produces hydrogen gas (EPA, 2002). Stabilisation of DRI via hot briquetting or via passivation can reduce the reactivity; however, DRI dust can pose a hazard in process areas and during materials handling. DRI dust will not be generated during the construction phase of the project.

• **PM$_{10}$** – a criteria air pollutant consisting of small particles with an aerodynamic diameter less than or equal to a nominal 10 microns (about 1/7 the diameter of a single human hair). Their small size allows them to make their way to the air sacs deep within the lungs where they may be deposited and result in adverse health effects. PM10 also causes reduced visibility.

• **PM$_{2.5}$** – includes tiny particles with an aerodynamic diameter less than or equal to a nominal 2.5 microns. This fraction of particulate matter penetrates most deeply into the lungs.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Averaging Period</th>
<th>Maximum Concentration</th>
<th>Goal within 10 years maximum allowable exceedance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particles as PM$_{10}$</td>
<td>1 day</td>
<td>50µg/m$^3$</td>
<td>5 days</td>
</tr>
<tr>
<td>Particles as PM$_{2.5}$</td>
<td>1 day</td>
<td>25µg/m$^3$</td>
<td>Not yet established</td>
</tr>
<tr>
<td></td>
<td>1 year</td>
<td>8µg/m$^3$</td>
<td>Not yet established</td>
</tr>
</tbody>
</table>

Table 2.1  Ambient Air Quality Criteria

2.3 Implementation of Management Plan

<table>
<thead>
<tr>
<th>Action</th>
<th>Timeframe for Implementation</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline monitoring</td>
<td>12 months prior to commencement of construction of the DRI plant.</td>
<td>12 months</td>
</tr>
<tr>
<td>Meteorological monitoring</td>
<td>12 months prior to completion of construction of the DRI or Power plant (whichever is sooner).</td>
<td>12 months</td>
</tr>
<tr>
<td>Dust Management Programme</td>
<td>Commencement of construction</td>
<td>Life of mine</td>
</tr>
<tr>
<td>Review of Management Plan</td>
<td>As required by the project EMS</td>
<td>Life of Mine</td>
</tr>
<tr>
<td>Dust monitoring</td>
<td>Commencement of construction</td>
<td>Life of mine</td>
</tr>
</tbody>
</table>

Table 2.2  Timeframe for Implementation of Management Plan
3.0 Dust management Procedures

3.1 Predicted Impacts

During the construction phase of a mining and mineral processing project, dust is generated as a result of the disturbance of soil and rock, and the handling of bulk construction materials such as crushed hard rock aggregate. During construction, the layer of vegetation and stable soil which would normally form a seal against wind dispersion is removed. Consequent environmental effects are usually localised and depend on the size of the dust particles and the strength of distributing factors and usually decrease rapidly with separation from the source. Under adverse weather conditions, however, dust can travel considerable distances, potentially resulting in its deposition in otherwise remote locations.

In the immediate vicinity of the source, dust can stress vegetation through blocking stomata and reducing light availability and, depending on the type and size of dust particles, can pose a human health risk through inhalation. Within the Pilbara region, the inherently dry and friable nature of the in situ soils presents further opportunities for dust generation.

Other than small amounts of combustion products from construction machinery, there is unlikely to be any significant emission of other pollutants during the construction phase of the project (SKM 2000).

During the construction phase of the project, dust generation is likely to come from activities such as:

- vegetation clearing;
- light / heavy vehicle movements;
- haul roads, track and access construction;
- drilling and blasting; and
- earth moving

The social impact of dust is expected to be low given that the nearest population centre is some 80 km to the north-east, although it may have some nuisance effect on recreational traffic utilising the informal coastal access tracks that traverse the project area. However, the greatest potential for impact will be within the immediate environs of construction activities, including the on-site construction camp, and on the surrounding vegetation. Accordingly, dust suppression measures will be necessary to mitigate any consequent adverse effects of construction related dust.

Potential impacts include:

- reduced visual amenity;
- smothering of surrounding vegetation;
- adverse impact and disturbance to fauna;
- risk to human health; and
- nuisance.
3.2 Management of Predicted Impacts

Objectives:

- Take all reasonable and practicable measures to ensure the prevention or minimisation of dust from all project construction related activities;
- Comply with limits set by the National Environment Protection (Ambient Air Quality) Measure (NEPC, 1998); and
- Ensure that nuisance dust levels and potential health hazards are not experienced by neighbouring land users

To achieve the above objectives, ‘best practice’ dust management procedures, entailing the following will be implemented:

- A ‘clearing’ policy will be adopted to ensure that vegetation is cleared only when and where necessary. In instances where the clearing of extensive areas is unavoidable, additional dust suppression techniques will be employed to ensure stabilisation of the cleared surfaces. When clearing:
  - where practicable vegetation salvaged from the site to be cleared (taking care to limit the amount of soil disturbance) and retained;
  - topsoil will be removed to the maximum depth practicable and consistent with best operational practice;
  - if the quantity of salvageable topsoil is insufficient for rehabilitation requirements, alternate cover such as detrital/gravel material will be used in site rehabilitation;
  - where practicable, topsoil will be directly transferred to exposed surfaces requiring rehabilitation and covered with salvaged vegetative material;
  - where direct transfer of topsoil is not possible, it will be stock piled and stabilised with previously salvaged vegetation; and
  - topsoil stockpiles will be further stabilised by encouraging native vegetation to establish and, if necessary, appropriate stabilising emulsion will be applied to supplement these measures.

- As practicable and consistent with operational requirements, disturbed areas will be progressively rehabilitated, to reduce the potential for windborne dust generation.

- Truck mounted sprays will water unsealed, regularly trafficked areas such as access tracks, work areas and haul roads as conditions require.

- Areas involving materials handling will be sprayed with water as conditions require.

- A periodic monitoring programme will be implemented to quantify dust levels, identify dust generating sources and to determine ambient dust levels.

- Any blasting required to facilitate construction will be conducted only under favourable wind and weather conditions, and the blasting site will be dampened with water sprays.
• Routine housekeeping practices will be employed to ensure that spillages and other materials that could contribute to dust generation do not accumulate within the project site.

• Routine maintenance of machinery will be carried out to ensure efficient operation (to minimise exhaust particulate emissions).

• In the event that dust levels exceed acceptable limits, dust suppression measures will be immediately reviewed and more stringent measures implemented as appropriate. Such measures could include the cessation of activities in the event of extreme adverse weather conditions.

• If additional dust control measures are required and dust suppressant products are deemed necessary, Mineralogy will ensure as practicable that only environmentally benign products will be used.

• All personnel (including contractors) will be informed of their responsibilities and the importance of minimising ambient dust levels during site inductions.

• Any complaints received will be registered and will trigger a review of the relevant dust management procedure/s by the site Environmental Officer as a basis for development and implementation of appropriate modified practice/s.
### Summary of Management Requirements

#### Table 3.1 Summary of Management Requirements

<table>
<thead>
<tr>
<th>Item</th>
<th>Task/Requirement</th>
<th>Timing</th>
<th>Responsibility</th>
<th>Related Plans/Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5.1</td>
<td>A ‘clearing’ policy will be adopted to ensure that vegetation is cleared only when and where necessary. In instances where the clearing of extensive areas is unavoidable, additional dust suppression techniques will be employed to ensure stabilisation of the cleared surfaces.</td>
<td>Construction phase</td>
<td>Construction Manager Environmental Officer.</td>
<td>Construction Environmental Management Plan</td>
</tr>
<tr>
<td>3.5.2</td>
<td>As practicable and consistent with operational requirements, disturbed areas will be progressively rehabilitated, to reduce the potential for windborne dust generation.</td>
<td>Construction phase</td>
<td>Construction Manager Environmental Officer.</td>
<td>Construction Environmental Management Plan</td>
</tr>
<tr>
<td>3.5.3</td>
<td>Unsealed, regularly trafficked areas such as access tracks, work areas and haul roads will be watered by truck mounted sprays as conditions require.</td>
<td>Project duration</td>
<td>Construction Manager</td>
<td>Dust control procedure</td>
</tr>
<tr>
<td>3.5.4</td>
<td>Areas involving materials handling will be sprayed with water as conditions require.</td>
<td>Project duration</td>
<td>Construction Manager</td>
<td>Dust control procedures</td>
</tr>
<tr>
<td>3.5.5</td>
<td>Any blasting required to facilitate construction will be conducted only under favourable wind and weather conditions, and the blasting site will be dampened with water sprays.</td>
<td>Project duration</td>
<td>Construction Manager</td>
<td>Dust control procedures</td>
</tr>
<tr>
<td>3.5.6</td>
<td>Routine housekeeping practices will be employed to ensure that spillages and other materials that could contribute to dust generation do not accumulate within the project site.</td>
<td>Project duration</td>
<td>Construction Manager</td>
<td>Staff Inductions / Training</td>
</tr>
<tr>
<td>3.5.7</td>
<td>Routine maintenance of machinery will be carried out to ensure efficient operation (to minimise exhaust particulate emissions).</td>
<td>Project duration</td>
<td>Construction Manager</td>
<td>Pre-start inspections checklist</td>
</tr>
<tr>
<td>Item</td>
<td>Task/Requirement</td>
<td>Timing</td>
<td>Responsibility</td>
<td>Related Plans/Procedures</td>
</tr>
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<td>--------</td>
<td>----------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>3.5.8</td>
<td>In the event that dust levels exceed acceptable limits, dust suppression measures will be immediately reviewed and more stringent measures implemented as appropriate. Such measures could include the cessation of construction activities in the event of extreme adverse weather conditions.</td>
<td>Project duration</td>
<td>Construction Manager, Environmental Manager</td>
<td>Environmental Management System, Dust control procedures</td>
</tr>
<tr>
<td>3.5.9</td>
<td>If additional dust control measures are required and dust suppressant products are deemed necessary, Mineralogy will ensure as practicable that only environmentally benign products will be used.</td>
<td>Project duration</td>
<td>Construction Manager, Environmental Manager</td>
<td></td>
</tr>
<tr>
<td>3.5.10</td>
<td>Any complaints received will be registered and will trigger a review of the relevant dust management procedure/s by the site Environmental Officer as a basis for development and implementation of appropriate modified practice/s.</td>
<td>Project duration</td>
<td>Environmental Officer</td>
<td>Environmental Management System, Complaints register</td>
</tr>
</tbody>
</table>
3.4 Performance Indicators

The proponent will ensure that all realistic, best practice measures to prevent or minimise the generation of dust from all construction activities will be implemented for the duration of construction activities, and the effectiveness of the Dust Management Programme will be reviewed against the following indicators:

- compliance with the National Environmental Protection Council (NEPC) standards for ambient air quality (see Section 2.2);
- the level of complaints received and registered;
- the level of complainant satisfaction achieved;
- the absence of fugitive dust originating from cleared areas and construction sites; and
- the level of impact on vegetation adjacent to cleared areas, haul roads, access tracks and construction sites.

Using these performance indicators, the proponent will undergo continuous review of its dust management procedures and will adjust target levels as improved resources, capability or technical understanding is achieved.

3.5 Monitoring

Under Ground 7 of Appeal Number 117 of 2002 (Objection to the Report and Recommendations of the EPA, Bulletin 1056), the Minister for the Environment accepted the proponent’s position regarding the requirement for establishment of a meteorological station. Accordingly, meteorological monitoring will be conducted over the 12 months preceding the completion of construction of the DRI plant or power station (whichever occurs first).

In order for the objectives of this management plan to be achieved, monitoring of suspended (airborne) particulates is required from the outset of the construction phase. This will provide a basis for evaluating the effectiveness of dust management programmes. Monitoring will provide for assessment of all activities undertaken during the construction of the mine, processing plant and associated infrastructure.

Monitoring will be undertaken at a number of levels. The simplest form of monitoring will entail visual assessment of both atmospheric levels of fugitive dust and dust deposition on the surrounding vegetation. This will provide an indication of developing trends, and ensure dust management techniques remain effective by identifying any need for remedial action. Although the construction environmental officer will be responsible for performing spot checks on a regular basis, the entire construction workforce will be made aware of issues relating to dust during site health, safety and environment inductions and will be required to report any excessive atmospheric particulates resulting from their work. To complement these observations, continuous data loggers will be employed to enable long term averaging.

Vegetation monitoring sites will be established in conjunction with depositional dust gauges and will be used to judge any changes in the quality of vegetation resulting from dust generation. In accordance with the Vegetation Monitoring Plan (Maunsell, 2005), sampling will be carried out under the BACI Sampling Design (Green, 1979). If possible, two sampling events will take place over a twelve month period to establish baseline data for both wet and dry season conditions, prior to the commencement of operations. Monitoring sites will be located adjacent to dust monitoring stations, while control sites will be established in locations removed from expected project related dust impacts.
Ambient data will be collected for a period of 12 months prior to commencement of construction of the DRI plant, in accordance with Ministerial Condition 10-4. Additionally, ambient data will also be collected at monitoring stations located upwind from construction and mining activities during the construction and operation phases of the project. Monitoring stations will be located according to the results of meteorological monitoring, in order to ensure that both project related dust impacts and ambient dust levels are being recorded at all times, regardless of wind direction. Monitoring equipment and sampling methods will conform to Australian Standards (listed below) and will be determined prior to commencement of the dust monitoring programme. Where possible, dust monitoring stations will be established in conjunction with Greenhouse Gas monitoring stations. Relevant Australian Standards for particulate monitoring are:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Method Title</th>
<th>Method Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Ambient Air – Guide for the Siting of Sampler Units</td>
<td>AS 2922</td>
</tr>
<tr>
<td>All</td>
<td>Workplace Atmospheres – Methods for Sampling Respirable Dust</td>
<td>AS 2985</td>
</tr>
<tr>
<td>All</td>
<td>Workplace Atmospheres – Methods for Sampling Inspirable Dust</td>
<td>AS 3640</td>
</tr>
<tr>
<td>Total Suspended Particles (TSP)</td>
<td>Determination of Total Suspended Particles</td>
<td>AS 2724.3</td>
</tr>
<tr>
<td>Particles as PM$_{10}$</td>
<td>Determination of Suspended Particulate Matter – PM$_{10}$ High Volume Sampler with Size-Selective Inlet - Gravimetric Method</td>
<td>AS 3580.9.6:2003</td>
</tr>
<tr>
<td></td>
<td>Determination of Suspended Particulate Matter – PM$_{10}$ Dichotomous Sampler – Gravimetric Method</td>
<td>AS 3580.9.7:1990</td>
</tr>
<tr>
<td></td>
<td>Determination of Suspended Particulate Matter – PM$_{10}$ Continuous Direct Mass Method Using a Tapered Element Oscillating Microbalance (TEOM) Analyser</td>
<td>AS 3580.9.8:2001</td>
</tr>
<tr>
<td>Particles as PM$_{2.5}$</td>
<td>Tapered Element Oscillating Microbalance (TEOM)</td>
<td>No Australian Standard available</td>
</tr>
</tbody>
</table>

Table 3.2 Australian Standards for Particulate Monitoring

As yet, there are no Australian Standards set for the measurement of particles as PM$_{2.5}$. The NEPC recommends the use of the USEPA reference method (US Code of Federal Regulations Title 40 Part 50 Appendix L Reference Method for the Determination of Fine Particulate Matter as PM$_{2.5}$ in the Atmosphere) as the designated reference method for use in Australia (NEPC, 2003). In addition, the NEP (Air Quality) Measure allows for the use of Tapered Element Oscillating Microbalance (TEOM) under the direction of AS 3580.9.8 with minor modifications (described in NEPC, 2003. pp 4 & 5).

A complaints register will be maintained by the Proponent’s Construction Manager, and any complaints received will be investigated and the dust suppression methods employed will be reviewed. Suitable remedial action will be undertaken as necessary. The proponent will seek to participate in the Coastal Communities Environmental Forum (based in Karratha) as it will provide the opportunity for public liaison on any dust-related issues associated with the project with the potential to affect the towns of Karratha and Dampier.
### Summary of Dust Monitoring Programme

<table>
<thead>
<tr>
<th>Item</th>
<th>Monitoring Action</th>
<th>Performance Indicator</th>
<th>Frequency</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.6.1</td>
<td>Baseline ambient air monitoring</td>
<td>National Environmental Protection Council (NEPC) standards for ambient air</td>
<td>12 months prior to commencement of construction of the DRI plant</td>
<td>Environmental Manager</td>
</tr>
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<td>Meteorological monitoring</td>
<td>Bureau of Meteorology <a href="http://www.bom.gov.au">http://www.bom.gov.au</a></td>
<td>Continuous, beginning 12 months prior to completion of construction of the DRI plant or Power plant (whichever is sooner)</td>
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<td>Continuous ambient air monitoring</td>
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<td>Build-up of dust on vegetation and structures</td>
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<td>Vehicle exhaust emissions</td>
<td>Vehicle Maintenance Register</td>
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<td>Pre-start Inspection checklist</td>
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<td>Vegetation monitoring</td>
<td>National Environmental Protection Council (NEPC) standards for ambient air</td>
<td>In conjunction with vegetation monitoring programme (every 6 months)</td>
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**Table 3.3** Summary of Dust Monitoring Programme
3.7 Training

All employees and subcontractors will be required to undergo a site specific induction, outlining environmental controls to be implemented during construction. The induction will provide necessary awareness of dust management and the procedures and work practices to minimise and report dust generation.

Regular toolbox meetings will also be held to reinforce a positive attitude towards dust management and to highlight any issues that arise during the course of construction. A record of all training will be maintained.

3.8 Reporting

Air quality data will be recorded on a continual basis, with the results published in monthly internal reports. All data collected for the Dust Monitoring Programme will be collated and summarised in the Annual Environmental Review, which will be submitted to the Environmental Protection Authority. Records will be maintained in accordance with the Project Environmental Management System. The regulatory bodies will be immediately notified of any exceedance of established dust-related ambient air quality criteria, and of the response to such exceedance.

All employees and contractors will be required to report any generation of significant dust plumes to the Site Environmental Officer (or equivalent) via their supervisor.
4.0 References


Environmental Protection Authority (EPA) (2002). Bulletin 1056. *Iron Ore Mine, Downstream Processing (Direct-reduced and Hot-briquetted Iron) and Port, Cape Preston, WA*.


Appendix A

Bureau of Meteorology Climate Data for Mardie Homestead
Weather Station 005008
<table>
<thead>
<tr>
<th>Element</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
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<th>Number of years</th>
<th>Percentage complete</th>
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Wind Roses using available data between 1957 and 2004 for Mardie
Site Number 005008 • Locality: Karratha • Opened Jan 1885 • Still Open
Latitude 21°11'26"S • Longitude 115°58'47"E • Elevation 11m

Only the hours 6 am, 9 am, 12 pm, 3 pm, 6 pm are included.

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We have taken all due care but cannot provide any warranty nor accept any liability for this information.
## Wind Roses using available data between 1957 and 2004 for Mardie

### Site Number 005008 • Locality: Karratha • Opened Jan 1885 • Still Open
Latitude 21°11'26"S • Longitude 115°58'47"E • Elevation 11m

Only the hours 6 am, 9 am, 12 pm, 3 pm, 6 pm are included.

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## Wind Roses using available data between 1957 and 2004 for Mardie

### Site Information
- **Site Number**: 005008
- **Locality**: Karratha
- **Opened**: Jan 1885
- **Still Open**
- **Latitude**: 21°11'26"S
- **Longitude**: 115°58'47"E
- **Elevation**: 11m

### Data Methodology
- Only the hours 6 am, 9 am, 12 pm, 3 pm, 6 pm are included.

### Wind Rose Data

<table>
<thead>
<tr>
<th>Month</th>
<th>Hour</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>6 pm</td>
<td>514</td>
</tr>
<tr>
<td>June</td>
<td>6 am</td>
<td>472</td>
</tr>
<tr>
<td>June</td>
<td>9 am</td>
<td>1397</td>
</tr>
<tr>
<td>June</td>
<td>12 pm</td>
<td>463</td>
</tr>
<tr>
<td>June</td>
<td>3 pm</td>
<td>1380</td>
</tr>
<tr>
<td>June</td>
<td>6 pm</td>
<td>474</td>
</tr>
<tr>
<td>July</td>
<td>6 am</td>
<td>485</td>
</tr>
<tr>
<td>July</td>
<td>9 am</td>
<td>1434</td>
</tr>
<tr>
<td>July</td>
<td>12 pm</td>
<td>480</td>
</tr>
<tr>
<td>July</td>
<td>3 pm</td>
<td>1432</td>
</tr>
<tr>
<td>July</td>
<td>6 pm</td>
<td>481</td>
</tr>
<tr>
<td>August</td>
<td>6 am</td>
<td>484</td>
</tr>
</tbody>
</table>

### Key:
- **Calm**: 20%
- **40% calms**

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### Wind Roses using available data between 1957 and 2004 for Mardie

**Site Number 005008 • Locality: Karratha • Opened Jan 1885 • Still Open**

Latitude 21°11'26"S • Longitude 115°58'47"E • Elevation 11m

Only the hours 6 am, 9 am, 12 pm, 3 pm, 6 pm are included.

<table>
<thead>
<tr>
<th>Month</th>
<th>Hours</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>August</td>
<td>9 am</td>
<td>1447</td>
</tr>
<tr>
<td></td>
<td>12 pm</td>
<td>484</td>
</tr>
<tr>
<td></td>
<td>3 pm</td>
<td>1442</td>
</tr>
<tr>
<td></td>
<td>6 pm</td>
<td>485</td>
</tr>
<tr>
<td>September</td>
<td>6 am</td>
<td>469</td>
</tr>
<tr>
<td></td>
<td>9 am</td>
<td>1395</td>
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<td>12 pm</td>
<td>474</td>
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<td></td>
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<td>October</td>
<td>6 am</td>
<td>510</td>
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<tr>
<td></td>
<td>9 am</td>
<td>1431</td>
</tr>
<tr>
<td></td>
<td>12 pm</td>
<td>512</td>
</tr>
</tbody>
</table>

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Wind Roses using available data between 1957 and 2004 for Mardie
Site Number 005008 • Locality: Karratha • Opened Jan 1885 • Still Open
Latitude 21°11'26"S • Longitude 115°58'47"E • Elevation 11m

Only the hours 6 am, 9 am, 12 pm, 3 pm, 6 pm are included.

October 3 pm 1433 observations  October 6 pm 513 observations  November 6 am 484 observations

November 9 am 1378 observations  November 12 pm 484 observations  November 3 pm 1353 observations

November 6 pm 488 observations  December 6 am 514 observations  December 9 am 1418 observations

December 12 pm 508 observations  December 3 pm 1412 observations  December 6 pm 515 observations

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