Balline Garnet Project

Dust Management Plan

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INTRODUCTION

1.1 Purpose and version

This Environmental Management Plan (EMP) for dust has been prepared for the Australian Garnet Pty Ltd (Australian Garnet) Balline Garnet Project (Figure 1), to ensure the management of actual and potential dust emissions is conducted in a manner that:

- Fulfils Australian Garnet's relevant legal obligations;
- Meets or exceeds industry leading practice and satisfies relevant guidelines; &
- Is responsive to changes in management and performance requirements.

These management principles are supported by specific dust management objectives, namely:

- To ensure that dust emissions from the premises, both individually and cumulatively, meet appropriate criteria and do not cause significant impacts on amenity, human health or environmental values; &
- To use all reasonable and practical measures to minimise dust emissions from the premises.

1.2 Standards, References and guidelines

The following documents have been used as a resource in the preparation of this management plan and should be duly considered when making any amendments to the plan in the future:

- A guideline for managing the impacts of dust and associated contaminants from land development sites etc., Department of Environment and Conservation, 2011;
- AS / NZS ISO 31000:2009 Risk Management - Principles and Guidelines, Standards Australia;
- Balline Garnet Mine Expansion Project, Mining Proposal Reg ID 55347;
- Draft Environmental Assessment Guidelines for Separation Distances between industrial and sensitive land uses. EPA 2015;
- National Environment Protection (Ambient Air Quality) Measure, Feb 2016;
- Bureau of Meteorology Australia. Website climate database and graphics;
- Main Roads WA "Weekly Class Report.M058.0.96.8.B.2018-02-21.08-25.199731975";
- Balline Project Clearing permits CPS 3891-2; &
- Onshore Environmental (2013) Balline Garnet Project Level 2 Flora and Vegetation Survey. Prepared for Australian Garnet Pty Ltd.

1.3 Definitions

Standard definitions used in the document as follows:

AGPL – Australian Garnet Proprietary Limited, the company. Also abbreviated to AG;

AS / NZS – Australian and New Zealand standards;

DCS – Distributed Control System. Computer system operating processing plant and support services;

DMIRS – WA Department of Mining Industry Regulation & Safety. Formerly DMP;

DWER – WA Department of Water and Environmental Regulation. Formerly Department of water and Department of Environmental Regulation, DoW & DER;

Fugitive dust – dust emitted from a source that is not defined;

Km – kilometres;

mAHD – metres above Australian Height Datum;

Mt – million tons;

Netsuite – AGPL database software used for the compilation of HSE statistics, data and incident records;

PM10 – particulate matter with an average size of less than 10 µm, (micrometres);

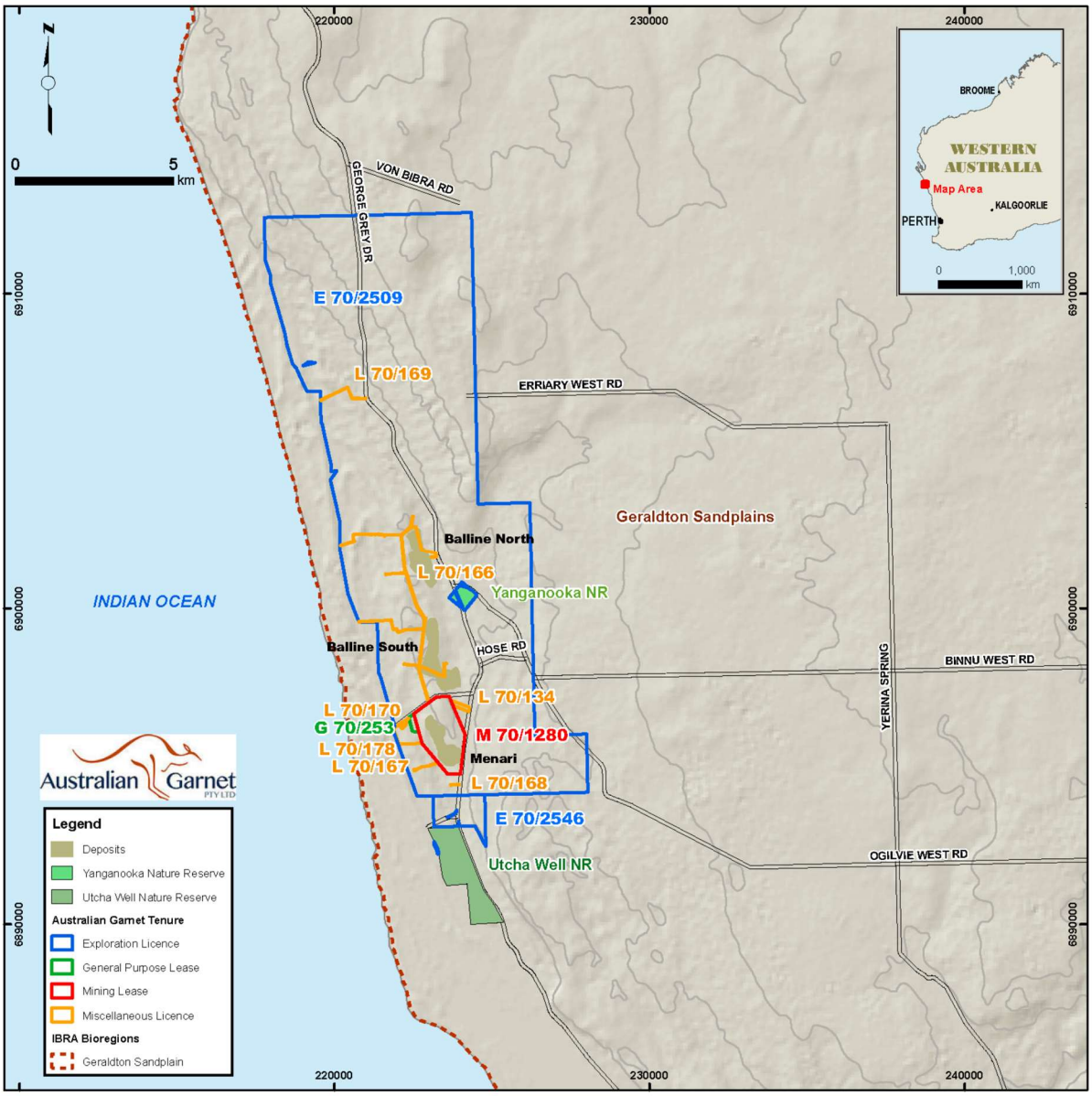
tpa – tonnes per annum;

TSP – Total Suspended Particulates;

TWA – Time weighted average;

Weekly Class Report – Data from Main Roads Western Australia of traffic measurements on specific roads

Figure 1: Regional location of the Balline project



2 PROJECT SETTING

2.1 Project Overview

The Balline Garnet project is a conventional mineral sand mine and processing plant, additionally designed to minimise energy and environmental impacts. The mining process involves stripping and stockpiling of topsoil.

As there is no waste the ore is then mined directly with a front end loader, with some bulldozing and fed directly to an in pit mining screen plant. Oversize is screened out and the ore is slurried with water and pumped back to a wet concentrator plant. Operating this way reduces trucking and minimises material movement, reducing energy consumption and dust generation.

The wet concentrator plant separates the heavy mineral from the mainly silica sand and slimes via a conventional gravity plant, which recovers approximately 5% of the ore mass as a heavy mineral concentrate. The plant is similar to most wet mineral sand concentrator processes that is a reliable and proven method of efficient ore extraction.

The heavy mineral concentrate is then fed directly to a dry separation plant located adjacent to the wet plant. The damp mineral is dried, then treated via conventional screens and magnets to recover the garnet. The dry garnet sand products are then loaded directly from an overhead silo into trucks and transported to Geraldton in preparation for export via the port.

All tailings from the wet and dry plants are slurried and pumped back to the mine to backfill the pit behind the current mine path and then recontoured to fit back into the existing landscape ready for immediate rehabilitation directly behind the current mining area. The mining rate is planned to be 4.5mtpa.

2.2 Climate

The region experiences a Mediterranean climate with hot, dry summers and mild, wet winters. The nearest Bureau of Meteorology weather stations are:

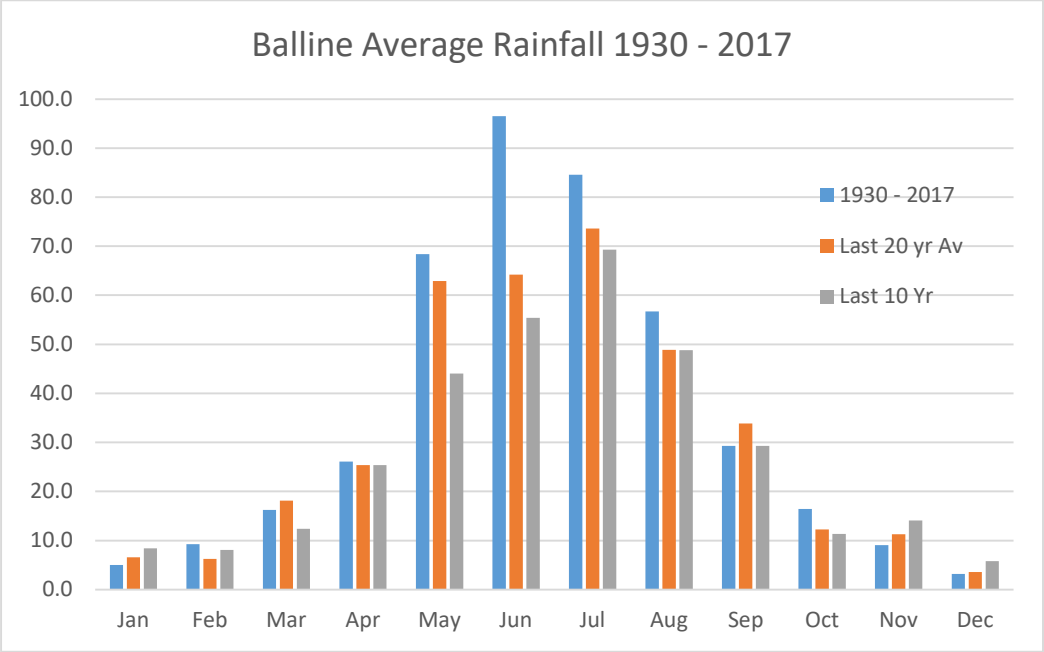
- Lynton station (operating since 1915), approximately 23km SSE;
- Kalbarri (operating since 1970), approximately 36km north;
- Geraldton Airport approximately 98km SE; &
- Balline station (operating since 1930), approximately 5km NE.

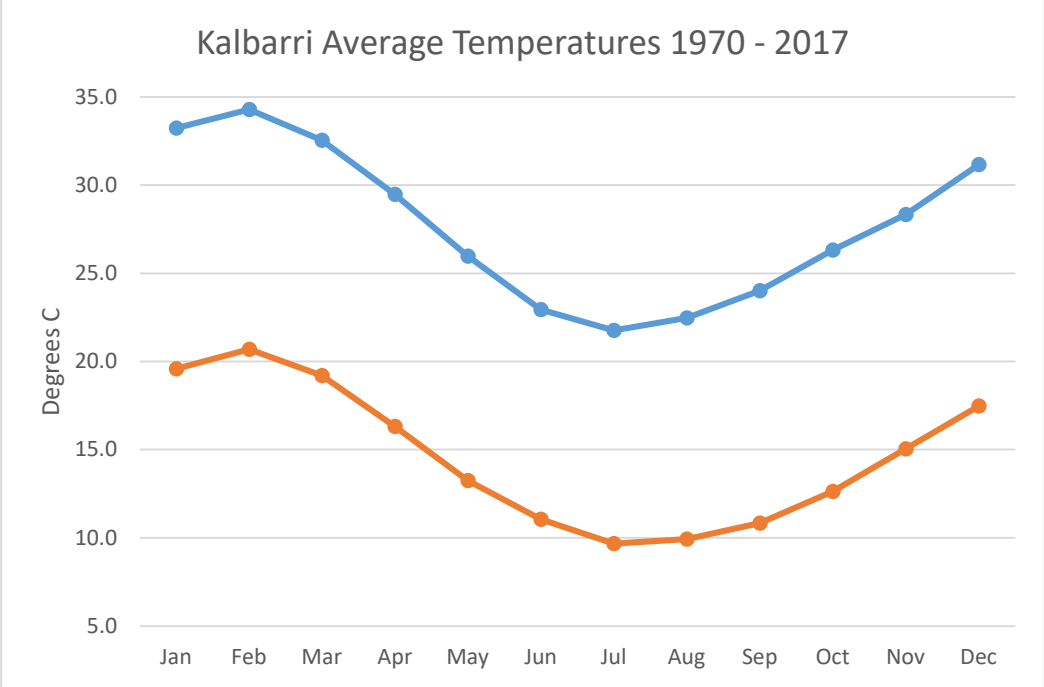
Records from these stations show that median rainfall is approximately 400 mm with most of the rainfall occurring in the winter months.

Average maximum temperatures range from 21.8 C in July to 34.3 C in February. Average minimum temperatures range from 9.7 C in July to 20.7 C in February (Figure 2).

Winter storms bring squally winds from the northwest to southwest. During summer, south westerly sea breezes occur in the afternoon, while hot dry easterly winds of moderate strength occur at night and early in the day.

Figure 2: Summary of climatic data





In summer the typical wind pattern for the area is hot dry easterly winds of moderate strength in the mornings and overnight, with afternoon sea breezes of moderate to strong strength mainly from the S to SW direction. In winter the wind is typically light to medium easterlies.

Figure 3a and 3b show wind roses for 9 am and 3 pm for the Kalbarri weather station, this wind pattern is expected to be similar to those seen at the Balline mine site.

Figure 3a: Annual Wind Rose Kalbarri 09:00 Hrs, (BoM Data)

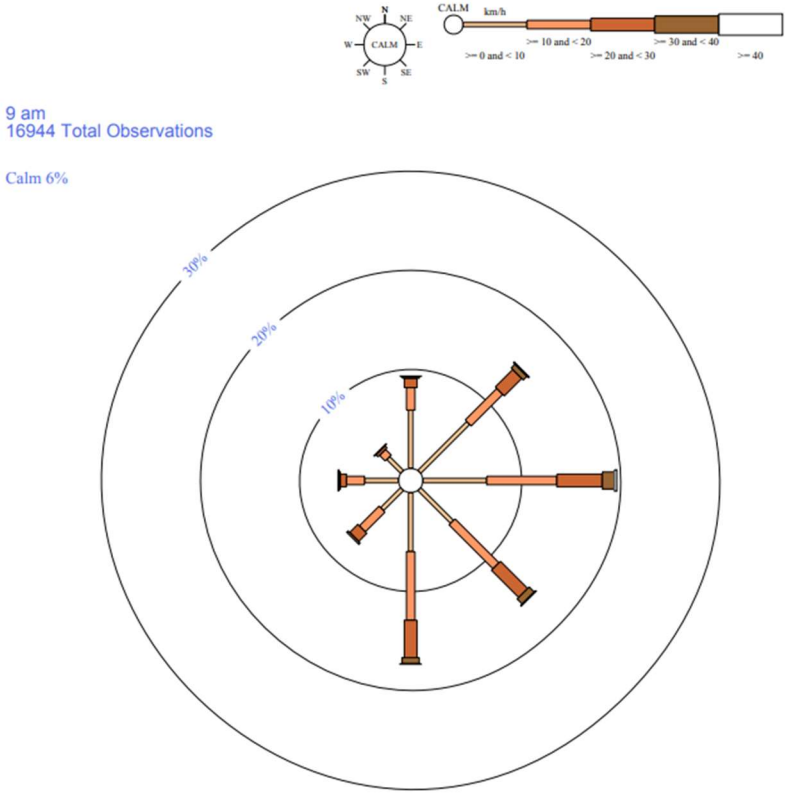
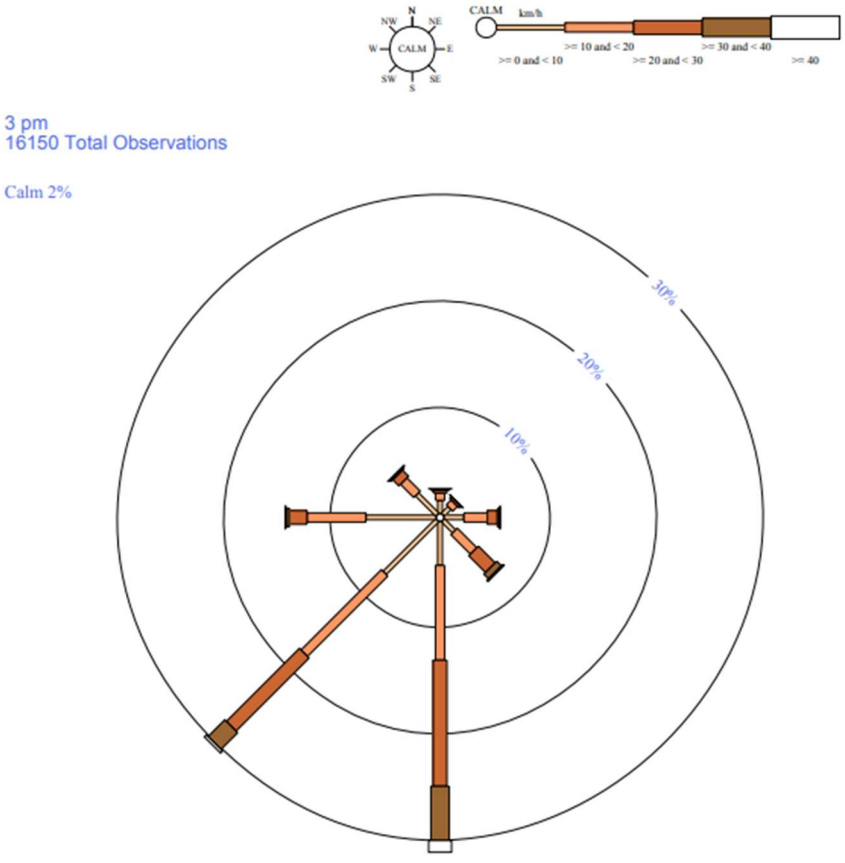


Figure 3b: Annual Wind Rose Kalbarri 15:00 Hrs, (BoM Data)



Figures 3c and 3d below show the annual average wind speeds in Kalbarri

Figure 3c: Annual Wind Average speed Kalbarri 09:00 Hrs, (BoM Data)

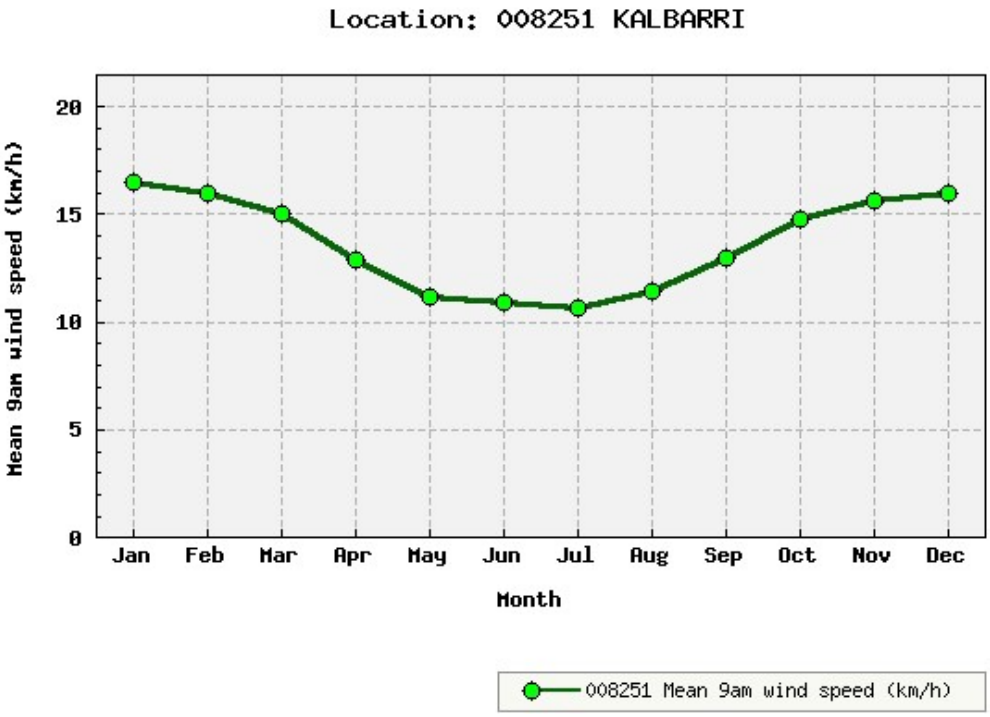
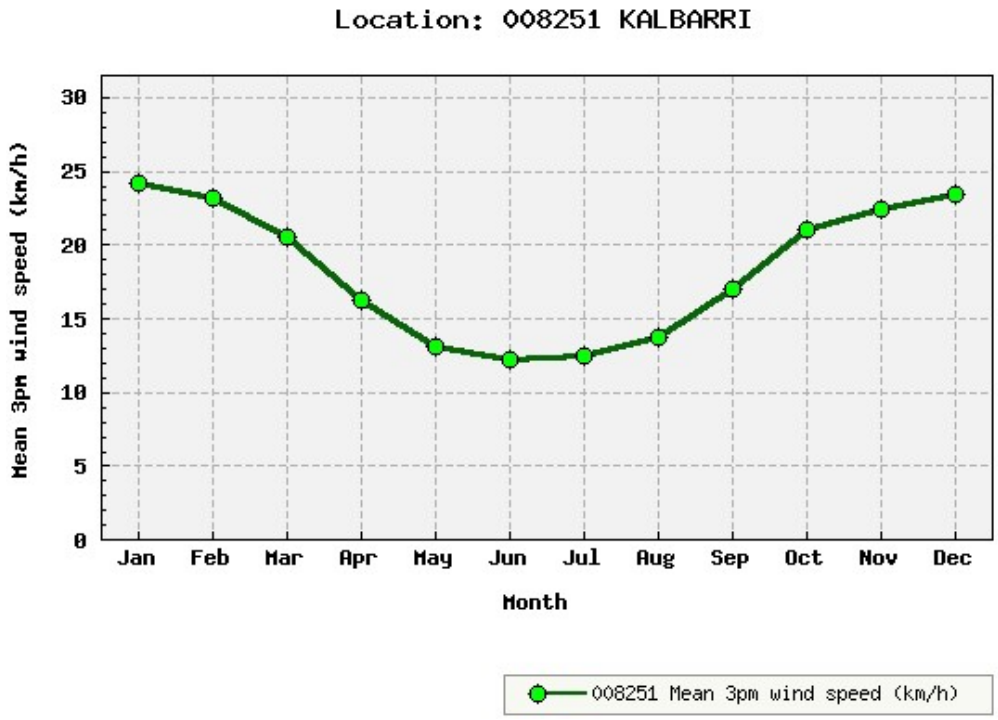


Figure 3d: Annual Wind Average speed Kalbarri 15:00 Hrs, (BoM Data)



2.3 Topography

The topography of the Balline project area is covered with poorly consolidated or still mobile sand dunes and red loam soils. The project area is to be developed in a coastal dunal system, which is characterised by numerous small internally draining catchments with no clearly defined drainage lines adjacent to the coast and approximately 1.8km inland from the ocean.

There is a primary vegetated dune running generally parallel with the coast in a north to south direction. The highest point of the dune is approximately 75mAHD and the lowest point being approximately 15mAHD. The project area is not located on sand dunes that are currently mobile as a result of coastal processes.

The area is typical of the landforms found in the region and the features are well represented across the landscape.

2.4 Geology, landform and soils

The Balline area is dominated by the Tamala Limestone, a belt of coastal limestone extending up to 8km inland (Gibson, 1997). It is composed of aeolianite that accumulated originally as coastal sand dunes in the Late Pleistocene.

This has accreted over a basement of Late Cretaceous aged Winning Group sediments (e.g. Tumblagooda Sandstone), which can be seen outcropping near Yanganooka Well and in coastal cliffs surrounding the town of Kalbarri, about 40km north of the project area.

A number of erosional scarps have developed on the seaward side of the Tamala Limestone that have received deposition of HM-enriched sands during times of sea- level still stand. Typically this deposition and preservation is enhanced in the protected environment northward of prominent coastal headlands.

Mobile coastal dunes, are extensively developed and transgress over the Tamala Limestone. They are divided into a coastal zone of large mobile longitudinal and crescent dunes from an inner zone of older, stabilised and more sparsely distributed crescent dunes (Gibson, 1997).

The older and more sparsely distributed crescent dunes host the mineralisation within the Balline project area.

2.5 Physical and chemical properties

The garnet resource is located close to the surface. The clean sand tailings that are generated from the Wet concentrator spirals and classification circuit is initially disposed of to the sand tailings storage area for drying until the tailings can be transferred as backfill to the mine.

The sand fraction of the ore is typically coarse with a median size of 500 µm. This is very coarse compared to other sand deposits, where median sizes are more in the 100 – 200 µm range. The fine portion of the ore, below 53 µm or slimes, represents only 4.2% by mass. This is a low percentage compared to most typical mineral sand deposits, which commonly are around 10 – 30%.

A bulk sample and sub sample of the wet plant tail streams was submitted for XRF analysis. The results of the analysis are presented in Table 1.

Table 1: Balline Garnet Bulk Sample and Sand tailings analysis

Elements	Unit	Sample Origin	
		Initial Bulk	Spiral Tails
SiO_2	%	43.5	83.7
Al_2O_3	%	1.8	1.0

CaO	%	27.1	6.2
Fe_2O_3	%	1.3	1.6
K_2O	%	0.5	0.1
MgO	%	1.3	0.5
Na_2O	%	0.3	0.1
P_2O_5	%	0.1	0.002
SO_3	%	0.2	0.04
TiO_2	%	0.8	1.4
MnO	%	0.0	0.1
Cl	%	0.0	0.0

The Initial Bulk sample refers to the slimes produced from the deslime circuit in the WSP. They are characterised by approximately 44% SiO_2 and 27% CaO, with the remainder comprising minor impurities including heavy minerals.

Further testing of the ore, topsoil and process streams is planned to better characterise the potential dust issues and understand how to control any dust.

2.6 Surrounding Environment

The expansion project area occurs within the Irwin Botanical District of the Northern Sandplains Region within the Southwest Province as described in Beard (1990). It is characterised by scrub heath on sandplains near the coast and *Acacia-Casuarina* thickets further inland. It falls within the Greenough System, which includes *Acacia rostellifera* and *Melaleuca cardiophylla* thickets on rocky ridges, *Acacia-Banksia* scrub on sand covered limestone, *Acacia rostellifera* on alluvial flats and *Acacia ligulata* open scrub on recent dunes.

Beard (1979) mapped the vegetation in this area as being Shrublands; *Acacia rostellifera* thicket. The coastal region between Kalbarri and Geraldton has been extensively cleared for agricultural purposes. Much of the vegetation remaining in the region is comprised of fragmented remnants of the Pre-European extent of the vegetation associations. According to Shepherd (2002) the original extent of *Acacia rostellifera* thicket is 75,658.24 ha of which approximately 88% remains in the Shires of Irwin, Northampton and Shark Bay. Accordingly. this vegetation association is considered to be well represented in the region (Ecoscape, 2009).

Beard (1979) mapped the vegetation in the area as consisting of predominately shrublands, *Acacia rostellifera* thicket.

While much of the coastal area between Kalbarri and Geraldton has been cleared for agricultural purposes, this particular vegetation association is well represented in the area and extremely resilient to disturbance.

2.7 Receiving Environment

2.7.1 Sensitive receptors.

The Balline project is adjacent to three different sensitive receptors, shown on figure 4:

- R1 – residential building on a rural property;
- R2 – group of leasehold recreational dwellings known as Half Way Bay Camp located on crown land and administered by the Shire of Northampton; &
- R3 – Balline farm house, residential and associated buildings on a rural property.

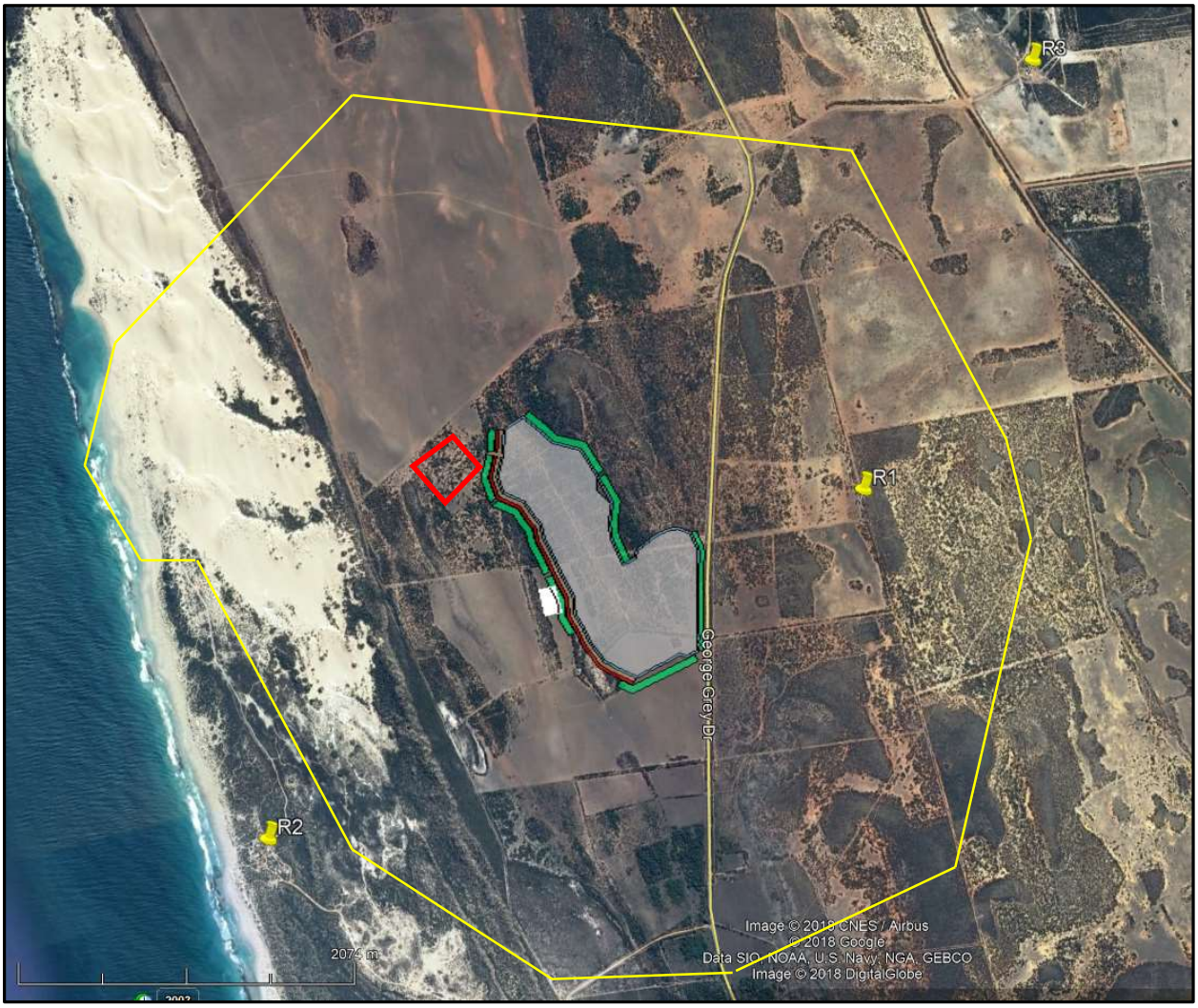
Table 2 shows the nearest distance for each property from the operation, and compares to the EAG guidelines for separation distances, (EPA 2015). The next nearest sensitive receptors are in excess of 5km away.

Table 2: Separation distances for sensitive receptors to the project, (nearest point)

Sensitive Receptor	Separation Distance	Guideline Recommended Separation Distance	Comment
R1	1,000 m	2,000 m	The location is not in a prevalent wind direction Location but is inside the recommended separation distance for a mineral sand mine
R2	2,260 m	2,000 m	The location is upwind of prevalent strong winds
R3	3,620 m	2,000 m	Well outside recommended guideline

The guideline recommends a separation distance of 2,000m for a mineral sand mining and processing facility. Note also the guideline recommends a distance of 300 – 500m for a sand or clay pit. The red square in Figure 4 indicates the process plant and offices.

Figure 3: Dwellings adjacent to the Balline project area. Yellow boundary designates 2,000m separation from project activity boundary. Red boundary designates processing plant and office location.



2.7.2 Other Receptors

The other major potential impact of air quality would be members of the public on George Grey Drive. This can be seen on Figure 4.

George Grey drive is a reasonably quiet road, with limited commercial and mainly residential and tourists travelling.

Main roads data suggests 386 vehicle movements a day on average, or one vehicle movement every 3.75 minutes. Of this 13.7% or 53 vehicles a day are heavy vehicles.

3 RISK ASSESSMENT

3.1 Assessment criteria

The following management objectives and performance criteria provide the measures by which to assess and rank the risk level associated with each operational aspect of the Balline Garnet Project.

3.1.1 Management objectives

Australian Garnet's specific management objectives for dust are:

- To ensure that dust emissions from the premises, both individually and cumulatively, meet appropriate criteria and do not cause an environmental or human health problem; &
- To use all reasonable and practical measures to maintain dust emissions as low as reasonably practical.

3.1.2 Performance targets and criteria

Australian Garnet has adopted the following limit for dust emissions:

- The concentration of dust (measured as Total Suspended Particulates, TSP) resulting from operations at the mine not to exceed 260 µg/m^3 at the premises boundary, (NEPM standard).

No operational aspect of the Balline Project that has a real potential to result in the dust emission limit being exceeded will be carried out until adequate controls are in place.

To support the continued achievement of this limit, Australian Garnet has put in place the following:

- Adequately trained supervisors that will conduct frequent inspections to monitor dust at the premises boundary; &
- Installation of a real time weather station to monitor ambient conditions. This will allow targeted inspections of boundaries susceptible to the conditions.

Any incidents either reported from site or outside will require investigation and controls where possible.

3.2 Potential Dust Sources

The Balline Garnet Project includes the following operational aspects that have potential implications for dust emissions:

- Clearing of vegetation and mulching of material not required for rehabilitation;
- Topsoil removal and stockpiling;
- Leaving stripped areas bare and exposed to winds;
- Mining of ore and overburden;
- Construction and use of internal roads and laydown / hardstand areas;
- Removal and stockpiling of oversize material;
- Temporary stockpiling of processed sand tails to create the initial mining area;
- Stockpiling of HMC;
- Pit walls, stockpiles and batters exposed to winds; &
- Earthworks and surface preparation associated with landform reinstatement, contouring and rehabilitation activities.

3.3 Key risks

The greatest risk of potential emissions comes from the removal, replacement and stockpiling of topsoil material, and wind action on disturbed areas, pit walls and batters generating dust.

Other sources of dust generation include soil cultivation during rehabilitation operations, vehicle movements outside of the pit, processing of ore through the mining unit, screening of ore, dry separation unit and the overhead silo load-out area for trucking to Geraldton. The clearing of vegetation will also exposure the soil to wind erosion

The key potential sources of dust emissions are outlined in Table 3 below:

.

Table 3: Key dust risks and potential causes

Dust Risk	Causes
Topsoil removal	• unfavourable weather and soil conditions • inadequate application by water carts • excessive machinery / activity
Disturbed areas	• unfavourable weather and soil conditions • excessive traffic • inadequate stabilisation, including water carts
Vehicle movements	• unfavourable weather and road conditions • excessive or speeding traffic • inadequate stabilisation, including water carts
Mining Unit, screening and processing plant	• bulk handling • overhead silo • Trucking • Dry separation unit equipment failure
Stockpiles	• unfavourable weather and soil conditions • inadequate stabilisation

4 RISK MANAGEMENT

4.1 Responsibility

The management of dust risks and emissions from the Balline Project is the responsibility of the Mining Services Manager. The Mining Services Manager will adopt both a proactive and reactive approach to managing dust emissions.

4.2 Management approach

The prevention of excessive dust emissions relies on effective management at the dust sources through careful planning by:

- Minimising the scale, intensity and exposure to high risk activities or conditions;
- Ensuring adequate management resources are available for current activities and conditions, and also if conditions change for the worse;
- Educating the workforce on site to understand dust generation risks and controls. In particular mining & processing supervisors will be trained in recognising dust issues and what processes to follow should these issues arise, including the use of controls to minimise dust;
- Continually improving practices, keeping up with innovative developments and testing new techniques to better performance;
- Recognising when weather conditions are too severe or otherwise unsuitable for conducting high dust risk activities and practical levels of management response would be ineffective; &
- Consideration of current and forecast weather conditions, along with the potential for dust lift-off.

4.2.1.1 Ambient Condition triggers

A weather station will operate at the Balline plant site and continuously record wind speed and direction. The weather station data will be coupled with visual assessments of areas and activities of concern to reliably predict when dust management objectives may be at risk.

Further investigation is planned to understand dust mobility and impacts. This work will enable a better understanding of the circumstances that could trigger a dust event. This can then be used to generate specific dust management procedures based on ambient condition triggers.

The precise triggers for an event will be determined with the modelling and site experience. Procedures would be developed where defined steps would take place if the trigger points are reached.

4.2.1.2 Ambient dust alerts

Australian Garnet will monitor the site boundaries for visible dust, especially in high risk weather conditions.

Table 4 describes the alert triggers and actions to be taken.

Table 1: Dust alert levels for activities in the project area

Parameter	Alert Level	Data Source	Action
TSP (dust)	Visible dust blowing towards and likely to cross or crossing the Balline or Balline premises boundary.	Site supervisors	Identify source of dust. Take steps to minimise dust generation. Actions can include stopping or minimising activity, deploying water cart, starting sprinklers, reallocation of activities to reduce source of the dust
	Wind events where the wind may generate dust likely to go in the direction of a sensitive receptor	Real time weather station data Weather forecast	Identify source of dust. Take steps to minimise dust generation. Actions can include stopping or minimising activity, deploying water cart, starting sprinklers

4.2.2 Employee and contractor training

All employees and contractors will undergo a site induction before commencing work or undertaking contractual duties. As a minimum site induction training will be refreshed after 2 years or as required.

As a part of the site induction process employees and contractors undergo dust awareness training to highlight the importance of on-site dust management. Training would cover the impacts to health, safety and environment from dust.

The training will cover dust management and monitoring strategies and responsibilities as well as providing employees with strategies to minimise their impact.

Supervisors will be trained in the following areas:

- Recognition of dust events, weather conditions and activities that have the potential to increase dust issues;
- Knowledge of local conditions, sensitive receptor locations and premises boundaries; &
- Training in processes and procedures to take action should a dust event occur. These processes would focus on potential controls and actions to control the event.

Toolbox meetings, safety meetings and pre-starts will also be used to reinforce requirements, highlight issues and management strategies.

4.2.3 Neighbourhood consultation and alerts

Where required, the Mine Services Manager or a responsible delegate will provide open and transparent consultation with the local community on potential dust impacts, monitoring activities and mitigation measures.

Regular meetings will be held with local sensitive receptors and stakeholders to maintain open communication about any air quality issues.

The front gate of the mine on George Grey Drive will have contact information for the local mine, which will nominate a telephone contact number for members of the public. The local Kalbarri and Northampton community newspapers will also be utilised to disseminate information to the public.

4.3 Area protection and stabilisation

4.3.1 Soil stabilisation

Dust generation on soils that have been exposed or disturbed (e.g. stockpiles, open areas) will be stabilised through the use of various surface treatments.

Adequate stabilisation using these treatments is dependent on many factors, including soil type, level of activity in area, and location. The method of surface treatment will be determined by the site supervisor on a case by case basis.

Table 2 lists some of the major treatments to be used for soil stabilisation along with the suitability and management requirements.

Table 2: Surface treatments for soil stabilisation

Treatment	Suitability	Management
Hydromulch	Areas where no traffic is required (e.g. Disturbed areas not in use, Pit Walls). Suitable as a short-term stabilisation agent prior to longer term stabilisation being applied (e.g. Prior to vegetation being established)	Restrict access to area once applied Inspect area to determine when re-application is required

Treatment	Suitability	Management
Chemical Stabilisation (Eg. Dustex™)	Areas with little or moderate traffic (e.g. site entry roads, light vehicle tracks, laydown areas)	Apply and manage as per manufacturer's instructions.
Bitumen Seal	Selected roads on site will have bitumen seal to reduce dust generation	As part of the site construction
Vegetative Cover	Non-trafficked areas where no more disturbance will occur (e.g. stockpiles).	Seed in winter with cover crop to ensure growth. Areas must be stabilised using other techniques until growth is adequate. Restrict access once growth is established. Encourage Acacia growth
Capping with Coarse waste material	Non-trafficked areas where vegetation has not been established yet. Areas where disturbance will occur shortly.	Restrict access once applied. Inspect area to determine when reapplication is required.
Stabilisation with gravel, limestone or similar material	Suitable for highly trafficked areas (e.g. haul roads).	Maintain formation of surface with graders etc. Use in conjunction with water application or chemical stabilisation.
Mulch	Non-trafficked areas where no further disturbance is required.	Use of cleared vegetation in the mine path and in rehabilitation areas.
Barrier	Physical barrier to block wind from dust sources	Tree lines and shelter belts can be used in the long term. Other measures to consider include fences, shade cloth and stabilised earth.

Regular inspections of stabilised areas will be undertaken by area supervisors. The focus of these inspections will be to identify areas that need re-application, alternative or additional treatments (e.g. visible breakdown of surface crust or dust lift off) by:

- Reviewing the effectiveness of treatment;
- Assessing the surface of treated area and noting level of breakdown;
- Assessing level of erosion across treated area; &
- Assessing level of activity within area (and effectiveness of restrictions) and level of future activity.

The effectiveness of the stabilisation technique will be assessed through consideration of the longevity of treatment, cost, time considerations and dust suppression ability. Where a treatment was considered ineffective a different treatment method will be applied in future.

4.3.2 Water application

Wetting down unsealed areas is an effective measure of suppressing dust generation. This strategy is effective in areas where surface treatments cannot be used (e.g. trafficked areas). This will be utilised in several ways on the minesite including:

- Water carts will be used to wet down unsealed trafficable and working areas of the minesite; &
- Use of sprinklers in localised areas.

Water application across the minesite will be the responsibility of the Mining Services Manager.

Application and operating hours of the wetting systems will be dependent on activities on-site and weather conditions amongst other factors.

A water truck will be available 24 hrs / day 7 days a week at the mine site should it be required for water application.

4.3.3 Tillage Practices

Where applicable appropriate tillage practices will be used in post mined rehabilitation areas and pre-stripped mining areas

For example 'Listing' may be used for sandy soils that do not produce durable clods..

Listing must be perpendicular to the eroding wind and should always start on the upwind side of the field. Properly listed, the flat surface of a field can be changed so that ridges are 25 to 30 cm higher than the troughs, and about 90 cm apart.

Listing reduces the fetch of the wind thereby reducing potential for dust lift off.

4.3.4 Planting of long term shelter belts

Planting of long term tree lined shelter belts to improve visual amenity, noise and dust impacts from the project in key locations will be undertaken. Specific areas are along George Grey drive, mine boundary and internal site roads.

Maintaining and enhancing existing tree lines and shelter belts as part of mine planning wherever possible will be undertaken.

4.3.5 Dust screens

Screening along the boundary of the site will be used as a barrier against dust leaving the site.

Screening will occur in the form of vegetation screens, mesh fencing or stabilised stockpiles along the boundary.

As a contingency, screens may be erected after taking into account the distance of current operations to the boundaries, the level of activity at the boundary and distance to neighbours and public roads.

4.4 Working procedures

There will be a number of work instructions developed which apply to the day-to-day management of dust generating activities.

These work instructions will provide dust management techniques for specific activities. Work instructions will be developed or modified as new or better practices are identified.

Work practices will be reinforced to mine site employees through monthly toolbox talks, seasonal internal "Enviro-Updates" and inductions.

Internal traffic

- Mine site speed limits on the main access haulage road and unformed tracks will be restricted to no more than 60 km/h for light vehicles and haulage trucks;
- Heavy earthmoving equipment will drive to soil conditions with water applied to working areas as needed; &
- Speed limits for heavy earthmoving equipment are a contingency available during adverse conditions, based on the area supervisors' assessment.

Topsoil Stripping

- Topsoil will normally only be stripped in suitable conditions with a weather window that allows for dust mitigation measures to be implemented prior to the mining units accessing the area;
- Water carts will be used to suppress dust when low soil moisture conditions require it;

- Topsoil will be stripped on a progressive basis so the disturbed area is the minimum required for continued operation;
- Topsoil stockpiles will be mulched of sown with a cover crop to reduce wind erosion;
- If topsoil stripping occurs outside of winter months then water carts will be used to keep the soil and stockpile damp during topsoil stripping;
- Weather conditions will be assessed before commencing topsoil stripping, and re-assessed on a daily basis during stripping; &
- Topsoil to be direct returned to rehabilitation areas wherever possible.

Haulage (Bulk Haulage by Contractor)

- Management of dust from the haulage road is to be controlled by using well formed roads;
- Assessment of weather conditions prior to operations commencing; &
- Dependent on conditions haulage roads will be dampened through water application such as water carts.

Disturbed Areas

- Clearing areas will be restricted to the minimum requirement for continued operation;
- Outside of winter months, stabilising agents will be applied to any disturbed areas that are not to be immediately utilised;
- Soil will be dampened by utilising water carts in high activity, disturbed areas that cannot be stabilised using traditional sealing agents or areas that are awaiting application of sealing agents;
- Access will be restricted to any areas that have been stabilised using sealing agents; &
- Sprinkler systems will be used in areas where dust control is not achieved by the other control measures outlined above.

Stockpiles

- Stabilising agents will be applied progressively to the batters of stockpiles;
- At the completion of stockpiles an appropriate soil stabilisation treatment will be applied;
- Appropriate stockpiles will be seeded with a vegetative crop in winter; &
- Access to stabilised stockpiles for purposes other than stabilisation will be restricted.

4.5 Long-term actions

Progressive rehabilitation behind the active mining area proceeds along the mine path. Once mining is complete, the mine path is backfilled with tails and blended with fines. The subsurface and topsoil are re-instated.

These disturbed areas are then recontoured, seeded and stabilised with groundcover immediately following construction to control dust generated from areas of bare ground.

This activity would be limited to times when weather conditions reduce the chance of dust generation.

4.6 Contingency and complaint response

If conditions, activities or events, through one reason or another, result in the criteria being potentially exceeded, or if a public complaint is received, an Environmental Incident will be initiated through the company's Environmental Management System.

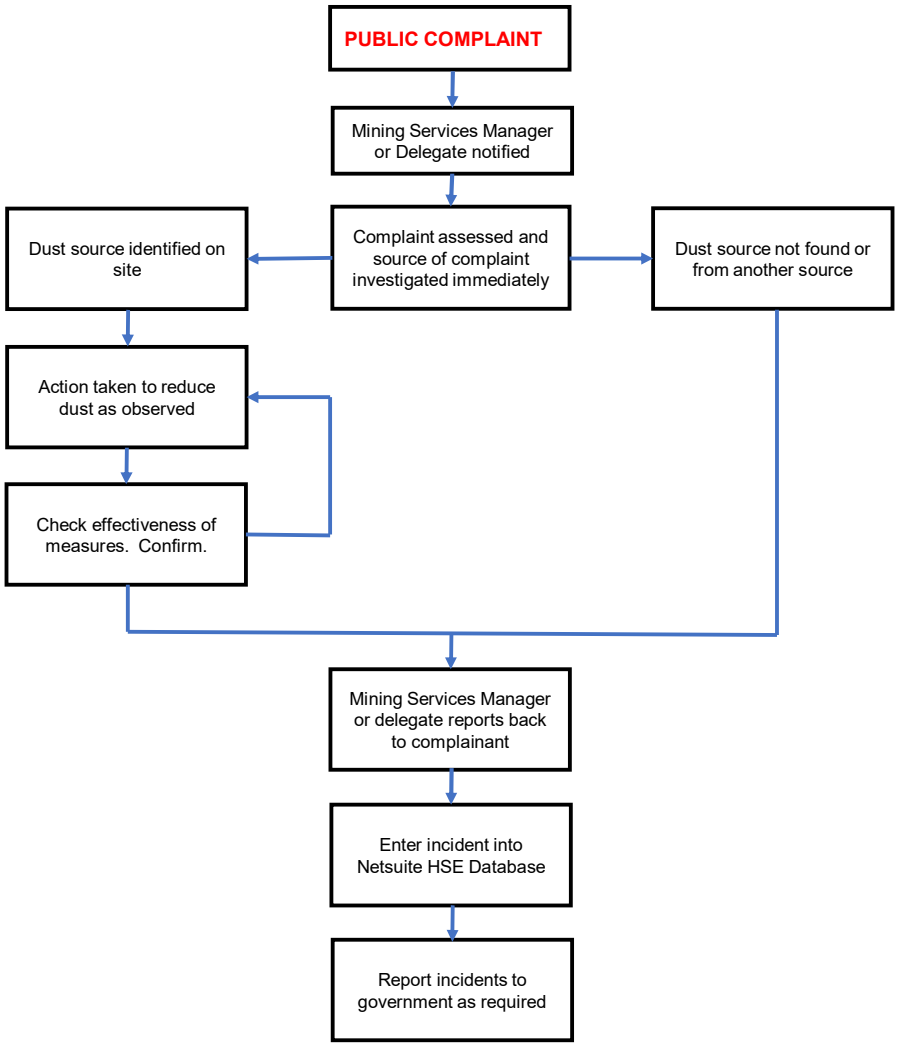
The following procedure will be undertaken:

1. An immediate on-site assessment of the current conditions will be made by the Mining Services Manager or delegate. The assessment will take into account current and predicted wind and weather conditions, dust monitoring observations and dispersal pattern, and the potential for further generation;
2. The Mining Services Manager or delegate will determine whether there is potential for, or an actual, dust nuisance occurring and determine the source(s) of dust generation;

3. If it is deemed that on-site activities are generating excessive dust or weather conditions have the potential to worsen dust generation then one or more of the following contingency measures will take place:
   a. Divert activities away from the areas where dust is originating to less susceptible areas or reduce the level of activity in the affected areas, (e.g. reduce the number of machines or cease working in that particular area);
   b. Ensure the management actions are being carried out for the particular dust source;
   c. Implement additional dust control measures, such as increasing water cart frequency and operating hours in the area of dust generation and ensure the management actions specified for the particular source are being carried out;
   d. Reduce the total amount of dust generating activity across the site (e.g. reduce the number of machines working across the site so that only essential activities are taking place); &
   e. If the dust is being generated by a particular activity that can be scheduled to take place in more favourable conditions (e.g. topsoil removal, vegetation disposal); cease the activity until more suitable conditions prevail.
4. After implementing the contingency actions, assess whether mitigation of the dust emissions was successful. If necessary continue to implement further management actions to reduce the generation of dust emissions;
5. In the event that the above actions do not result in reducing PM levels to below trigger levels and / or visible dust continues to leave the premises, all non-essential activity on the project site will cease.

The following flow diagram describes the process.

Figure 6: Flow diagram of complaint response process.



5 MONITORING AND REPORTING

5.1 Monitoring

Monitoring of environmental air quality is carried out across the Balline project area for the purposes of:

- Gauging the effectiveness of the management plan;
- Providing early warning of high risk conditions;
- Assessing and demonstrating compliance with ambient and emission targets and limits for dust.

The air quality monitoring program is set out in
Table 6 is proposed but would be reviewed in future to conform to the DWER site operating licence.

Table 6: Environmental monitoring program for air-borne particulates at Balline

Monitoring Objective	Indicators	Min. Frequency
To ensure that airborne particulate emissions from the premise, both individually and cumulatively, meet appropriate criteria and do not cause significant impacts on amenity, human health or environmental values.	Track incidents and report correctly	Every incident is logged in the HSE database with measures taken and outcomes.
	Contact with sensitive receptors	Minimum of contact every 3 months. Details of any issues collated and treated as an incident
	Wind Speed Wind direction	Continuous. Logged on DCS
	Improvements	Monitoring of controls. Tracking of incidents to measure improvement to the control program

5.1.1 Calibration of monitoring equipment

Equipment used to monitor air quality as part of the monitoring program is calibrated in accordance with the manufacturer's instructions.

5.2 Review and reporting

5.2.1 Internal review

Air quality monitoring results are assessed as they come to hand. Results are then formally reviewed and reported internally each quarter.

Exceedances of targets and limits, or public complaints are reported as an Environmental Incident through the company's incident reporting system.

5.2.2 Complaint review

Public complaints of excessive dust and smoke resulting from the mine site premises are reportable as an Environmental Incident through the company's incident reporting system.

Complaints will be investigated and, if necessary acted on. The company's response to the complaint can then be reviewed and reported to the Mine Services Manager for final review.

5.3 External reporting

5.3.1 Notification of incidents or non-conformances

Australian Garnet is required to notify the DWER:

- Annually on incidents recorded and summary of measures and controls for the previous year. In addition, proposed actions or improvements to controls for the following year;

- Any severe event or catastrophic failure of controls for an event.

The timing, manner and contact details for notifying the DWER will be set out in the operating licence.

In addition, Australian Garnet is obliged under the *Environmental Protection Act 1986* to notify the DWER as soon as reasonably practicable any events that have the potential to cause pollution or environmental harm.

5.3.2 Annual reporting

Every twelve months, Australian Garnet prepares a full review of its environmental performance over the previous calendar year and submits to the relevant government agencies.

This Annual Environmental Review (AER) presents all monitoring data collected under programs set out in approvals, licences, permits and management plans, or in response to incidents or complaints.

Accordingly, all monitoring results collected under this management plan will be presented and reviewed in the AER.

Attachment 1: Table 7: Management measures for environmental dust

Management objective	Action
To minimise dust generated by internal traffic movements	• Mine site speed limits on the main access haulage road and unformed tracks will be restricted to no more than 60 km/h for light vehicles and haulage trucks; • Heavy earthmoving equipment will drive to soil conditions with water applied to working areas as needed. Speed limits for heavy earthmoving equipment are a contingency available during adverse conditions, based on the Mining Services Manager assessment; • Management of dust from the haulage road is to be controlled by using well-formed roads. Consideration of dust minimisation chemical application; • When required haulage roads will be dampened through water application such as water carts.
To minimise dust from clearing activities and open areas	• Clearing areas will be restricted to the minimum requirement for continued operation; • Outside of winter months, soil stabilisation methods will be applied to any disturbed areas that are not to be immediately utilised; • Soil will be dampened by utilising water carts in high activity, disturbed areas that cannot be stabilised using traditional sealing agents or areas that are awaiting application of sealing agents; • Access will be restricted to any areas that have been stabilised using sealing agents; • Sprinkler systems will be used in areas where dust control is not achieved by the other control measures outlined above.
To minimise dust from topsoil stripping activities	• Topsoil will normally only be stripped outside summer months, or when weather conditions suit the activity. Water carts will be used to suppress dust when low soil moisture conditions require it; • Exceptions to this may occur where soil conditions do not require it; • Topsoil will be stripped on a progressive basis so the disturbed area is the minimum required for continued operation; • If topsoil stripping occurs during poor conditions then water carts will be used to keep the soil and stockpile damp during topsoil stripping; • Weather conditions will be assessed before commencing topsoil stripping and re-assessed on a daily basis during stripping.
To minimise dust from stockpiles	• Stabilising agents will be applied progressively to the batters of stockpiles; • At the completion of stockpiles an appropriate soil stabilisation treatment will be applied; • Appropriate stockpiles will be seeded with a vegetative crop in winter; • Access to stabilised stockpiles for purposes other than stabilisation will be restricted.
Continuous Improvement	• Management commitment to continually improving and innovating practices; • Annual review of the Dust Management Plan, updated with new information; • Ongoing training and awareness of mine site staff about the risks, controls and benefits of dust management.

Attachment 2: Risk Assessment for Excessive Airborne Particulate Matter Emissions – Balline Projects

The risk assessment uses the following keys.
LIKELIHOOD KEY
E = RARE: The event only occurs in exceptional circumstances
D = UNLIKELY: The event could occur at some time
C = POSSIBLE: The event might occur at some time
B = LIKELY: The event will probably occur
A = ALMOST CERTAIN: The event is expected to occur

CONSEQUENCE KEY
1 = INSIGNIFICANT: No ecological or visual impact / Short term effect / immediately remedied. Low financial cost
2 = MINOR: Minimal Ecological or visual risk / on-site effects immediately contained / remedied within days, medium financial loss
3 = MODERATE: Ecological risk / on-site release contained with outside assistance / weeks to remedy, high financial loss
4 = MAJOR: Offsite release with no lasting detrimental effects / months to remedy, high financial loss
5 = CATASTROPHIC: Emergency response preparedness procedures required / offsite effects requiring outside assistance / years to remedy huge financial loss.

TABLE 8: RISK ASSESSMENT

Aspect	Potential Impact	Risk	Management control	Res. Risk
Heavy Earthmoving Equipment (HE) involved in mining operations may increase dust emissions.	Pit Operations may increase dust emissions.	Low (D2)	• Operator awareness, supervision & training. Monitoring of conditions; • Water carts to wet down areas; & • Schedule non-critical work during optimum weather conditions	Low (D1)
Removal and replacement of topsoil material.	Dust emissions may be increased by the action of HE removing or replacing topsoil.	High (B3)	• Remove topsoil outside summer months (unless access restricted by weather conditions); • Assess weather conditions & forecasts prior to topsoil stripping operations; • Utilise water carts to wet down topsoil during stripping operations; • Wet down top of stockpile during construction; & • Apply stabilising agents to batters of stockpile.	Low (D2)
Stockpiled topsoil material	Dust emissions may increase through wind action on the stockpiled topsoil material.	High (B3)	• Apply stabilising agents; • Seed appropriate stockpiles with vegetative crop to provide adequate cover; • Restrict access to completed stockpiles for purposes other than stabilisation; & • Regularly inspect stabilised stockpiles and assess effectiveness of stabilisation.	Low (D2)
Light Vehicle use	Travel on unformed tracks may generate dust emissions.	Low (D2)	• Operator awareness, supervision and training; & • Internal speed limit of 60 km/h.	Low (D1)
Removal of vegetation	Removal of vegetation may generate dust and other particulate matter in the air.	Moderate (C2)	• Operator awareness, supervision & training; & • Consider activities during preferred weather conditions.	Low (C1)
Disposal of vegetation	Mulching of residues may affect air quality	Low (D2)	• If an alternative use can be found utilise resources rather than mulching; & • Consider weather conditions and forecast before commencing mulching operations.	Low (D2)
Disturbed areas	Wind may cause nuisance dust from areas where vegetation or topsoil has been removed.	High (B3)	• Minimise disturbed areas to only that which is necessary to sustain continuous mining operations; • Apply stabilising agents to areas which are not in immediate use; • Restrict access to disturbed areas once stabilised; • Wet down unstabilised areas; • Install dust screens in high risk areas on the site boundary; & • Regularly inspect stabilised areas and assess the effectiveness of stabilisation.	Low (D2)
Stockpiling of HMC	Wind may cause dust emissions from the HMC stockpiles.	Low (C1)	• Minimise stockpile volume; & • Install wind barrier for stockpile.	Low (D1)

Aspect	Potential Impact	Risk	Management control	Res. Risk
Haulage	Truck movements on unsealed haulage roads may cause dust emissions	Low (D1)	• Truck speed limit of 30 km/h; • Wet down haulage road using water carts; & • Consider road stabilisation agents.	Low (E1)
Soil cultivation for rehabilitation	Cultivation and seeding operations may contribute to dust emissions.	Moderate (C2)	• Wet down working areas prior to cultivation; • Consider weather conditions and forecast prior to cultivation.	Low (D2)
Stormwater runoff	Stormwater may cause erosion of landforms resulting in dust	Low (D1)	• Install contour banks; & • Consider drainage and run off in road alignments.	Low (E1)
Fabrication of new plant / equipment	Fabrication of new equipment may affect dust levels (abrasive blasting)	Low (D1)	• If possible abrasive blasting to be conducted off site; & • Consider use of barriers to restrict dust emissions.	Low (E1)
Pit walls & batters	Wind action on pit walls and batters may generate dust.	High (B2)	• Apply stabilising agents to pit walls and batters progressively; & • Consider installing wind barriers on pit crest.	Low (D2)