SCHEME OF AIR QUALITY MONITORING AND CONTROL

BOULBY MINE

Prepared for: Cleveland Potash Limited

SLR Ref: 403.064404.00001
Version No: v1.0
February 2023

BASIS OF REPORT

This document has been prepared by SLR with reasonable skill, care and diligence, and taking account of the manpower, timescales and resources devoted to it by agreement with Cleveland Potash Limited (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

SLR shall not be liable for the use of or reliance on any information, advice, recommendations and opinions in this document for any purpose by any person other than the Client. Reliance may be granted to a third party only in the event that SLR and the third party have executed a reliance agreement or collateral warranty.

Information reported herein may be based on the interpretation of public domain data collected by SLR, and/or information supplied by the Client and/or its other advisors and associates. These data have been accepted in good faith as being accurate and valid.

This document may contain information of a specialised and/or highly technical nature and the Client is advised to seek clarification on any elements which may be unclear to it.

Information, advice, recommendations and opinions in this document should only be relied upon in the context of the whole document and any documents referenced explicitly herein and should then only be used within the context of the appointment.

CONTENTS

DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

SLR Consulting Limited (SLR) has been instructed to prepare an Air Quality Monitoring Plan to satisfy Condition 21 of a planning permission (North York Moors Ref: NYM/2019/0764/MEIA) on behalf of Cleveland Potash Ltd for the continued operation of Boulby Mine over the next 25 years. Condition 21 requires *'a scheme of ambient air quality monitoring and control for the Boulby Minehead operational site shall be submitted to the MPA for written approval in consultation with RCBC and SBC EHOs.'*

The aim of the air quality monitoring plan (MP) is to provide details of the monitoring program and reporting processes required to determine whether the Site is operating within the relevant air quality standards and permitted limits.

1.1 Background

The Site began mining potash in 1973 and subsequently developed to also mine salt for road and animal feed application. Since 2016 however focus shifted to mining polyhalite. Potash mining ceased in 2018. Polyhalite, sold as 'Polysulphate™' is a fertilizer providing sulphur, potassium, magnesium and calcium. CPL also blends the polyhalite with imported potash on site to create 'PotashpluS™'.

1.2 Scope

The scope of the monitoring is to quantify concentrations of airborne pollutants at the site during standard operations throughout the year. The MP is designed to measure and assess various air emissions during operations in order to identify any exceedances of the air quality standards and criteria.

Monitoring will focus on the following air emissions:

- Deposited dust, directional dust and surface soiling;
- Particulate matter – PM_{10}, $PM_{2.5}$, and PM_1 fractions;
- Nitrogen dioxide (NO_2);
- Total Volatile Organic Compounds (VOCs) and Benzene; and
- Metals analysis.

2.0 SITE SETTING

2.1 Site Setting

The Site is located within Boulby in North York Moors National Park Authority's administrative area, approximately 1.5km from Staithes village and centred at the approximate National Grid Reference (NGR): x476200, y518200. The Site is bounded by:

- the A174 to the immediate north, followed by residential properties and farmland, beyond which lies the North Sea;
- Roxby Woods Ancient Woodland immediately to the east with residential properties and Staithes village further afield;
- a continuation of Roxby Woods located immediately to the south alongside the Site railroad out and various existing residential properties further afield; and
- rural land to the immediate west, beyond which are existing residential properties.

2.2 Site Layout

Figure 2-1 illustrates the Site layout and any process areas which have the potential to generate significant quantities of fugitive emissions.

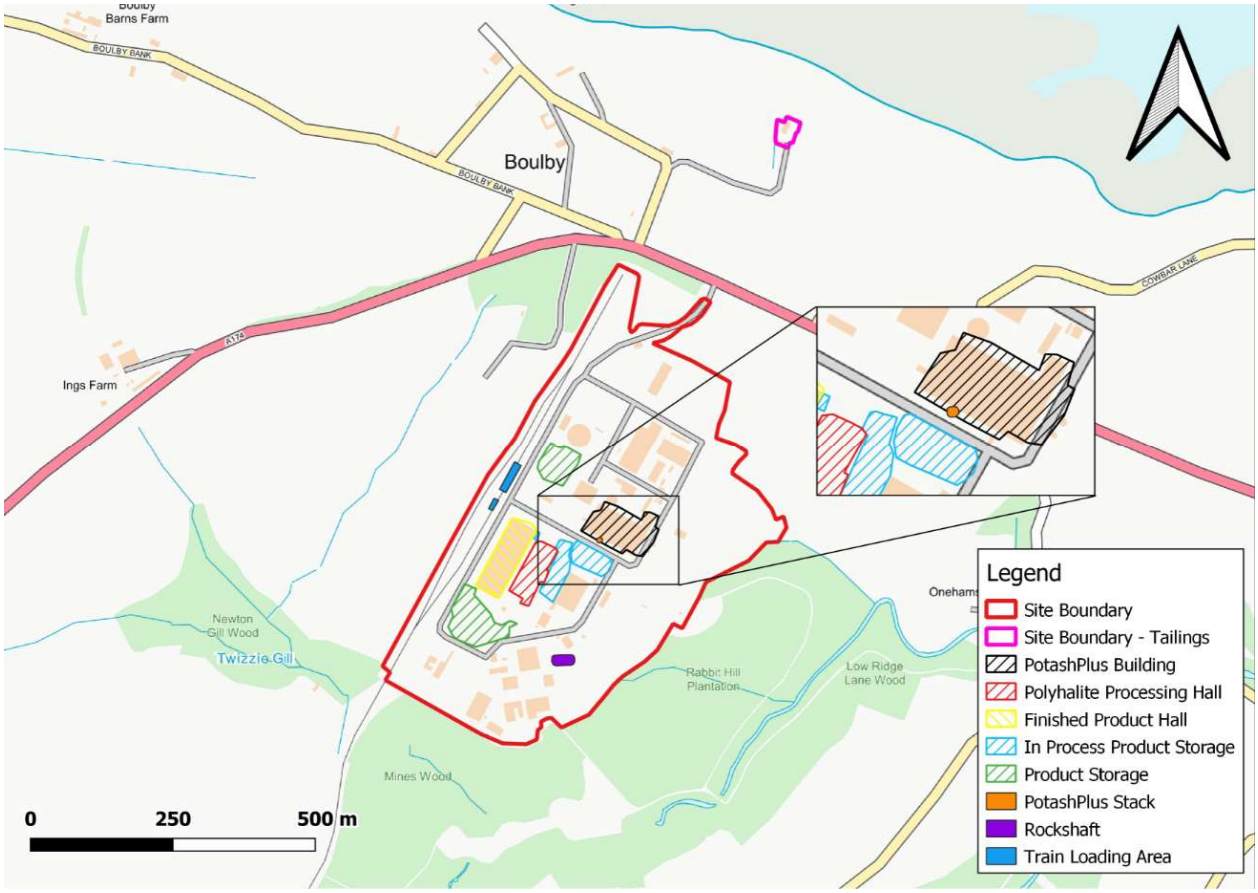

Figure 2-1
Site Layout and Process Features

2.3 Receptors

Various dust receptors have been identified within the mine's area of influence. The sensitive receptors are listed in the 'Environmental Improvement Plan' spreadsheet referenced in the site Dust Management Plan (DMP). The nearest have been summarised in Table 2-1 below and illustrated in Figure 5-1. The receptors identified within this non-exhaustive list have been used to inform the dust monitoring plan.

Table 2-1
Nearby Sensitive Receptors

Receptor	Receptor Type	Direction from Site	Distance to Site Boundary (m)
R1	Boulby Grange Holiday Cottages	Northwest	230
R2	Residential property off Boulby Bank	North	90
R3	Cleveland Way	North	260
R4	Redhouse Farm Holiday Cottage	Northeast	400
R5	Residential property off Ridge Lane	East	390
R6	Ridge Hall Holiday Cottages	Southeast	430
R7	Residential property off Ridge Lane	Southeast	430
R8	Residential property off Ridge Lane	Southeast	450
R9	Ings Farm	West	580

2.4 Meteorological Conditions

There are two meteorological stations on site, providing the most representative monitoring station. Wind speed and direction data for 28/05/2021 to 01/09/2022 is presented in Figure 2-2. It shows the prevailing wind to be from the west, southwest and south. As a result, the potential impact of emissions is likely to be greater to the north and east of the site. This informed the DMP and location of monitors in Section 5.0.

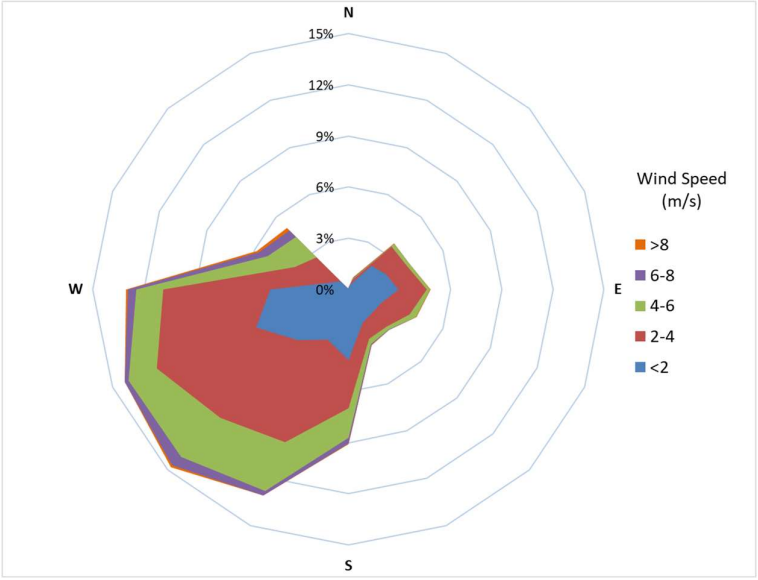

Figure 2-2
Onsite Meteorological Station 28/05/2021 to 01/09/2022 Wind Rose

3.0 SITE OPERATION AIR EMISSION SOURCES

Different air emission sources have been identified within the site boundary and operational processes. The detailed sources are listed in the 'Environmental Improvement Plan' referenced in the Dust Management Plan, Section 2.6 *Receptors*. These sources are summarised in the following sections whilst a full overview list can be found in Appendix 1.

3.1 Material Handling and Stockpiling

Operations for the mine include various large-scale movements of Polyhalite, Potash and PotashpluS material through use of hoists, conveyors, chutes and wagons across the Site. As Polyhalite material is hoisted to the surface, through the Rock Shaft, dust is disturbed and carried via ambient winds across the Site.

The material is subsequently transported through conveyors and into processing buildings which can generate dust through agitation of the material. Unloading and loading of material through front loading shovels, wagons and chutes onto stockpiles and trains causes dust to disperse. Wind whipping of external stockpiled material can occur, leading to dust dispersion across the Site.

3.2 Site Roads, Rail Load Out and Vehicles

Vehicle movements on internal site roads can disturb dust that has previously settled on the road, and mobile plant and lorries driving across the Site exacerbate the effects of wind whipping on exposed material and increase dust agitation. Alongside this, dust material is collected on the tyres of visiting vehicles and tracked out off-site.

Furthermore, vehicles movements onsite and associated combustion emissions lead to emissions of NO_2 and VOCs in areas in which they operate.

During the Rail Load Out operations the trains are loaded via chutes before departing the Site. Once the trains have departed, enhanced wind whipping can occur due to the movement of the train along with meteorological conditions causing dust emissions to arise from the carriages.

3.3 Material Processing

Once material has been hoisted from the mine or imported through road transport links it goes through several processing stages within buildings on Site. Crushing and screening operations within the facility, by the nature of the process, can generate significant volumes of dust. Whilst the processing operations within these buildings are enclosed, various building entrances, shutters and doorways are opened for operational purposes. As a result, fugitive dust emissions from these process buildings can arise.

Furthermore, open exhaust vents atop some process building roofs allow for further fugitive emissions of dust.

3.4 Stack and Exhaust

During the processing of the PotashpluS product there is a requirement to dry the product in which a wet stack system is operated. In this process, dust and particulate matter is vented through the stack at a height of 87.5m.

As such, emissions of particulates to atmosphere occurs within the site and this is permitted to a limit of 50mg/m^3 through Redcar and Cleveland Permit Ref: RCBC/P00/14.

4.0 RELEVANT AIR QUALITY LIMITS

4.1 Air Quality Standards

The Air Quality Standards Regulations 2010[1] (AQSR) transpose both the EU Ambient Air Quality Directive (2008/50/EC)[2], and the Fourth Daughter Directive (2004/107/EC)[3] within UK legislation, in order to align and bring together in one statutory instrument the Government's obligations. The AQSR includes Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment.

4.1.1 Particulate Matter (PM_{10} and $PM_{2.5}$)

Statutory limits exist for PM_{10} and $PM_{2.5}$ concentrations under the AQSR and are displayed in Table 4-1 below.

Table 4-1
Ambient Air Quality Standards – Particulate Matter

Pollutant	Limit Value	Measured As
Particles (PM_{10})	50 µg/m^3	24-hour mean (not to be exceeded on more than 35 occasions per calendar year)
	50 mg/m^3	Permitted stack emissions (as per RCBC/P00/14)
	40 µg/m^3	Annual mean
Particles ($PM_{2.5}$)	20 µg/m^3	Annual mean

4.1.2 Deposited Dust and Surface Soiling

Currently, there are no statutory limits for the assessment of deposited dust and its impacts. However, Environment Agency M17[4] guidance suggests a 'custom and practice' threshold of 200mg/m^2/day where complaints may be likely and as a means of assessing site performance in the absence of any recognised limit values for visible deposited dust.

Furthermore, there are currently no statutory limits for surface soiling rates, but complaint thresholds[5], as displayed in Table 4-2, are recommended and are widely adopted when assessing impacts of surface soiling on receptors.

Table 4-2
Surface Soiling Complaint Thresholds

% Effective Area Covered (EAC) per day	Outcome
0.2	Noticeable
0.5	Possible Complaint

[1] The Air Quality Standards Regulations (England) 2010, Statutory Instrument No 1001, The Stationary Office Limited.
[2] Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.
[3] Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004.
[4] Environment Agency. Technical Guidance Note (Monitoring) M17. Monitoring Particulate Matter in Ambient Air around Waste Facilities. V2. July 2013.
[5] Bearman & Kingsbury, Assessment of Nuisance from Deposited Particulates Using a Simple and Inexpensive Measuring System, Clean Air, Vol.11.

% Effective Area Covered (EAC) per day	Outcome
0.7	Objectionable
2.0	Probable Complaint
5.0	Serious Complaint

4.1.3 Nitrogen Dioxide (NO_2)

Statutory limits exist for NO_2 concentrations under the AQSR and are displayed in Table 4-3 below.

Table 4-3
Ambient Air Quality Standards – Nitrogen Dioxide

Pollutant	Limit Value ($\mu g/m^3$)	Measured As
Nitrogen Dioxide (NO_2)	40	Annual mean
	200	1-hour mean (not to be exceeded on more than 18 occasions per year)

4.1.4 Total VOCs and Benzene

While there are no statutory limits for concentrations of Benzene in ambient air, limits exist in relation to workplace exposure as derived from Health and Safety Executive, EH40/2005 Workplace Exposure Limits (EH40).

Table 4-4
Workplace Exposure Limits – Benzene

Pollutant	Limit Value (mg/m^3)	Measured As
Benzene	3.25	8-hour Time Weighted Average

4.1.5 Metals

While there are no statutory limits for concentrations of metals and metalloids in ambient air, there are a set of recommended guidelines developed in consultation with the Department for Environment, Food and Rural Affairs[6] (Defra). Initially a full metals suite analysis will be conducted to determine which, if any, metals arise on the site. Once metals have been identified, and if applicable, the following site concentration targets will be applied as displayed in Table 4-5.

Table 4-5
Guidelines for Metals and Metalloids in Ambient Air

Metal	Guideline Value	Measured As
Arsenic	3 ng/m^3	Annual mean, as PM_{10} fraction
Nickel	0.020 $\mu g/m^3$	Annual mean, as PM_{10} fraction
Beryllium	0.2 ng/m^3	Annual average, PM_{10} fraction
Chromium	0.2 ng/m^3	Annual mean, as PM_{10} fraction

[6] Defra. Consultation on guidelines for metals and metalloids in ambient air for the protection of human health. May 2008.

5.0 MONITORING METHOD

Various receptors sensitive to air emissions/pollutants have been identified within the mine's Area of Influence, the nearest receptors are displayed in Figure 5-1. The receptors in Figure 5-1 and Table 2-1 along with the dominant meteorological conditions set out in Figure 2-2 have informed the methods and monitoring locations applied within this MP. The following sections describe each monitoring scheme to monitor concentrations of the parameters previously discussed.

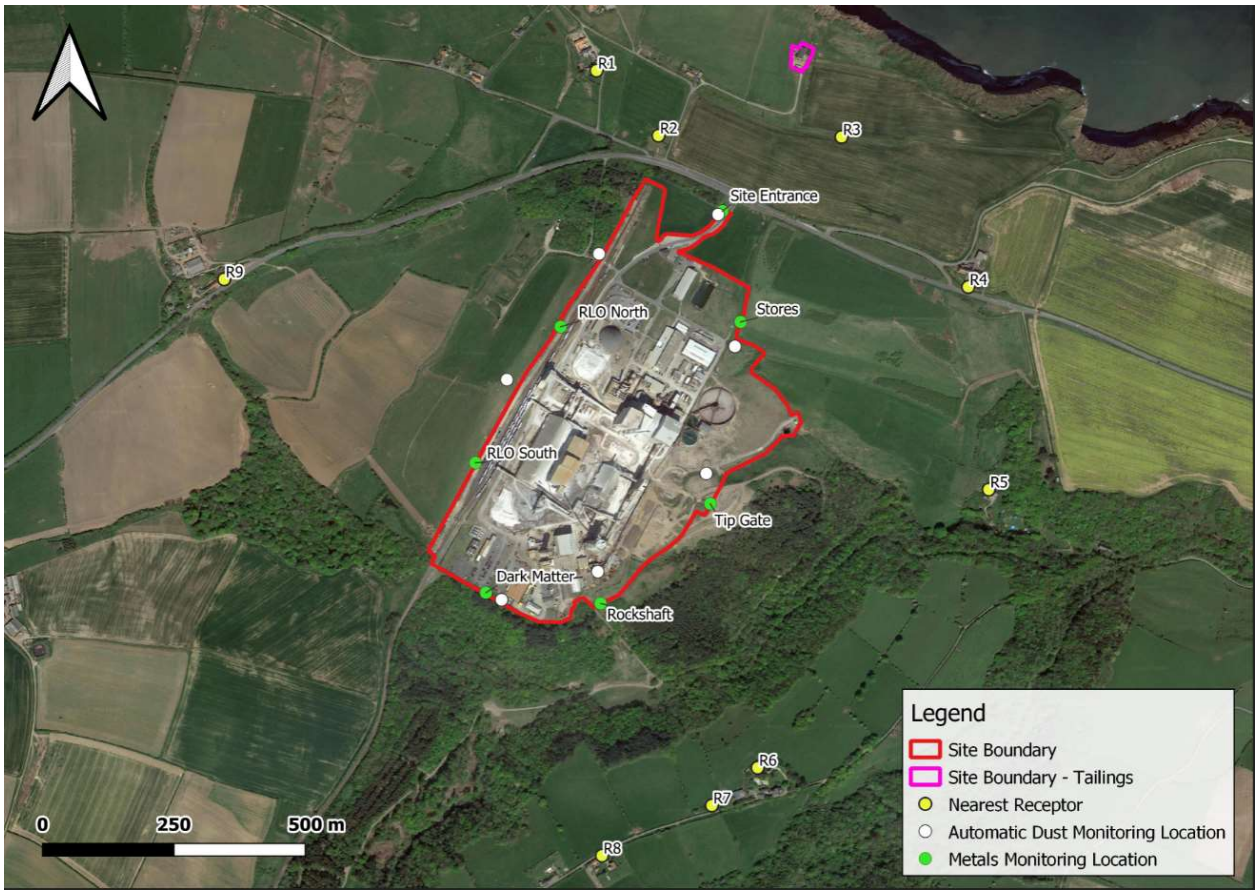

Figure 5-1
Site Monitoring Locations and Nearest Receptors

5.1 Particulate Point Source Emissions and Dust (PM10, PM2.5, PM1) Monitoring

An ISO 17025 accredited and Mcerts certified organisation will conduct the annual particulates emissions testing from the drier stack. The approved Environment Agency method to follow will be BS EN 13284-1 "*Determination of low range mass concentration of dust - Part 1: Manual gravimetric method*".

Seven automatic air monitoring units will be deployed at perimeter locations around the site in order to obtain fugitive dust measurements during all wind directions. Proaxis Opcube air quality monitors will be installed, please refer to Section 4.2.3.1 *Continuous Real Time Dust Monitors* of the Dust Management Plan for information on data capture. The locations for the installation of automatic monitors are shown in Figure 5-1. The automatic air quality monitoring will be undertaken in real-time using continuous air quality monitors which allow simultaneous monitoring of PM_{10}, $PM_{2.5}$ and PM_{1}.

The units use photometers to analyse individual particles as they pass through a laser beam, this technology can measure particulates of varying fractions, reporting mass concentrations of PM_{10}, $PM_{2.5}$ and PM_1. The units log data and send it via a GSM connection to an online portal where the real-time data can be viewed via an online application which enables the user to view changes in concentrations throughout a defined time period.

As the Site is a 24/7 operation, this monitoring method enables the site management to closely assess concentrations of particulate matter arising throughout site operations.

Site limits are set for both PM_{10} and $PM_{2.5}$ concentrations reflecting the air quality standards set out in Section 4.1.1. This will send alerts to site management when concentrations are above these standards and allows for a quick and immediate mitigation response. Refer to Section 4.2.4 *Response* of the Dust Management Plan.

Visual monitoring for dust emissions will be undertaken daily alongside routine site walkovers and will provide the site management with an overview of areas in which dust is being generated and where dust emissions could potentially lead to impacts or exceedances of the air quality limits. Refer to Section 4.2.3.3 *Visual Inspections* of the Dust Management Plan.

5.2 NO2, VOCs and Benzene

Passive sampling will target NO_2, VOCs and Benzene concentrations. These parameters will be monitored at seven locations on a quarterly basis by using diffusion tubes. The tubes will be sited at the Metals Monitoring Locations as shown in Figure 5-1.

Diffusion tubes work through the process of molecular diffusion in which high concentrations of a substance in the air move to areas of lower concentration. Substances within the air are at a higher concentration than that inside the tube and therefore the substances diffuse into the tube and are absorbed at the end cap.

Diffusion tubes are suited to long term monitoring as over time a sufficient quantity of the pollutant is absorbed onto the tube.

The following tube setup and changeover protocol will be followed:

- Liaise with the laboratory for an order of new diffusion tubes;
- Upon receipt of the new tubes, they will be kept refrigerated until deployment;
- Tubes shall be installed at a height of 2m from ground level and with free-flowing air around the exposed end of the tube. Ideally tubes will be installed away from building facades and areas in which airflow is significantly obstructed and influenced by structures;
- Each tube location shall be marked with an identification number and logged, to ease collection of tubes and avoid sample submission errors;
- Once installed, the exposure cap should be removed from the tube and kept for use at the completion of the monitoring period;
- A travel blank tube should be escorted whilst installing the tubes and stored in refrigeration until collection of the exposed tubes; and
- After a period of 2 – 4 weeks the diffusion tubes will be collected, capped and sent to the laboratory for analysis along with the travel blank.

5.3 Metals

At the end of every quarter, dust deposition gauges will be installed at the Metals Monitoring Locations as shown in Figure 5-1, to collect fugitive dust to be analysed for metals by an ISO 17025 accredited laboratory.

For the first year, a full metals suite analysis will be undertaken to assess metal concentrations in the dust and to characterise the dust in an attempt to understand the source (mine, or general geological dust). Once any metals have been determined and the source verified, the monitoring plan approach to metals analysis will be reviewed and amended accordingly.

The sampling equipment will be placed at the sampling points identified on the monitoring location plan (Figure 5-1), unless site circumstances indicate that this would not enable a representative sample to be collected. Circumstances which might be encountered include; not enough quantity of sample collected, crops being grown around a proposed monitoring point or being harvested nearby, overhanging trees, a change in the site access road location, etc. If this occurs advice will be sought from the Environmental and Sustainability Manager as to whether re-locating the monitoring point would be appropriate or whether the monitoring equipment should be set up in the original location or the monitoring abandoned for that point. If it is decided to continue with the monitoring at that point, a note will be made to aid with interpretation of anomalous results.

5.4 Complaints Response

Upon receipt of a dust complaint the site management will aim to collect as much information as possible from the complainant including location, date, time, details of dust and any further information which will aid an assessment of the complaint.

Once details have been determined, further assessment shall be undertaken to substantiate the dust complaint through:

- Review the live PM_{10} and $PM_{2.5}$ concentrations from the automatic monitors, if assessing a historic complaint utilise data previously captured;
- Review any dust mitigation measures in place during the time of the complaint;
- Review meteorological conditions (wind direction/wind speed/rainfall) from the onsite weather station during the complaint period to see if a pathway can be established between the site and complainant; and
- Review deposited dust and surface soiling results for the period in which the complaint was made.

If the complaint is received in a timely fashion from the event reported, reactive visual dust inspection of the site will be carried out by the site management. It should be noted that targeted visual inspection is only of use soon after the event reported as conditions (both meteorological and/or operational) rapidly change. If required to substantiate a dust complaint, a visual inspection at the complaint location should be undertaken to verify authenticity of the complaint received.

Please refer to Section 6 – *Complaints* of the Dust Management Plan for details on the complaints logging procedure.

6.0 REPORTING

All laboratory analysis and monitoring results from the various methods will be collated and stored on file by site management and procedures for reporting should follow the relevant sections below.

6.1 Particulate Matter (PM10, PM2.5 & PM1)

Particulate matter alerts will be set according to the limits set out in Section 4.1.1, this will alert the site management to any exceedances of PM_{10} and $PM_{2.5}$ limits. A limit for PM_1 has not been regulated yet. The analysers deployed will be PRAXIS/OPCUBE Air Quality Monitors. Please refer to the Dust Management Plan Section 4.2.3.1. *Continuous Real Time Dust Monitors*.

When an alert is triggered, the following steps will be undertaken as soon as practicable:

- Log the time in which the alert occurred;
- Note all meteorological observations and recorded information from the onsite weather station;
- Record all onsite activities and operations underway during the alert period;
- Monitor concentrations reported by the automatic units and if they do not fall take onsite action to reduce dust emissions; and
- After 24 hours, the mean will be calculated and if in exceedance of the air quality limit it shall be logged as an incident on Enablon.

Please refer to Section 4.2.4 – *Response* of the Dust Management Plan for the detailed alarm response procedure.

6.2 Fugitive Emissions of Metal Compounds

Deposited metal dust results for each gauge will be received from the laboratory undertaking the analysis and collated in order to assess potential fugitive emissions of metal compounds. Initially the monitoring will only look at whether there is presence of metals in airborne dust. This requirement will be reassessed once quarterly results throughout the first year have been collated.

6.3 NO2, VOCs and Benzene

Passive sampling results for NO_2, VOCs and Benzene will be reported by the laboratory, and these shall be logged in a database format until sufficient monitoring has been conducted to assess concentrations against air quality standards. If the standards have been exceeded, site management will undertake investigation and actions to reduce concentrations of the relevant substance on site.

6.4 Mitigation

Good site practice and the compliance with mitigation measures set up within the Dust Management Plan should be executed at all times on the site. Site management will continuously assess the effectiveness of mitigation measures in line with the results of the monitoring campaigns and where appropriate reinforce mitigation to reduce concentrations of any relevant exceedances of the air quality standards as set out in this monitoring scheme. Please refer to Sections 3.1. and 3.2. *Good Practice Mitigation* of the Dust Management Plan.

6.5 Reporting to the Mineral Planning Authority

Results of particulate matter monitoring and planned and implemented mitigation measures will be reported quarterly to the Mineral Planning Authority and Redcar and Cleveland Council.

Results of fugitive emissions of metal compounds, NO_2, VOCs and Benzene and planned and implemented mitigation measures will be reported to the Mineral Planning Authority within 30 days of the receipt of final and complete results.

APPENDIX 1

Air Emissions Inventory

Potential Dust Source	Associated Site Activities	Details	Operational Profile
Internal Site Roads	Dumper Trucks and other site vehicles moving about site.	Vehicle Movements on internal operational roads disturbs dust on the road. The roads are not tarmacked.	24-hour operation - When vehicles are active.
Product/Material being carried by Dumper Trucks	Dumper Trucks moving material about site.	Wind whipping (exacerbated by truck movement) on exposed material releases dust.	When dumper trucks are active.
Storage Piles/Deposited material	Exposed storage piles (final product, imported potash, out of spec material, waste material) and dust on all surfaces.	Wind whipping on storage piles/deposited dust releases dust to atmosphere.	24-hour exposure.
Unloading from Dumper Trucks	Material unloaded from Dumper Trucks onto piles.	Dumper Trucks unload material onto ground outside exposed locations (e.g. a pile directly outside the Potash Plus building)	When dumper trucks are active.
Train Bay Filling	Trains bays filled - material dropped from conveyor.	Dust escape from bay and whilst being dropped from conveyor	When Trains are being filled.
Dust settled on Trains	Trains in transit from site.	Trains fill bays on site and transport product to Teeside dock. Material deposited on trains (and tracks) is disturbed by the train movement and releases dust onto area surrounding tracks.	When Trains leave site
Dust settled on Lorries	Lorries in transit from site	Lorries filled on site and transport offsite. Material deposited on lorries and picked up by wheels is released onto surrounding road and area.	When lorries leave site
Conveyors	Conveyor movement of material. Dropping of material off conveyor onto pile.	Conveyors to southern side of site connecting to rockshaft are not fully covered. Conveyors dropping material onto 'off-spec' product pile.	When conveyors in operation transporting material.

Potential Dust Source	Associated Site Activities	Details	Operational Profile
Movement of material within Buildings	Material moved by machinery and plant (including front end loaders).	Material moved by machinery and plant (including front end loaders) inside building disturbs and releases dust	24-hour operation.
Rockshaft Mine Shaft - Hoisting of Material	Material hoisted from mine below to surface.	Dust disturbance at surface by hoisting of material from deep	Evening and through night.
Screening	Screening of material within process buildings.	Agitating of material leading to dust generation and dispersion	24-hour operation
Crushing	Crushing of material within process buildings	The crushing of product leads to dust creation and dispersion	24-hour operation

EUROPEAN OFFICES

AYLESBURY
T: +44 (0)1844 337380

BELFAST
belfast@slrconsulting.com

BIRMINGHAM
T: +44 (0)121 2895610

BONN
T: +49 (0)176 60374618

BRADFORD-ON-AVON
T: +44 (0)1225 309400

BRISTOL
T: +44 (0)117 9064280

CARDIFF
T: +44 (0)2920 491010

CHELMSFORD
T: +44 (0)1245 392170

CORK
T: ++353 (0) 21 240 9000

DUBLIN
T: +353 (0)1 296 4667

EDINBURGH
T: +44 (0)131 335 6830

EXETER
T: +44 (0)1392 490152

FRANKFURT
frankfurt@slrconsulting.com

GRENOBLE
T: +33 (0)6 23 37 14 14

LEEDS
T: +44 (0)113 5120293

LONDON
T: +44 (0)203 8056418

MAIDSTONE
T: +44 (0)1622 609242

MANCHESTER
T: +44 (0)161 8727564

NEWCASTLE UPON TYNE
T: +44 (0)1844 337380

NOTTINGHAM
T: +44 (0)115 9647280

SHEFFIELD
T: +44 (0)114 2455153

SHREWSBURY
T: +44 (0)1743 239250

STIRLING
T: +44 (0)1786 239900

WORCESTER
T: +44 (0)1905 751310