

## REPORT

# Phase 7 - Woodsmith Mine Construction Vehicle and Plant Management Plan

Woodsmith Mine Phase 7 - CVPMP

Client: Sirius Minerals plc

Reference: 40-RHD-WS-70-CI-PL-0012 Rev 2

Revision: 0.3/Final

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HASKONINGDHV UK LTD.

Manchester One  
53 Portland Street  
Manchester  
M1 3LF  
Industry & Buildings  
VAT registration number: 792428892

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Author(s): Charlotte Goodman

Drafted by: Charlotte Goodman

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Checked by: John Drabble

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Approved by: Matthew Hunt

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Project related



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## 1 INTRODUCTION

1.1.1 In 2014 a planning application (reference NYM/2014/0676/MEIA) was submitted to North York Moors National Park Authority (NYMNPA) for permission to develop a polyhalite mine and underground Mineral Transport System (MTS). Planning permission was subsequently granted in 2015, subject to conditions, as varied in February 2018 by NYM/2017/0505/MEIA.

1.1.2 This document has been prepared on behalf of Sirius Minerals plc (Sirius Minerals) and details the requirements with respect to construction vehicles and plant for Phase 7 of the development at Woodsmith Mine (see paragraph 1.1.5 below). This document is required to partially discharge condition 92 of the NYMNPA planning permission NYM/2017/0505/MEIA and has been prepared in accordance with current good practice. The planning condition states that:

*“Prior to the commencement of each Phase of Construction at either Dove’s Nest Farm or Lady Cross Plantation, a Construction Vehicle and Plant Management Plan (CVPM) shall be submitted to and approved in writing by the MPA. The CVPM shall include details of monitoring locations and baseline particulate emissions; predicted traffic movements into/out of the sites including levels at the A171/Mayfield junction; predicted particulate emissions from plant and HGVs during the construction period; proposed particulate control levels; proposed avoidance or mitigation measures to comply with control levels, and arrangements for monitoring over the construction period. Development shall only occur in strict accordance with the measures set out in the CVMP [sic], unless otherwise agreed in writing with the MPA.”*

1.1.3 The specific requirements of the planning condition are detailed in **Table 1-1**.

Table 1-1: Condition NYMNPA-92 Construction Vehicle and Plant Management Plan

Condition NYMNPA-92	Compliance with Condition NYMNPA-92
Details of monitoring locations and baseline particulate emissions	Section 2
Predicted traffic movements into/out of the sites including levels at the A171/Mayfield junction	Section 3
Predicted particulate emissions from plant and Heavy Goods Vehicles (HGVs) during the construction period	Section 4
Proposed avoidance or mitigation measures to comply with control levels	Section 5
Proposed particulate control levels	Section 5
Arrangements for monitoring over the construction period	Section 2

1.1.4 This management plan details only the Phase 7 Works at Woodsmith Mine and does not include any activities at Lady Cross Plantation, as these works are deferred. Updates to this plan will be prepared for subsequent construction phases and following any design review or method change. The NYMNPA has confirmed that it supports this approach.

1.1.5 The activities required for the Phase 7 Works comprise the following:

- Completion of Service Shaft Headgear Chamber;
- Completion of Service Shaft to 83.17m AoD via Vertical Shaft-Sinking Machine (VSM) method;
- Excavation of Production Shaft Headgear Chamber;
- Excavation from base of Production Shaft Headgear Chamber to 83.66m AoD;

- Surface water run-off silt treatment facility building;
- Erection of temporary facilities to enable mobilisation of deep shaft-sinking contractor;
- Earthworks and drainage; and
- Contingency grouting of the MTS Shaft (if required).

1.1.6 Meetings to discuss the scope and content of this document were held with the Environmental Health Officer (EHO) of Scarborough Borough Council (SBC) and NYMNPA on 17 March 2016 and 27 April 2016 respectively. The scope was re-confirmed with the EHO in a meeting on 1 December 2016. This document follows the agreed approach, and is in line with the CVPMPs previously submitted to partially discharge planning condition NYMNPA-92 for earlier Works.

## 2 BASELINE CONDITIONS

2.1.1 Baseline dust and particulate matter conditions remain unchanged from those reported in the Phase 4 CVPMP (reference 40-RHD-WS-70-CI-PL-0005).

### 2.1 Background Particulate Matter Concentrations

2.1.1 Background particulate matter concentrations for 2018 were reported in the Phase 5 CVPMP (reference 40-RHD-WS-70-CI-PL-0009).

### 2.2 Additional Monitoring

2.2.1 The existing monitoring data, provided in the Phase 4 CVPMP (reference 40-RHD-WS-70-CI-PL-0005), provide a suitable and sufficient characterisation of baseline particulate conditions at the site. No additional monitoring is proposed, for reasons set out previously (reference 40-RHD-WS-70-CI-PL-0005).

## 3 PREDICTED TRAFFIC MOVEMENTS ASSOCIATED WITH PHASE 7 WORKS

### 3.1 Construction Phase Road Traffic Movements

3.1.1 The anticipated traffic movements associated with Phase 7 align with those presented in the Construction Traffic Management Plan (CTMP), submitted to partially discharge planning condition NYMNPA-34. The Phase 7 Works will be undertaken across a period of approximately one year.

3.1.2 This approach was agreed with SBC and the NYMNPA during the respective meetings (as detailed in Section 1). The number of traffic movements generated during the Phase 7 Works is detailed in **Table 3-1**.

Table 3-1: Traffic Movements Generated during Phase 7 at Woodsmith Mine

Vehicle Type	Maximum Number of Vehicles During Phase 7 (Two-Way)*	Maximum Number of Vehicles per Day (Two-Way)
HGV	39,936	126
Park and Ride Coaches	3,650	10
Light Goods Vehicles (LGVs)**	43,800	120

\*HGVs are restricted on Sundays and therefore the total number of HGVs during Phase 7 does not equate to the duration multiplied by the number of HGVs per day

\*\*Includes cars, minibuses and vans

- 3.1.3 Whilst it is not possible to quantify exact numbers of vehicles that will travel through the A171/Mayfield junction, a conservative approach, assuming that all LGVs and HGVs travel through the A171/Mayfield junction, indicates a maximum increase in vehicles of 239 per day (87,386 vehicles over the duration of Phase 7).

## 3.2 On-Site Plant

- 3.2.1 The number and types of plant that would be operating for the duration of Phase 7 at Woodsmith Mine is provided in **Table 3-2**.

Table 3-2: Plant Required during Phase 7

Plant Type	Number of Units	Duration of Phase 7 That Plant Will Be Used
22T excavator with breaker	2	100%
35T excavator	1	100%
Articulated dumper truck	4	30%
160T crawler crane	1	42%
42m concrete pump truck	1	8%
Lighting tower	4	100%
Jet grouting drilling rig	2	75%
60kVA generator	1	100%
25t excavator	3	100%
Hydraulic drilling rig	1	100%
20t excavator	1	100%
100t mobile crane	1	8%
50t mobile crane	1	8%
20T excavator	1	8%

## 4 PREDICTED PARTICULATE EMISSIONS FROM PLANT AND HGVS DURING PHASE 7

### 4.1 Methodology

4.1.1 Particulate matter will be generated during Phase 7 by the combustion of fuel, and brake and tyre wear associated with the following activities:

- Transportation of workforce to site;
- HGV deliveries and movements; and
- The operation of on-site plant (referred to as Non-Road Mobile Machinery (NRMM)) and generators.

4.1.2 Associated Phase 7 emissions were calculated in line with the approach set out in previous CVPMPs (see Phase 4 CVPMP (reference 40-RHD-WS-70-CI-PL-0005)), including the Defra Emission Factor Toolkit (version 8.0.1) and standard UK fleet composition for 2018.

### 4.2 Assumptions

4.2.1 The following assumptions were made in the assessment of particulate emissions from NRMM and vehicle movements:

- Generators would be operating at full power load;
- The duration of Phase 7 will be approximately one year, with all Sundays worked; and
- HGV deliveries are restricted to 10% of weekday volumes on Sundays (as per the CTMP), with Sunday HGV deliveries being 10% of weekday trips.

4.2.2 Sensitivity testing and supporting data were also derived in line with previous CVPMPs (reference 40-RHD-WS-70-CI-PL-0005).

### 4.3 Emissions from Construction Phase Road Traffic Movements

4.3.1 The quantification of particulate emissions generated by construction-phase traffic movements was undertaken using the following input data:

- Number of daily HGV and car movements;
- Average trip lengths (km);
- Average speed vehicles will be travelling; and
- Emission factors for each vehicle type.

4.3.2 Input and output data from the Emission Factor Toolkit are detailed in **Table A2** and **Table A3** in **Appendix A2**.

### 4.4 Emissions from the Operation of On-Site NRMM and Generators

4.4.1 The input data used to calculate particulate (PM<sub>10</sub>) emissions from NRMM and generators are detailed in **Appendix A3** and **Appendix A4**. The calculated particulate emissions from NRMM, using average load factors of 0.5 and 0.7, and generators are detailed in **Table 4-1**.

Table 4-1: Total PM<sub>10</sub> Emissions from NRMM during Phase 7

Plant	Number of Plant Items	Total PM <sub>10</sub> Emission (tonnes)	
		Load Factor = 0.5	Load Factor = 0.7
22T excavator with breaker	2	0.016	0.023
35T excavator	1	0.014	0.020
Articulated dumper truck	4	0.024	0.034
160T crawler crane	1	0.031	0.044
42m concrete pump truck	1	0.001	0.002
Lighting tower	4	0.012	0.017
Jet grouting drilling rig	2	0.016	0.023
60kVA generator	1	0.084*	0.084*
25t excavator	3	0.071	0.099
Hydraulic drilling rig	1	0.029	0.041
20t excavator	1	0.021	0.029
100t mobile crane	1	0.004	0.006
50t mobile crane	1	0.003	0.005
20T excavator	1	0.002	0.002

\*Assuming generator will be operating at full loading

## 4.5 Total Particulate Emissions Generated during Phase 7

4.5.1 The total particulate matter predicted to be generated during Phase 7 as a result of emissions from construction-phase traffic, NRMM and generators is detailed in **Table 4-2**.

Table 4-2: Total PM<sub>10</sub> Emissions from Construction Traffic, NRMM and Generators

Source	Total PM Emission (tonnes)	
	Load Factor = 0.5	Load Factor = 0.7
Construction Traffic	0.34	0.34
NRMM and Generators	0.33	0.43
<b>TOTAL</b>	<b>0.67</b>	<b>0.77</b>

4.5.2 The total PM<sub>10</sub> emission within the SBC area was derived from National Atmospheric Emission Inventory (NAEI) mapping<sup>2</sup>, which is shown in Figure 1.

4.5.3 The total PM<sub>10</sub> emission within the whole SBC area of jurisdiction was 254.95 tonnes in 2015. Particulate emissions generated during Phase 7 will therefore contribute 0.26% to 0.30% of the total emissions (using a load factor range of 0.5 to 0.7 respectively).

<sup>2</sup> National Atmospheric Emission Inventory (2014) Emission Maps for the UK [http://naei.defra.gov.uk/data/map-uk-das?pollutant\\_id=24&emiss\\_maps\\_submit=naei-20160526090831](http://naei.defra.gov.uk/data/map-uk-das?pollutant_id=24&emiss_maps_submit=naei-20160526090831)



## **5 MITIGATION MEASURES**

### **5.1 Construction Dust and NRMM Mitigation Measures**

5.1.1 Details of mitigation measures to minimise construction phase dust emissions and emissions from NRMM are included in the Phase 4 CVPMP, which remain valid for the Phase 7 Works.

5.1.2 Construction activities will be subject to a range of dust and vehicle management measures, as set out in the Phase 5 Construction Environmental Management Plan (CEMP) (40-CAR-WS-8300-PA-MS-00001), which remain valid for Phase 7 Works, submitted to partially discharge planning condition NYMNPA-93. The measures detailed in the CEMP include regular visual site inspections to monitor compliance with dust control procedures, and a specific Dust Management Plan (DMP).

### **5.2 Junction and Road Improvements**

5.2.1 There have been no changes to planned junction improvements from the Phase 4 CVPMP (reference 40-RHD-WS-70-CI-PL-0005).

## A1 Background Particulate Matter Concentrations

Table A1 2018 Background Particulate Matter Concentrations

Grid Square	PM <sub>10</sub> Background Concentration (µg.m <sup>-3</sup> )	PM <sub>2.5</sub> Background Concentration (µg.m <sup>-3</sup> )
489500,504500	7.24	5.09
489500,505500	8.53	5.76
490500,504500	7.89	5.42
490500,505500	8.83	5.89

## A2 Inputs and Outputs of the Emission Factor Toolkit

**Table A2** Input Data into the Emission Factor Toolkit

Vehicle Type	Number of Vehicles During Phase 7	Number of Vehicles per Day (Averaged over Phase 7)	Speed (kph)	Trip Length (km)
HGV	39,936	109	69	64
Park and Ride Coaches	3,650	10	52	13
Cars	43,800	120	60.4	50

**Table A3** Output from the Emission Factor Toolkit

Vehicle Type	Emissions of PM <sub>10</sub> over Phase 7 (kg)
HGV	334
Park and Ride Coaches	7
Cars	83
<b>Total</b>	<b>424</b>

### A3 Calculation of Emissions from NRMM

The European Monitoring and Evaluation Programme (EMEP)/European Environment Agency (EEA) Emission Inventory Guidebook 2016<sup>3</sup> provides the following equation to calculate emissions from NRMM:

$$E = N \times \text{HRS} \times P \times (1 + \text{DFA}) \times \text{LFA} \times \text{EF}_{(\text{base})}$$

Where:

- E = mass of emissions generated
- N = source population
- HRS = hours of use over the period
- P = engine size (kW)
- DFA = deterioration factor adjustment
- LFA = load factor adjustment
- EF<sub>(base)</sub> = base emission factor (g/kWh).

The average kilowatt (kW) power ratings for the proposed NRMM are provided in **Table A4**.

**Table A4 Power Ratings of Required Plant During Phase 7 at Woodsmith Mine**

Plant	Power in kW
22T excavator with breaker	102
35T excavator	180
Moxy	250
160T crawler crane	230
42m concrete pump truck	223
Lighting tower	3.1
Jet Grouting Drilling Rig	403
25t excavator	147
Soilmec SR40	180
20t excavator	130
100t mobile crane	350
50t mobile crane	270
20T excavator	130

The input data used to calculate emissions from NRMM are detailed in **Table A5**.

<sup>3</sup> EMEP/EEA (2016) *Emission Inventory Guidebook – Non-Road Mobile Sources and Machinery*

**Table A5 Input Data Used to Calculate Particulate Emissions from NRMM**

Plant	kW	Hours of Use During Phase 7	Number of Units	Load Factor		Emission Factor Stage	Emission Factor (g/kWh)
22T excavator with breaker	102	4,368	2	0.5	0.7	3B	0.025
35T excavator	180	4,368	1	0.5	0.7	3B	0.025
Moxy	250	1,310	4	0.5	0.7	4	0.025
160T crawler crane	230	1,848	1	0.5	0.7	3A	0.1
42m concrete pump truck	223	336	1	0.5	0.7	4	0.025
Lighting tower	3.1	3,276	4	0.5	0.7	-	0.4
Jet Grouting Drilling Rig	403	1,092	2	0.5	0.7	3B	0.025
25t excavator	147	8,760	3	0.5	0.7	3	0.025
Soilmec SR40	180	8,760	1	0.5	0.7	3A	0.025
20t excavator	130	8,760	1	0.5	0.7	4	0.025
100t mobile crane	350	672	1	0.5	0.7	3B	0.025
50t mobile crane	270	672	1	0.5	0.7	3B	0.025
20T excavator	130	672	1	0.5	0.7	4	0.025

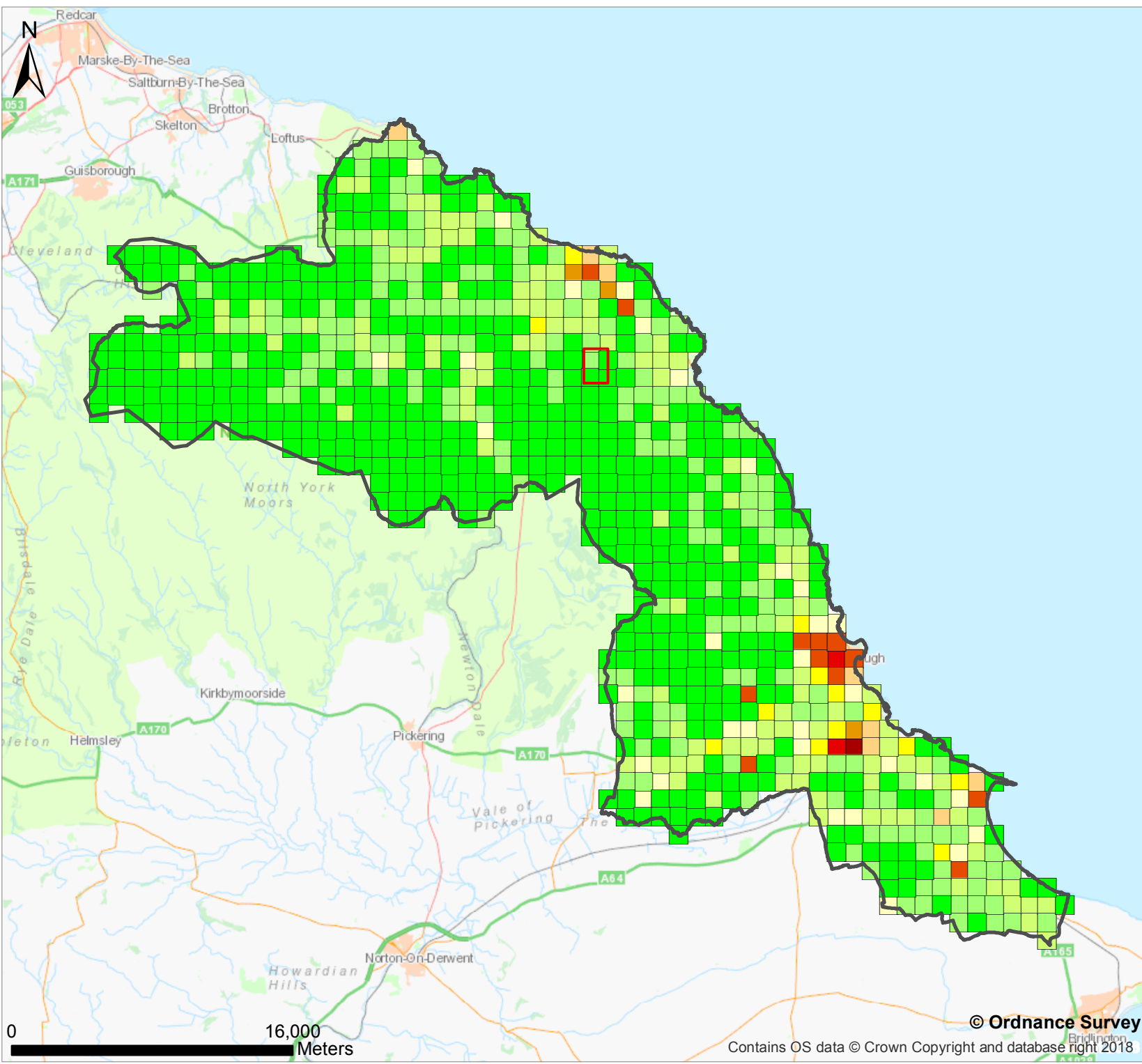
## A4 Calculation of Emissions from Generators

**5.2.2 Generator emission rates were calculated using** data provided by Aggreko for a 60kVA diesel generator. The inputs are detailed in **Table A5**.

**Table A5 Input Data Used to Calculate Particulate Emissions from Generators**

Number of Generators	Power (kVA)	Power (kW*)	PM <sub>10</sub> Emission (g/kWh)	PM <sub>10</sub> Emission (g/h)	Hours of Operation During Phase 7	Tonnes/Year PM <sub>10</sub> Emitted
1	60	48	0.2	9.6	8,760	0.084

\*Based on kVA to kW conversion of 0.8



**Key:**

- Woodsmith Mine
- Scarborough Borough Council Administrative Area

**1km x 1km PM10 Concentrations  
(Tonnes PM/km2)**

- <0.1
- 0.1 - 0.2
- 0.2 - 0.5
- 0.5 - 1.0
- 1.0 - 1.5
- 1.5 - 2.0
- 2.0 - 2.5
- 2.5 - 5.0
- 5.0 - 10.0
- 10.0 - 65.0

**Title**  
2015 NAEI PM10 Emissions Mapping

**Project**  
NYMNP-92 Construction Vehicle and Plant Management Plan

**Client**  
Sirius Minerals

**Date**  
10/08/2018

**Scale**  
1:300000

**Figure**  
Figure 1

**Drawn by**  
CG

**Checked by**  
JD

**Number**  
v1



0 16,000 Meters