Hanson

ABN: 90 009 679 734

Air Quality Review

for the

East Guyong Quarry

Prepared by:

R.W. CORKERY & CO. PTY. LIMITED

November 2017

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Prepared for:

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1. INTRODUCTION

1.1 SCOPE

On 6 October 2017, Hanson Construction Materials Pty Ltd (Hanson) was issued with an Official Caution from the Department of Planning and Environment (DPE) following an investigation of six exceedances of the approved PM_{10} criteria in April and May 2016. The Official Caution required Hanson to commission a consultant to undertake a review of air quality monitoring and management at the East Guyong Quarry (the Quarry). R.W. Corkery & Co. Pty Limited (RWC) has been commissioned by Hanson to undertake the review. A site inspection was undertaken of the Quarry on 13 November 2017 to review the existing air quality management system at the Quarry and inform this review.

RWC prepared the approved Air Quality Monitoring Program (AQMP) for the Quarry and has compiled the Annual Review documentation for each year of operations since they commenced in 2012. As has been reported in the Annual Review documents, air quality monitoring at the Quarry has occurred generally in accordance with the approved Air Quality Monitoring Program (AQMP) since monitoring commenced in May 2012. There have been periods each year when the monitoring equipment has been offline due to the need to have the equipment recalibrated to ensure accurate results are being recorded.

Exceedances of the air quality assessment criteria have occurred at the Quarry in the past (October 2013 and January 2014), however these results were attributed to bushfires in the local area on the date of the recorded exceedances and acknowledged in the respective Annual Review documents. However, the exceedances recorded during 2016 were not all related to bushfire activity and coincided with comments in a Community Consultative Committee meeting regarding observed dust at the Quarry. In addition, Hanson failed to notify DPE of the incidents in accordance with the AQMP and Condition 6 of Schedule 5 of Project Approval (PA) 06_0193. These incidents were reported to DPE in the 2016 Annual Review. Following review of the available data and an investigation, DPE issued an Official Caution and requested that Hanson undertake a review of air quality monitoring at the Quarry. The scope of the review (taken from the Official Caution) is provided as follows.

To avoid an ongoing breach of the approval [PA 06_0193], *the Secretary requires Hanson to:*

- *review the timer on the Dust Trak by 13 October 2017 to ensure it is correctly recording the time and confirm in writing to the Department that the time is being recorded correctly.*
- *commission a consultant by 31 October 2017 to:*
  - *undertake a review of the AQMP to identify whether the AQMP is adequate to monitor dust emissions on site; in particular whether the PM_{10} monitor is providing an accurate assessment of dust being generated by operational activities at the site, taking into account the location of the quarrying and processing activities, predominant wind direction and location of sensitive receivers;*
  - *review air quality monitoring data for 2016 and 2017 (year to date);*
  - *recommend improvements in the air quality monitoring program, based on the review;*

  - *identify improvements for the assessment of air quality monitoring data, including the identification of non-compliances; and*
  - *identify improvements to the reporting of information on the website to allow for the simple interpretation by website users; and*
- *submit a copy of the review to the Department by 30 November 2017; and*
- *revise and submit the AQMP to the Department to incorporate the outcomes of the review by 31 March to align with the submission of all revised management plans.*

The following sections present an overview of the environmental setting of the Quarry and address the matters identified by DPE for inclusion in this review.

1.2 BACKGROUND

PA 06_0193 was granted by the Land and Environment Court on 21 May 2012 and has been modified once on 24 December 2012, to permit a revised alignment to the Quarry Access Road. The approved site layout of the Quarry is displayed in **Figure 1**. The activities approved under PA 06_0193 comprise the following.

- Establishment of an extraction area to extract basalt using standard drill, blast, load and haul techniques.
- Construction and use of a processing plant to process the extracted basalt to produce a range of quarry products, including aggregates and road base, and stockpiling of the resulting products adjacent to the processing plant.
- Construction of a Quarry Access Road and intersection with the Mitchell Highway.
- Transportation of up to 400 000t per year of quarry products via the Mitchell Highway using truck and dog and B Double trucks.
- Construction of a range of bunds and mounds and establishment of native vegetation to provide visual screening for the quarry operations.

Hanson is currently undertaking technical assessments and preparing an Environmental Assessment to support an application to realign and slightly expand the approved extraction area.

Key sources of dust at the Quarry include hard rock crushing and screening activities, load and haul of materials, stockpiling, blasting and truck use of unsealed roads. The active extraction areas and the processing plant are considered to be the most significant sources of dust.

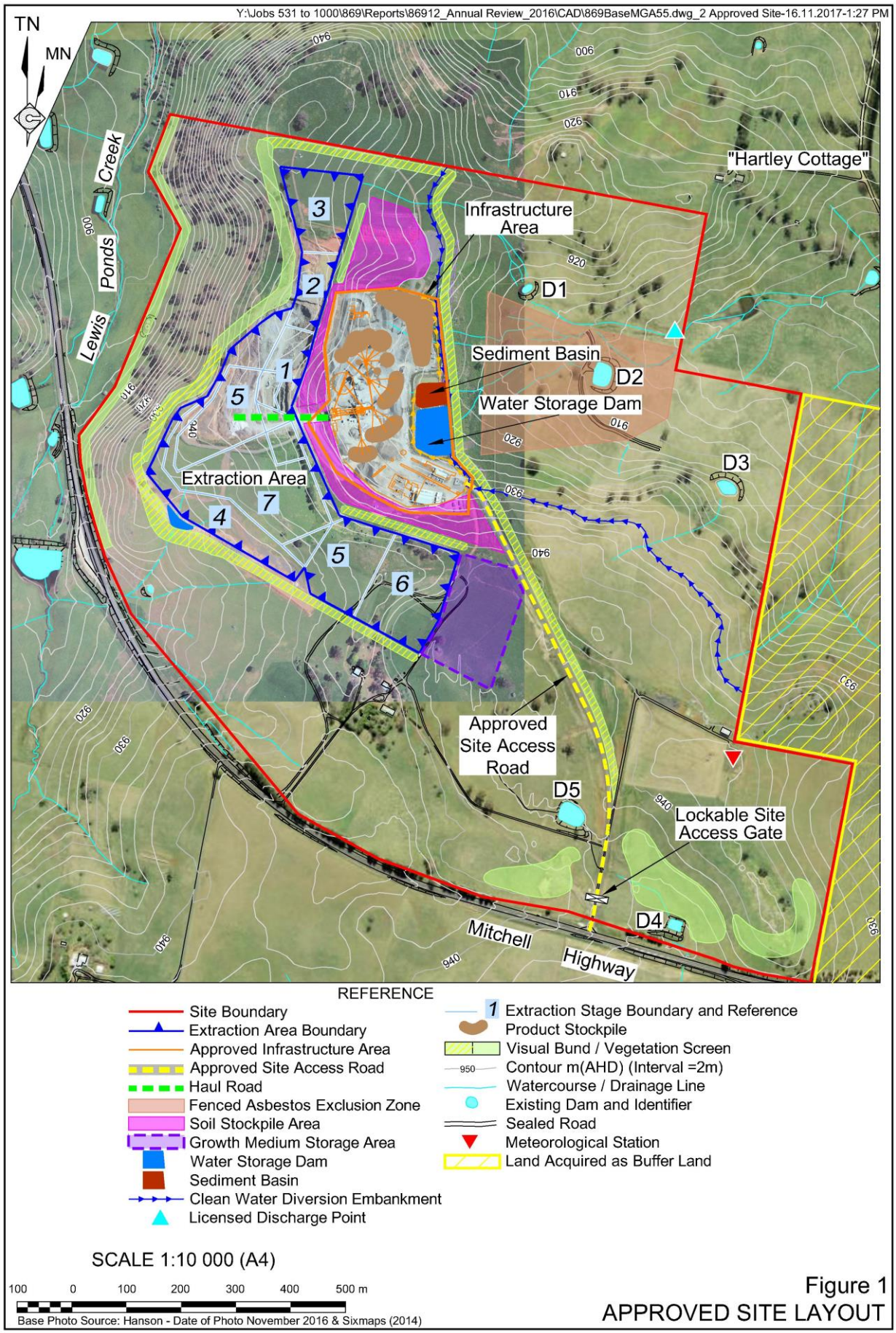

Figure 1
APPROVED SITE LAYOUT

2. ENVIRONMENTAL SETTING

2.1 INTRODUCTION

The Quarry is located approximately 22km southeast of Orange and 36km west of Bathurst. Environmental monitoring at the Quarry includes the following.

- Continuous meteorological monitoring.
- Monthly deposited dust monitoring.
- Continuous particulate matter (PM_{10}) monitoring.
- Quarterly compliance noise monitoring.
- Continuous monitoring of groundwater levels in six bores.
- Annual groundwater quality monitoring in six bores.
- Surface water quality during any discharge.
- Asbestos fibre monitoring in accordance with the approve Asbestos Management Plan.

In most cases, monitoring commenced in July 2012 with results reported and discussed in the Annual Review. It is therefore considered that the environmental setting of the Quarry is well understood. The following subsections provide an overview of the environmental setting relevant to air quality management at the Quarry.

Plates 1 to **8** provide a record of site conditions and monitoring equipment at the Quarry.

2.2 CLIMATE

Meteorological data is recorded continuously at the Quarry's Automatic Weather Station (AWS) (also displayed in **Plate 1** and on **Figure 2**). **Table 1** presents the recorded temperature and rainfall data recorded at the Quarry as well as long term-average climate data from the Bureau of Meteorology-operated Orange Airport AWS (Station No 063303).

Technical issues with the temperature gauge at ground level has limited the data available for this review. However, in comparison with the average results recorded at the BOM managed AWS at the Orange Airport, the results at the Quarry indicate generally higher maximum records and lower minimum records than the airport records. Temperature records generally follow seasonal patterns with several records exceeding 30 degrees in summer and several negative value readings in winter. Quarry operations have been limited in some years to snowfall.

Total rainfall levels recorded at the Quarry are generally inconsistent when compared across years and with the Orange airport data. However, a pattern can be seen in the number of rain days, with longer periods of rainfall occurring during winter and spring. During the summer and autumn seasons, the Quarry generally experiences more frequent high rainfall, but short term events.

Plate 1: The Automatic Weather Station (E869K_015)

Plate 2: Dust Trak particulate matter monitor located on the top of a farm shed (E869K_013)

Plate 3: Dust Gauge 3 located to the south of the extraction area (E869K_020)

Plate 4: Amenity bunding observed from the Mitchell Highway – no stabilising vegetation (E869K_002)

Plate 5: Amenity bunding to the east of the processing and stockpiling area with evidence of successful revegetation (E869K_025)

Plate 6: Haul truck being loaded within the extraction area (E869K_034)

Plate 7: Enclosed primary crusher and secondary screening area – evidence of good practice for dust management (E869K_048)

Plate 8: Automatic sprinkling system between administration and weighbridge building and workshop - evidence of good practice for dust management (E869K_062)

Table 1
Meteorological Monitoring Results

Year		Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Ann
Average Temperature (ºC)														
2015	Maximum	30.1	31.2	29.8	24.6	19.0	14.3	N/A	N/A	N/A	N/A	N/A	N/A	-
	Minimum	6.6	9.9	1.8	1.2	-1.1	-3.1	-4.8	-3.2	-0.6	4.3	2.6	7.0	-
2016	Maximum	34.2	33.1	31.1	26.5	21.5	13.3	15.4	15.3	16.7	21.6	25.1	30.5	-
	Minimum	8.5	8.4	5.9	6.7	-2.2	-3.4	-1.1	-1.7	1.8	1.8	1.6	8.9	-
2017	Maximum	N/A	38.8	N/A	21.4	16.4	14.5	N/A	N/A	N/A	N/A	N/A	N/A	
	Minimum	N/A	5.2	N/A	2.3	-4.2	-4.6	N/A	N/A	N/A	N/A	N/A	N/A	
Long Term Average[1]	Maximum	27.1	26.0	22.8	18.5	14.1	10.9	9.7	11.2	14.8	18.2	21.8	24.6	-
	Minimum	12.7	12.6	9.8	5.4	2.5	1.3	0.5	0.9	3.2	5.6	8.4	10.4	-
Rainfall (mm)														
2015	Total	59.2	54.6	25.8	151.0	48.6	34.6	84.4	76.6	16.0	30.0	88.0	68.0	736.8
	No. of Rain Days	6	7	4	18	14	19	19	15	8	6	10	7	133
	Max Daily Rainfall	26.6	26.4	12.0	25.2	30.8	13.0	13.8	18.2	7.4	11.8	25.0	37.6	-
2016	Total	111.4	0.2	52.8	35.8	66.0	154.6	93.8	95.2	194.2	63.6	46.8	73.6	988.0
	No. of Rain Days	11	1	9	6	10	23	15	14	19	15	9	11	143
	Max Daily Rainfall	20.2	0.2	21.2	20.4	27.6	30	39.4	35.6	48.6	15.2	31.4	52.6	52.6
2017	Total	45.8	15.0	118.8	N/A	36.0	5.0	20.4	43.6	18.0	55.4	N/A	N/A	N/A
	No. of Rain Days	8	4	10	N/A	13	15	10	9	6	5	N/A	N/A	N/A
	Max Daily Rainfall	35.4	10.6	42.6	N/A	12.4	1.4	13.6	19.2	10.8	27.6	N/A	N/A	N/A
Long Term Average[1]	Total	60.8	79.2	68.9	42.1	48.7	79.8	76.6	84.1	79.8	73.6	79.4	89.8	900.2
	No. of Rain Days	8	8	8	8	13	18	18	16	12	9	10	9	137
	Max Daily Rainfall	69.0	89.0	109.6	68.0	50.4	57.2	40.8	74.0	46.8	61.0	80.0	94.0	109.6

Note 1: Long-term average data source - Orange Airport AWS (Station No 063303) – Updated 21 March 2017

Source: Hanson Construction Materials Pty Ltd

Seasonal and annual wind roses for 2016 and records to date for 2017 are presented in **Figures 2** and **3**. Results from the on-site AWS indicate that annual average wind conditions are influenced by periods where wind conditions appear dominant in one direction. These records strongly skew the annual results for 2016 and 2017.

Further review of wind data recorded at the Orange Airport AWS and the information used for the Air Quality Assessment for the original application indicate that these results are not consistent that recorded at the on-site AWS. **Figure 4** displays annual wind roses for morning and afternoon wind records at the Orange Airport AWS. While these records are not strictly comparable to the on-site records, it is concluded that there may be a technical fault with the on-site AWS and it is recommended that the anemometer at the on-site AWS be checked by the equipment supplier. The Orange Airport is located approximately 12km to the west-northwest of the Quarry and is therefore considered to be a suitable analogue for wind conditions for the purpose of this review. Results recorded at the Orange Airport AWS indicate that prevailing winds vary during the day with morning winds predominantly from the north and northeast and afternoon winds predominantly from the southwest.

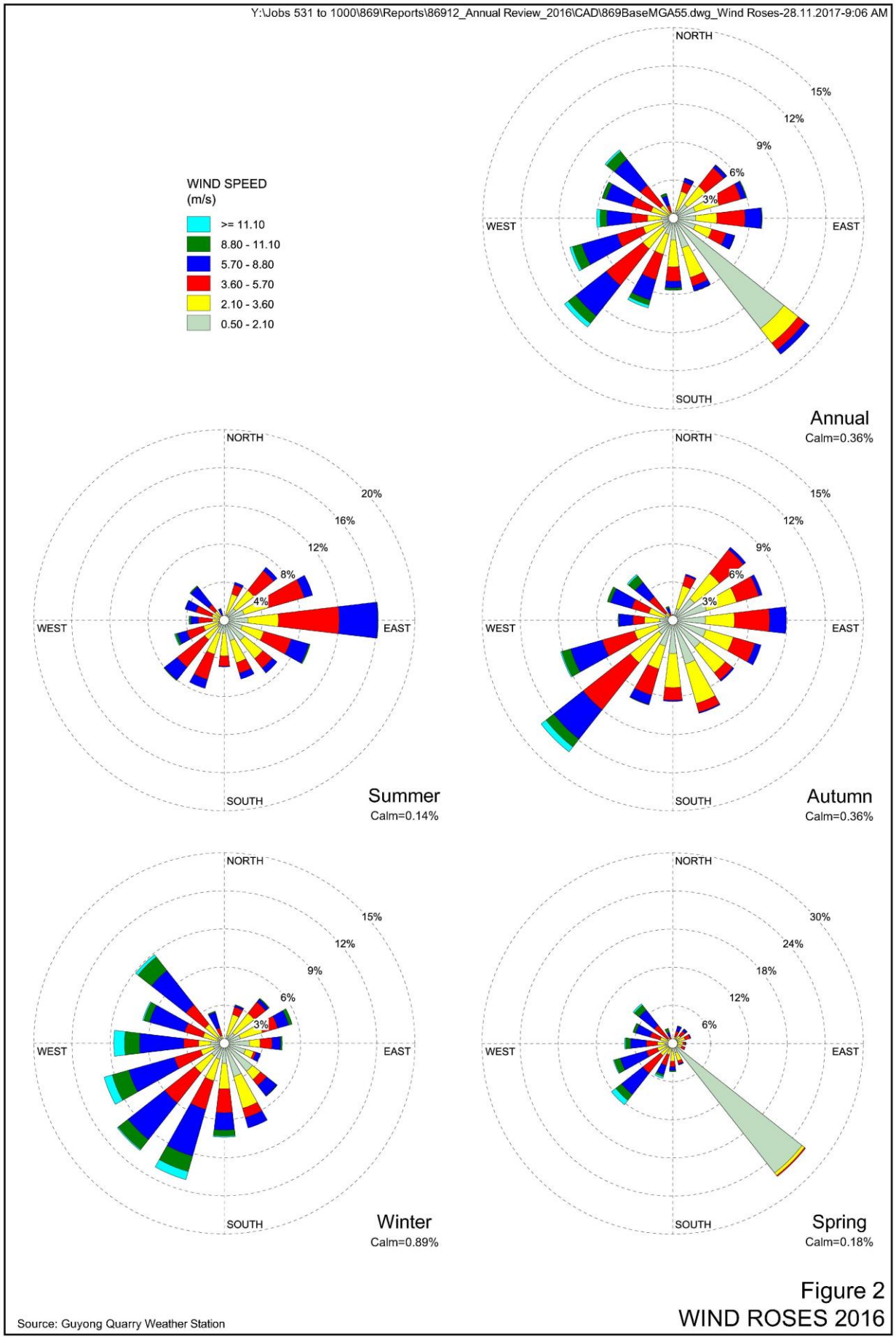

Figure 2
WIND ROSES 2016

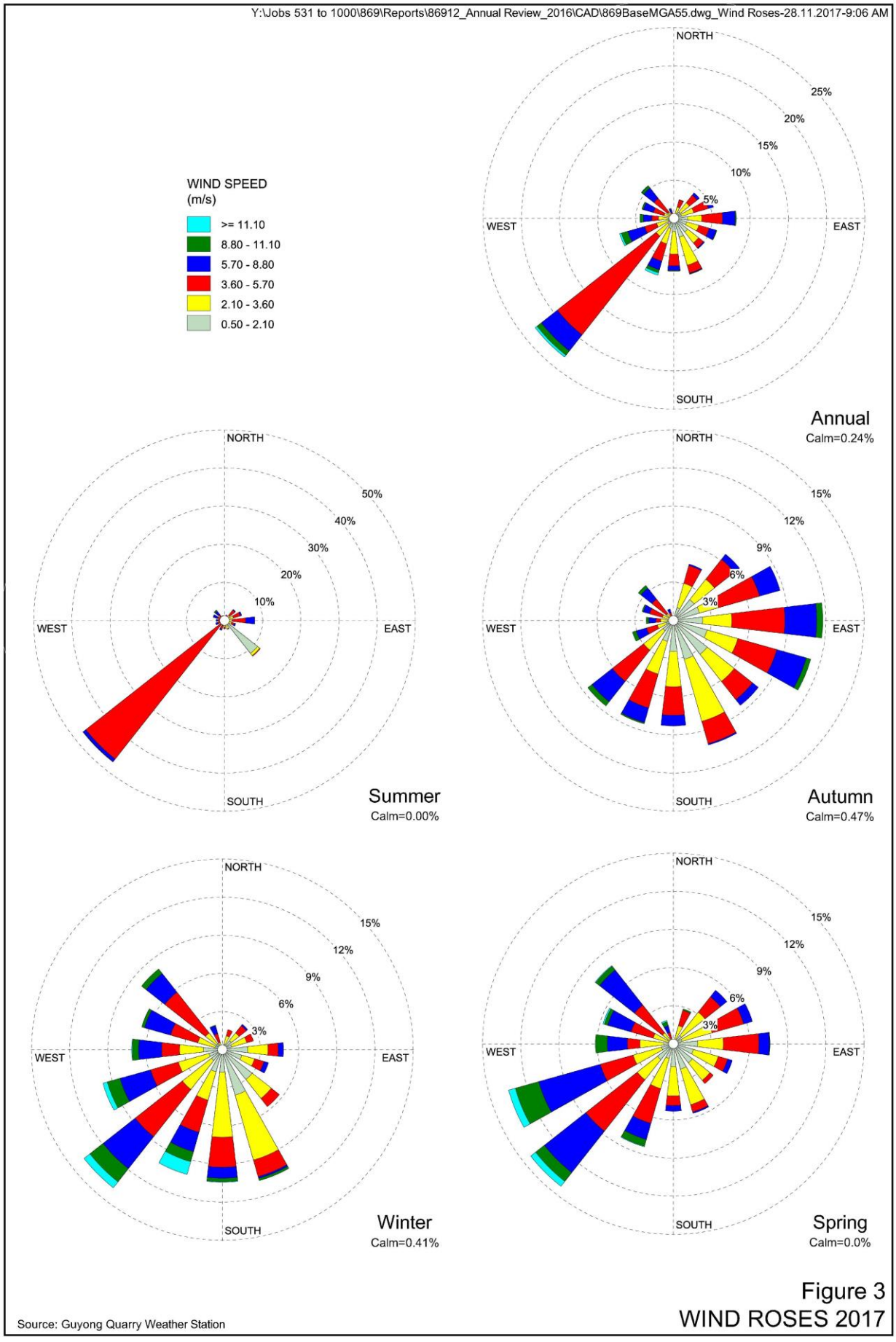

Figure 3
WIND ROSES 2017

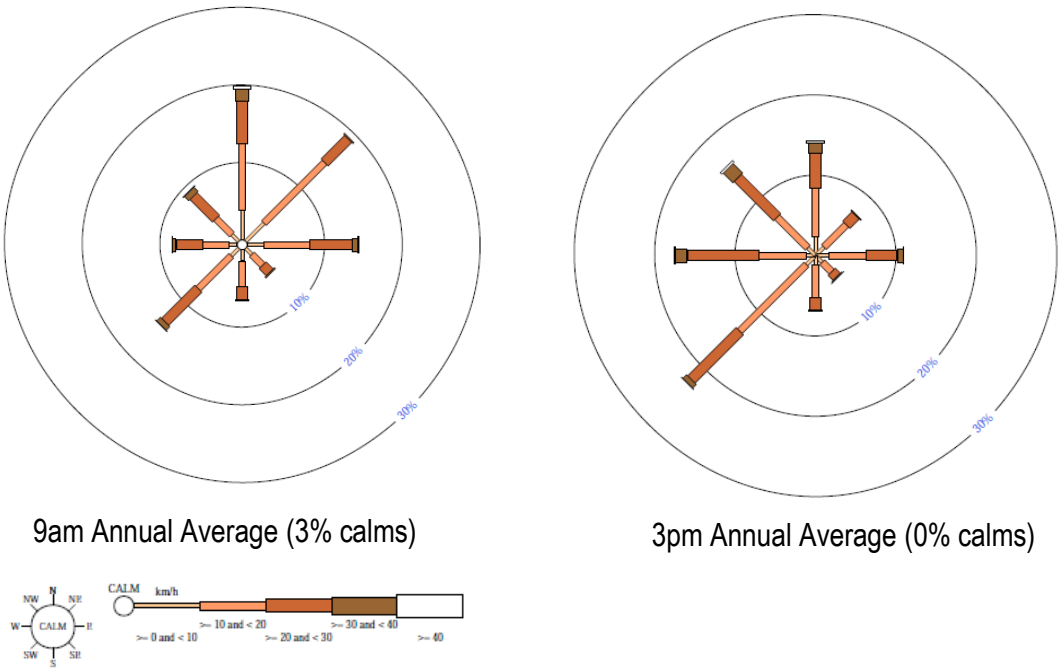

Figure 4
Annual Wind Roses - Orange Airport AWS (BOM Station No 063303)

2.3 LAND OWNERSHIP AND LAND USE

The nearest village areas to the Quarry are Spring Hill (6km to the west), Millthorpe (11km to the southwest) and Lucknow (10km to the northwest). **Figure 5** displays the location of residences within 2km of the extraction and infrastructure area. The Quarry shares a property boundary with three adjoining landowners on the northern side of the Mitchell Highway. To the east is a holding of approximately 528ha, to the north a holding of approximately 698ha, and to the west a holding of approximately 37ha.

The Quarry is bordered by agricultural land with grazing the principal rural land use in the area. Hanson has purchased land to the east of the Quarry as a buffer to neighbouring properties (see **Figure 5**). Neighbouring farmers graze sheep on this land intermittently under agreement with Hanson.

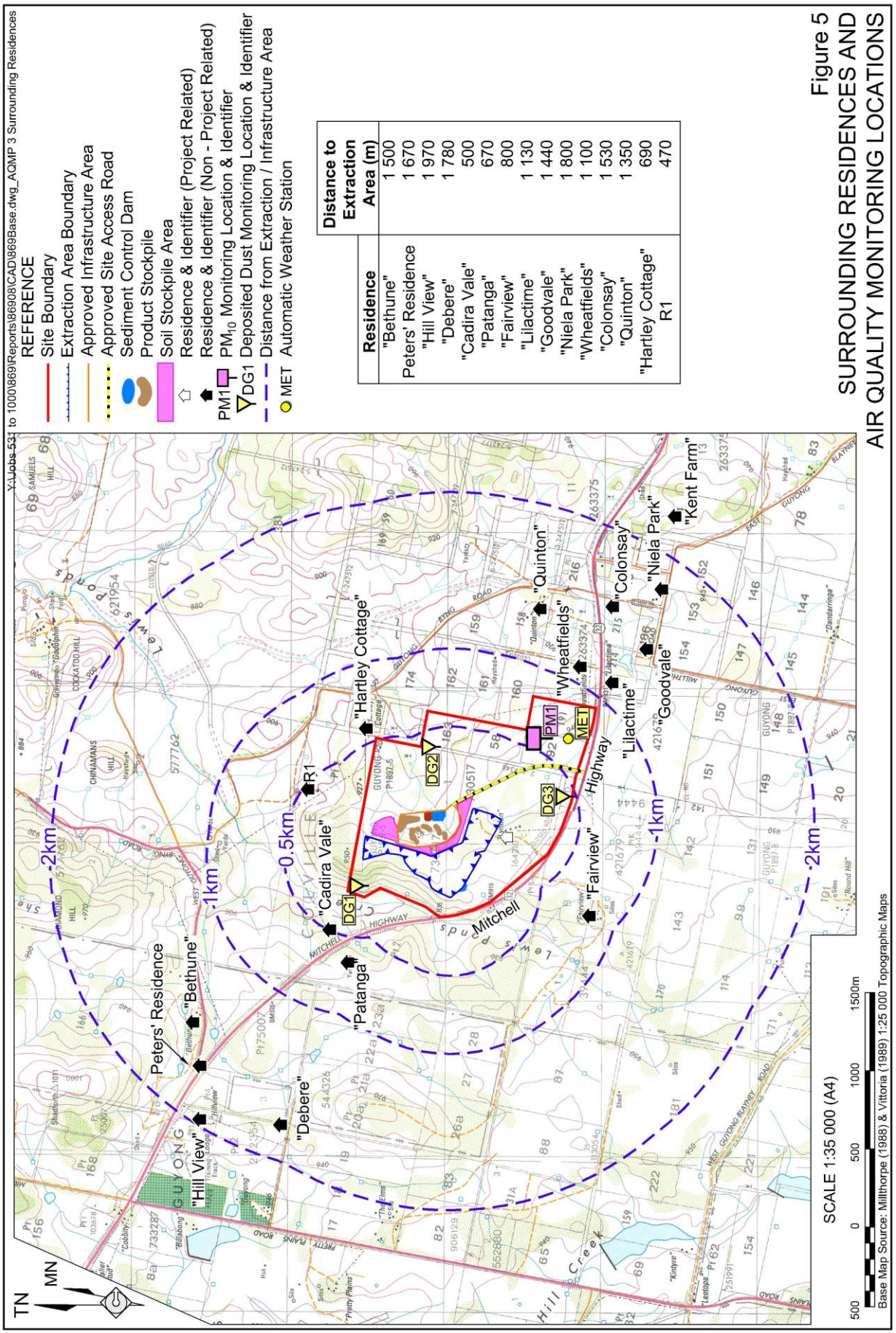

Figure 5
SURROUNDING RESIDENCES AND
AIR QUALITY MONITORING LOCATIONS

3. AIR QUALITY MANAGEMENT MEASURES

Table 2 presents the dust control procedures that are presented in the AQMP to mitigate dust emissions from the quarrying activities.

Table 2
Dust Control Procedures

Source	Control Procedures	Personnel Responsible
General	• Visually inspect operations several times per day for visible dust and adjust operations to reduce visible dust.	Quarry supervisor
Clearing Operations	• Disturb only the minimum area necessary for quarrying and related operations.	Quarry Supervisor
	• Maintain water sprays/water truck on stockpiles to minimise the generation of dust, as required.	Quarry Supervisor All personnel
Soil Stripping	• Maintain water sprays/water truck on stockpiles to minimise the generation of dust, as required.	Quarry Supervisor All personnel
Topsoil Stockpiles	• Revegetate long term topsoil stockpiles	Quarry Supervisor
Drilling	• Ensure dust suppression equipment is installed and operational.	Quarry Manager
Blasting	• Design blast to minimise dust and fume emissions.	Quarry Manager
Loading of rock	• Minimise the drop heights between front-end loader buckets and truck carrying quarry materials.	Quarry Supervisor and Equipment Operators
Internal Roads	• All unsealed roads and trafficked areas will be watered, as required, to minimise the generation of dust.	Quarry Supervisor
	• Enforce a speed limit of 40km/hr on the site access road and 20km/hr on all unsealed roads within the Site.	All personnel
	• All roads will have edges clearly defined with marker posts or equivalent to control their locations.	Quarry Manager
	• Development of minor roads or tracks will be limited and the locations of these clearly defined.	Quarry Manager
	• Obsolete roads will be ripped and re-vegetated.	Quarry Manager
Processing	• Installation of automatic water sprays within the crushing plant or enclosing of the primary or secondary crusher area.	Quarry Manager
	• Minimise drop heights from the loading bin to the primary crusher.	Equipment Operators
Product Stockpiles	• Maintain product handling areas / stockpiles in a moist condition as required to minimise wind-blown and traffic-generated dust.	Quarry Manager
Transportation of Product	• Maximise truck capacities to reduce the number of movements necessary to transport products.	Quarry Manager
	• Cover all loads with tarps prior to leaving site.	Quarry Manager
	• Seal the Site Access Road from the intersection with the Mitchell Highway to the weighbridge.	Quarry Manager
Rehabilitation	• Establish the interim or final landform as soon as areas become available for rehabilitation.	Quarry Manager
	• Revegetate interim or final landforms as soon as conditions are favourable.	Quarry Manager
	• Apply dust suppressants if conditions are not favourable for the establishment of vegetation.	Quarry Supervisor

Source: Hanson Construction Materials Pty Ltd

Quarry personnel reported that the majority of these measures are implemented as standard practice. However, during the site inspection it was observed that some measures were not being implemented or could be improved. Clearing, soil stripping, drilling and blasting were not occurring during the site inspection and therefore the proper implementation of applicable management practices for these activities could not be verified.

Topsoil stockpiles and recently constructed amenity bunding was observed without effective groundcover (**Plate 4**). While the majority of amenity bunding within the Quarry has successfully been covered with a stabilising groundcover (**Plate 5**), some areas are yet to be commenced and topsoil stockpiles had been in place for more than 12 months without cover.

Loading of haul trucks was observed during the site inspection (**Plate 6**) with very little dust evident during the activities. Quarry personnel reported that the most significant use of water on site was for watering roads and stockpiles as well as for automated sprinkling systems (**Plate 8**). Finally, both the primary crusher and secondary screen deck have been completely enclosed (**Plate 7**) with sprays installed on some conveyors to minimise dust impacts.

The Quarry Manager and the Quarry Supervisor ensure they review daily predictions of meteorological information to assist planning for the following day. If adverse conditions are predicted the various activities planned for the day are reassessed to determine if further control procedures are required. If compliance is unlikely to be achievable, activities are limited or temporarily suspended.

4. AIR QUALITY MONITORING PROGRAM

4.1 BACKGROUND

Air quality monitoring at the Quarry consists of three deposited dust gauges and a continuous particulate matter monitor. The locations of the dust gauges and particulate matter monitor relative to the Quarry are presented in **Figure 5**. The continuous particulate matter monitoring commenced in January 2012 using a DustTrak PM_{10} monitor, however, useful data was only collected between May 2012 and November 2012 due to technical issues with the equipment. The monitor was eventually replaced and monitoring recommenced in August 2013 until the present. Deposited dust monitoring commenced at monitoring locations DG1, DG2 and DG3 on 27 February 2013 and has been recorded on a monthly basis since that time. Monitoring of Total Suspended Particulates in not undertaken at the Quarry as monitoring of PM_{10} is an approved surrogate for demonstrating compliance.

Following approval of PA 06_0193, neighbouring residents were contacted in accordance with Condition 1 of Schedule 4 to notify them of their right to request monitoring in accordance with an independent review of operations (under Condition 3 of Schedule 4). Shortly after providing a request for air quality monitoring at the “Quinton” and “Wheatfield’s” properties, the owners of those properties sold them. Hanson contacted the purchaser, Mr Errol Babbage on 3 August 2012. During that conversation, it was agreed that monitoring should be done on the Company-owned land, as close as practicable to the residences on “Quinton” and “Wheatfields”. This was the basis for selecting the location of the particulate matter monitor.

4.2 PREDICTED IMPACTS AND PERFORMANCE CRITERIA

Tables 3 and **Table 4** present the air quality performance criteria presented in Condition 18 of Schedule 3 of PA 06_0193.**Table 5** presents the predicted cumulative air quality impacts at the closest potentially affected residences to the Quarry.

Table 3
Air Quality-related Performance Criteria – Suspended Particulates

Pollutant	Averaging period	Criterion	Basis
Total suspended particulate (TSP) matter	Annual	90µg/m^3	Total
Particulate matter < 10µm (PM_{10})	Annual	30µg/m^3	Total
Particulate matter < 10µm (PM_{10})	24 hour	50µg/m^3	Total

Table 4
Air Quality-related Performance Criteria – Deposited Dust

Pollutant	Averaging period	Maximum increase[2] in deposited dust level	Maximum total[1] deposited dust level
Deposited dust	Annual	2g/m^2/month	4g/m^2/month

Table 5
Predicted Cumulative Air Quality Impacts – Stages 1, 3 and 7

Receptor[1]	Stage	Cumulative Depositional Dust annual average (g/m^2/month)[2]	Cumulative PM_{10} 24-hour average (µg/m^3)[3]	Cumulative PM_{10} annual average (µg/m^3)[4]
Performance Criteria		**4.0**	**50**	**30**
"Cadira"	1	1.7	39	15
	3	1.8	40	15
	7	1.8	39	15
"Hartley Cottage"	1	1.9	43	15
	3	2.1	44	16
	7	2.0	44	16
"Quinton"	1	1.7	39	15
	3	1.7	39	15
	7	1.7	39	15
"Lilactime"	1	1.7	40	15
	3	1.7	42	15
	7	1.7	40	15
"Fairview"	1	1.7	39	15
	3	1.8	39	15
	7	1.8	42	16
"Cadira Vale"	1	1.7	39	15
	3	1.7	39	15
	7	1.7	39	15

Note 1: See **Figure 6** for location
Note 2: Total includes ambient air quality level of 1.6g/m^2/month plus predicted contribution by the Quarry
Note 3: Total includes varied ambient air quality levels plus predicted contribution by the Quarry
Note 4: Total includes ambient air quality level of 13µg/m^3

Sources: Heggies (2007b) – Modified from Tables 8, 9, 10

There have been no recorded exceedances of the deposited dust assessment criteria to date, although single months have been recorded close to the criteria level. As described previously there were two recorded exceedances of the PM_{10} assessment criteria in 2014 and six exceedances in 2016.

4.3 DEPOSITED DUST

Deposited dust monitoring results from 2016 and 2017 to date is presented in **Table 6** and **Table 7**, respectively.

Table 6
Deposited Dust Monitoring Results - 2016[1]

Start Date	End Date	DG1	DG2	DG3	Criterion[2]
29-Dec-15	3-Feb-16	0.8	3.6	2.5	4.0
28-Jan-16	3-Mar-16	0.6	6.3	2.3	4.0
26-Feb-16	1-Apr-16	1.3	2.2	1.3	4.0
29-Mar-16	4-Apr-16	1.8	1.5	1.1	4.0
29-Apr-16	1-Jun-16	0.5	0.7	1.6	4.0
27-May-16	25-Jul-16	0.3	1.6	1.0	4.0
30-Jun-16	25-Jul-16	0.8	0.2	0.4	4.0
28-Jul-16	29-Aug-16	0.5	1.5	0.6	4.0
29-Aug-16	4-Oct-16	0.5	0.3	4.7	4.0
29-Sep-16	21-Nov-16	0.3	1.5	0.6	4.0
27-Oct-16	20-Dec-16	0.4	0.5	0.6	4.0
28-Nov-16	20-Dec-16	1.7	1.3	1.8	4.0
Annual Average		**0.8**	**1.8**	**1.5**	**4.0**

Note 1: Units – g/m^2/month
Note 2: Averaged over a 12 month period
Source: Hanson Construction Materials Pty Ltd

Table 7
Deposited Dust Monitoring Results – January to September 2017[1]

Start Date	End Date	DG1	DG2	DG3	Criterion[2]
20-Dec-16	30-Jan-17	2.0	0.8	2.7	4.0
30-Jan-17	3-Mar-17	2.9	2.1	2.4	4.0
3-Mar-17	3-Apr-17	3.8	3.9	0.8	4.0
3-Apr-17	3-May-17	1.2	1.7	2.1	4.0
3-May-17	2-Jun-17	0.3	3.7	3.8	4.0
2-Jun-17	4-Jul-17	0.3	0.4	0.2	4.0
4-Jul-17	3-Aug-17	0.5	3.7	0.6	4.0
3-Aug-17	4-Sept-17	0.4	3.9	1.1	4.0
4-Sept-17	5-Oct-17	0.8	1.5	0.5	4.0

Note 1: Units – g/m^2/month
Note 2: Averaged over a 12 month period
Source: Hanson Construction Materials Pty Ltd

Deposited dust monitoring results are consistently within the assessment criteria levels. During the review period there was only one instance where the monthly result exceeded the annual average criteria level (28 January 2016 to 3 March 2016 at DG2).

4.4 PARTICULATE MATTER

PM_{10} monitoring from 2016 and 2017 to date are presented graphically in **Figure 6**. A graph of long-term results is provided as **Appendix 1**.

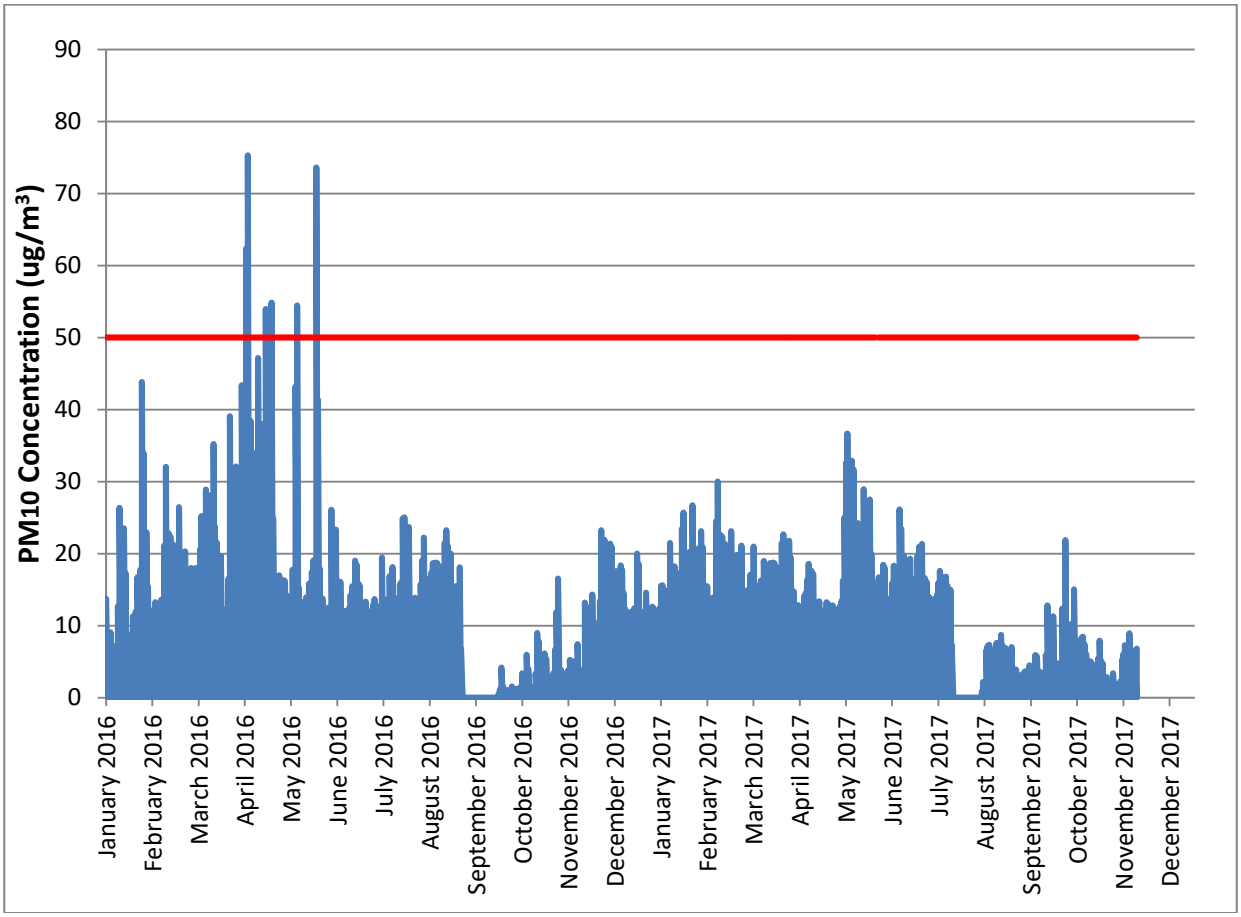

Figure 6 Average 24-Hour PM_{10} Dust Concentration

A review of the long-term data presented in the Annual Review documents for the Quarry indicates that particulate matter levels recorded by the monitor remained consistently low until November 2015, at which time the long-term average level increased to be more consistently in the range of 10µg/m^3 to 30µg/m^3. This was coincident with an increase in monthly production at the Quarry as production levels reached a more consistent level.

Excluding the identified exceedances, results during 2016 and 2017 to date have been consistent with the recent average range of 10µg/m^3 to 30µg/m^3 which is below the levels predicted in the Air Quality Assessment for the original application. Results during April of 2016 were consistently higher than the average range and closer to 30µg/m^3 to 40µg/m^3.

It is noted that, for a short period during August and September 2016 and July and August 2017, no data could be recorded while the monitoring equipment was serviced and recalibrated. While this time cannot be avoided and is necessary to ensure the results remain accurate, this remains a brief period during each year when monitoring results are not recorded.

4.5 TOTAL SUSPENDED PARTICULATES

Section 11.3 of the Air Quality Monitoring Program notes that TSP monitoring is not undertaken at the Quarry and that compliance with the assessment criteria for PM_{10} is a surrogate for compliance with the TSP criteria. Likewise, it is assumed that non-compliance with the PM_{10} would also result in non-compliance with TSP, although it is acknowledged that the larger particle fraction of total dust would be more likely to fall out of the air and not be dispersed as far away from the source as PM_{10}.

4.6 RECOMMENDATIONS

Following review of the recorded data and inspection of the monitoring equipment, is it concluded that the air quality monitoring program is providing an acceptable record of air quality in the vicinity of the Quarry.

The records of deposited dust are consistent with levels predicted in the air quality assessment for the original application while particulate matter is consistently below predicted levels. It is noted that the air quality assessment assumed a relatively high background level for particulate matter, which does not seem to be present.

The deposited dust gauges are located at three points around the Quarry and close to nearby residences. There is no gauge directly to the south of the Quarry, which may be useful to record deposited dust from the Quarry emanating in all directions. The continuous particulate matter monitor is located to the southeast of the Quarry, with this location selected at the request of the nearest neighbour. Prevailing winds at the Quarry are considered to be from the north and from the southwest (see Section 2.2). Neither direction is captured by the monitor at present. It is also noted that the are numerous residences to the southeast of the Quarry and that winds from the northwest feature (but are not predominant) in the afternoon wind records recorded at the Orange Airport AWS. If the Quarry Manager were certain that the neighbours to then southeast would not object to moving the monitor, records of windblown dust may be more accurately captured by relocating the monitor to a suitable location to the south or northeast of the Quarry.

Quarry personnel should investigate the possibility of setting automatic trigger notifications from the PM_{10} monitoring equipment such as via email or text message to the relevant Quarry personnel. Trigger levels should be set to a reasonable level below the assessment criteria to provide sufficient forewarning and to trigger modifications to operations where necessary.

5. AIR QUALITY REVIEW AND REPORTING

5.1 MANAGEMENT PROTOCOLS

The approved AQMP includes the management protocols that will be implemented to ensure that air quality management at the Quarry is occurring effectively. The objectives of air quality management in addition to the design and operational controls and mitigation measures described in Section 3 include the following.

- The evaluation of monitoring results and therefore review of compliance with the relevant assessment criteria.
- Establishing and responding to triggers for an investigation of air quality controls at the Quarry. These triggers include:
  - a recorded exceedance of the air quality assessment criteria;
  - an air quality related complaint;
  - other triggers such as forecast weather conditions or observed dry and dusty conditions.
- The timely notification of relevant stakeholders regarding air quality-related incidents. Stakeholders included relevant government agencies and the local community (neighbours)
- Reporting of air quality-related incidents in accordance with the conditions of PA 06_0193.
- Publication of the approved AQMP, monitoring results, reporting and relevant information relating to air quality at the Quarry.
- To regularly review and where necessary update the approved AQMP to ensure air quality management continues to be consistent with best practice.

5.2 REVIEW OF MANAGEMENT PRACTICE

The recorded exceedances of the PM_{10} assessment criteria in April and May 2016 and subsequent failure to notify the relevant stakeholders or investigate the exceedances demonstrates that management practices relating to air quality have not followed the approved management protocols described in the AQMP. The practical management of dust at the Quarry appears to be successful, as proven by the lack of dust-related complaints and the activities observed during the site inspection. However, it is not clear that Quarry personnel were aware of the exceedances until the monitoring data was compiled for the preparation of the Annual Review.

Review of data available on the Hanson website indicates that the AQMP and updated monitoring data is made available to the public. Deposited dust monitoring data is presented as a year-to-date summary which allows for easy review of annual average dust levels. PM_{10} data is also made available on a monthly basis. However, the data is presented at 15-minute intervals, with unclear headings for table columns and in some instances the date is obscured. While this data is readily accessible it would be difficult for most viewers to interpret the results in any meaningful way.

Monitoring of air quality at the Quarry is intended to provide Quarry personnel with the information needed to effectively respond to instances where excessive dust is being produced by Quarry operations. If the recorded data is not available to Quarry personnel to review in a meaningful way, the necessary triggers for notification, investigation and reporting will not proceed.

5.3 RECOMMENDATIONS

It is recommended that Hanson provide Quarry personnel with the necessary training to efficiently review, investigate and publish monitoring results in a meaningful way. The review of PM_{10} data should occur on an at least a weekly basis to identify any exceedances. Data should be compiled and published on the Hanson website in a form that is easy for the general public to access and understand. This should include, as a minimum, presentation of the 24-hour PM_{10} levels to enable direct comparison to assessment criteria, and preferably year to date graphing such as presented in this review.

It would be expected that once the data is accessed in a meaningful way and on a regular basis, the subsequent management protocols (review, investigation, notification and reporting) would be implemented effectively. However, Hanson should make sure any exceedance is notified to the relevant stakeholders as soon as practically possible and a report prepared in accordance with the requirements of PA 06_0193.

6. SUMMARY AND CONCLUSIONS

This review has identified several practical measures that may be implemented to improve air quality management as well as providing recommendations for improving the air quality monitoring program and the implementation of air quality management practices. The following specific recommendations should be considered in any review and update of the approved AQMP.

- Commission a service/maintenance of the on-site AWS and anemometer.
- Ensure that exposed surfaces (topsoil stockpiles or amenity bunding) has a stabilising groundcover established as soon as possible following completion of stockpiling works to limit dust lift off.
- Consider placing a fourth dust gauge to the southwest of the Quarry extraction area and processing and stockpiling area to monitor deposited dust in this location and complement the existing dust monitoring network.
- Consider relocating the PM_{10} monitor to south or the northeast of the extraction area and processing and stockpiling area in light of prevailing winds.
- Review the possibility of implementing automatic text message or email triggers from the PM_{10} monitoring equipment to relevant Quarry personnel.
- Implement a program of training for relevant staff to access and review PM_{10} monitoring data in a meaningful way.
- Ensure that PM_{10} data is reviewed on at least a weekly basis to identify any exceedances.
- Ensure that all exceedances are reported to the relevant stakeholders as soon as practically possible, investigated internally and a report prepared and submitted to relevant stakeholders in a timely manner. The report should describe the results of the investigation, including the likely source of the particulate matter, operational activities occurring at the time and measures to be implemented to prevent further exceedance.

Appendix 1

Average 24-hour PM_{10} Dust Concentration

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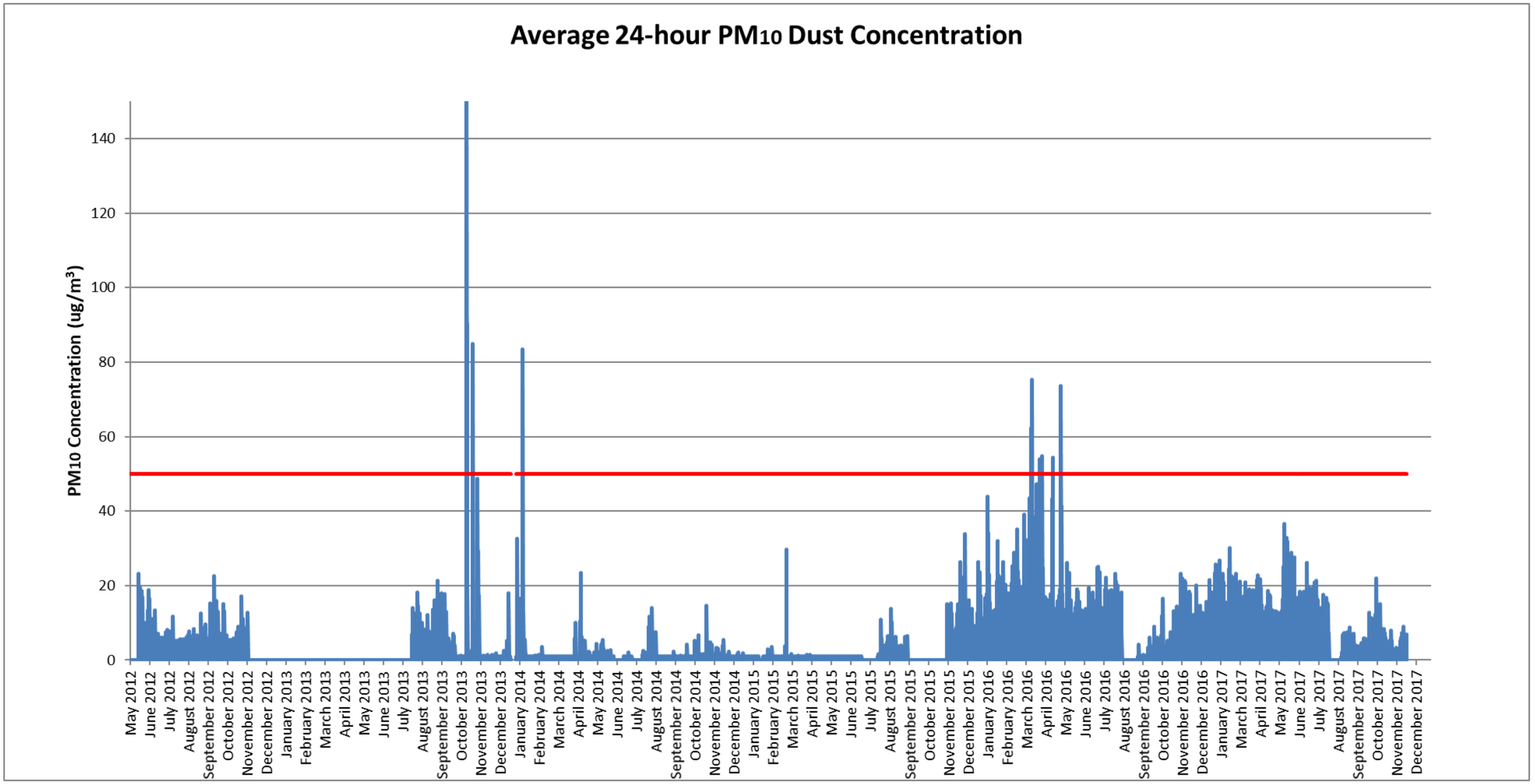
Average 24-hour PM10 Dust Concentration
PM10 Concentration (ug/m³)
140
120
100
80
60
40
20
0
May 2012
June 2012
July 2012
August 2012
September 2012
October 2012
November 2012
December 2012
January 2013
February 2013
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