



**Heron Resources Limited
Tarago Operations Pty Limited**

Woodlawn Mine

SML 20

Summary of Environmental Monitoring Data

Environmental Protection Licence Number 20821

Project Approval 07_0143MOD2

Record Update – 30 April 2018



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1. Introduction

1.1 Introduction

Tarago Operations Pty Ltd, a wholly owned subsidiary of Heron Resources Limited, holds Environment Protection Licence 20821 (EPL 20821) issued by the Environment Protection Agency (EPA) under the Protection of the Environment operations Act 1997 (the Act) and operates under the conditions of Project Approval 07_0143MOD2 granted by the NSW Department of Planning and Infrastructure for the Woodlawn Mine Project. This report has been prepared to satisfy the reporting requirements of the Act as directed by the EPA and also for Condition 11, Schedule 6 of the Project Approval.

This report summarises environmental monitoring results for the Woodlawn Mine for the period 1 – 30 April 2018. Historical depositional dust results recorded by Veolia since January 2015 are included in Appendix A to this report to provide a background air quality baseline.

A summary of the EPL information is provided in the following tables. Table 1 shows the licence information and Table 2 summarises the frequency and units for monitoring data for the reporting period.

Table 1. Licence information

| | |
|--|---|
| Environment Protection Licence number | 20821 |
| Licensee | Tarago Operations Pty Ltd |
| Licensee address | Level 7, Suite 702 191 Clarence Street SYDNEY NSW 2000 |
| Premises | Woodlawn Mine Project 507 Collector Road TARAGO NSW 2580 |
| Link to full licence on the EPA website | http://app.epa.nsw.gov.au/prpoeoapp/ViewPOEOLicence.aspx?DOCID=115339&SYSUID=1&LICID=20821 |
| Link to Notice of Variation of EPA licence | http://app.epa.nsw.gov.au/prpoeoapp/ViewPOEONotice.aspx?DOCID=-1&SYSUID=1&LICID=20821 |
| Complaints Telephone Number | Sydney Office (02) 9119 8111 Woodlawn Office (02) 9119 8140 |

Table 2. Supporting information of EPL monitoring requirements

| Parameter | Monitoring site | Monitoring frequency | Unit of measure |
|---|---------------------------|-------------------------|-------------------------|
| Air quality monitoring: Deposited Dust (insoluble solids) | DG 22*, DG28*, DG33* DG34 | Monthly | g/m ² /month |
| TSP | HVAS-1 | 24 hours every six days | µg/m ³ |
| PM10 | HVAS-2 | 24 hours every six days | µg/m ³ |

*Monitoring undertaken by Veolia

1.2 Explanation of units of measurement

- **mg/m³** = milligrams per cubic metre
- **g/m²/month** = grams per square metre per month
- **µg/m³** = micrograms per cubic metre
- **Day** = 7am to 6pm Monday to Saturday and 8am to 6pm Sunday and public holidays
- **Evening** = 6pm to 10pm on any day
- **Night** = 10pm to 7am Monday to Saturday and 10pm to 8am Sunday and public holidays

1.3 Abbreviations

- TOP – Tarago Operations

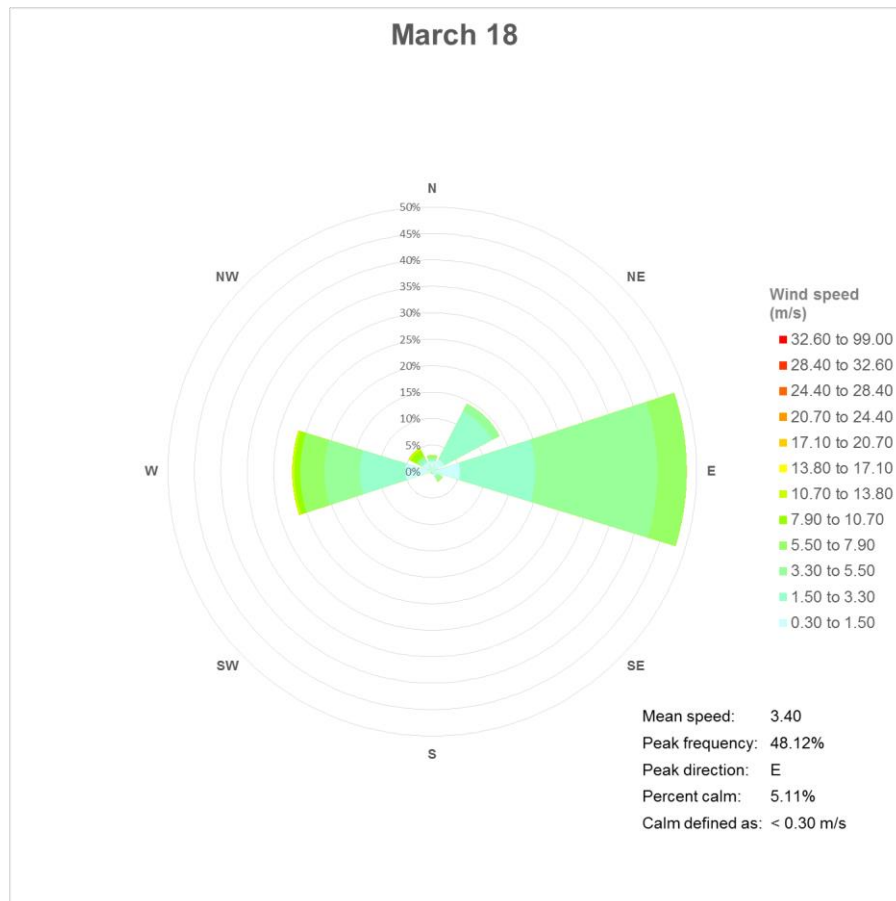
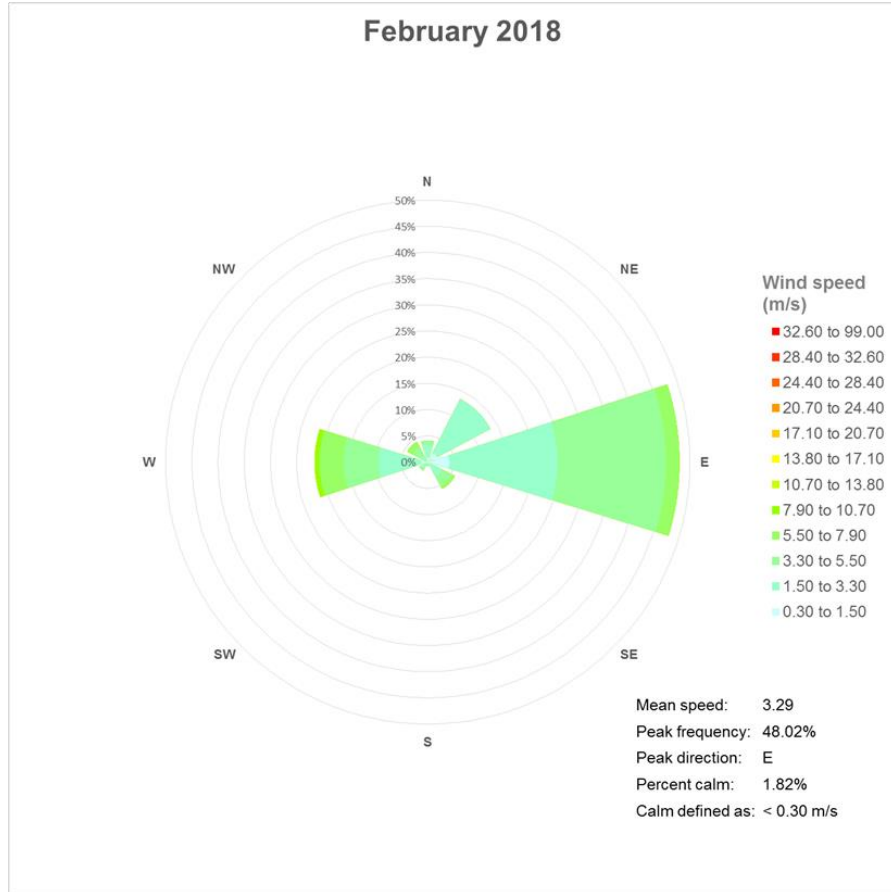
2. Meteorological Monitoring

Heron is required to undertake meteorological monitoring on site. Veolia operate an approved weather station (EPA licence 11436, Point 9). As weather may influence monitoring results for dust and noise a summary showing the rainfall, temperature, evaporation and average wind speed for the three months Feb to Apr 2018 is detailed in Table 3. Despite the high February rainfall, seasonal conditions are very dry and evapotranspiration has exceeded rainfall during the period. The autumn vegetation growth flush has not occurred due to low rainfall and higher than normal temperatures and the plant growth index is classified as extremely low. Likewise, the soil water index is extremely low across the region. The NSW DPI have reported that the southeast region is in a 'drought onset' period (<https://www.dpi.nsw.gov.au/climate-and-emergencies/droughthub/information-and-resources/seasonal-conditions/ssu/april-2018>).

Table 3. Summary of weather conditions for previous 3 months (Feb 2018 – Apr 2018)

| | Feb | Mar | Apr |
|---|-------|------|-------|
| Total rainfall (mm) | 114.0 | 16.0 | 19 |
| Total number of wet days | 11 | 4.0 | 3 |
| Average maximum temperature at 2m (°C) | 25.7 | 22.5 | 22.04 |
| Average minimum temperature at 2m (°C) | 13.0 | 11.4 | 10.16 |
| Average wind speed at 10m (m/s) | 3.29 | 3.4 | 2.88 |
| Evapotranspiration (mm) | 120 | 114 | 88 |

The prevailing wind direction trends for the 3 months Feb – Apr 2018 is displayed in Figure 1 using wind roses. The wind roses depict the wind speed and direction recorded at 10 m above ground level. During February and March the prevailing winds came from an easterly direction. During April the winds were predominantly from the west, indicating the seasonal shift when westerlies dominate during the colder months.



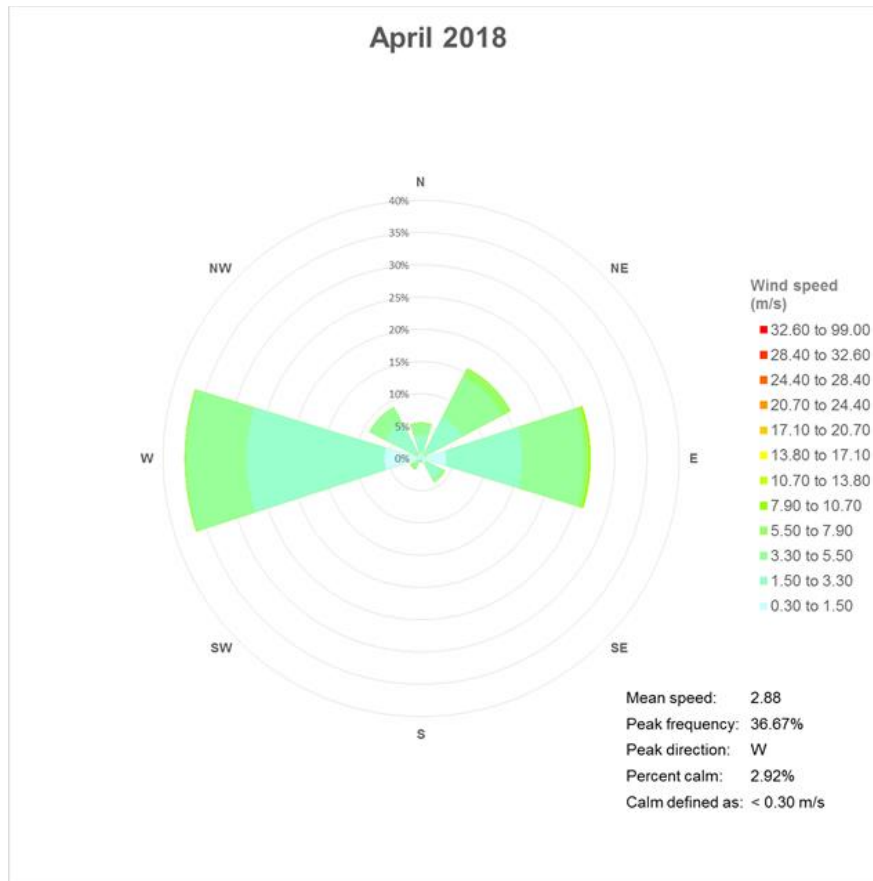


Figure 1. Prevailing wind direction (percentage for month) Jan, Feb and Mar 2018

3. Air Quality Monitoring

The Air quality monitoring results for Woodlawn Mine are summarised in the following sections.

3.1 Depositional Dust

Depositional dust monitoring around the Woodlawn site is undertaken on a monthly basis. Four depositional dust gauges DG22, DG28, DG33 and DG34 are present to monitor the levels of depositional dust. They are located on Site as follows:

- DG22 – East side of void
- DG28 – Pylara
- DG33 – MBT plant
- DG34 – Behind core shed

DG24, has been used to record dust to the west of the void. Due to construction of the box cut and mine office infrastructure for the new mine the gauge was decommissioned on 31 Jan 2018. The Veolia EPL has been varied accordingly. A new dust gauge, DG34, was installed on 1 Feb 2018. The gauge is positioned west of the void, but in a new location.

Historical monthly raw results for the period January 2015 – Mar 2017 are shown in Appendix A – Historical deposition dust record. The results were recorded by Veolia prior to the issue of Heron’s EPL and are presented to provide an indication of the background air prior to commencement of the TOP construction.

The EPA licence for the Woodlawn Mine project was issued on May 2017. The raw results for depositional dust commencing from that date are recorded in Table 4.

Table 4. Depositional dust (g/m²/month - insoluble solids) recorded since May 2017

| Date sampled | DG22 | DG24 | DG28 | DG33 | DG34 |
|--------------|------|----------------|------|------|------|
| May 2017 | 3.3 | 0.6 | 0.8 | <0.2 | |
| Jun 2017 | 1.4 | 0.4 | <0.2 | <0.2 | |
| Jul 2017 | 1.7 | 0.5 | 2.4 | <0.2 | |
| Aug 2017 | 3.7 | 0.5 | 4.0 | 0.2 | |
| Sep 2017 | 4.8 | 0.8 | 2.1 | 0.4 | |
| Oct 2017 | 3.9 | 3.0 | 1.0 | 0.5 | |
| Nov 2017 | 5.2 | 1.9 | 0.8 | 0.4 | |
| Dec 2017 | 2.4 | 1.9 | 0.4 | 0.9 | |
| Jan 2018 | 5.3 | 4.7 | 1.8 | 1 | |
| Feb 2018 | 2.4 | Decommissioned | 1.1 | 1.4 | 2.8 |
| Mar 2018 | 3.7 | | 0.4 | 1.4 | 0.7 |

A graphical representation of raw depositional dust gauge monitoring results since 1 January 2015 is shown in Figure 2.

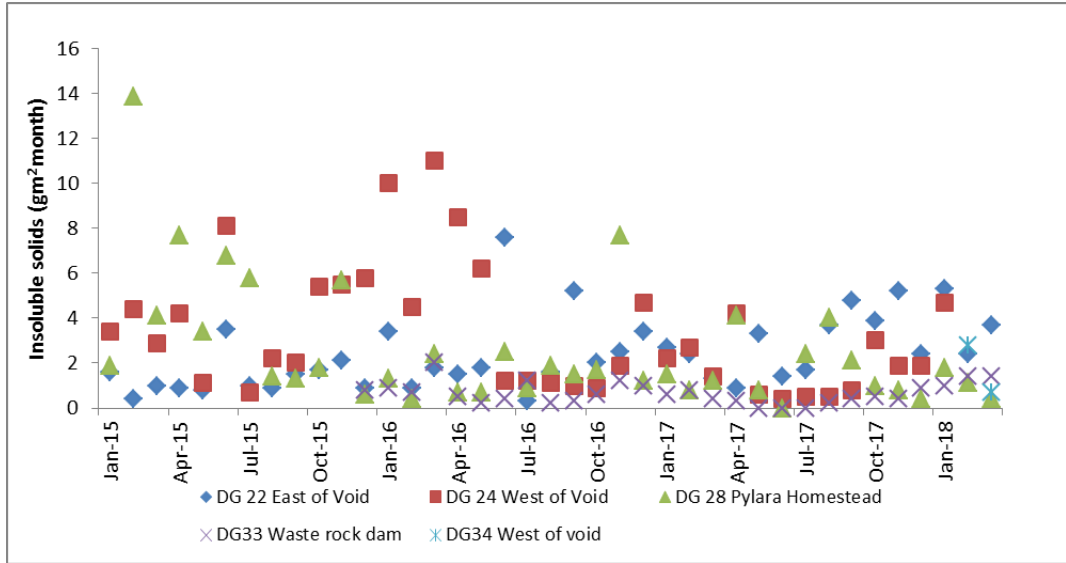


Figure 2. Monthly dust deposition gauge results

Figure 3 shows the annual rolling average for deposited dust (insoluble solids grams per m² per month) for the four monitoring sites between Jul 2016 and end March 2018.

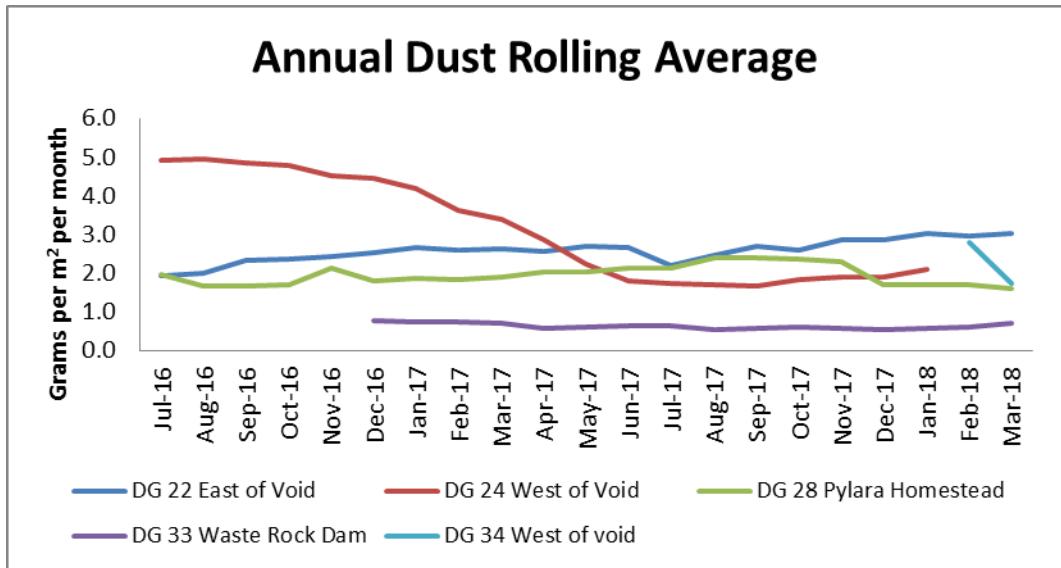


Figure 3. Annual rolling average for insoluble solids (g/m²/month)

The limits for deposited dust are outlined in the Project Approval. The limits are detailed in Table 5.

Table 5. Deposited dust limits

| Pollutant | Averaging period | Maximum increase in deposited dust level | Maximum total deposited dust level |
|-----------------------------|------------------|--|--|
| ^c Deposited dust | Annual | ^b 2 g/m ² /month | ^a 4 g/m ² /month |

- ^a Total impact (i.e. Incremental increase in concentrations due to the project plus background concentrations due to all other sources).
- ^b Incremental impact (i.e. incremental increase in concentrations due to the project on its own)
- ^c Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter – Gravimetric Method.

Data recorded prior to 14 Sep 2017 is detailed in Appendix A and summarised in Table 6 to show the average background deposited dust levels recorded prior to commencement of construction. The data shows that the annual average for all four depositional dust gauges did not exceed 4 g/m²/month during the period Jan 2015 to Aug 2017 nor increase the background by more than 2 g/m²/month.

Table 6. Background deposited dust values for Woodlawn (Jan 2015 – Aug 2017)

| | DG22 | DG24 | DG28 | DG33 |
|-------------------------------------|------|------|------|------|
| Individual gauge background average | 2.1 | 3.5 | 3.0 | 0.7 |
| Overall background average | 2.5 | | | |

Average raw deposited dust levels from each gauge for the period since construction commenced (Sep 2017 to Mar 2018) is shown in Table 7. DG24 was decommissioned on 31 Jan 2018 and DG34 was commissioned on 1 Feb 2018.

Table 7 Average deposited dust values since commencement of construction (Sep 2017)

| | DG22 | DG24 | DG28 | DG33 | DG34 |
|--------------------------|------|----------------|------|------|------|
| Individual gauge average | 3.96 | Decommissioned | 1.09 | 0.86 | 1.75 |
| Overall average | 2.04 | | | | |

3.2 Atmospheric dust – particulate matter

The Project Approval requires monitoring of total suspended particulate (TSP) matter and particulate matter < 10µm (PM₁₀) to ensure particulate matter emissions generated by the project do not exceed the criteria listed at any residence on privately owned land. High volume air sampling (HVAS) equipment for atmospheric monitoring was installed on 16 October 2017 at Pylara, the nearest residence located to the east of Woodlawn Mine. Monitoring commenced on 17 October 2017 and is undertaken for a 24 hour cycle every 6 days.

Raw results obtained from the HVAS for PM₁₀ and TSP are shown in Table 1 and Figure 4. Rolling 12 month average is shown in Figure 5.

Table 8. Raw results for PM₁₀ and TSP

| Date start of 24 hour sampling run (7:00am – 7:00am) | PM ₁₀ µg/m ³ | TSP µg/m ³ |
|--|------------------------------------|-----------------------|
| 17 Oct 2017 | 6.7 | 14.2 |
| 23 Oct 2017 | 6.7 | 20.6 |
| 29 Oct 2017 | 8.6 | 16.8 |
| 4 Nov 2017 | 12.0 | 22.3 |
| 10 Nov 2017 | 9.5 | 14.4 |
| 16 Nov 2017 | 13.9 | 20.6 |
| 22 Nov 2017 | 11.8 | 20.9 |
| 28 Nov 2017 | 9.1 | 15.0 |
| 4 Dec 2017 | 8.4 | 14.5 |
| 10 Dec 2017 | 18.3 | 27.1 |
| 16 Dec 2017 | 23.7 | 35.5 |
| 22 Dec 2017 | 18.6 | 30.4 |
| 28 Dec 2017 | 22.3 | 35.5 |
| 3 Jan 2018 | 11.9 | 17.3 |
| 9 Jan 2018 | 9.5 | 20.1 |
| 15 Jan 2018 | 8.7 | 14.2 |
| 21 Jan 2018 | 40.6 | 69.2 |
| 27 Jan 2018 | 11.4 | 19.7 |
| 2 Feb 18 | 7.4 | 13.2 |
| 8 Feb 18 | 19.1 | 44 |
| 14 Feb 18 | 48.3 | 102 |
| 20 Feb 18 | 7.3 | 15.5 |
| 26 Feb 18 | 7.1 | 10.7 |
| 4 Mar 18 | 8.9 | 15.9 |
| 10 Mar 18 | 9.2 | 17.7 |
| 16 Mar 18 | 14.9 | 31.9 |
| 22 Mar 18 | 6.7 | 14.4 |
| 28 Mar 18 | 14.9 | 25.5 |
| 3 Apr 18 | 15 | 30.1 |
| 9 Apr 18 | 18.5 | 38.4 |
| 15 Apr 18 | 12.0 | 42.2 |
| 21 Apr 18 | 18.0 | 34.1 |
| 27 Apr 18 | 11.6 | 29.5 |

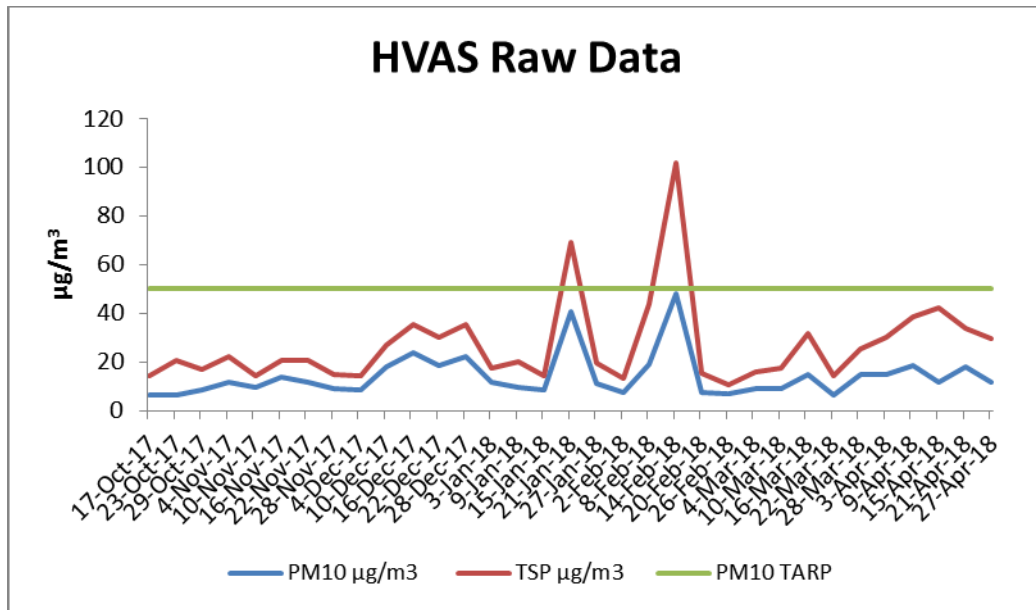


Figure 4. PM₁₀ and TSP raw data results

Annual rolling average results for both PM₁₀ and TSP are shown in Figure 5.

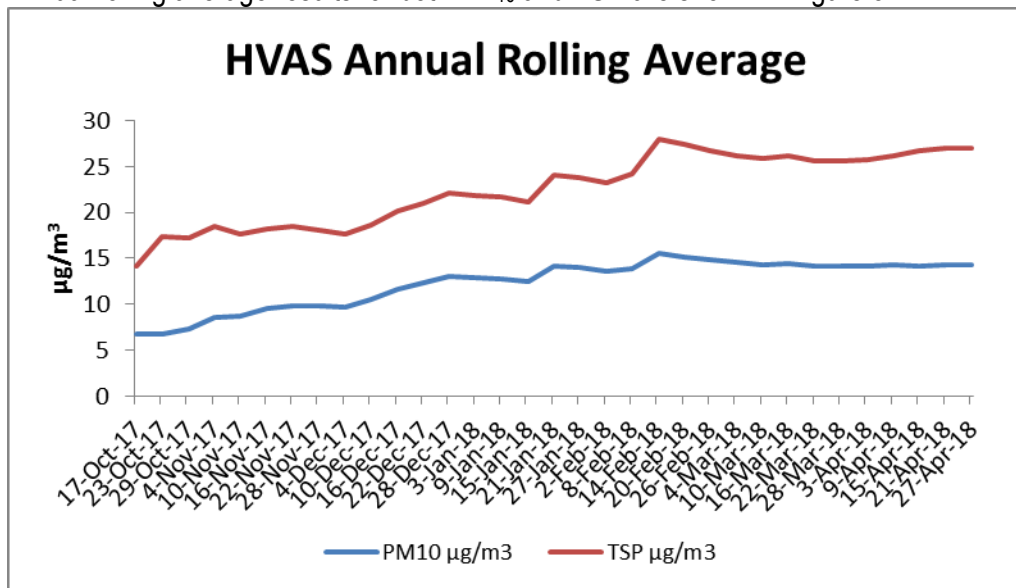


Figure 5. PM₁₀ and TSP annual rolling average results

Table 9. TSP and PM₁₀ limits

| Pollutant | Averaging Period | ^d Criterion |
|--|------------------|-----------------------------------|
| Total suspended particulate (TSP) matter | Annual | ^a 90 µg/m ³ |
| Particulate matter < 10 µm (PM ₁₀) | Annual | ^a 30 µg/m ³ |
| Particulate matter < 10 µm | 24 hour | ^a 50 µg/m ³ |

- ^a Total impact (i.e. Incremental increase in concentrations due to the project plus background concentrations due to all other sources).
- ^d Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fog, fire incidents or any other activity agreed by the Director-General.

Compliance summary:

The PM₁₀ and TSP results for 24 hour period are within the criteria set out in the PA.

The annual average emissions are within the criteria set out in the PA with the PM₁₀ annual average concentration up to 27 Apr 2018 of 14.26 µg/m³ and TSP of 27.06 µg/m³.

4. Noise Monitoring

The noise criteria to be met at any residence on privately owned land is contained in the project approval and described in Table 10.

The EPL requires that the premises must not emit noise exceeding an L_{Aeq} , 15 minute noise level of 35 dB(A) at any sensitive receivers during the operational phase. There are no specified limits covering the construction phase however the Interim Construction Noise Guideline allows for construction activities being undertaken during daytime to be 10 dB(A) above background.

The meteorological conditions to be met during noise monitoring include:

- a) Wind speeds up to 3 m/s at 10 m above ground level; or
- b) Temperature inversion conditions of up to 3°C/100m and wind speeds up to 2 m/s at 10m above ground level

Table 10. Noise criteria (dB(A))

| Receivers | Day/Evening/Night ($L_{Aeq}(15\text{minute})$) | Night ($L_{A1}(\text{max})$) |
|---------------------------|---|-----------------------------------|
| All residential receivers | 35 | 45 |

Attended noise surveys were carried out on 30 March 2018 at the three monitoring locations shown in Table 11. Daytime noise monitoring was undertaken between 9.00 am and 12.00pm.

Table 11. Monitoring locations for noise monitoring

| Monitoring location | Description |
|---------------------|--|
| NM1 | Pylara - Residence owned by Veolia |
| NM2 | Cowley Hills – Residence owned by Veolia |
| NM3 | Woodlawn – Residence owned by Veolia |

Attended noise measurements were undertaken using a calibrated Type 1, Castle Group Ltd dBAir environmental monitor. The noise monitor was run using two measurement profiles as follows:

- Measurement 1 – Frequency weighting A, time weighting F
- Measurement 2 – Frequency weighting C, time weighting F.

Real time meteorological conditions were obtained at each location using a BL-300 Anemo-thermometer and hygrometer and validated using the authorised Woodlawn on-site weather station. Readings were taken at the Pylara, Woodlawn and the Cowley Hills residences. All locations represent the nearest receptors and are owned by Veolia. The results show that the construction activities have little noise impact on any of the receptor locations.

Compliance statement: The construction program complies with the nominated construction noise guidelines.

5. Blasting

Airblast overpressure and the ground vibration level are required to be monitored for all blasts undertaken during operations. EPL and Project Approval limits at any residence on privately owned land are detailed in Table 12.

Table 12. EPL & Project Approval limits for airblast and ground vibration

| Time of blasting | Airblast overpressure (dB(Lin Peak)) | Ground vibration (mm/s) | Allowable exceedance |
|---|--------------------------------------|-------------------------|---|
| Any time | 120 | 10 | 0% |
| Day | 115 | 5 | 5% of the total number of blasts over a period of 12 months |
| Evening | - | 2 | 5% of the total number of blasts over a period of 12 months |
| Night, and all day on Sundays and public holidays | - | 1 | 0% |

The first blasting operation was carried out on 20 April 2018. This was a test blast. The second operation was carried out on 24 April 2018. Four blast monitors were set up to monitor the blast events. The monitors were located at the following sites:

- Mine High wall
- Mechanical Biological Treatment facility (MBT)
- Pylara homestead
- SW SML boundary

Blast results for each monitoring location are detailed in Table 13.

Table 13. Blast Monitoring Results

| Date | Time | Monitor Location | Airblast overpressure (dB(Lin Peak)) | Ground vibration (mm/s) |
|---------|-----------|------------------|--------------------------------------|-------------------------|
| 20/4/18 | 16.52 hrs | Mine High wall | 101 | 1.25 |
| 20/4/18 | 16.52 hrs | MBT | Nil | Nil trigger |
| 20/4/18 | 16.52 hrs | Pylara Homestead | Nil | Nil trigger |
| 20/4/18 | 16.52 hrs | SW Boundary | Nil | Nil trigger |
| 24/4/18 | 16.52 hrs | Mine High Wall | 115.1 | 2.3 |
| 24/4/18 | 16.52 | MBT | 106.0 | 0.58 |
| 24/4/18 | 16.52 hrs | Pylara Homestead | Nil | Nil trigger |
| 24/4/18 | 16.52 hrs | SW Boundary | Nil | Nil trigger |

Compliance statement: Airblast overpressure and ground vibration monitoring results during the two surface blasting operations were recorded below the project limits.

6. Complaints

No complaints occurred during the reporting period.

Table 14. Complaints register

| Date and time | Complainant | Nature of complaint | Recorded by | Corrective action | Date closed |
|----------------------|--------------------|----------------------------|--------------------|--------------------------|--------------------|
| | | | | | |

Appendix A – Historical deposition dust record

| Date sampled | DG22 | DG24 | DG28 | DG33 |
|--------------|------|------|------|------|
| Jan 2015 | 1.6 | 3.4 | 1.9 | |
| Feb 2015 | 0.4 | 4.4 | 13.9 | |
| Mar 2015 | 1.0 | 2.9 | 4.1 | |
| Apr 2015 | 0.9 | 4.2 | 7.7 | |
| May 2015 | 0.8 | 1.1 | 3.4 | |
| Jun 2015 | 3.5 | 8.1 | 6.8 | |
| Jul 2015 | 1.0 | 0.7 | 5.8 | |
| Aug 2015 | 0.9 | 2.2 | 1.4 | |
| Sep- 2015 | 1.5 | 2.0 | 1.3 | |
| Oct 2015 | 1.7 | 5.4 | 1.8 | |
| Nov 2015 | 2.1 | 5.5 | 5.7 | |
| Dec 2015 | 0.9 | 5.8 | 0.6 | 0.8 |
| Jan 2016 | 3.4 | 10 | 1.3 | 0.9 |
| Feb 2016 | 0.9 | 4.5 | 0.4 | 0.7 |
| Mar 2016 | 1.8 | 11 | 2.4 | 2.0 |
| Apr 2016 | 1.5 | 8.5 | 0.7 | 0.5 |
| May 2016 | 1.8 | 6.2 | 0.7 | 0.2 |
| Jun 2016 | 7.6 | 1.2 | 2.5 | 0.4 |
| Jul 2016 | 1.2 | 0.3 | 23 | 1.2 |
| Aug 2016 | 1.1 | 0.6 | 1.9 | 0.2 |
| Sep 2016 | 1.0 | 1.2 | 6.0 | 0.3 |
| Oct 2016 | 0.9 | 2.0 | 3.2 | 0.6 |
| Nov 2016 | 1.9 | 2.2 | 2.6 | 1.2 |
| Dec 2016 | 4.7 | 1.1 | 1.7 | 1.0 |
| Jan 2017 | 2.2 | 2.3 | 4.7 | 0.6 |
| Feb 2017 | 2.7 | 2.0 | 1.1 | 0.8 |
| Mar 2017 | 1.4 | 0.9 | 3.9 | 0.4 |
| Apr 2017 | 4.2 | 0.9 | 0.09 | 0.3 |