Northparkes Mines

Environmental Monitoring Results Summary

01 January to 31 March, Quarter 1, 2016

Name of Mine	Northparkes Mines
Name of Leaseholder and Mine Operator	CMOC Mining Pty Ltd
Mining Leases	ML 1247, ML 1367 and 1641
Environment Protection Licence	EPL 4784
Development Consent	PA11-0060, (Mod 1& Mod 2)

Reviewed by	**Michael Priest**
Title	Superintendent - Environment & Farming
Date	16/5/16
Signature	
Approved by	**Rebecca Stevenson**
Title	A/Manager – People, Safety and Environment
Date	16/5/16
Signature	

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Introduction

A summary of Northparkes mines operations, setting and localised weather conditions experienced during the reporting quarter.

1. INTRODUCTION

The Northparkes copper-gold mine (NPM) is located in central western New South Wales, approximately 27 kilometres north north-west of the town of Parkes. NPM consists of underground operations accessing several copper sulphide porphyry ore bodies. The mined rock is processed onsite using conventional crushing, semi-autogenous grinding and flotation circuits to obtain copper concentrate. The concentrate is then thickened, filtered and stockpiled ready to be transported from site by road train to nearby Goonumbla rail siding. From there, it is railed to Port Kembla for shipping to overseas customers.

1.1 Regulatory context

During October 2009, the New South Wales Minister for Planning approved NPM's proposal for an extension to the existing underground operations. This approved extension was subject to specific environmental conditions stipulated in the new Project Approval PA11_0060 and previous Development Consent (DC 06-0026) which has since undergone two Modifications. One of the condition in the new Project Approval requires the preparation and implementation of an environmental monitoring program, to the satisfaction of the Director-General. In July 2014, NPM had its new Environmental Approval (11_0060) signed by the Director General and in June 2015, NPM received approval for Sub Level Caving mining and the Project Approval PA11-0060 was changed into PA11_0060 MOD 1.

In April 2016, approval was granted for PA11_0060 Mod 2 to incorporate work proposed under MLA514 including the Caloola ponds.

1.2 Scope of report

This report provides a summary of monitoring results for the period from 1 January 2016 to 31 March 2016. This monitoring is undertaken in accordance with the Environmental Monitoring Program (available at www.northparkes.com.au).

Details of air quality, noise and water monitoring locations are available in the Environmental Monitoring Program.

2. WEATHER CONDITIONS

NPM is located in a temperate weather zone. Weather conditions are recorded at an onsite weather station, as required in PA11_0060. A summary of the weather conditions experienced during the reporting quarter are provided in Table 1 and Figures 1, 2 and 3.

Table 1 Summary of weather conditions for the reporting quarter

	January	February	March
Total rainfall (mm)	110.5	0.4	19
Long term average rainfall (mm)*	54.2	48.6	25.4
Total number of wet days	8	1	9
Minimum temperature (°C)	13.7	11.5	8.7
Maximum temperature (°C)	44.2	42.4	38.7

*Long term average data sources from www.weatherzone.com.au
All other weather conditions data sourced from Northparkes Mines weather station

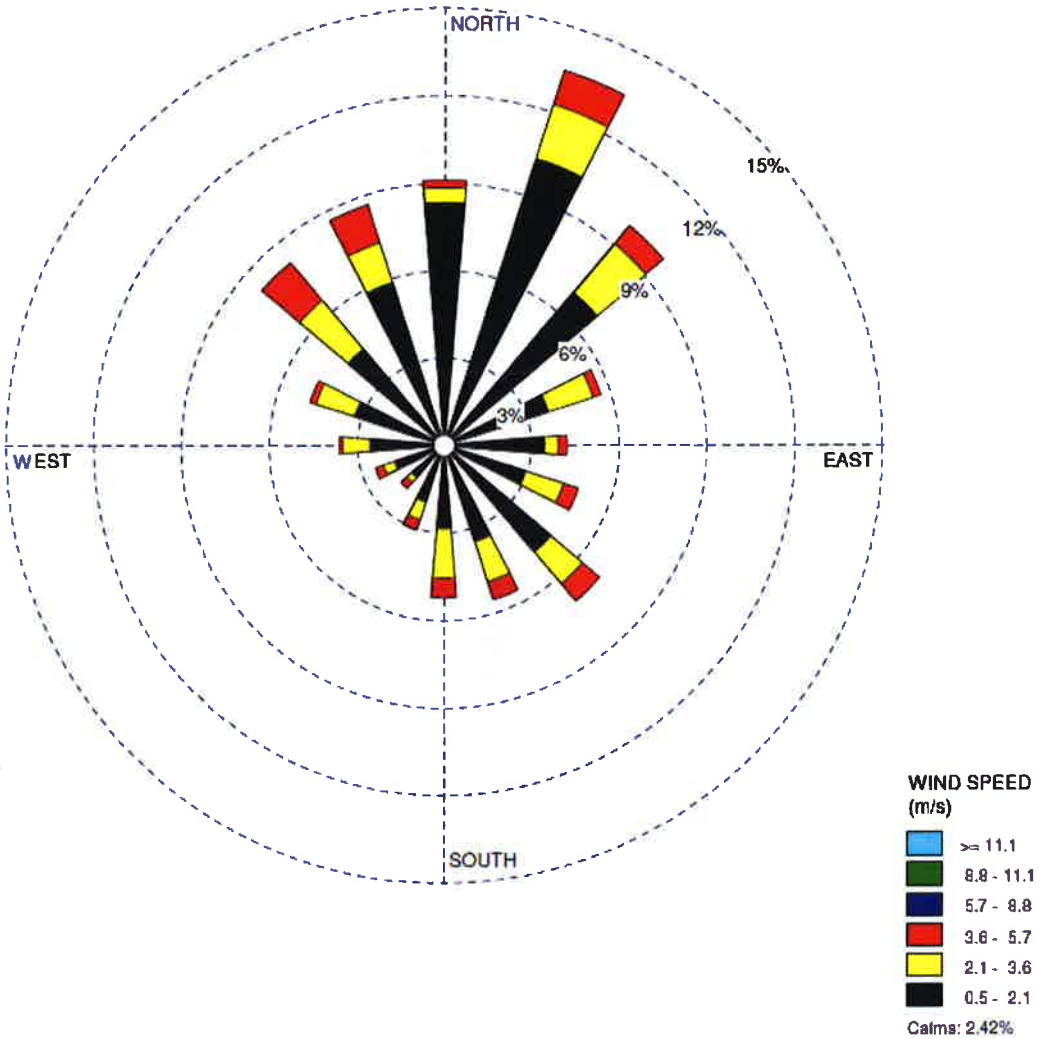


Figure 1 Wind direction and speed for the month of January 2016

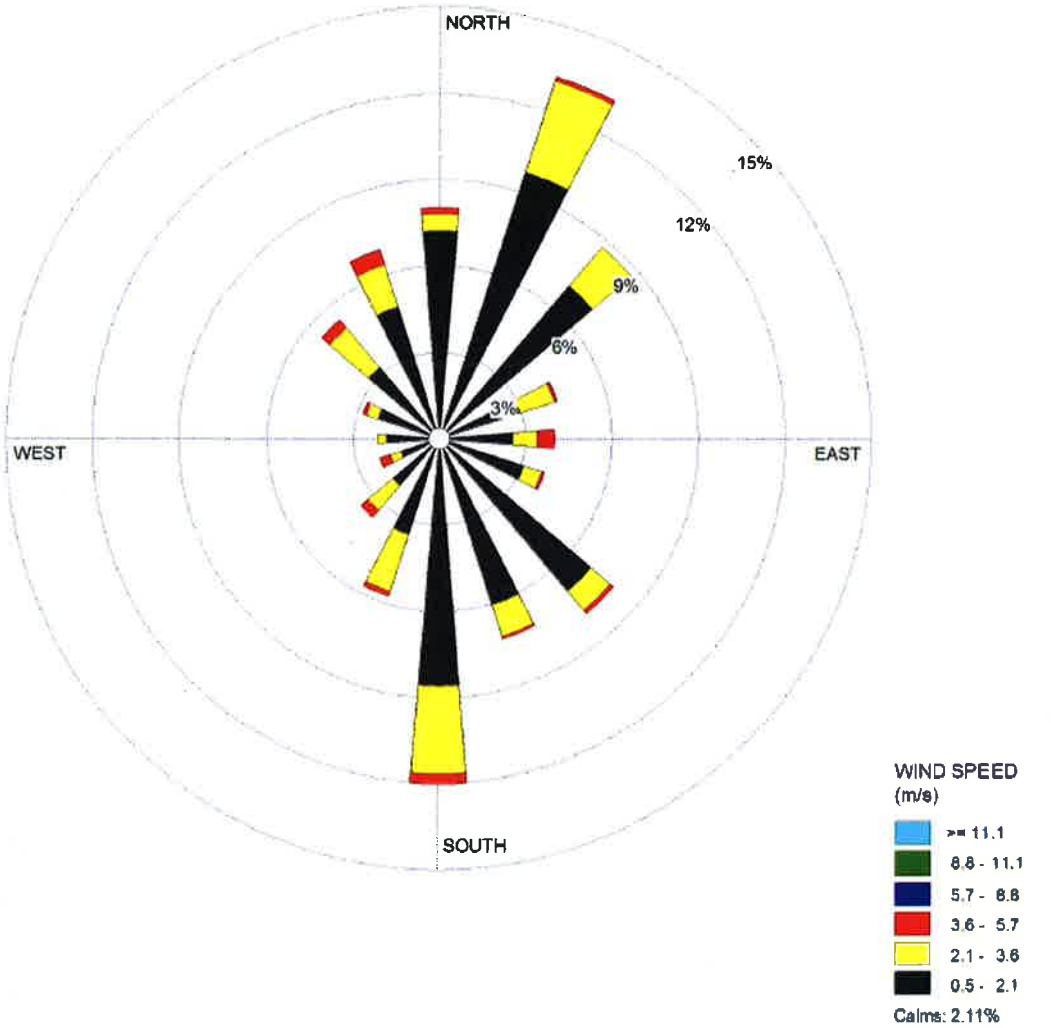


Figure 2 Wind direction and speed for the month of February 2016

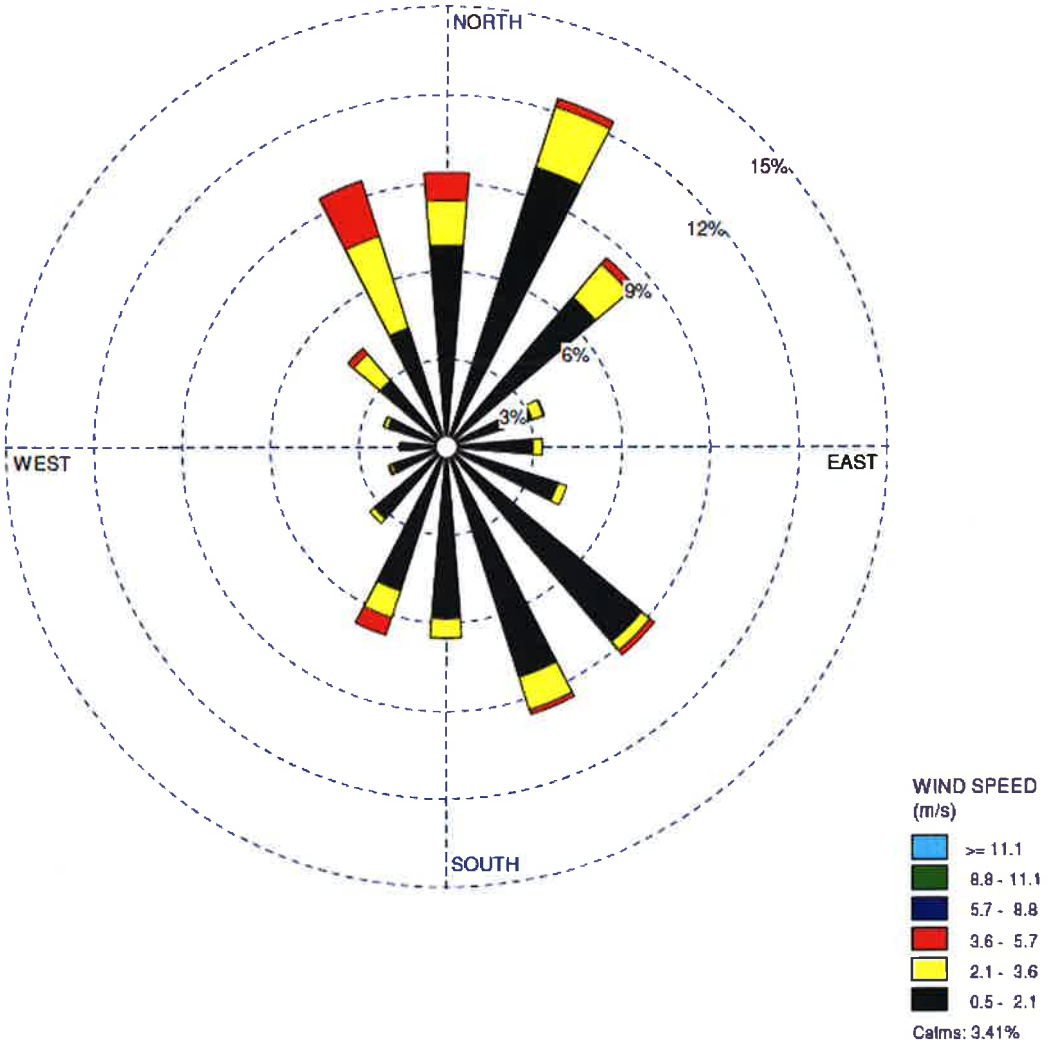


Figure 3 Wind direction and speed for the month of March 2016

Air quality

The air quality monitoring program utilises PM_{10} (beta attenuated monitors), TSP's (high volume air samplers (HVAS)) and depositional dust gauges. Monitoring locations are strategically positioned around the mine lease and neighbouring properties.

1. PARTICULATE MATTER

Fine dust particles, up to 10 microns in diameter, are measured as PM_{10}. This particulate matter is monitored using continuous, carbon-14, beta-attenuation monitors (BAMs), which are fitted with a size selective inlet. Each BAM station operates continuously, in accordance with *Australian Standard 3580.9.11:2008, PM_{10} continuous direct mass method using Beta Attenuation Measurement*. This method is set to measure time-integrated mean particle concentrations for 10 min period. These measurements are subsequently averaged over a 24-hour period, to provide a 24h-average PM_{10} concentration. PM_{10} dust particles can be sourced from a range of mining and non-mining activities and are typically formed by mechanical disruption with a lifetime that can range from minutes to hours and travel times varying from <1km to up to 10km.

Total suspended particulate matter (TSP), is measured using a high volume sampler (Hi-Vol), which samples for 24 hours every 6-days. Monitoring is conducted in accordance with AS/NZS 3580.9.3:2003 – *Methods for sampling and analysis of ambient air Method 9.3: Determination of suspended particulate matter—Total suspended particulate matter (TSP) — High volume sampler gravimetric* method. TSP generally includes particles with an equivalent aerodynamic diameter (EAD) of less than 50 µm and can include particles generated from burning of vegetation, industrial/mining processes, combustion and natural causes.

1.1 Overview

TSP and PM_{10} monitoring has been undertaken at three nearby farm residences Hubberstone, Milpose and Hillview. Results were obtained using both Hi-Volume samplers and Real-Time Beta Attenuated Monitors. Summaries of the monitoring results are provided below.

1.2 Quarterly monitoring analysis

All PM10 monitoring data collected during this reporting period was sampled using real-time beta-attenuation monitoring units. There were no exceedances under the PM10 criterion that were recorded during the reporting period at all three locations.

The PM_{10} monitor did not run for seven days (29/01/2016 to 4/02/2016) at Milpose during the reporting period, due to power issues that have occurred at this residence. At present, NPM is considering a process of relaying a new electricity source to the monitoring unit to eliminate power outrage in the future. The indicative annual average was below the annual average criterion at all locations during the reporting period except Hillview, which recorded 53.21 ug/m3 on 15 January 2016. This reading exceeded the 24 hr limits, With an investigation undertaken to determine the likely cause, which concluded the high readings were due to farming activities in the vicinity. For more information on PM_{10} results for the reporting period, refer to

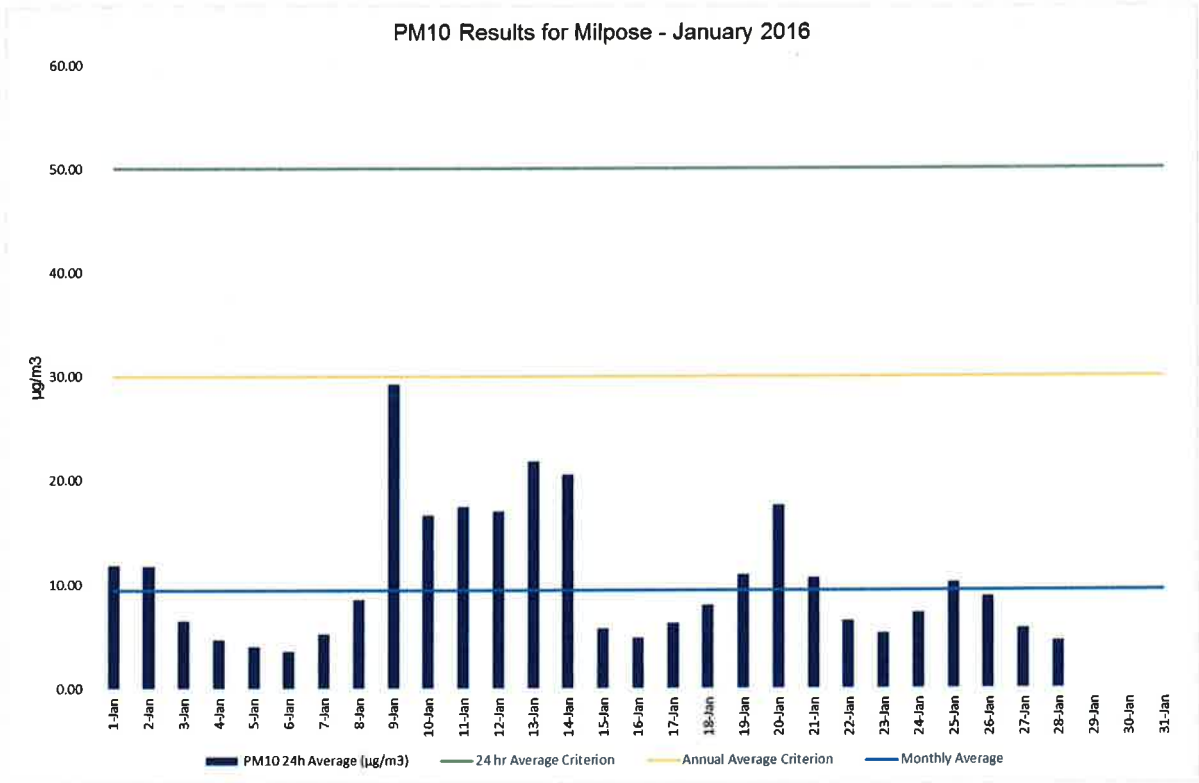


Figure 5 -

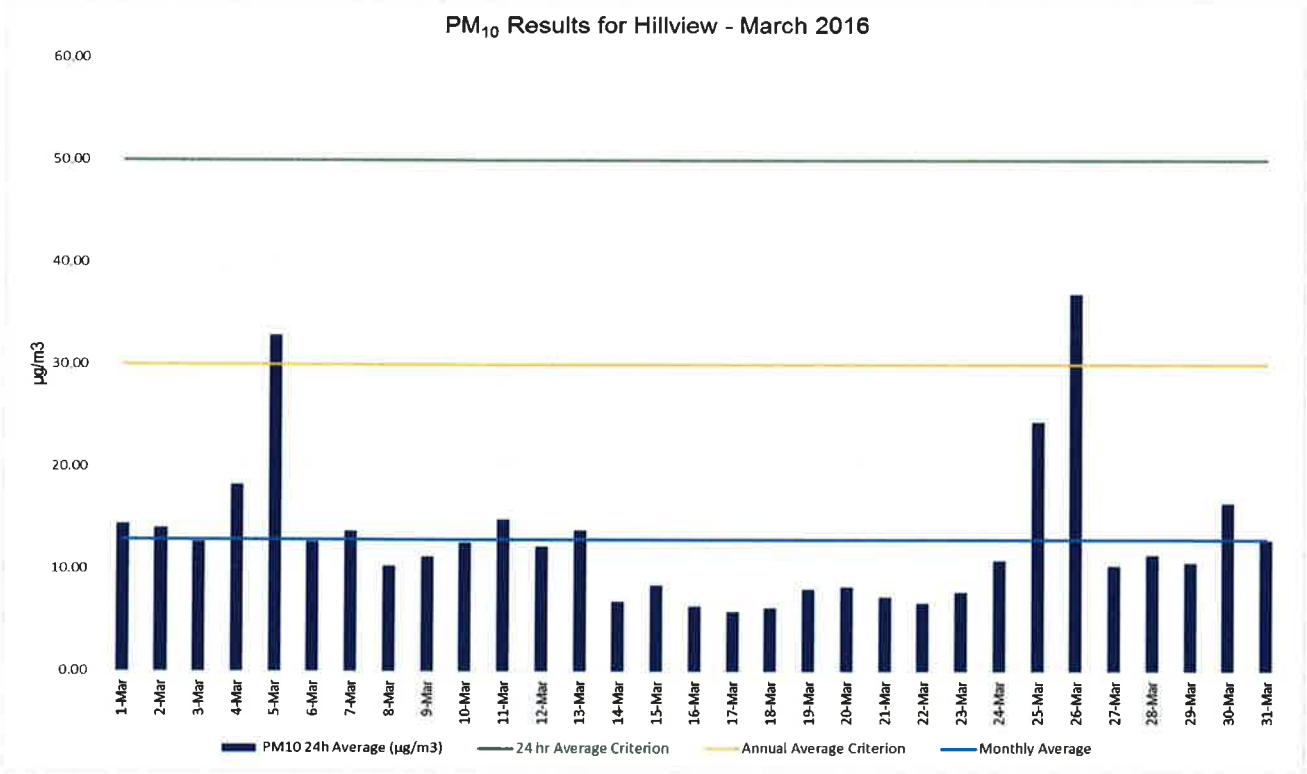


Figure 13.

TSP monitoring commenced on 7th March 2015 (Q1), to align with the beginning of the Rosedale Tailings Project. Consistent with the TSP results from Q1, TSP data shows that levels are well below the annual average criterion across all locations. For more information on TSP results for the reporting period, refer to Figure 14 - Figure 16.

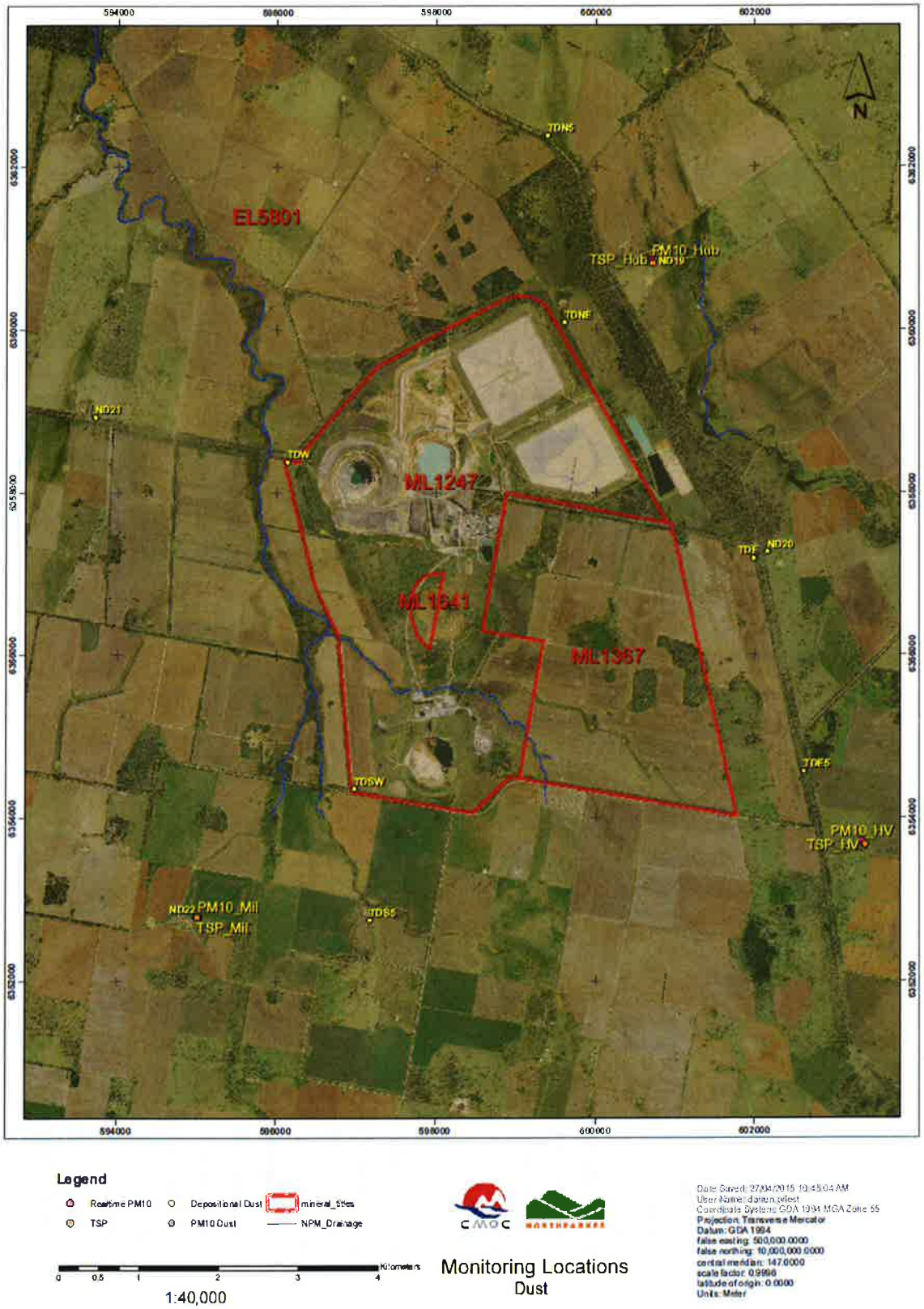


Figure 4 NPM Air Quality Monitoring Location (TSP, PM_{10} and Depositional Dust)

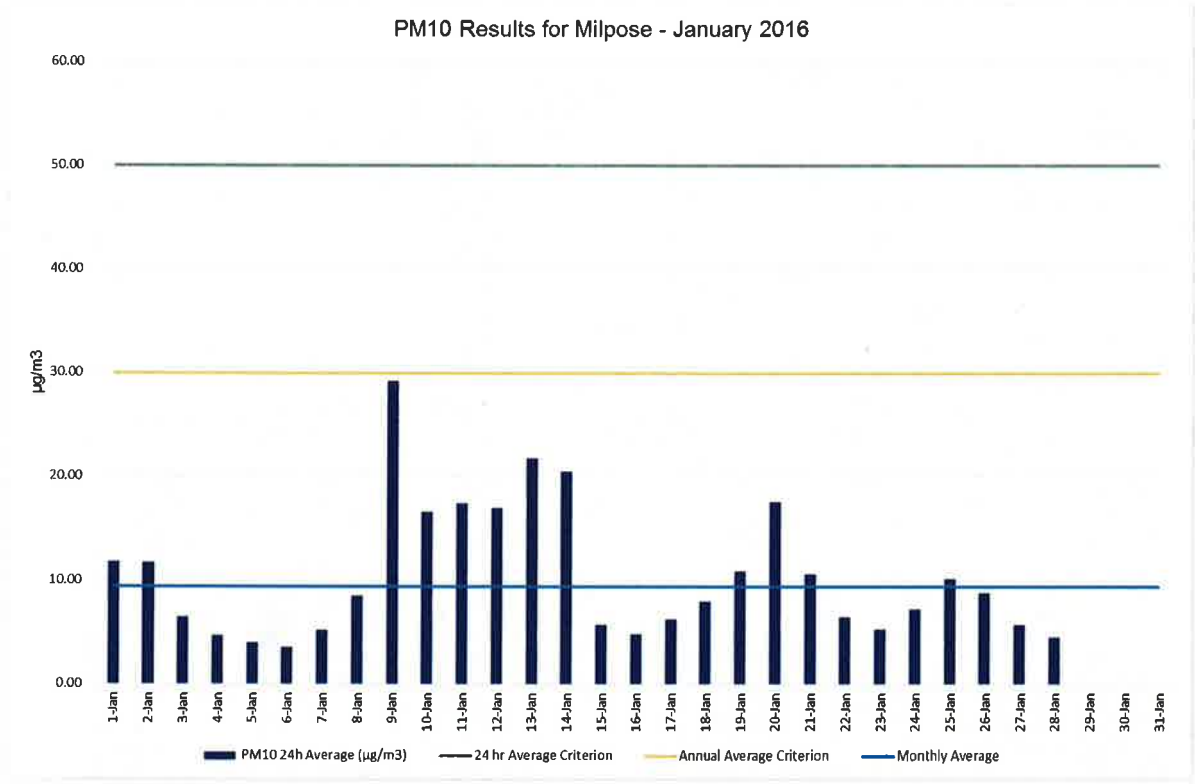


Figure 5 PM_{10} results for Milpose residence for January 2016

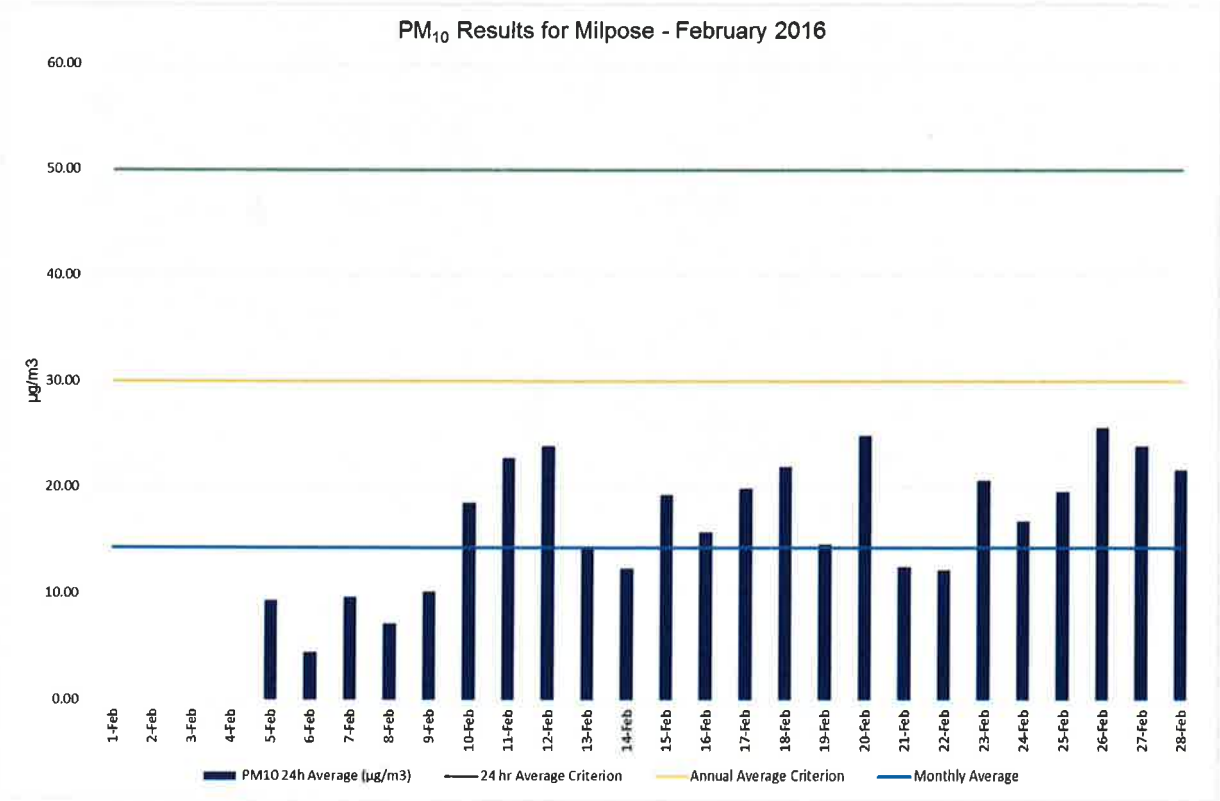


Figure 6 PM_{10} results for Milpose residence for February 2016

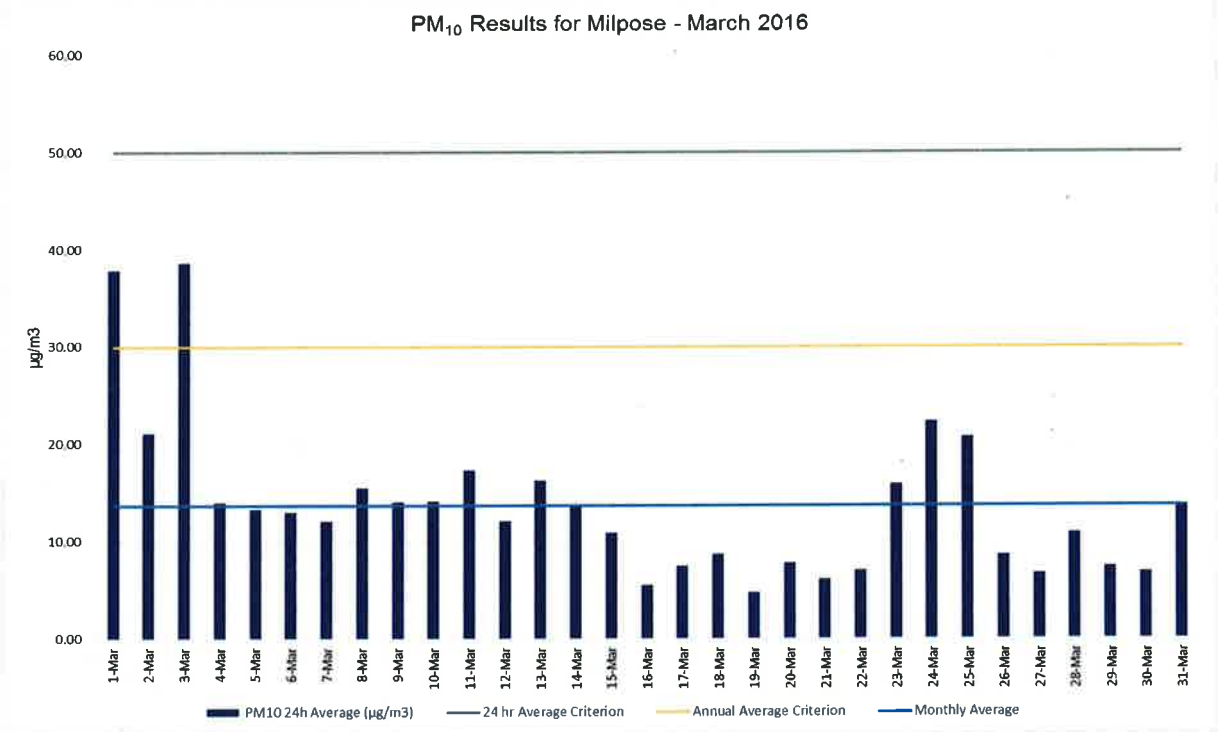


Figure 7 PM_{10} results for Milpose residence for March 2016

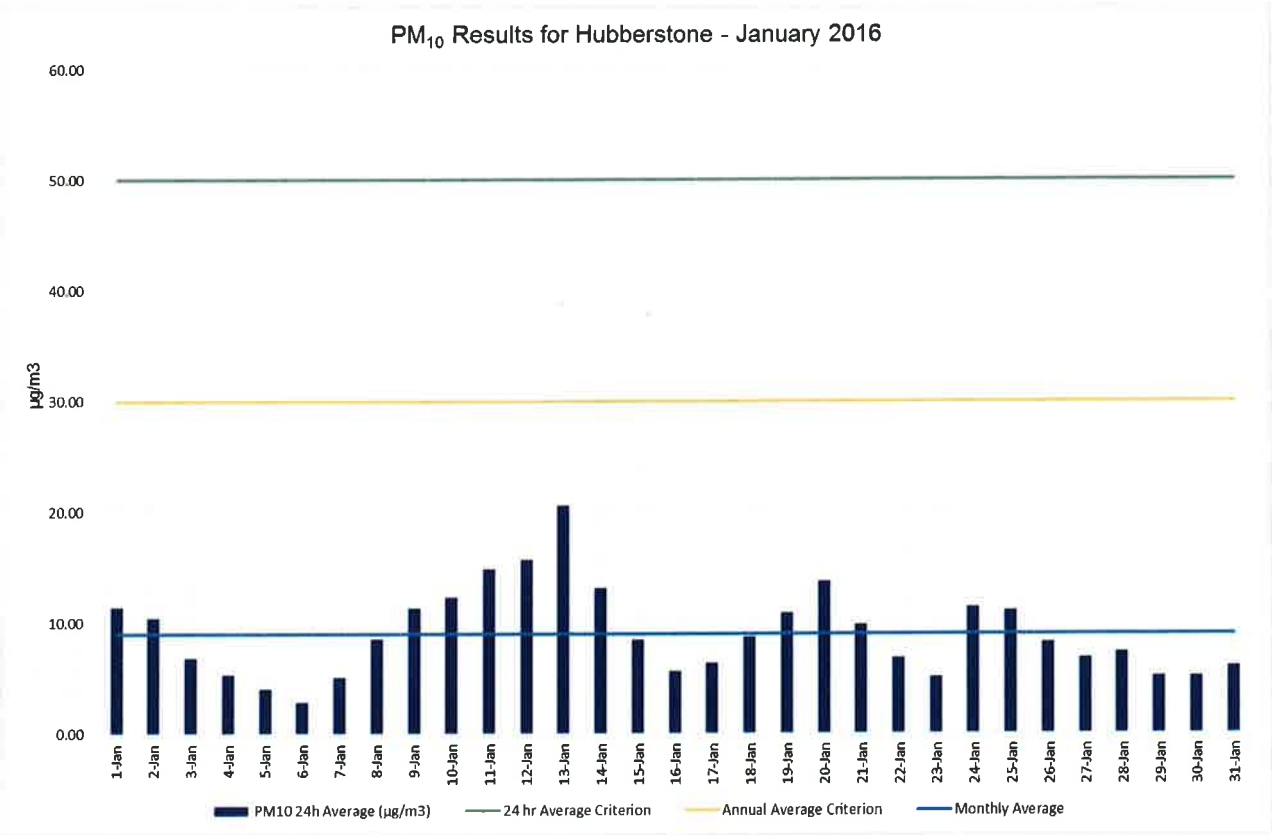


Figure 8 PM_{10} results for Hubberstone residence for January 2016

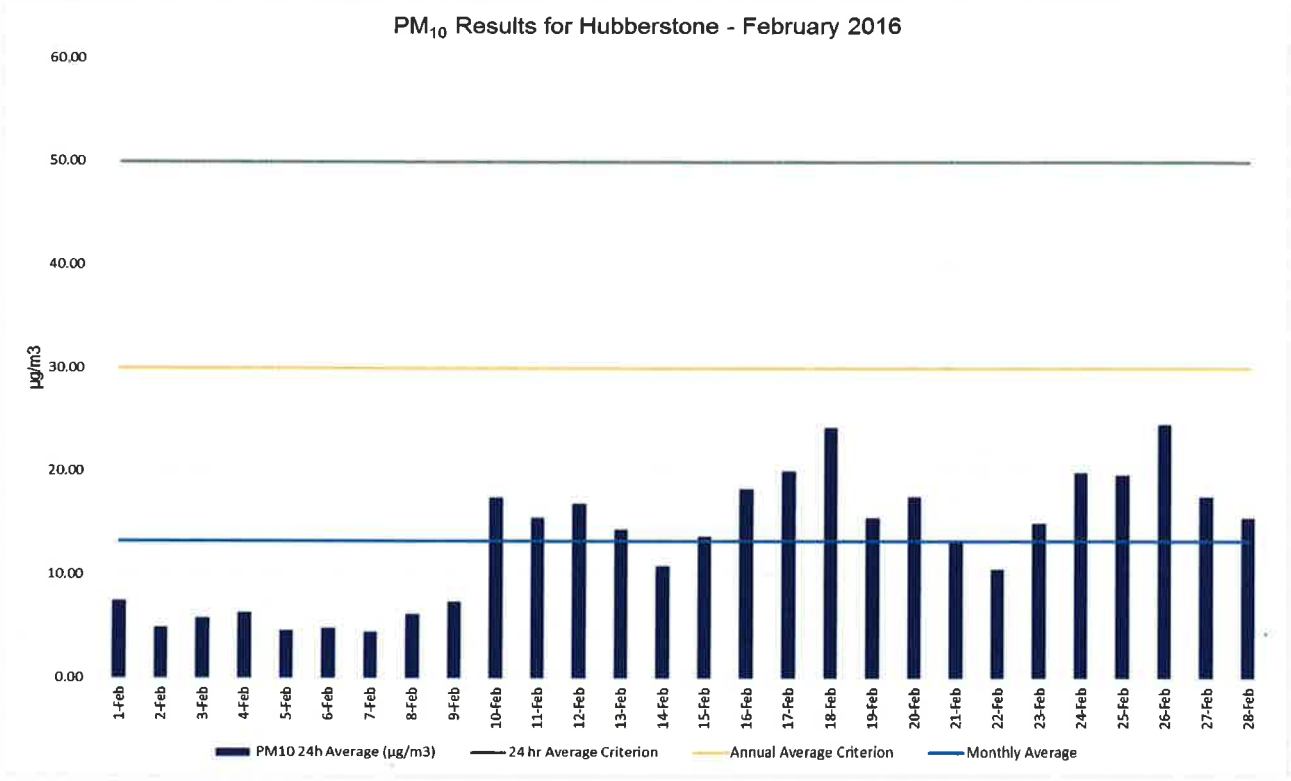


Figure 9 PM_{10} results for Hubberstone residence for February 2016

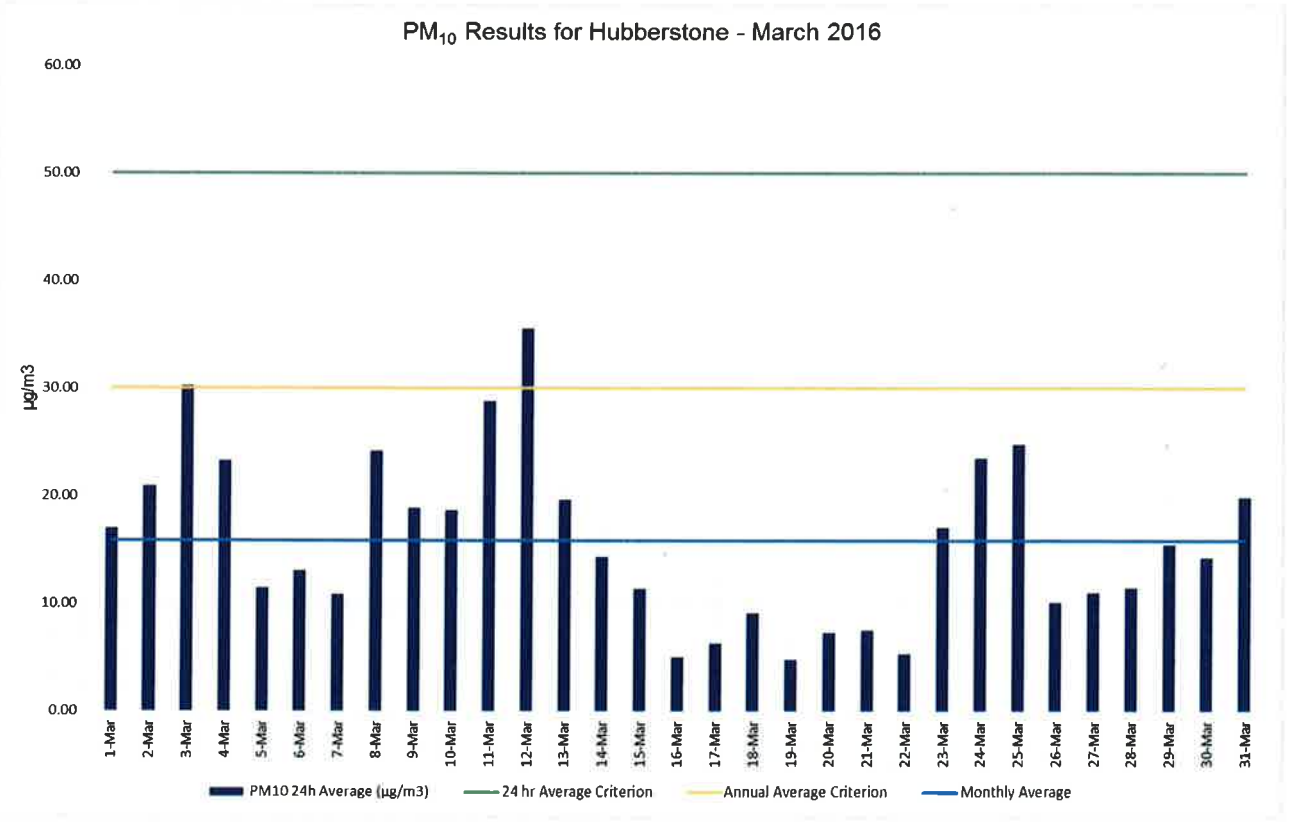


Figure 10 PM_{10} results for Hubberstone residence for March 2016

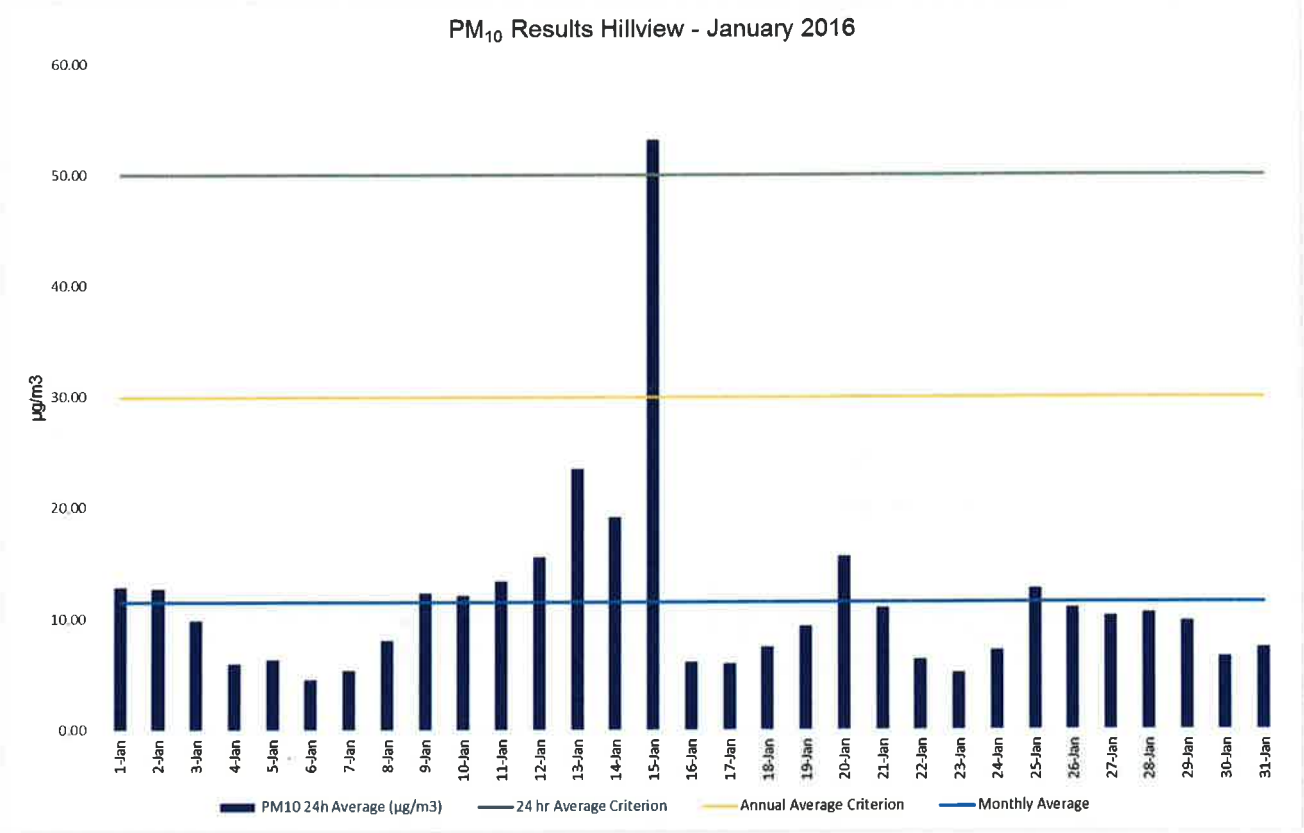


Figure 11 PM_{10} results for Hillview residence for January 2016

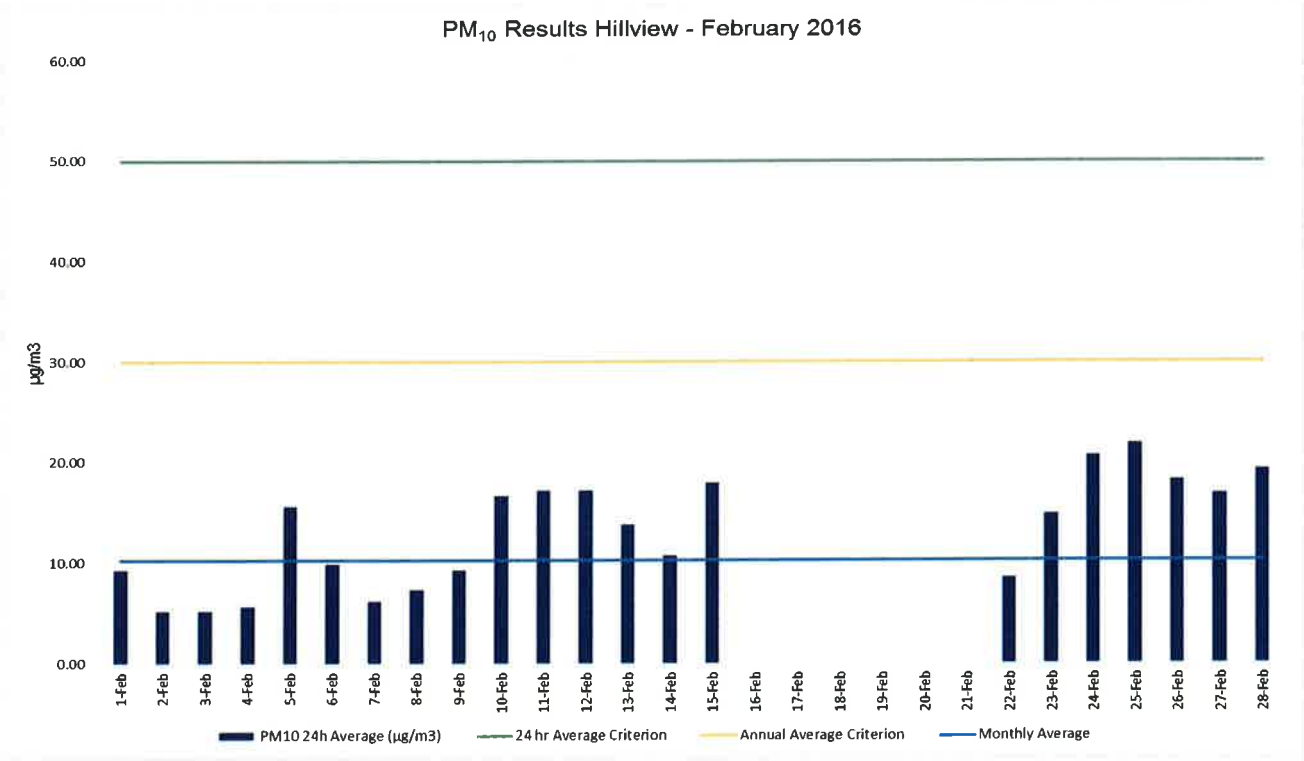


Figure 12 PM_{10} results for Hillview residence for February 2016

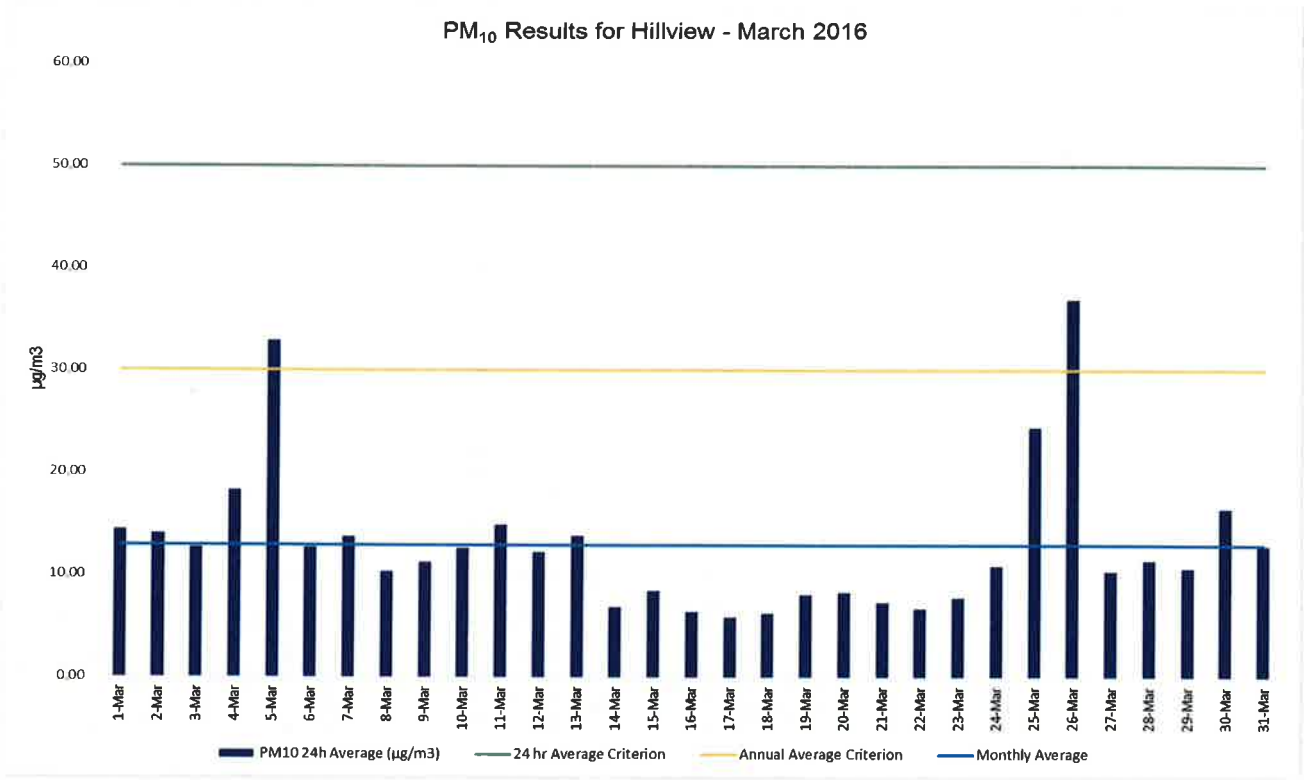


Figure 13 PM_{10} results for Hillview residence for March 2016

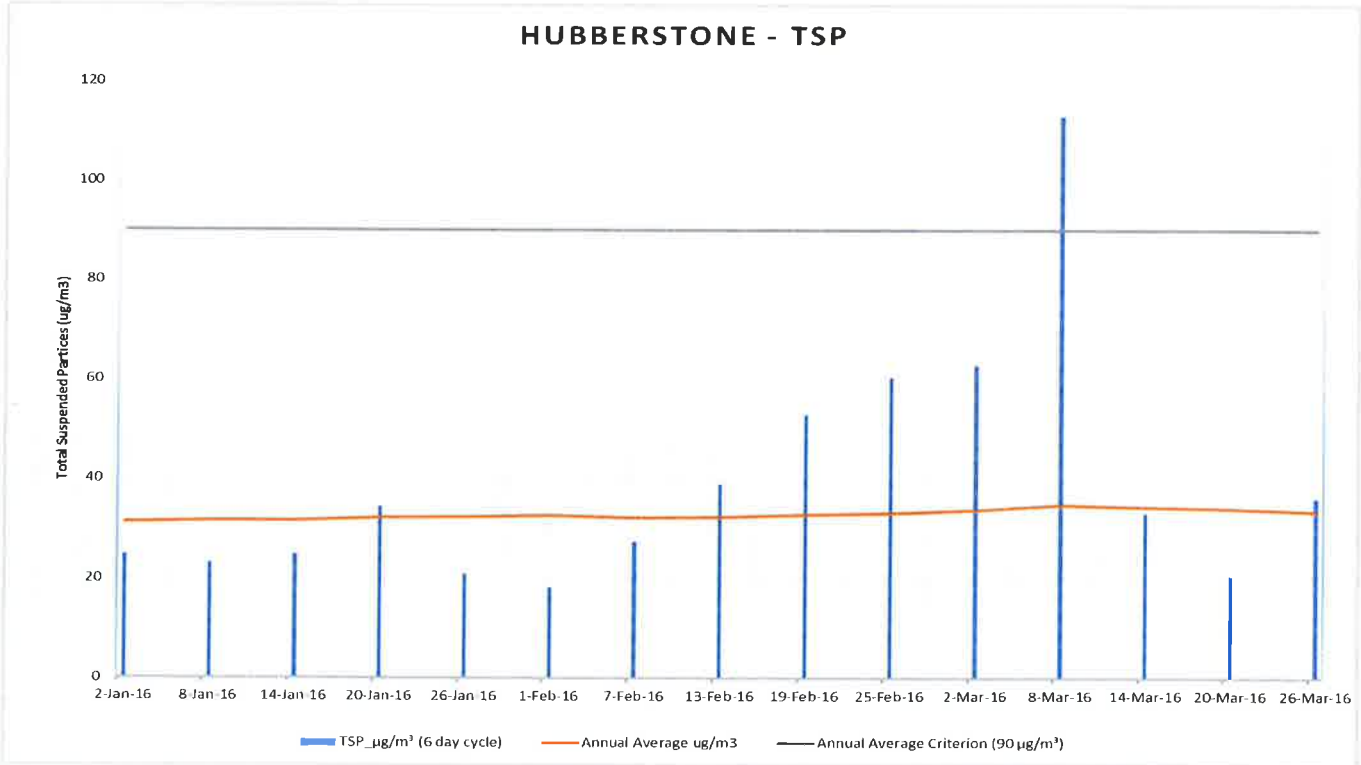


Figure 14 TSP results for Hubberstone for Q1 2016

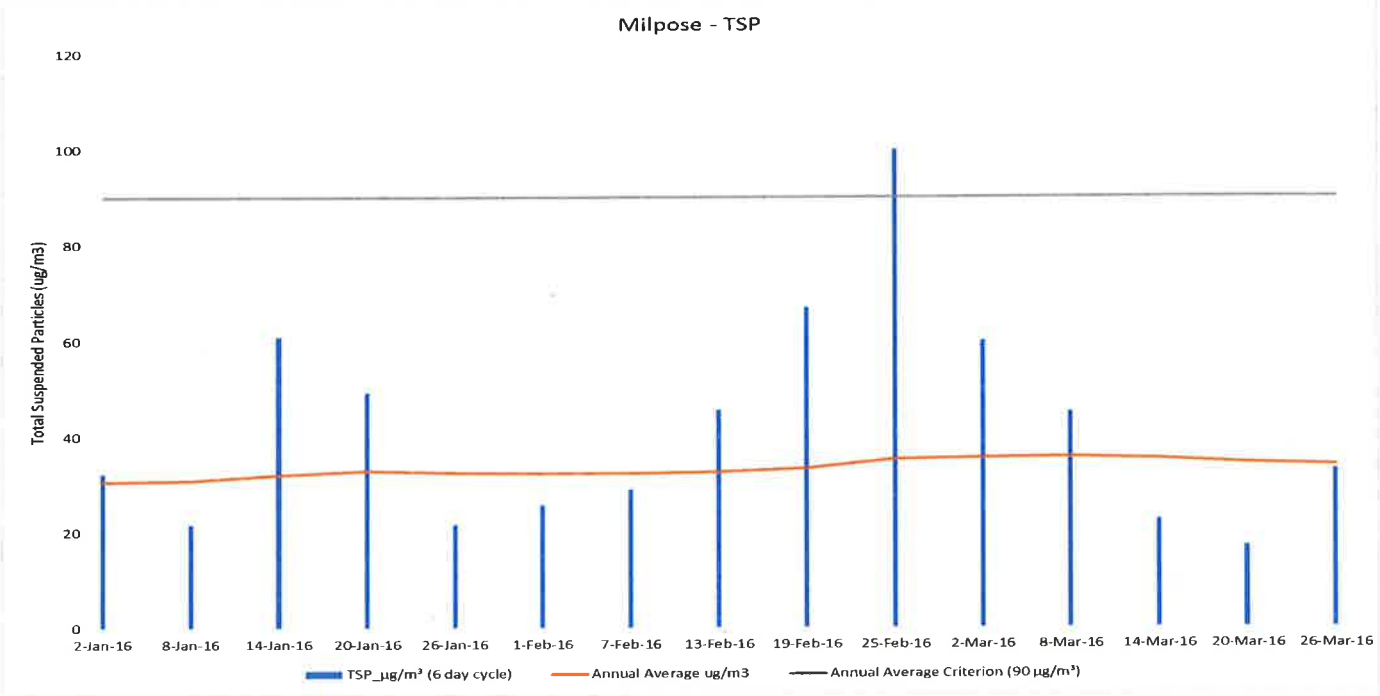


Figure 15 TSP results for Milpose residence for Q1 2016

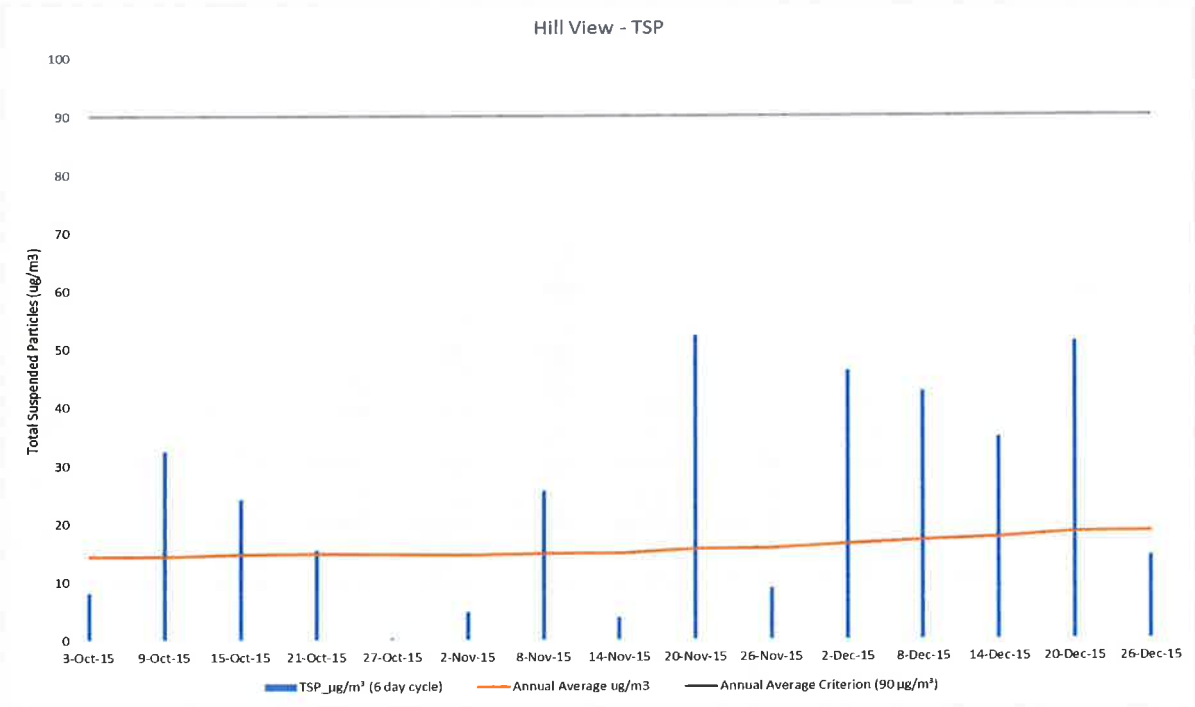


Figure 16 TSP results for Hill-View residence for Q1 2016

2. DEPOSITIONAL DUST

Depositional dust gauges record the total of deposited dust for a month long period and are a useful measure of broad scale changes to the local air quality. They are influenced by mining and non-mining related activities restricted to the localised area.

2.1 Overview

Eleven depositional dust gauges are located across the mining lease and neighbouring residential properties to monitor fallen dust in a monthly period. For a summary of the monthly monitoring results for Q1 2016 at each monitoring location, refer to Figure 17 - Figure 19.

2.2 Quarterly monitoring analysis

There were no depositional monitoring results that exceeded the trigger levels in Q1 2016 monitoring period and were well under the required criteria.

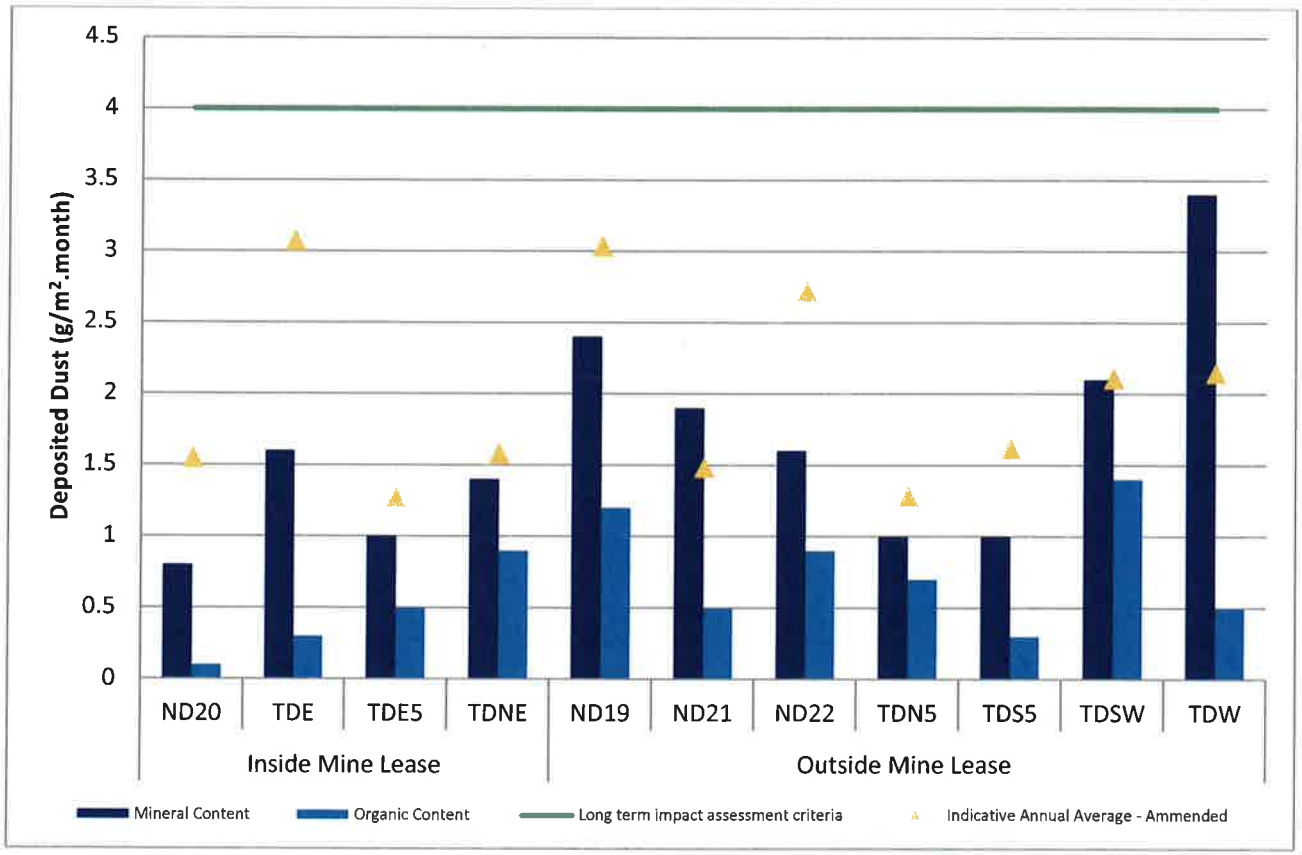


Figure 17 Depositional dust monitoring results for January 2016

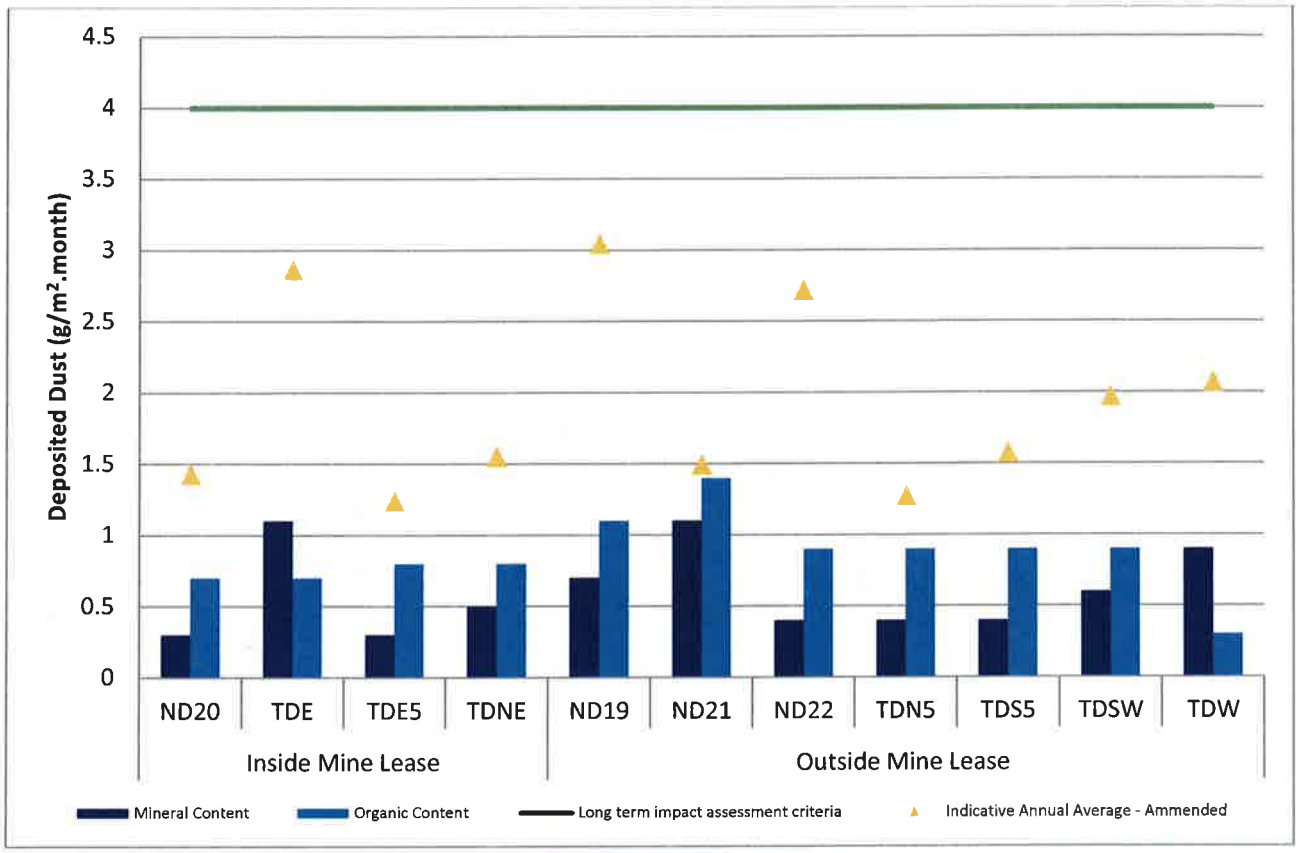


Figure 18 Depositional dust monitoring results for February 2016

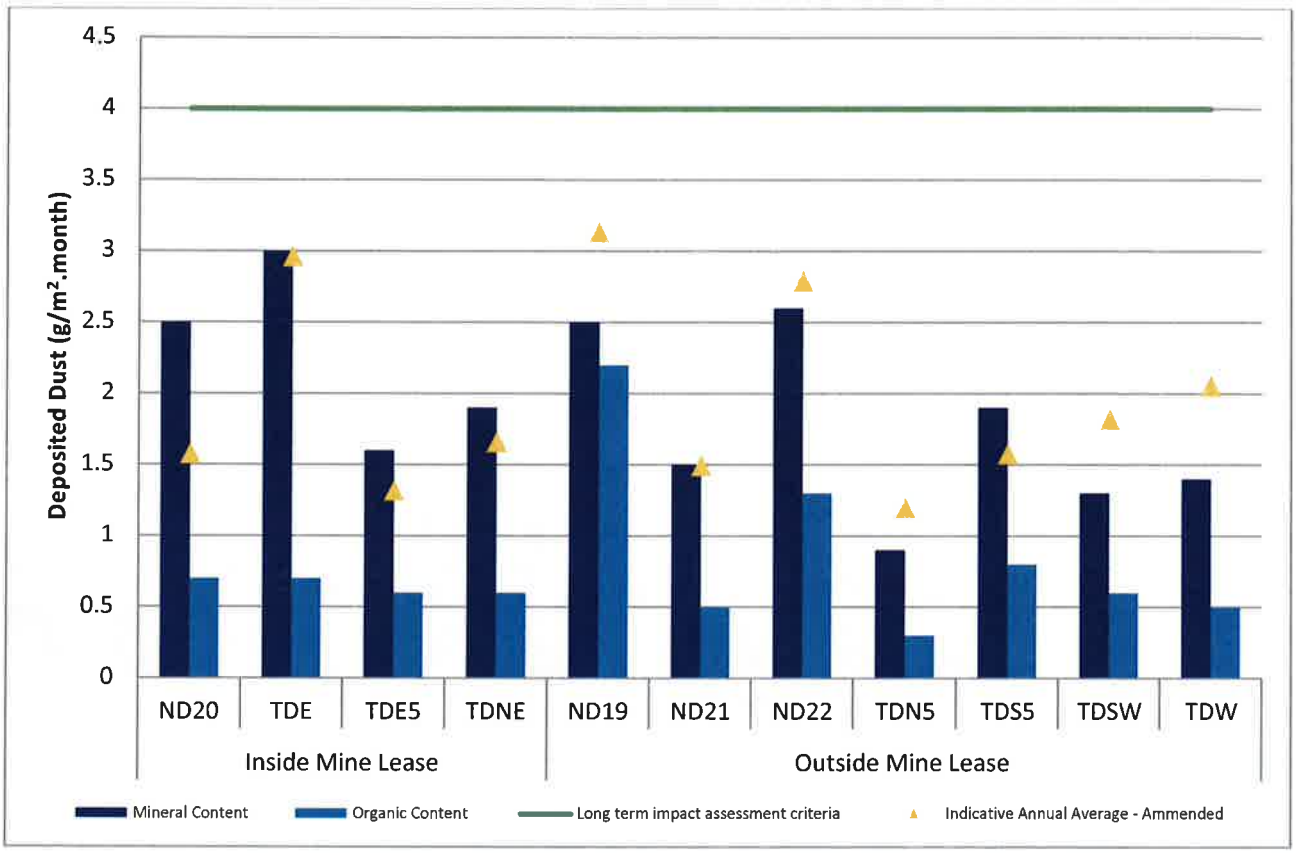


Figure 19 Depositional dust monitoring for March 2016

Water

Surface water and groundwater resources are monitored for quality and quantity. All water samples are analysed at an independent National Association of Testing Authorities (NATA) accredited laboratory.

1. SURFACE WATER

The surface water monitoring program consists of water quality sampling of various surface water courses and drainage system locations on and off the mine lease.

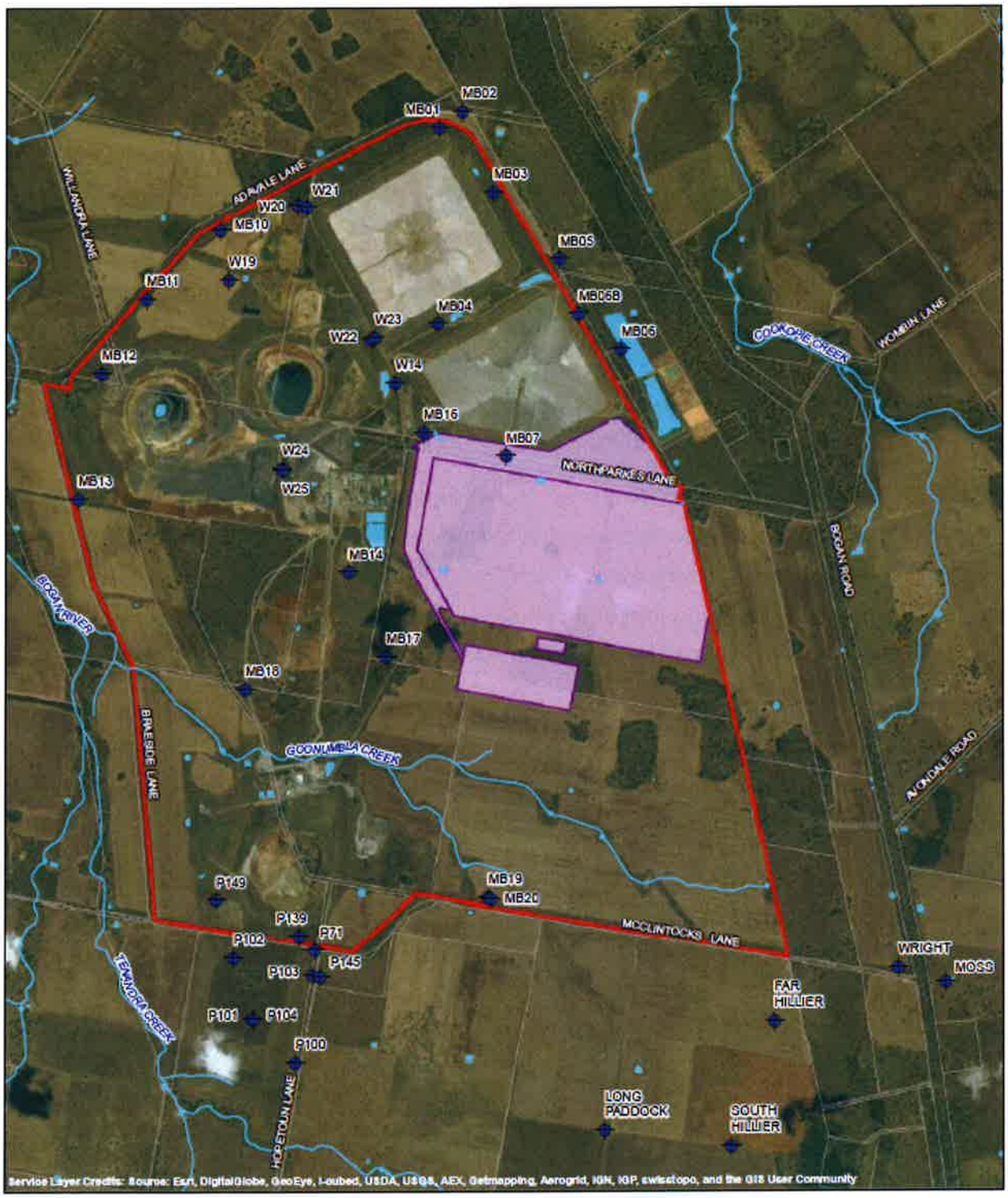
Water recycled from ore processing activities, in addition to surface water captured on the mine lease, forms the process water system. This is a closed system, which is monitored for internal purposes and not summarised in this report.

1.1 Overview

Water monitoring occurs routinely on a quarterly basis or after significant rainfall events that result in natural water flow through monitoring site(s). NPM is a zero process water discharge operation and impact to nearby water courses is not expected.

Monitoring results are assessed and interpreted utilising historical trend analysis and internal water quality criteria and trigger levels to identify potential changes.

Figure 20 NPM Surface Water Monitoring Locations



LEGEND

- Site Boundary
- Tailings Footprint
- Cadastre
- Waterway
- Waterbody
- Groundwater Monitoring Bore

Figure 21 NPM Groundwater Monitoring Locations

1.2 Quarterly monitoring analysis

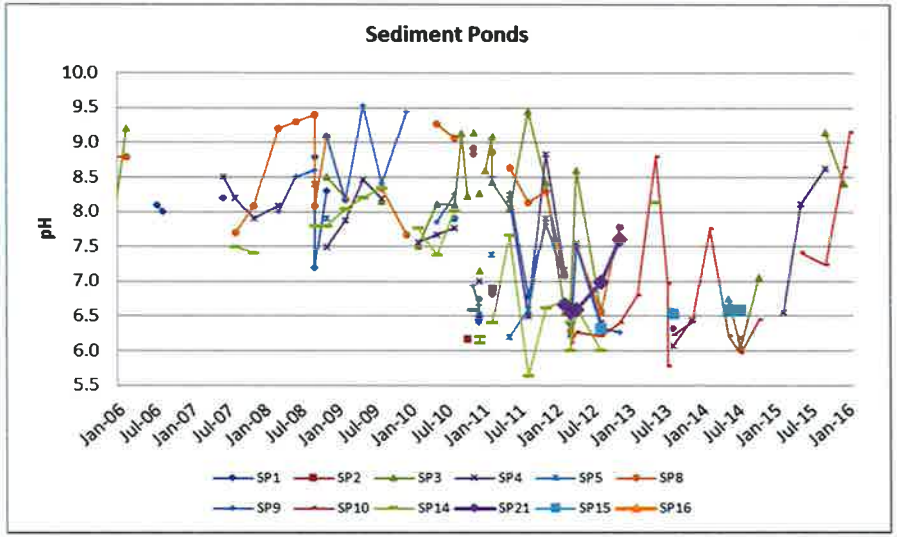
Water quality of onsite sediment ponds are presented in **Error! Reference source not found.**. Dry conditions during the reporting period meant the majority of the sediment ponds were dry or at levels below 10%, which resulted one sediment pond SP10 was monitored for the period. There was an increase in pH and EC but the copper concentrations reduced from last monitoring period.

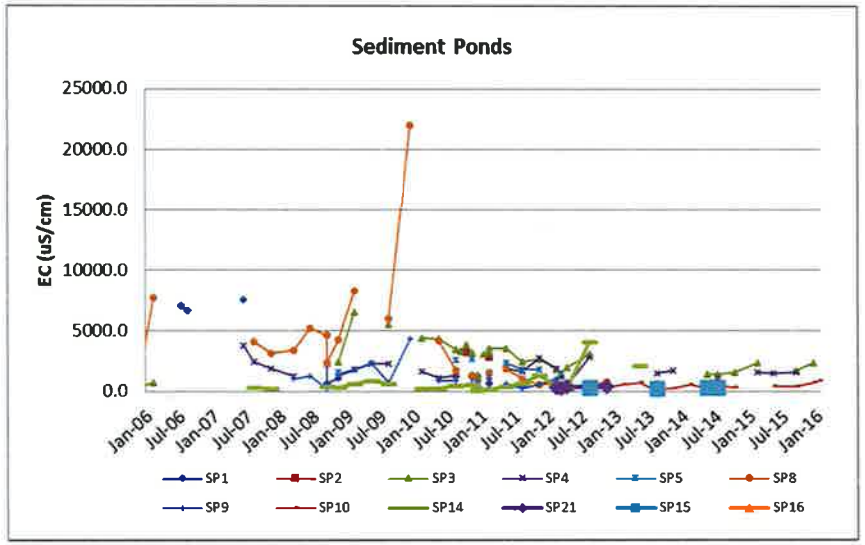
The pH at SP10 increased from 8.64 (Quarter 4, 2015) to 9.15. This increase may be a result of dirty water from the old conveyor hardstand area may have infiltrated into the sediment pond resulting in steep increase in pH levels. This location will be closely monitored during the next monitoring period and any variances will be investigated and reported in the next quarterly report. Otherwise, results for SP10 were generally within range of the long term average for these locations.

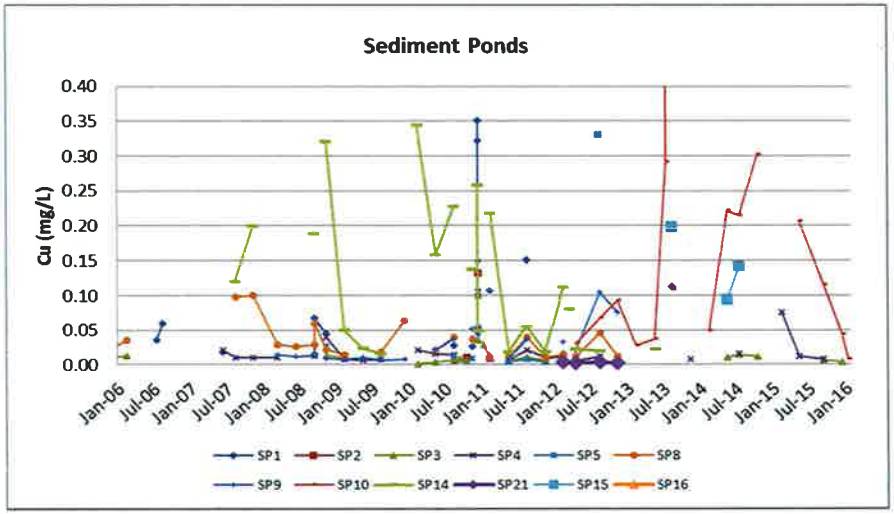
The EC at SP10 increased significantly from last monitoring period. This increase may a result of low water levels in the dams which may undergo physio-chemical reactions, thereby effecting the water quality parameters. This location will be closely monitored during the next monitoring period and any variances will be investigated and reported in the next quarterly report. Historical trend data from the farm dams in proximity to the mine lease is recorded in **Figure 23.**

All the farm dams were dry or had water less than 10% of its capacity which resulted in farm dam samples collected for this monitoring period. Three of the farm dams (FD13, FD14 and FD15) are located within the Rosedale construction footprint and will no longer be monitored during future monitoring events.

There was no rainfall event resulting in flow during the reporting period. Watercourses WC2, WC5, WC7, WC11 and WC13 were monitored for the reporting period. Results remain unchanged from Quarter 4, 2015 shown in Figure 24.







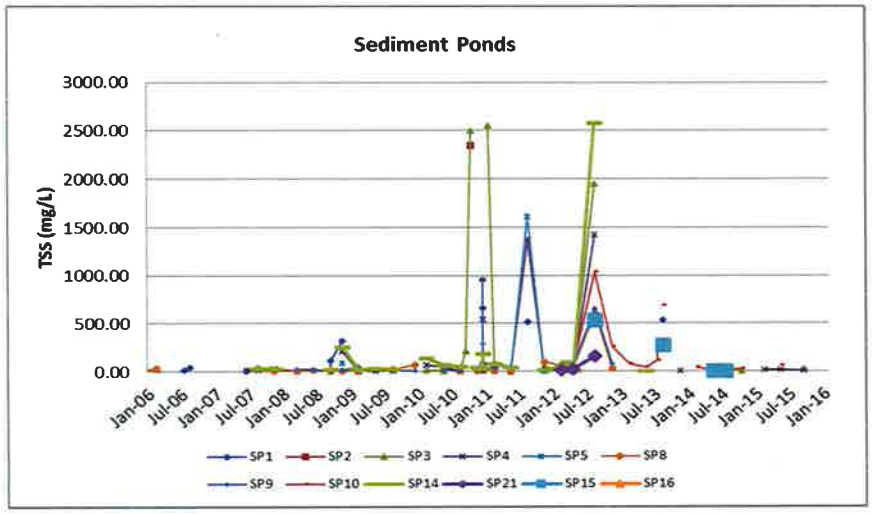
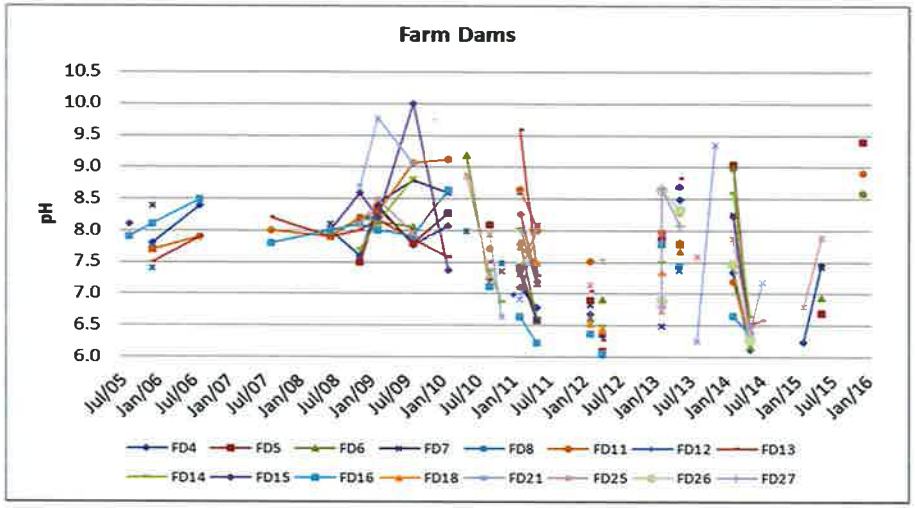
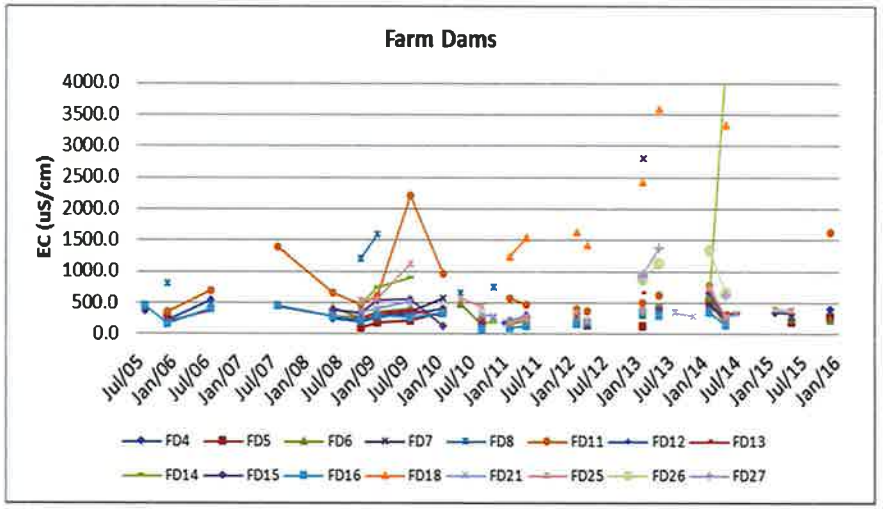
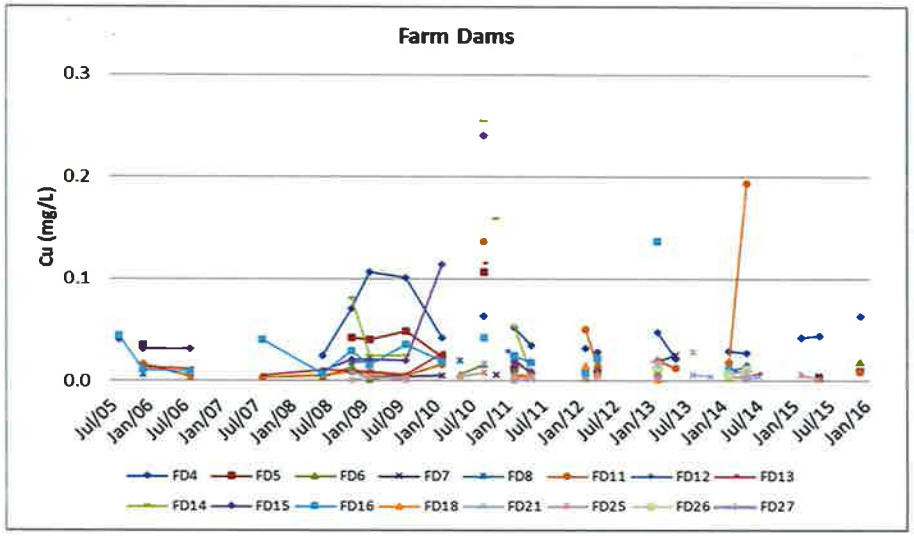


Figure 22 Surface water quality results – Sediment Dams







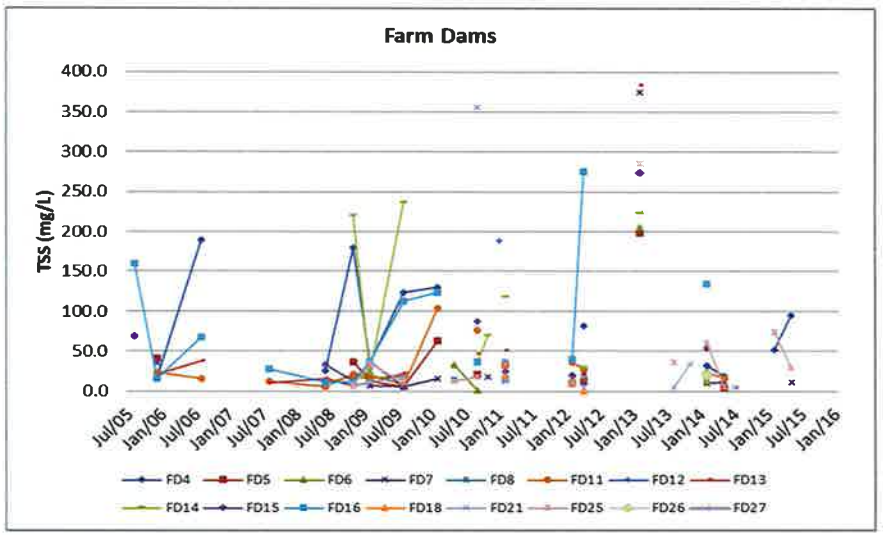
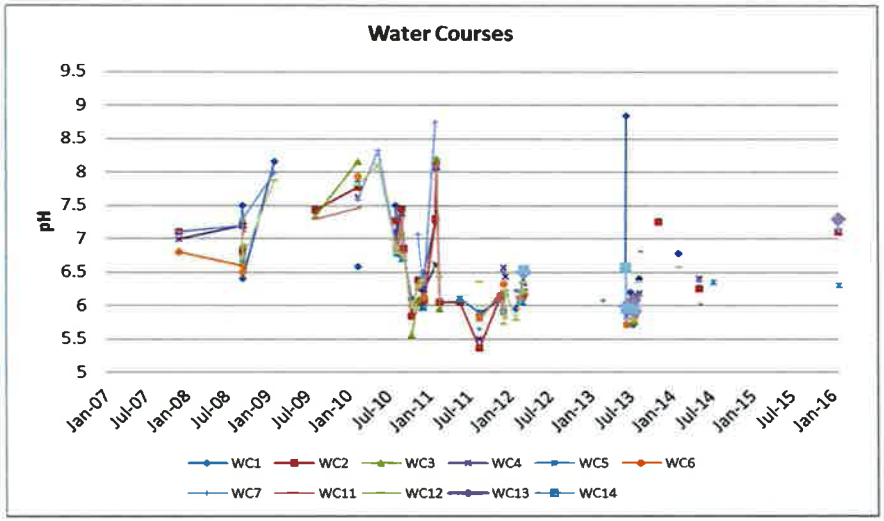
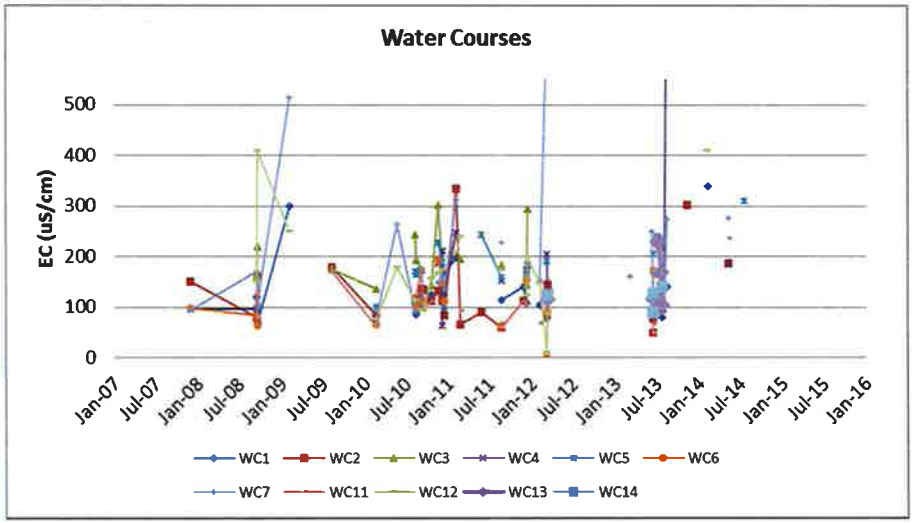
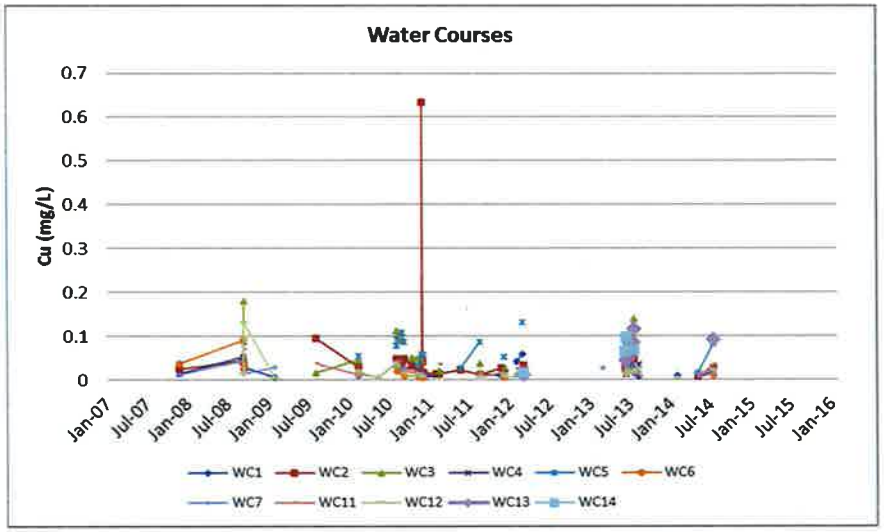


Figure 23 Surface water quality results – Farms Dams







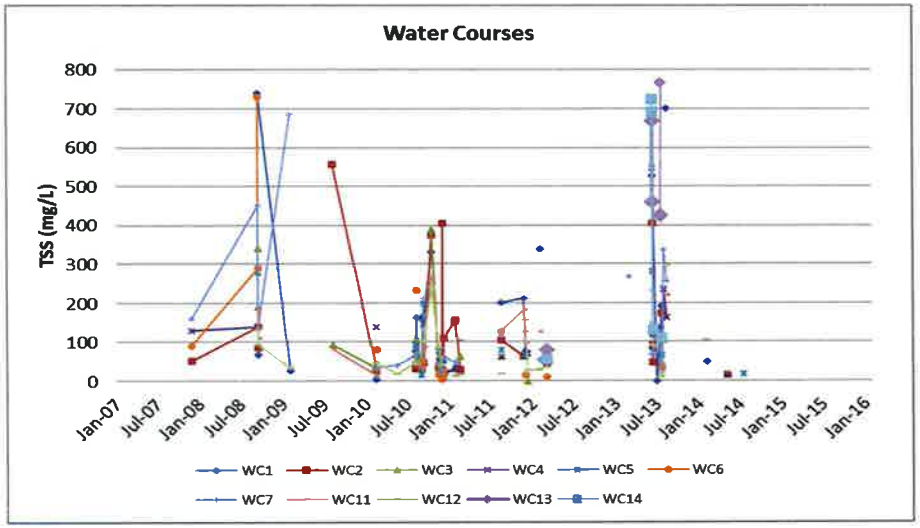


Figure 24 Surface water quality – Water Course

2. GROUNDWATER

2.1 Overview

The groundwater monitoring program involves the monitoring of water levels and water quality at various locations upstream and downstream of the site, to determine any potential impacts as a result of NPM activities. In the absence of regulatory defined assessment criteria all groundwater quality results are assessed against historical baseline and internally developed water quality criteria and trigger levels.

2.2 Quarterly monitoring analysis

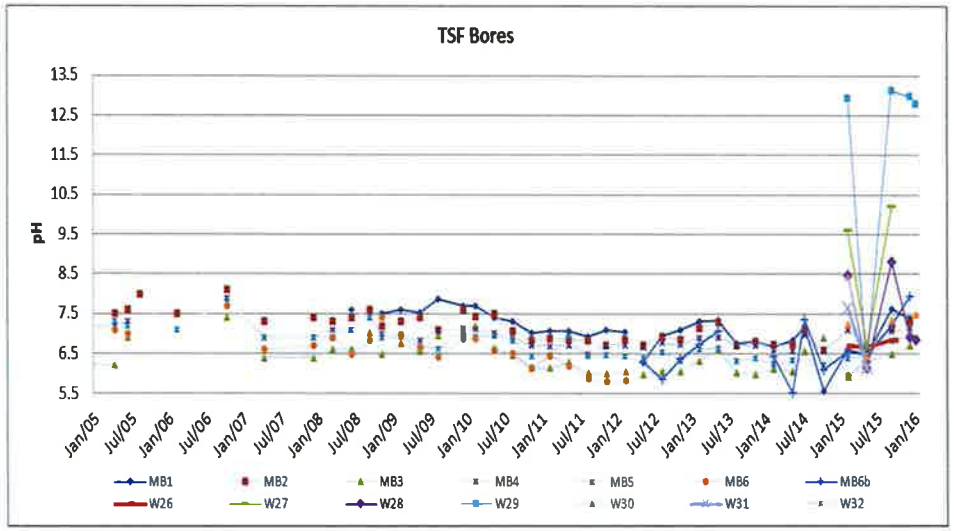
Groundwater levels around the perimeter of the tailings storage facilities (TSF) remain steady (Figure 25). There were no changes in the water levels compared to previous quarter and in line with the long term averages.

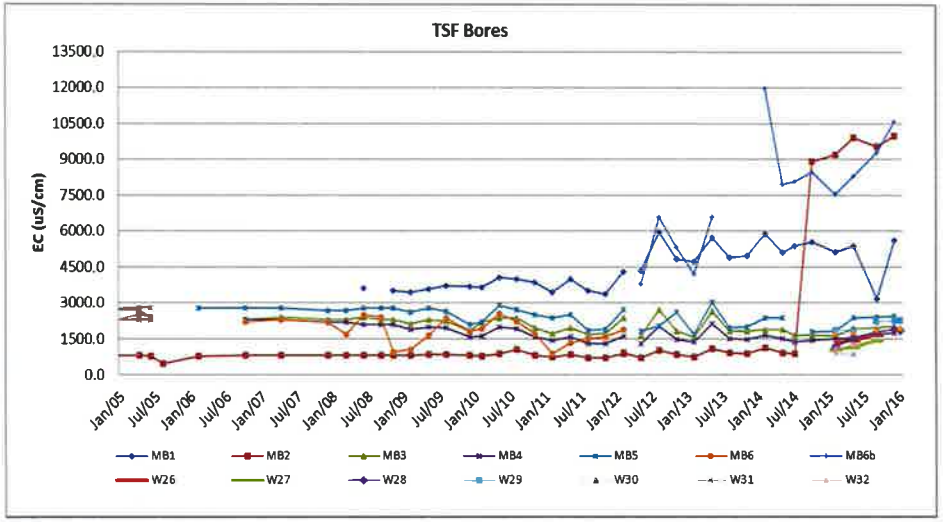
In general, pH and copper at the TSF Bores have remained in line with historical average for this reporting period. However, there was a slight increase in electrical conductivity (EC) concentration at MB1 and MB6B. These location will be closely monitored during the next monitoring period and any variances will be investigated and reported in the next quarterly report.

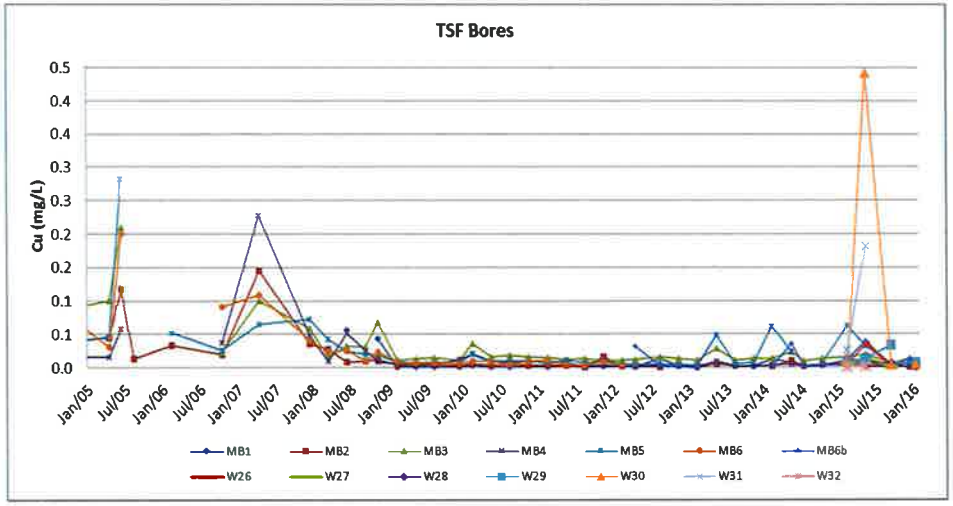
The copper concentrations from open cut groundwater bores are in line with historical trends (refer to (Figure 26). The pH levels were relatively stable for this quarter and in line with long term averages. A slight increase in in EC at W23 which recorded 19360 us/cm compared to the previous quarter which was 15700 us/cm, similarly the EC concentration at W22 decreased from 19200 us/cm to 15900 us/cm. Further monitoring will be undertaken at W23 and W22 and reported in the next quarterly report.

Groundwater quality results from the underground area (Figure 27) indicate that the water levels have remained constant. The pH, EC and copper concentrations show no variation compared to previous reporting period and are in-line with long term averages. The ground water levels at all underground bores remain similar to the previous reporting period with the exception of bore P149, which decreased to 55.4 m when compared to 53.76 m in the previous reporting period. This bore will be closely monitored in the next quarter and any variances will be investigated and reported in the next reporting period.

Regional water levels remained similar to the previous reporting period and in-line with the long term averages. The groundwater pH was generally consistent will previous monitoring periods, with the exception of Long Paddock, which decreased from previous reporting period. (Figure 28). This corresponds with previous averages recorded at this location. Copper and EC concentrations for the monitoring period remain in line with historical trend.







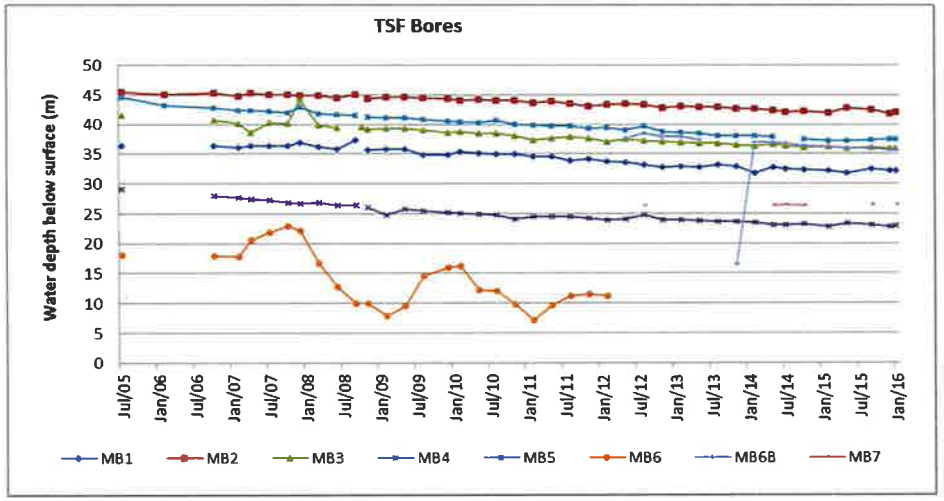
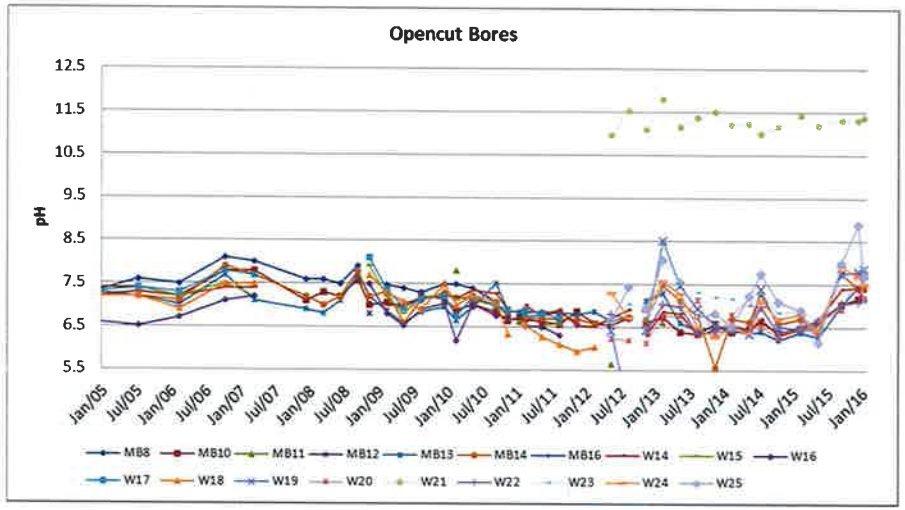
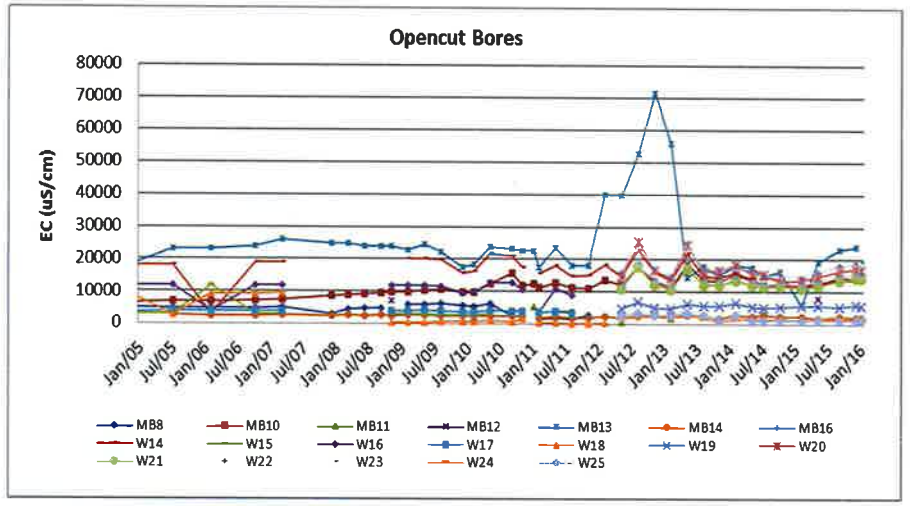
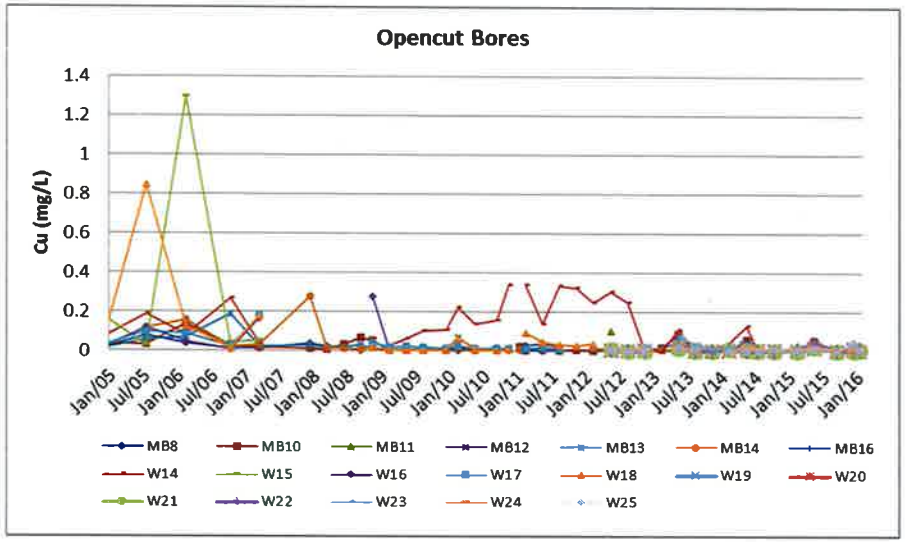


Figure 25 Groundwater quality and water levels – Tailings dam bores







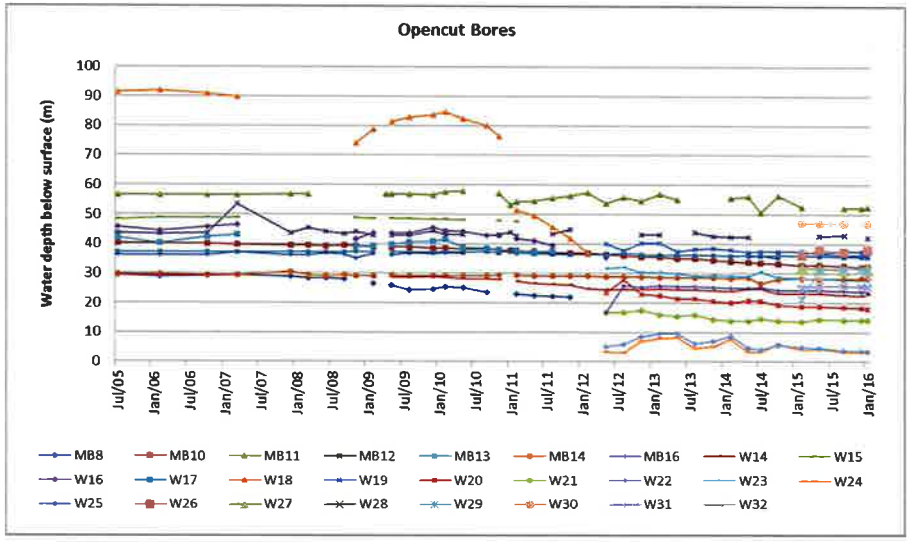
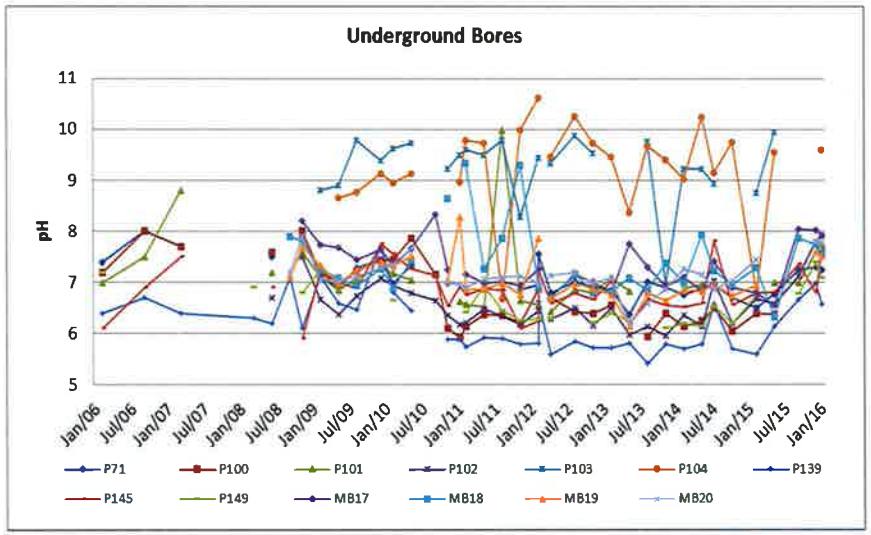
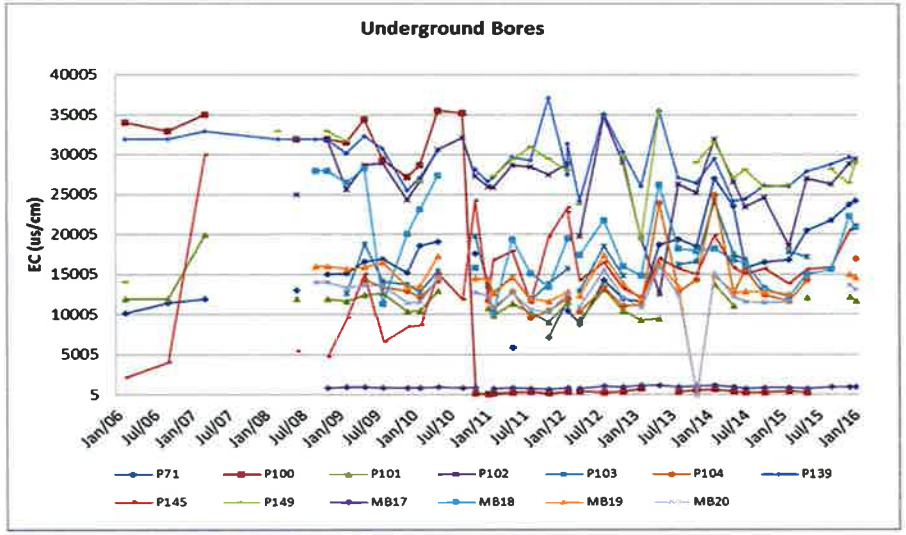
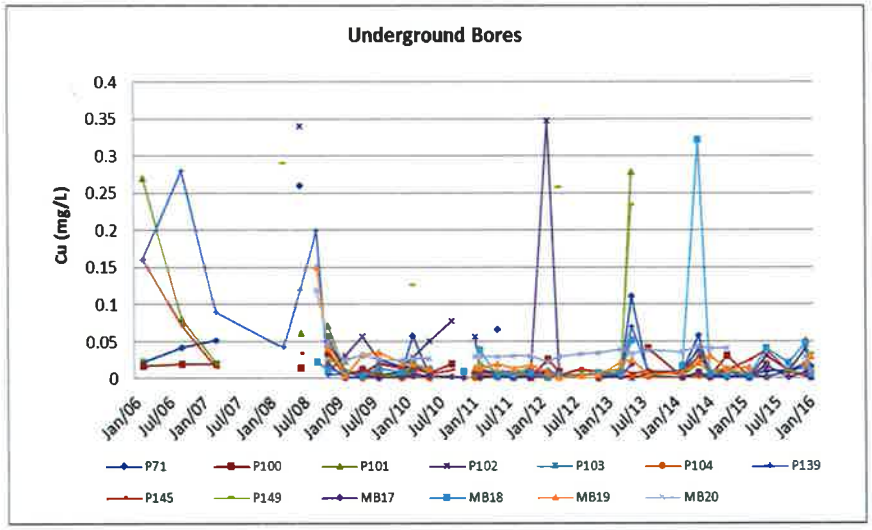


Figure 26 Groundwater quality and water levels – Opencut bores







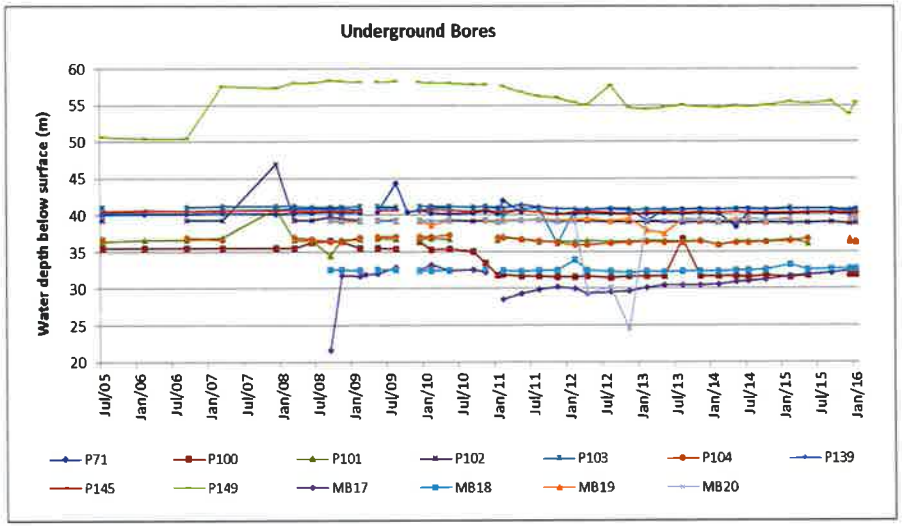
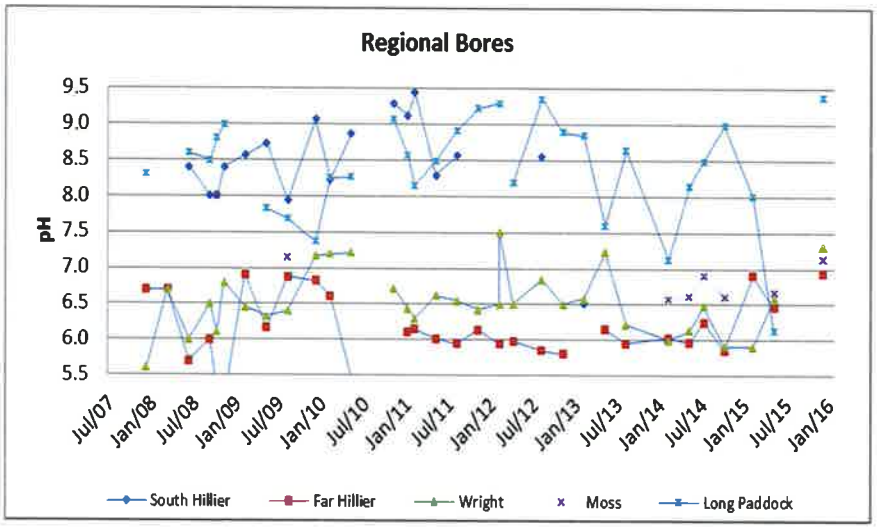
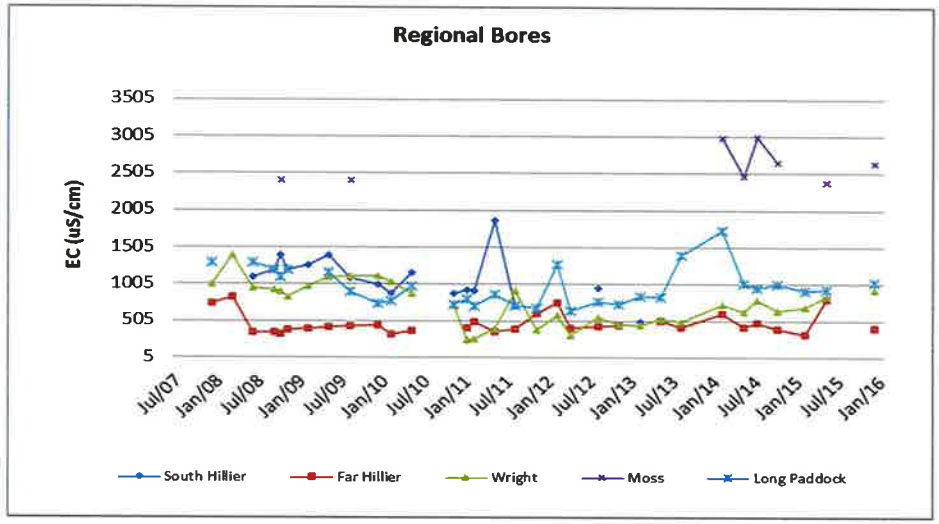
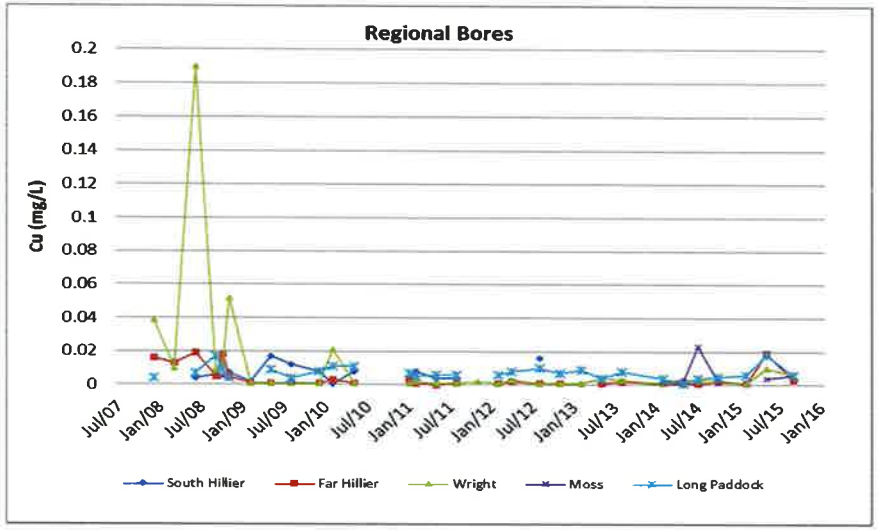


Figure 27 Groundwater quality and water levels – Underground bores







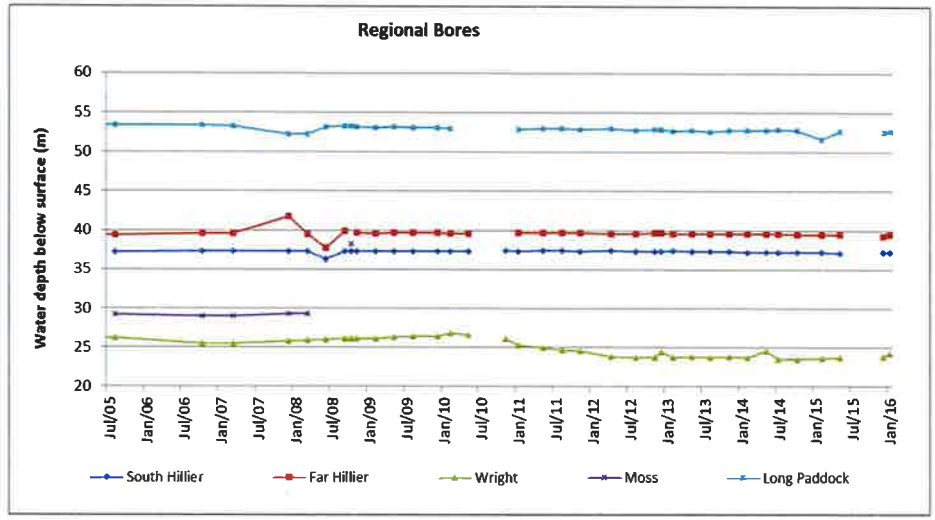


Figure 28 Groundwater quality and water levels – Regional bores

Noise and vibration

Noise and vibration monitoring is included in the NPM environmental monitoring program to assess potential impact of its operations on nearby communities and neighbours.

1. BLAST AND VIBRATION

Blasting activities are undertaken to ensure rock fragmentation for mining activities. Such practice has the potential to impact the surrounding community through vibration in the air (overpressure) and earth (ground vibration), as well as dust generation.

1.1 Overview

Vibration and air blast overpressure monitoring occurs at nearby privately owned residence. Such monitoring is only undertaken during open cut mining activities as stipulated in the existing Project Approval 11_0060.

1.2 Quarterly monitoring analysis

NPM ceased operations in the E27 and E22 open cut pits in October 2010. Blast and vibration monitoring is therefore no longer undertaken or reported on.

2. NOISE - OPERATOR ATTENDED NOISE MONITORING

2.1 Overview

Operator-attended noise measurements and recordings shall be conducted in order to quantify the intrusive noise emissions from construction and of general mine activity as well as the overall level of ambient noise.

Operator attended noise monitoring records a L_{A1} and L_{Aeq} measurement at each of the designated monitoring locations. L_{A1} is the noise level which is exceeded for 1 per cent of the monitoring time. L_{Aeq} is the average noise energy experience during the monitoring period. This noise monitoring was undertaken by an independent and suitably qualified noise professional.

Results include all noise sources; it should be noted that NPM generated noise cannot be differentiated from other noise within the area (e.g. air craft, wildlife, vegetation noise) and therefore, NPM may not necessarily be responsible for all measured noise levels.

Noise monitoring undertaken must comply with minimum weather condition requirements outlined in the Project Approval 11_0060, MOD 1. Noise levels recorded when the wind speed is above 3 metres per second must be discounted as the source of noise is unable to be determined.

2.2 Quarterly monitoring analysis

2.2.1 Attended noise monitoring

Conditions were less than ideal during the attended monitoring period. High winds impacted both the day and evening monitoring periods. Attended noise monitoring during conforming wind conditions complied with the $L_{Aeq(15\ min)}$ 35 dB limit at each of the measurement locations.

Significant extraneous noise sources were encountered mainly in the form of insect noise; this was particularly noticeable at Lone Pine and, to a lesser extent, at Milpose. Numerous results required adjustment (i.e. the impact of non-NPM related, higher frequency noise was reduced).

It is noted that at various times during attended monitoring, extraneous noise sources, i.e. sources other than the mine, were the primary contributor to measured noise levels. Commonly, these noise sources include wildlife (e.g. birds and insects), livestock (e.g. sheep and cattle), road traffic, overhead aircraft, farm machinery and vegetation noise (i.e. rustling of foliage). Where possible, extraneous noise was excluded from the result either by pausing the sound level meter until the extraneous noise event had ceased (such as for traffic or aircraft noise) or by removing the extraneous noise via frequency analysis – i.e. subtracting the contribution to the overall sound pressure level at key frequencies not related to noise emissions from NPM.

Measurements indicate compliance with the night limit of L_{A1} 45 dB at all locations.

For the most part, conditions were generally good during the attended monitoring period. Only one measurement, the final evening measurement at Milpose, was impacted by high winds. Attended noise monitoring during conforming wind conditions complied with the $L_{Aeq(15\ min)}$ 35 dB limit at each of the measurement locations.

Significant extraneous noise sources were encountered mainly in the form of insect noise; this was particularly noticeable at Milpose and, to a lesser extent, at Lone Pine. Numerous results required adjustment (i.e. the impact of non-NPM related, higher frequency noise was reduced).

It is understood that the mine was operating as normal during the monitoring period. High levels of road traffic required frequent pausing of the SLM at Hillview during day and evening monitoring.

Where possible, extraneous noise sources have been excluded from attended measurements by pausing the sound level meter when non-NPM sources predominate (e.g. passing traffic or aircraft)

and/or subtracting the component of the frequency spectrum that is caused by non-NPM sources (e.g. wildlife noise, livestock noise or foliage noise). Extraneous noise sources may contribute as much as 15 to 20 dB to the overall measured noise levels.

2.2.2 *Unattended noise monitoring*

In accordance with Project Approval 11_0060, Appendix 5, Clause 3, "attended monitoring is to be used to evaluate compliance with the relevant conditions of this consent". Specifically, unattended monitoring is therefore not to be used to evaluate compliance with the Project Approval criteria. Nonetheless, ESP notes that average night-time results from unattended monitoring indicated compliance with the LA1 45 dB limit at Hillview and Lone Pine.

Unattended noise measurements will invariably include noise levels that cannot be directly attributed to NPM. Road traffic, farm machinery, livestock, wildlife and air traffic are some of the noise sources that contribute to noise levels logged during unattended noise monitoring. Extraneous noise sources are expected to have a higher contribution during the day and evening period.

Noise levels were continuously monitored over a period of seven days from the 24th of February to the 2nd of March. These summarised levels include extraneous noise which cannot be excluded from the continuous monitoring conducted; the results do not include measurements where the wind speed, measured at each location, exceeded three meters per second. (Note: Wind speed data is not collected at Lone Pine therefore data from NPM's main weather station were used.)

Table 2 Summary of unattended noise monitoring (24/02/2016 – 02/03/2016)

Location	$L_{Aeq\ (15min)}$			$L_{A1\ (1min)}$
	Day	Evening	Night	Night
Hillview	42	41	38	38
Hubberstone	41	48	46	48
Lone Pine	36	43	37	43
Milpose	37	51	49	50

Table 3 Attended noise monitoring levels (Measured in decibels (dB)) – Day

Location	Date and Time	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A90} dB	Compliance ?	Notes
Milpose	24/02/2016 14:50	40	36	**32**	26	Yes	
	24/02/2016 15:05	45	38	**34**	27	Yes	Mine inaudible. Low frequency noise from opposite direction to mine. Gusting wind. Bird noise.
	24/02/2016 15:20	43	37	**33**	25	Yes	
Lone Pine	24/02/2016 15:50	40	33	**31**	24	Yes	
	24/02/2016 16:05	40	35	**32**	27	Yes	Mine inaudible. Wind gusting up to 6m/s.
	24/02/2016 16:20	44	36	**35**	33	Yes	
Hubberstone	24/02/2016 17:15	39	37	**34**	33	Yes	
	24/02/2016 17:30	41	35	**32**	25	Yes	Mine inaudible. Some insect noise. Wind gusting up to 5m/s.
	24/02/2016 17:45	39	29	**29**	26	Yes	
Hillview	24/02/2016 13:55	39	37	**35**	34	Yes	
	24/02/2016 14:10	37	31	**31**	27	Yes	Mine inaudible. Truck & car traffic. Wind gusting.
	24/02/2016 14:25	41	39	**35**	30	Yes	

Table 4 Attended noise monitoring levels (measured in decibel (db)) - Evening

Location	Date and Time	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A90} dB	Compliance?	Notes
Milpose	25/02/2016 20:50	47	46	**27**	42	Yes, Adj.	
	25/02/2016 21:05	49	44	**31**	41	Yes, Adj.	Mine only just audible. Incessant insect noise. Winds increased at 21:15; winds up to 5m/s.
	25/02/2016 21:20	40	37	**36**	34	NA	
Lone Pine	25/02/2016 20:00	42	38	**28**	35	Yes, Adj.	
	25/02/2016 20:15	47	46	**28**	39	Yes, Adj.	Mine inaudible. Incessant insect noise necessitated adjustment of all measurements. Engine running at house.
	25/02/2016 20:30	45	44	**27**	38	Yes, Adj.	
Hubberstone	24/02/2016 18:00	40	33	**31**	27	Yes	
	24/02/2016 18:15	41	37	**34**	29	Yes	Mine inaudible. Some traffic, foliage & bird noise.
	24/02/2016 18:30	40	35	**33**	29	Yes	
Hillview	24/02/2016 18:50	38	36	**34**	32	Yes	
	24/02/2016 19:05	40	47	**35**	29	Yes	Mine inaudible. Some traffic, foliage & bird noise. Wind gusting continuously.
	24/02/2016 19:20	39	35	**33**	30	Yes	

Table 5 Attended noise monitoring levels (measured in decibel (db)) - Night

Location	Date and Time	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A90} dB	Compliance?	Notes
Milpose	25/02/2016 22:00	**44**	42	**34**	36	Yes, Adj.	
	25/02/2016 22:15	**40**	39	**29**	35	Yes, Adj.	Mine inaudible. Gusting winds, significant insect noise.
	25/02/2016 22:30	**42**	40	**31**	37	Yes, Adj.	
Lone Pine	25/02/2016 22:50	**37**	34	**33**	31	Yes	
	25/02/2016 23:05	**42**	35	**34**	31	Yes	Mine audible. Insect noise.
	25/02/2016 23:20	**41**	34	**33**	31	Yes	
Hubberstone	25/02/2016 23:40	**35**	32	**30**	27	Yes	
	25/02/2016 23:55	**38**	33	**32**	28	Yes	Mine clearly audible.
	26/02/2016 00:10	**36**	33	**32**	30	Yes	
Hillview	26/02/2016 00:50	**37**	34	**33**	31	Yes	
	26/02/2016 01:05	**36**	34	**33**	31	Yes	Mine inaudible. Insect noise.
	26/02/2016 01:20	**34**	32	**31**	29	Yes	

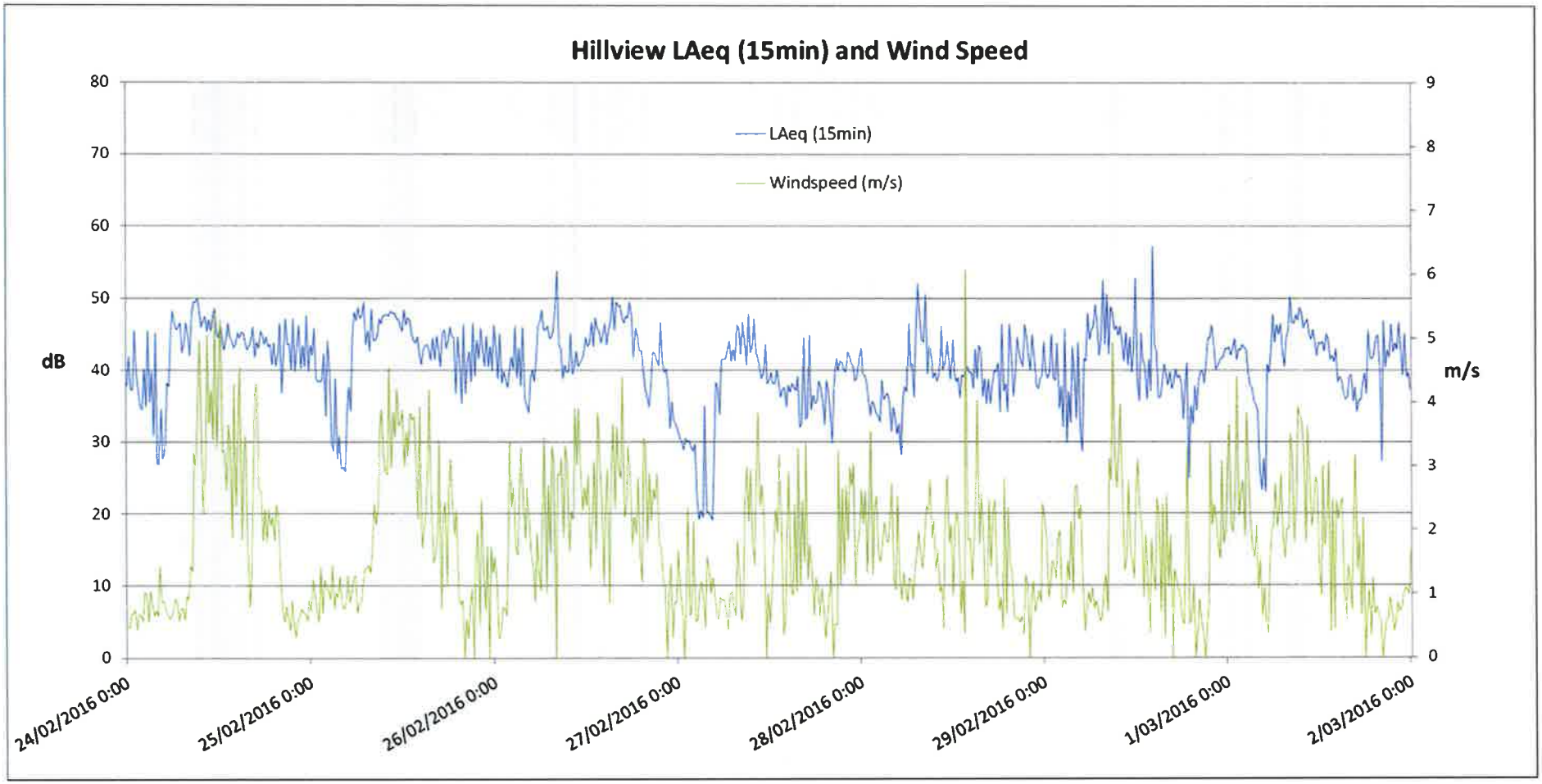


Figure 29 Hillview L_{Aeq} and Wind Speed

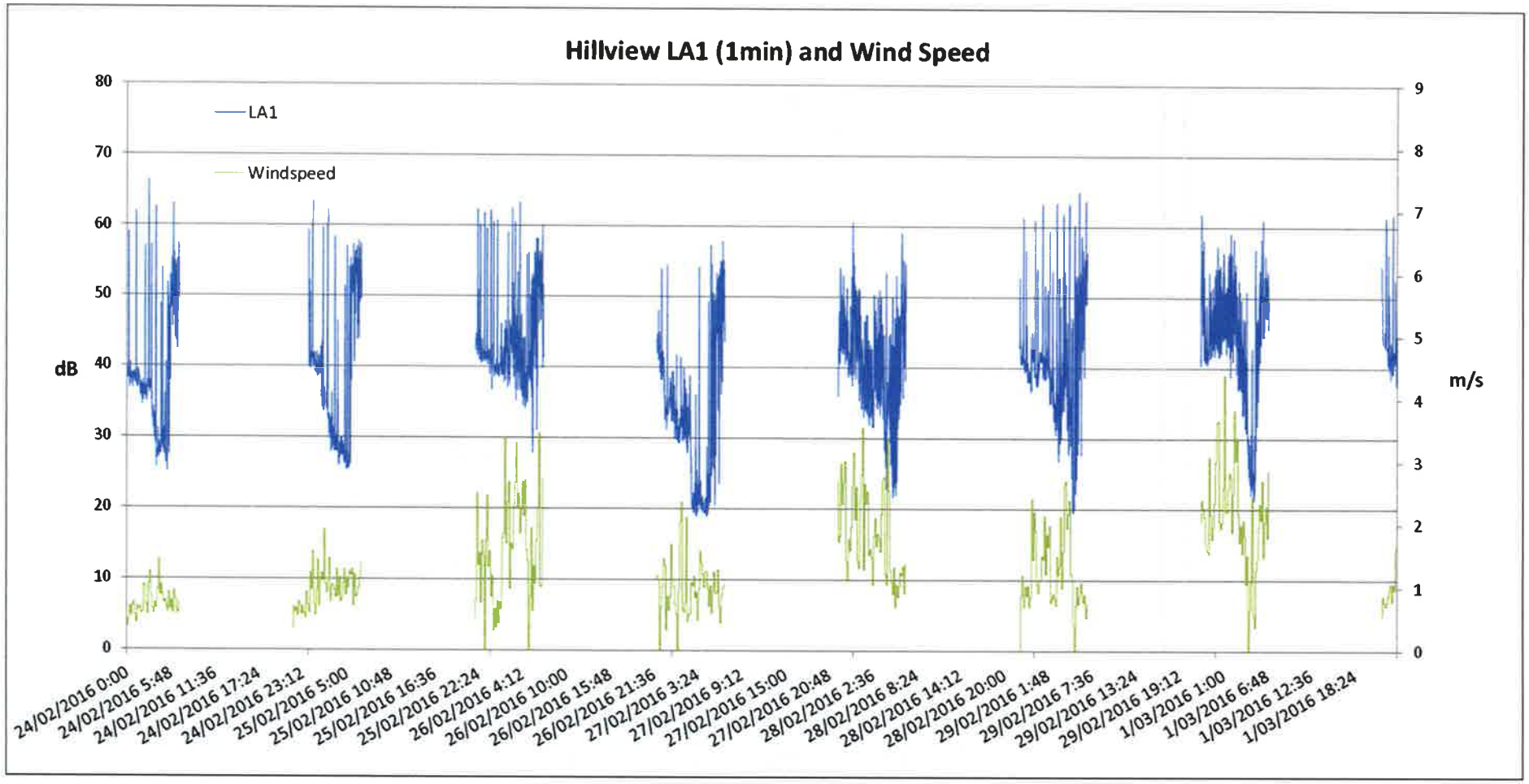


Figure 30 Hillview $L_{A1\ (1min)}$ and Wind Speed

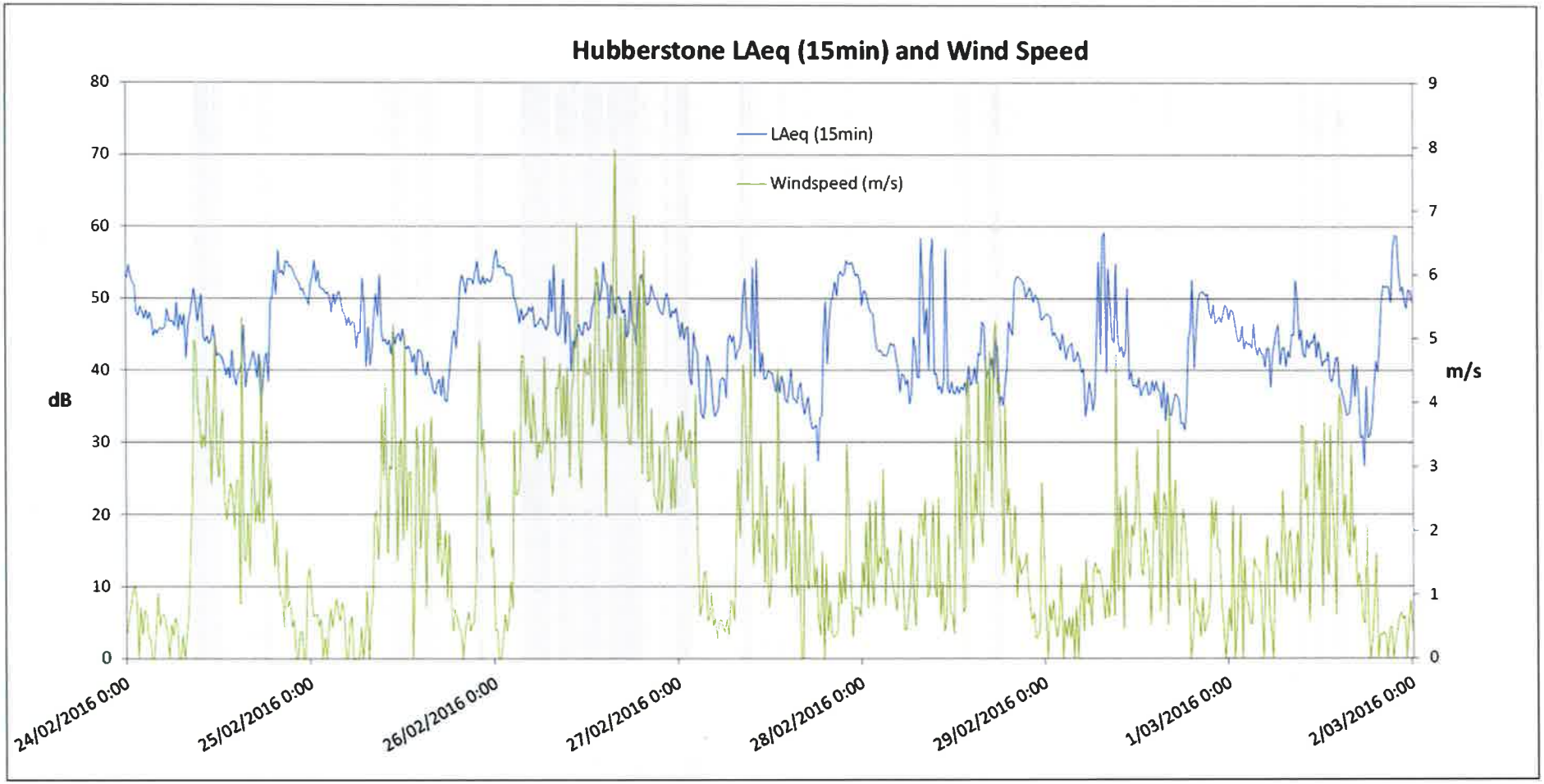


Figure 31 Hubberstone L_{Aeq} and Wind Speed

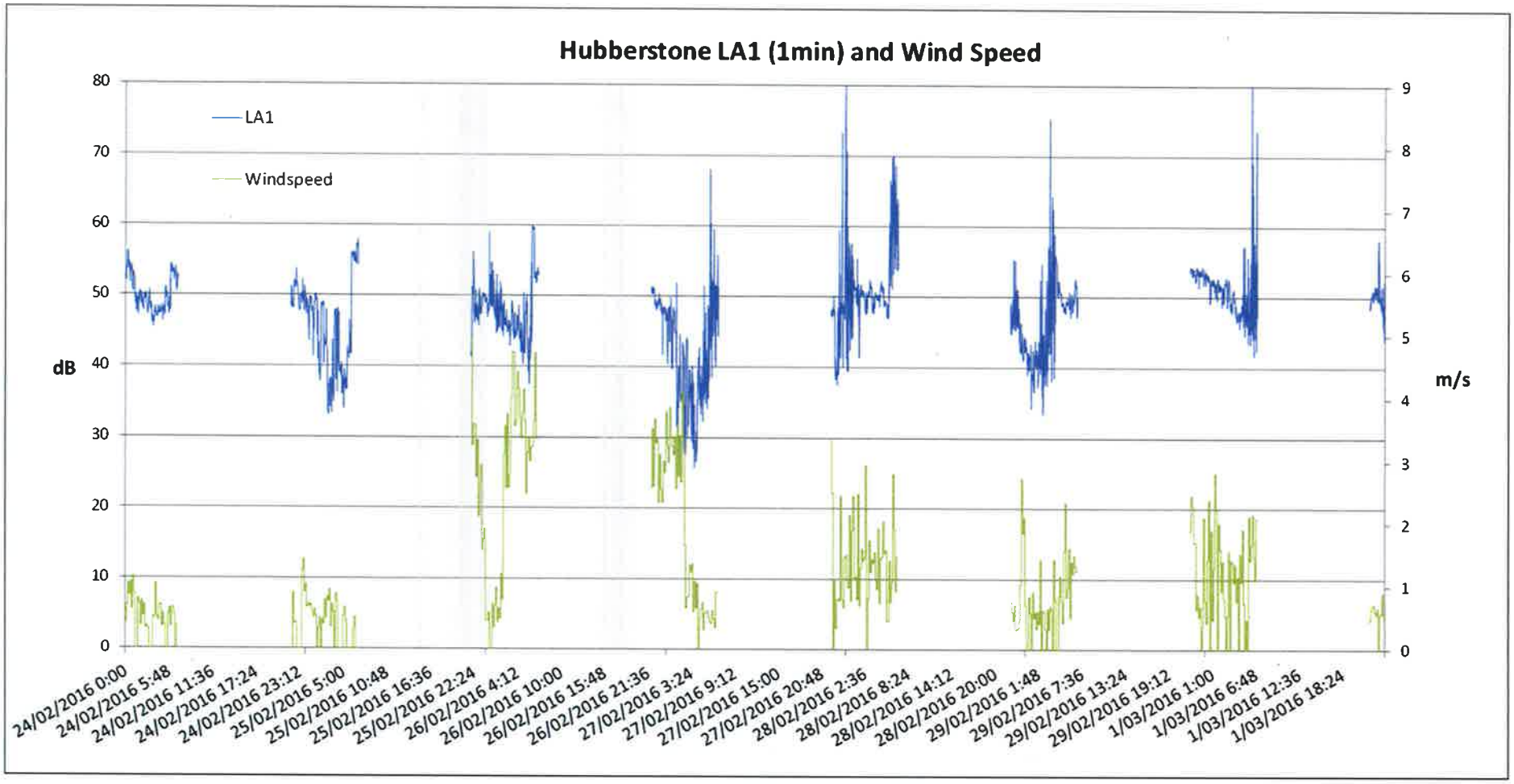


Figure 32 Hubberstone $L_{A1\ (1min)}$ and Wind Speed

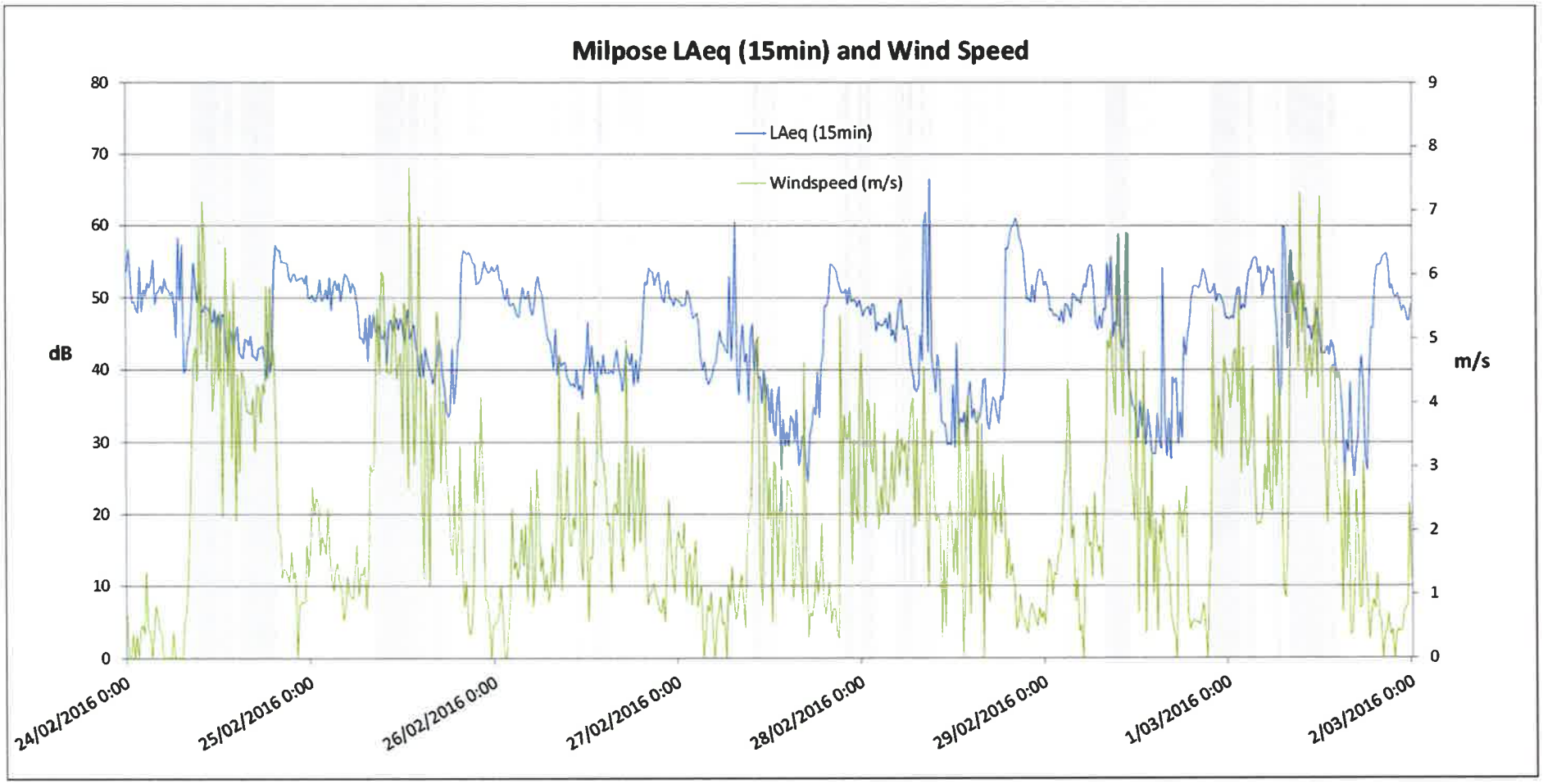


Figure 33 Milpose L_{Aeq} and Wind Speed

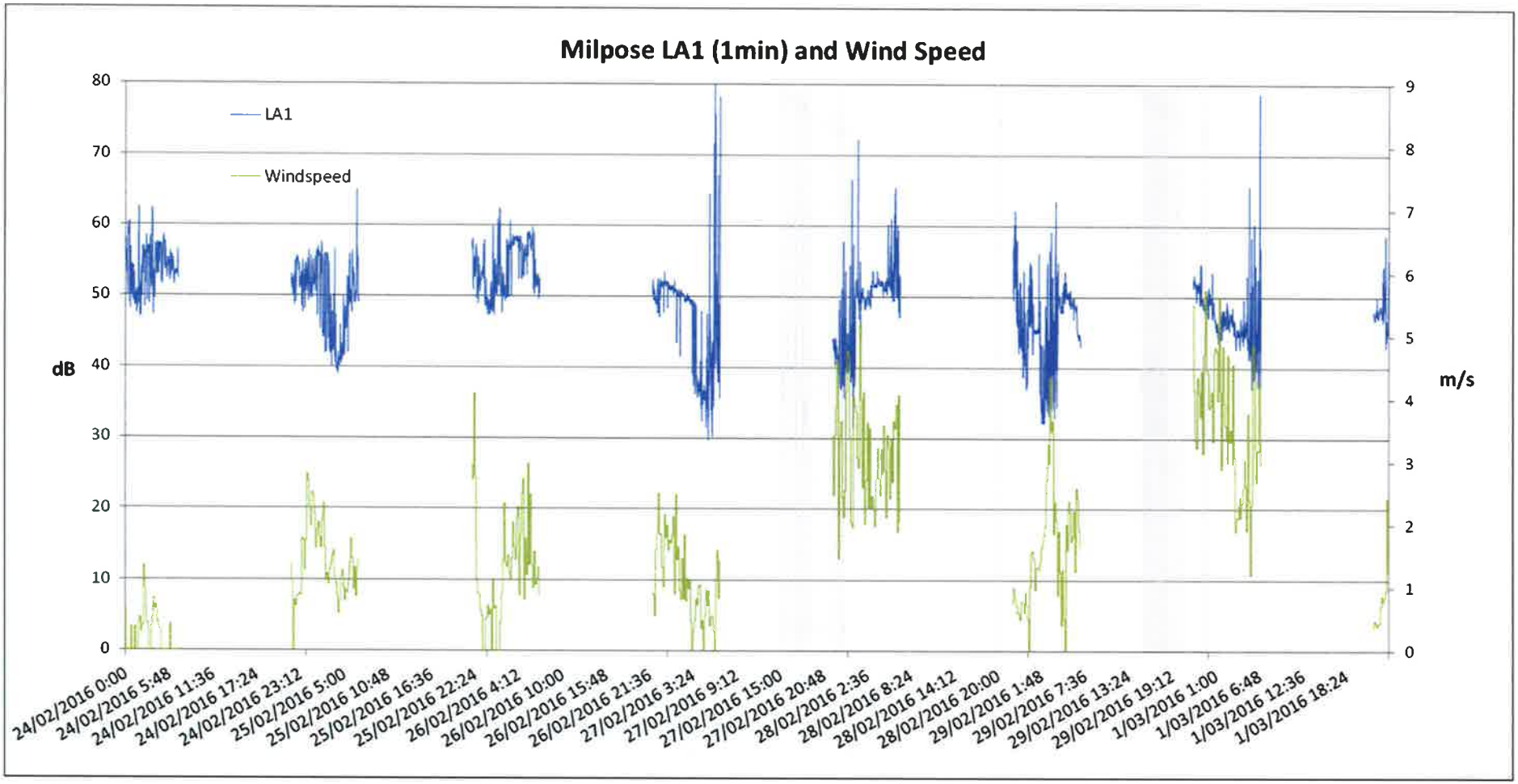


Figure 34 Milpose $L_{A1\ (1min)}$ and Wind Speed

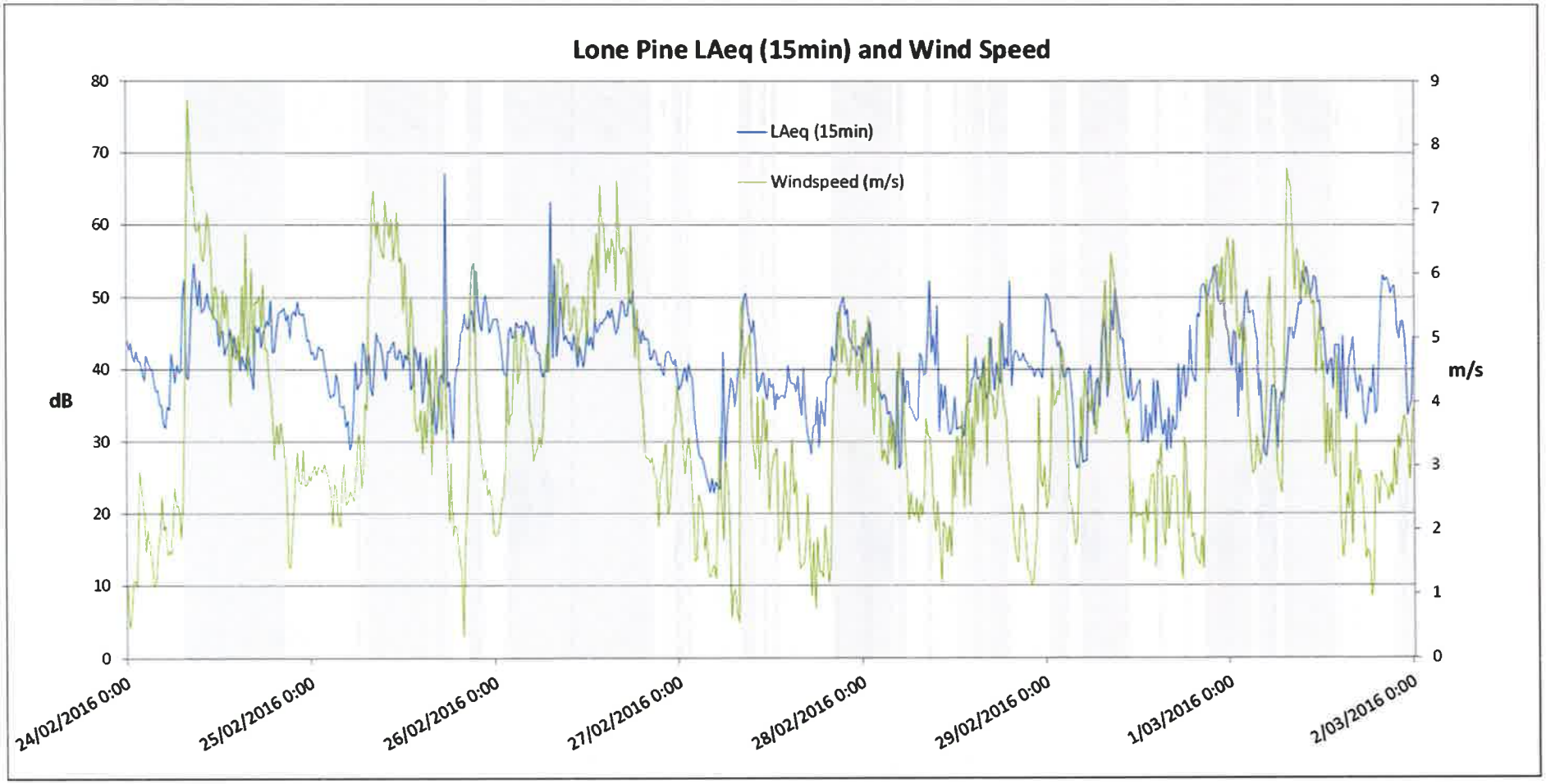


Figure 35 Lone Pine L_{Aeq} and Wind Speed

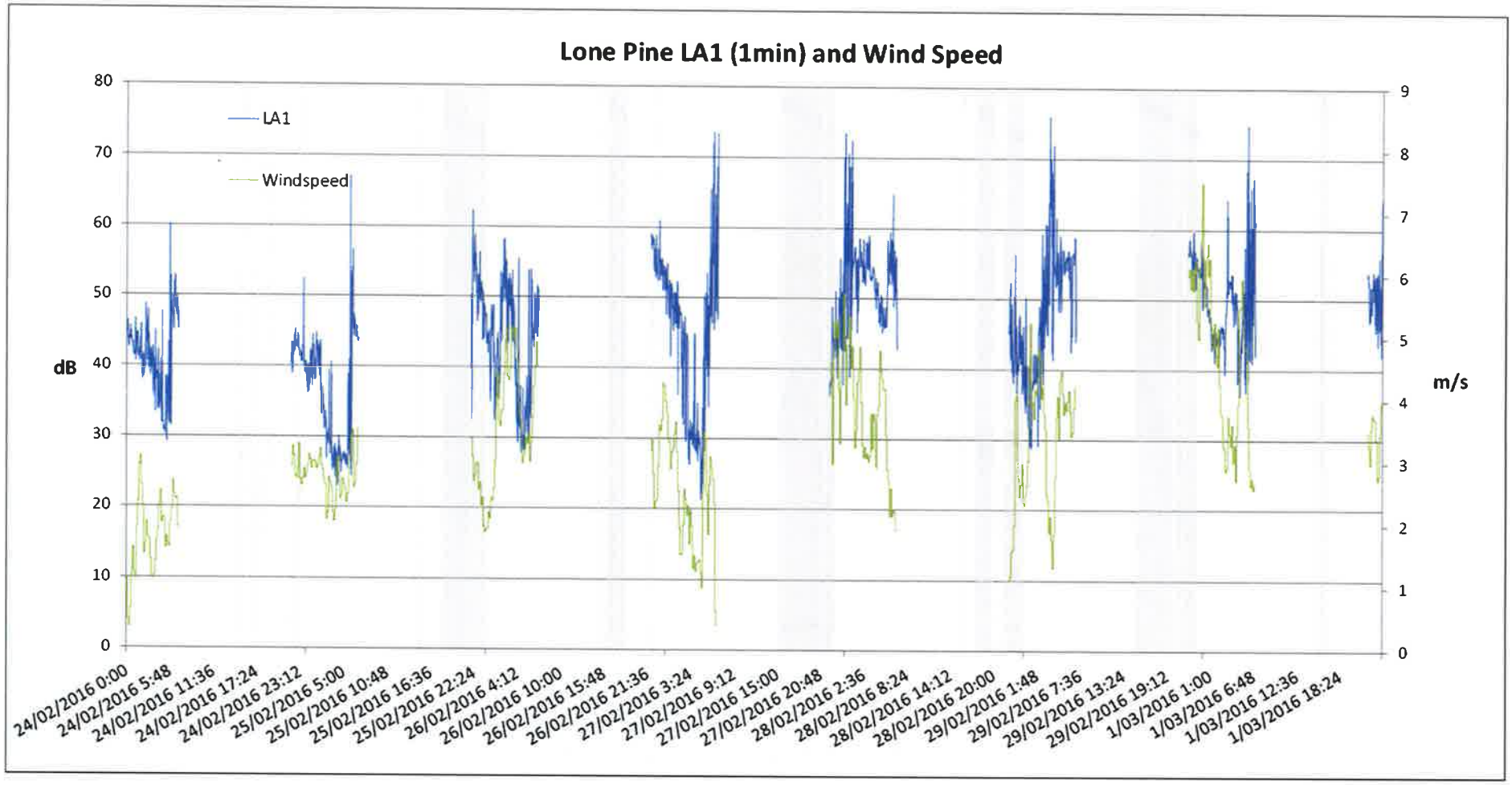


Figure 36 Lone Pine $L_{A1\ (1min)}$ and Wind Speed