APPENDIX D

Lamberts North Operational Noise Assessment – June 2019

aurecon

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Lamberts North – Operational Noise Assessment June 2019

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1 Introduction

1.1 Project Understanding

On 16 February 2012, Delta Electricity received Project Approval (09_0186) under delegation from the Minister of Planning for the Mt Piper Ash Placement Project (the Project) under Section 75J - *Environmental Planning and Assessment Act 1979*, to permit the continued disposal of ash generated by the Mt Piper Power Station into the Lamberts North area, which is an extension of the existing Mt Piper Ash Repository. The Project Approval was granted subject to Conditions of Approval. EnergyAustralia NSW acquired Mt Piper Power Station and associated land holdings and infrastructure from the state-owned Delta Electricity in September 2013. As such the project is now owned by EnergyAustralia NSW.

This report has been developed in accordance with the Lamberts North Ash Placement Project Condition of Approval (CoA) E11 and the mitigation measures specified in the Operational Environment Management Plan (OEMP May 2013). The OEMP outlines the requirements of the ongoing noise monitoring program and operational noise review in accordance with CoA's E7, E8, E9 and E11.

1.2 Background to the Project

Lamberts North Ash Repository is located immediately east of EnergyAustralia NSW's existing Mt Piper Ash Repository, which is described as Area 1 in the Environmental Assessment (EA) (SKM, 2010). Ash placement at Mt Piper Ash Repository is still currently being undertaken but alternates with ash placement at Lamberts North.

Both sites are located in an area characterised by both rural and industrial influences, with a number of coal mines in relatively close proximity. The project site is predominately surrounded by Ben Bullen State Forest, which lies to the north and south east of Mt Piper Power Station, together with open cut coal mines and coal washeries. Wallerawang Power Station which is also owned by EnergyAustralia NSW, lies to the south east of the project site, approximately 5 km away, but is no longer operational following the announcement in November 2014, that the power station would be closed.

Lamberts North ash repository is approximately 53 hectares.

Historically, the Lamberts North area has been highly disturbed as a result of extensive mining activities including underground working (from the 1950s to the early 1990s) and recent open-cut mining activities being carried out by Centennial Coal.

EnergyAustralia NSW has engaged a principal contractor (Lend Lease) to manage and operate both the Mt Piper (Area 1) and Lamberts North ash repositories. Operations at Lamberts North commenced on 2 September 2013.

1.3 Scope of Work

In accordance with CoA E11, the scope of works includes a noise assessment comprising of attended and unattended noise measurements at two sensitive receiver locations, to determine potential impacts arising from the operational activities at Lamberts North ash repository.

1.4 Sensitive Receivers

The sensitive receivers located within the vicinity of the Project and identified for noise impacts within the Operation Noise Management and Monitoring Plan (ONMMP), a sub plan of the OEMP, are described in Table 1 below. The two sensitive receivers closest to the site are located at Blackmans Flat approximately 1.4 km to the east of Lamberts North and at Wallerawang approximately 2.5 km south east of Lamberts North.

A third location 'Location 3' has been used as an additional location to measure the reference noise levels from operational activities. Measurements at location 3 / 3A are within the Lambert's North and Ash Repository sites and are used for reference only, and monitoring requirements at these locations are not covered in the ONMMP.

The positions of the measurement locations are shown in Figure 1.

Table 1 | Sensitive receivers nearest to Lamberts North

Location ID[a]	Description	Map Coordinates	Noise monitoring location	Distance from Lamberts North Ash Repository
1	Blackmans Flat	33.36468ºS 150.05904ºE	Located at the western end of Noon Street on the southern side of the road. Positioned at the boundary of the residential property 90 m from the Castlereagh Highway.	1.4 km east
2	Wallerawang	33.374001ºS 150.065370ºE	Situated on a rural property southeast of Lamberts North, and approximately 650m from Castlereagh Highway.	2.5 km south east
3	Ash Repository	33.355570ºS 150.045268ºE	Additional location within the Ash Sediment basin	300m west
3A	Lamberts North	33.357021ºS 150.049253ºE	Additional location at the north-western boundary of the Lamberts North site	Within the Lamberts North site

[a] Refer to Figure 1 for locations

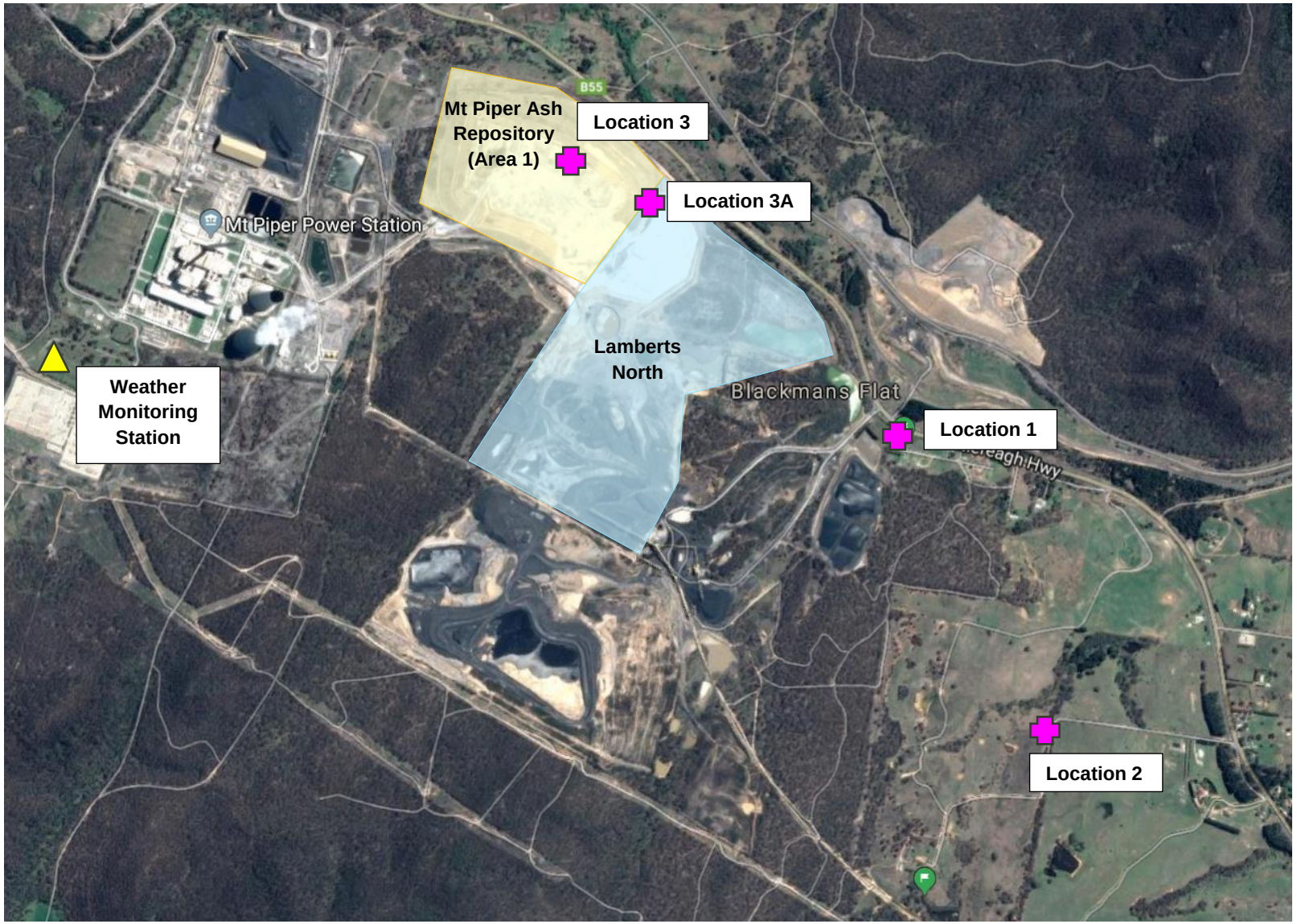


Figure 1 | Environmental noise monitoring locations

2 Site Operations

2.1 Operation Methodology

Key potential noise impacts during operational activities at Lamberts North and Mt Piper Ash Repository sites are listed below:

- Transporting fly ash and bottom ash to the ash repository using haulage trucks along the designated haul roads;
- Placing ash in stockpiles in designated areas before being spread out by a dozer;
- Compacting the ash using a dozer and roller;
- Maintenance on the haulage roads using a grader, roller, dozers and water carts;
- Dust suppression across the site using a series of techniques including but not limited to water carts and sprinkler systems;
- Developing and maintaining water management structures (containments, drains and sumps) using an excavator;
- Using various sized pumps on site to pump water from various water sources;
- Using light vehicles on occasion to inspect the ash repository and carry out environmental monitoring; and
- The machinery and plant generate noise from the engine and drive line, hydraulics and reverse warning devices.

2.2 Activities during Monitoring Period

The Mt Piper Ash Repository and Lamberts North sites are located adjacent to each other. Ash deposition at either site is dependent on several factors, typically decided on a weekly basis by the Lend Lease environmental manager.

During the site visit from 28th – 30th June 2019, ash placement operations were only occurring towards the western end Area 1 (within the ash sediment basin), with no ash placement activities occurring at the Lamberts North site (refer Appendix D).

Below is the summary of activities identified on site. Sound Power Levels (SWL) calculated from the measured reference noise levels are detailed in Table 2.

- The day activities started at 06:00 for a 06:15 start, which included the daily tool box talk and work-related discussions.
- The following plant/machinery was operational during the monitoring period,
  - 2 x Dump trucks were operating in total, being loaded with ash near the ash bins and transported to the ash sediment basin as illustrated in the figure below. Truck routes/access roads are also illustrated in the figure below.
  - 1 x dozer/drawler tractor, 1 x water cart/truck and 1 x roller were operating in the ash sediment basin, with the dozer and water truck using the B1, B2 circuit and the roller using the B5, B6 circuit.
  - No activities were being carried out in the southern part of the Lamberts North site.
- All activities ceased by 17:00. No activities occurred during the evening or night time periods (18:00 – 06:00).
- Please refer to Appendix B for site photographs.

Table 2 | Calculated Sound Power Levels of Noise Sources Operating during Site Visit

Plant	Quantity	Sound Power Level (SWL), dB(A)*
Dozer / Crawler tractor	1	Cumulative operations – 105
Water Cart / truck*	1	
Roller	1	108
Dump Truck	2 (only 1 operating at a time, typically at 20min intervals)	101
Ute	1	98

*Sound Power Levels (SWL) calculated based on noise measurements at approx. 7-10m from operating plant, on the 28th and 29th June 2019.

2.3 Description of the surrounding environment

Area 1 and Lamberts North sites are predominantly surrounded by Ben Bullen State Forest, with open cut coal mines and coal washeries also located to the north and east.

Activities at Springvale colliery, which is operated by Centennial Coal and lies to the south east of the site, primarily includes but is not limited to the transportation of coal via conveyors and operations of mobile and stationary plan. Noise impacts from these activities will contribute to the ambient noise measurements at locations 1 and 2.

Pine Dale coal mine is located to the north east of the site but is unlikely to contribute to the ambient environment at measurement locations as the mine is currently under care and maintenance (i.e. non-operational).

3 Noise Criteria

3.1 Conditions of Approval

The ONMMP seeks to address the specific requirements of the CoA attached to the Project Approval for Lamberts North, insofar as they relate to noise and vibration during operation.

CoA E7 and CoA D3a(ii) define the operational noise requirements for the project, to ensure noise emissions from operational activities do not exceed the criteria shown in Table 3 below.

Table 3 | Operational Noise Criteria

Location	Operational Noise Criteria, dB(A)$L_{eq(15min)}$		
	Day Time (7:00 – 18:00)	**Evening Time (18:00 – 22:00)**	**Night Time (22:00 – 7:00)**
All private receivers within the township of Blackmans Flat	42	38	35
All other residences	42	38	35

Note: These criteria do not apply where the Proponent and an affected landowner have reached a negotiated agreement regarding noise, and a copy of that agreement has been forwarded to the Director-General and the NSW EPA.

3.2 Operational Hours

In accordance with the CoA E1, operational activities associated with the project shall only be undertaken from 6:00am to 8:00pm Monday to Friday and 6:00am to 5:00pm Saturday and Sunday. Operations outside the hours stipulated above are only permitted in emergency situations.

4 Noise Survey

4.1 Methodology

Attended and unattended noise measurements were conducted from the 28th – 30th June 2019 at the boundary of the nearest residential properties (Location 1 and Location 2) likely to be exposed to noise from the ongoing ash placement operation.

- Unattended continuous monitoring was conducted using two Acoustic Research Laboratories type EL-316 noise monitors. The monitors were set to record continuously at 15-minute time intervals, in an A-weighted fast response mode. Both monitors were calibrated at the start and end of the monitoring period using a Brüel & Kjær type 4230 calibrator. No significant drift was noted.

- Attended noise measurements were conducted using a Brüel & Kjær Type 2270 Class 1 sound analyser, fitted with a type 4189 ½" microphone, set to record using 'A' frequency weighting in fast response mode. The sound analyser was also fitted with an approved windshield. A Brüel & Kjær Type 4230 calibrator was utilised to calibrate the sound level meter before and after each series of measurements. No significant calibration drift was noted. Measurements were undertaken for a period of 15-minutes at each of the selected measurement locations.

Measurements were typically taken at a height of 1.2 m and at least 3.5 m from any reflecting structure other than the ground. The weather during the noise survey period can be summarised as sunny conditions, with no rainfall and wind speeds were less than 5m/s at ground level. Measurements were generally taken in accordance with the Australian Standard *AS 1055.1 1997: Acoustics – Description and measurement of environmental noise*.

Table 4 | Noise Monitoring Equipment Calibration Information

Equipment/Measurement Location	Make	Serial	Last Calibration
Noise Monitor – Location 1	Acoustic Research Labs	16-707-005	May 2019
Noise Monitor – Location 2		16-203-502	Jan 2018
Sound Level Analyser – Location 3/3A.	Brüel & Kjær	3027570	February 2019

4.2 Weather Data

Weather data for the monitoring periods, as provided by the Mt Piper weather station (located within the Mt Piper Power Plant site), is shown in Appendix E. Noise measurement data with wind speeds higher than 5m/s was excluded from the assessment during that time.

As discussed in Section 2.2, there was no ash placement activity during the evening or night time period (18:00 – 06:00). In accordance with the NSW Noise Policy for Industry (NPI), activities at the Lamberts North site during 06:00 – 07:00 are not considered as night time activity as this time period falls within the defined shoulder period[b].

[b] As per NSW Noise Policy for Industry Section 3.3 (Dealing with 'shoulder' periods): For early morning (5am-7am) operations, it may be unduly stringent to expect such operations to be assessed against the night time criteria-especially if existing background noise levels are steadily rising in during these early morning hours.

As per Appendix C (*Procedure of assessing noise increase due to temperature inversions*) of *NSW Noise Policy for Industry, "if the development does not operate at night, there is no potential for noise impact due to inversions, and no further consideration of these effects is required"*.

Below is the summary of weather conditions prevalent during the noise monitoring periods which complies with the CoA E7 and CoA D3a(ii):

- Wind speeds were less than 3 m/s at 10 m above ground level for most of the time.
- Stability Category F temperature inversion conditions were not prevalent during the operational activities.
- Stability Category G temperature inversion conditions were not prevalent during the operational activities.

4.3 Noise Measurement Results

During the monitoring works, both attended and unattended monitoring was undertaken.

- Unattended continuous monitoring was undertaken at Locations 1 and 2 from 10:00am on the 28th June 2019 to 11:00am on the 30th June 2019. Detailed results of continuous noise measurements over the monitoring period are shown in Appendix C and statistical noise levels measured over the day, evening and night-time monitoring periods are detailed in Table 5.

  As noted in Appendix D and E, wind speeds greater than 5 m/s were experienced at the weather station for a few hours. The measured noise data during these periods was excluded from the overall measurements to ensure compliance with conditions CoA E7 and CoA D3a(ii).

- Attended noise measurements were conducted at locations 3 and 3A. These 15-minute statistical noise levels are also detailed in Table 5.

Table 5 | Results of Ambient Noise Monitoring

Note: rows in grey are results of attended monitoring, rows in white are results of unattended monitoring

Location	Date	Time	Period	Measured Noise Level, dBA				Note
				L_{Aeq}	L_{A10}	$L_{A90,}$	L_{Amax}	
Location 1 *(Blackmans Flat)*	28/06/2019	10:15am	Day	51	55	39	72	Note 1
	29/06/2019	10:19am	Day	49	52	43	65	
	28/06/2019	7am-6pm	Day	52	55	39	67	
		6pm-10pm	Evening	52	56	37	64	
		10pm-7am	Night	46	49	36	59	
	29/06/2019	7am-6pm	Day	52	55	41	64	
		6pm-10pm	Evening	48	52	37	63	
		10pm-7am	Night	46	49	39	68	
Location 2 *(Wallerawang)*	28/06/2019	9:51am	Day	41	42	34	66	Note 2
	29/06/2019	-	Day	Dirt bikes being used in property south of measurement location. No measurement conducted.				
	28/06/2019	7am-6pm	Day	45	47	36	64	
		6pm-10pm	Evening	46	49	37	59	
		10pm-7am	Night	43	45	36	53	
	29/06/2019	7am-6pm	Day	**62**	**52**	**39**	**91**	Note 2a
		6pm-10pm	Evening	43	46	38	54	Note 2
		10pm-7am	Night	49	52	39	63	
Location 3	28/06/2019	11:30am	Day	70	75	56	78	Note 3
Location 3A		11:50am	Day	64	67	58	71	

4.4 Discussion of results

Only the attended daytime noise measurement on the 28th June at location 2, complies with the assessment criterion of 42 dB(A)$L_{eq(15min)}$. All other daytime measurements exceed this noise limit and is discussed in detail for each location in the following sections.

4.4.1 Note 1 (Location 1 – Blackmans Flat)

We have been advised by EA NSW that this site has been purchased by Centennial Coal and currently there are no residential receivers on the site. Regular noise monitoring as per OEMP May 2013 is being conducted at this site.

During our site attendance, ambient noise was dominated by traffic noise from Castlereagh Highway. Intermittent noise impacts were also noted during the daytime attended monitoring period on the 29th June, from plant/machinery operating on the adjacent Springvale Coal Services site at 1613 Castlereagh Highway. Machinery included excavators and trucks/trailers.

There was no audible noise from the westerly direction (i.e. Lamberts North or Ash Repository).

The maximum equivalent continuous noise level at Location 1 was measured at 52 dB(A)L_{eq}. Birds, insects and heavy vehicle (trucks/trailers) passbys contributed to maximum noise levels of 63 – 72 dB(A)L_{max} in the day/ evening/ night time.

4.4.2 Note 2 (Location 2 – Wallerawang)

The ambient noise levels at this rural residential location is dominated by noise from birds/insects, low industrial hum from the western direction and distant traffic noise from Castlereagh Highway. Intermittent machinery/plant noise (tractors, pump/generator) was also faintly audible from the farm to the west/south-west.

Additionally, dirt bike activity was noted during the daytime period (initially at 10:10am and also at 2:30pm) within the farm property to the south of the monitoring location. Elevated levels during this time period is a result of this activity, which can also be seen in the noise logging data attached in Appendix C.

Subjectively on site there was no evidence of noise originating from the north-westerly direction, thus indicating negligible noise contribution from ash repository sites to ambient noise levels at this location.

The maximum equivalent continuous noise level at Location 2 was measured at 45 dB(A)L_{eq}. Birds, insects and vehicle passby (local resident vehicles on dirt road) contributed to maximum noise levels of 53 – 66 dB(A)L_{max} in the day/ evening/ night time.

4.4.2.1 Note 2a

Dirt bike activity was noted on the farmland to the west and south-west during the daytime period on the 29th June 2019. This was first noted during the daytime period (approx. 10:15am) and also confirmed extending into the afternoon and evening periods (2:30pm and 5:00pm).

4.4.3 Location 3 & 3A

As part of the assessment of compliance against the CoA, additional reference measurements were undertaken at locations 3 and 3A based on the activities being undertaken on site.

- Location 3 – Measurements of dozer and water cart operations, measured at the western edge of the ash sediment basin. Operational noise clearly audible at this location and included sources such as engine noise and reverse beeps.
- Location 3A – Measurement conducted at the western boundary of the Lamberts North site (between Area 1 and Lamberts North). Operational noise from dump trucks travelling along internal access road (to the ash sediment basin) and roller operating in the ash sediment basin clearly audible at this location. Operational noise from dozer and water cart barely perceptible at this location and not visible as a result of ash mound. Noise sources include engine noise and reverse beeps of roller.

4.5 Previous monitoring data

A summary of previous data collected by this office for Lamberts North is presented in Table 6 below.

Table 6 | Summary of previous Environmental Noise Monitoring Data

Location	Period	Measured Equivalent Sound Pressure Level, L_{Aeq} dBA						
		September 2015	March 2016	October 2016	April 2017	November 2017	April 2018	September 2018
Location 1 *(Blackmans Flat)*	Day	52	52	56	56	56	56	55
	Evening	50	49	53	52	51	51	51
	Night	47	47	51	50	48	49	49
Location 2 *(Wallerawang)*	Day	45	45	49	60	42	49	46
	Evening	41	45	46	46	40	44	42
	Night	41	43	51	44	44	43	49

- These receiver locations have not changed since 2015, with Aurecon endeavouring to install the noise monitors at approximately the same location during each visit.
- Noise levels are not expected to fluctuate greatly, which is evident from the historical data, as there has not been any major development in the immediate vicinity of these locations, to significantly impact on the existing ambient environment.
- Moreover, operations at Lamberts North have also been fairly consistent, with typical activities and associated plant/equipment only moving to different areas of the site. However, based on the distance of Lamberts North from these receiver locations and the existing terrain, this has had little to no impact on the measured noise levels. Fluctuations noted in the historical data is most likely a result of noise impacts associated with intermittent operations at the Springvale Coal Services site located to the west of Location 1 (1613 Castlereagh Highway), farm equipment and dirt bikes on adjoining farms and seasonal traffic variations along Castlereagh Highway. All these noise sources are significantly closer to the receiver locations than Lamberts North.
- The daytime equivalent sound pressure levels measured during this assessment period is consistent with the historical data presented above at both receiver locations.

5 Noise Assessment

The results of the measured ambient noise levels at the sensitive receivers stipulated in the CoA (Location 1 and Location 2) are detailed in

Table 5 above.

As discussed in Section 4.4, the ambient environment at both the receiver locations, was dominated by traffic noise, low industrial hum, noise from nearby coal mines and noise from birds/insects. It is impossible to accurately identify the industrial hum noted at location 1, given the location of several facilities in the westerly direction, i.e. Springvale mine, Pinedale mine, Lamberts South Centennial Coal site etc.

The measured equivalent sound pressure levels were in excess of the 42 dB(A)$L_{eq(15min)}$ day time noise target as detailed in Table 5, however no discernible operational noise was noted at either location from ash placement works, during the monitoring period. Given the large buffer distances (at least 1.4km to location 1 and over 2.5km to location 2), intervening topography and based on the measured reference noise levels measured from ash sediment operations plant/equipment (refer Table 2), noise impacts at both receiver locations would be minimal or insignificant.

Aurecon undertook a desktop assessment to predict noise impacts from the measured operational activities, to validate this statement and this is described in more detail in the following section.

5.1 Predicted noise contribution

For the purpose of this assessment, we have assumed a worst-case scenario of the plant/machinery detailed in Table 2 operating in the northern part of the Lamberts North site (as opposed to Area 1). We were informed by Lend Lease that operations only occur in the northern part of Lamberts North site and no activities take place in the southern half. Additionally, we were also informed that no activities had taken place in the northern part of Lamberts North over last two months and no operations were proposed in the immediate future. The operational activities on site commenced each day from approximately 06:30 until 17:00, during our site visit. There were no operational activities between 17:00 and 06:00.

We note that the magnitude of operational noise impacts will depend on the number and intensity of machines operating, and the working location of the equipment. It is unlikely that all the plant and equipment will be running simultaneously in the same location. In addition, the nature of activities onsite is expected to vary from day to day.

The predicted noise levels were calculated (based on sound propagation through geometric spreading) at a distance based on worst case noise emission levels (i.e. maximum sound power levels) without considering any barrier effects from the undulating surrounding terrain. However due to intermittent operational characteristics and constant change of distance between the source-receiver, a 50% operational efficiency (equipment operational for 50% of the time during each 15-minute measurement period) for each equipment type in the calculation has been used. The results of this calculation are shown in Table 7.

It should be noted that the predicted levels in this section are based on a worst-case operational scenario at both assessment locations and include adjustments for annoying activities as outlined in the NSW Environment Protection Authority's (EPA) Interim Construction Noise Guideline (ICNG). The above prediction methodology takes into account the number of individual machines operating as well as the percentage in use during a 15-minute period, with all scheduled equipment operating at the minimum distance from the nearest sensitive receiver.

The predicted levels in Table 7 provide a theoretical maximum cumulative noise impact. The distances shown in Table 7 are considered minimum between the operational works and the respective receiver zones. The calculation also assumes that each item of equipment is operating at maximum capacity (i.e. maximum sound power level). In reality the mobile plant operates at much lower capacity during its operation and hence the levels shown in Table 7 are considered conservative and should be interpreted as indicative worst case only.

Table 7 | Predicted Noise Emissions

Equipment at Lamberts North	Sound Power Level (SWL), dBA	Predicted Noise Levels, dB(A)$L_{eq(15min)}$	
		Location 1 – Blackmans Flat (approx. 1.4km)	Location 2 – Wallerawang (approx. 2.5 km)
Dozer / Crawler tractor and Water Truck	105	31	26
Roller	108	34	29
Dump Truck x 2	101	28	22
Light commercial vehicle	98	23	<20
Cumulative predicted noise levels from the operation of the above equipment		**37**	**31**

Table 8 | Summary of Cumulative Noise Emissions against the Noise Criteria (dBA)

Location*	Description	Maximum theoretical predicted noise	Day limit 42 dBA (07:00-18:00)	Evening limit 38 dBA (18:00-22:00) ^	Night limit 35 dBA (22:00-07:00) ^
1	Blackmans Flat	37	✓	N/A	N/A
2	Wallerawang	31	✓	N/A	N/A

✓ Complies with the stipulated noise criteria

^ No operational activity during Evening or night time periods.

As shown in Table 8, results of our assessment revealed the following:

- Worst-case modelling predicted that noise levels would comply with the daytime and evening period noise criteria, at both Location 1 and Location 2.
- Worst case modelling indicates that the maximum predicted noise level will exceed the noise criteria during night time at Location 1. However, CoA E1 for Lamberts North restricts any activities after 20:00 on weekdays and 17:00 on weekends (refer to Section 3.2 for more details), and therefore any predicted night time exceedance is not relevant.

Additionally, the noise emission predictions correlate the on-site observations as the predicted emissions at Location 1 and Location 2 are greater than 10 dB below the ambient background noise levels measured on site and would thereby be subjectively inaudible.

6 Recommendations

6.1 Noise management measures

Should complaints from the community be received, the following noise control measures could be applied to minimise noise impacts;

- If possible avoid the coincidence of noisy plant/machine working simultaneously.
- Construction trucks and other heavy machinery to use loop tracks as much as possible on the site to minimise the amount of reversing activities, i.e. managed through the Operational Traffic and Transport Management Plan.
- Consider the use of alternative warning system to the conventional single tone reversing alarm, such as squawkers and broadband sound reversing alarm (e.g. bbs-tek® White Sound® reverse alarms).
- Installation of silencer/mufflers on the engine exhaust, if plant/machinery operations are proposed along the eastern boundary of the Lamberts North site.

7 Conclusion

Aurecon conducted operational noise measurements of the ash placement operations associated with the Lamberts North Ash Placement Project, as required by the Condition of Approval (CoA) E11 and the mitigation measures specified in the Operational Environment Management Plan (OEMP May 2013). Noise measurements were carried out at the two nearest affected sensitive receiver locations (Blackmans Flat and Wallerawang) between 28th – 30th June 2019, in accordance with the project OEMP.

- *Location 1 – Blackmans Flat*

The ambient noise at Location 1 (i.e. Blackmans Flat) was relatively high and the maximum equivalent continuous sound pressure level over 15 minutes at Location 1 was measured at $L_{Aeq\ (15minute)}$ 52 dB(A). The measured noise levels were dominated by traffic noise from Castlereagh Highway. Intermittent noise impacts were also noted during the daytime attended monitoring period on the 29th June, from plant/machinery (excavators and trucks/trailers) operating on the adjacent Springvale Coal Services site at 1613 Castlereagh Highway. Attended measurements indicated that noise emissions from the Lamberts North site was subjectively inaudible at the Location 1 site.

The maximum predicted noise contribution resulting from the operation of equipment/ plant at the Lamberts North site at Location 1 was determined to be 37 dB(A)$L_{eq(15min)}$, as detailed in Table 7. This contribution is deemed to comply with the requirements of the CoA.

- *Location 2 – Wallerawang*

The ambient noise at Location 2 (i.e. Wallerawang) was dominated by noise from birds/insects, low hum from Mt Piper Power Station and distant traffic noise from Castlereagh Highway. Intermittent machinery/plant noise (tractors, pump/generator) was audible from the farm to the west/south-west. Additionally, dirt bike activity was noted during the daytime period (initially at 10:10am and also at 2:30pm) within the farm property to the south of the monitoring location.

Subjectively there was no evidence of noise originating from the north-westerly direction at Location 2. This suggests that noise contribution from Lamberts North to the overall equivalent sound pressure level at this location is negligible. Maximum equivalent continuous noise over 15 minutes at Location 2 was measured at $L_{Aeq\ (15minute)}$ 45 dB(A), ignoring Sunday (29 June) daytime dirt bike noise contributions.

The maximum predicted noise contribution resulting from the operation of equipment/ plant at the Lamberts North site at Location 2 was determined to be 31 dB(A), as detailed in Table 7. This contribution is deemed to comply with the requirements of the CoA.

- *Summary*

The ambient noise levels measured at Locations 1 and 2 exceed the 42 dB(A) day time noise target. However, noise contributions from surrounding simultaneous noise sources and activities including coal mines, road traffic and local environment (birds, insects and dogs barking), were noted as the dominant contributors. Subjectively there was no evidence of noise originating from the Lamberts north site direction at either receiver location.

To validate this observation, a desktop assessment of the measured operational levels associated with the ash placement activities was also undertaken by this office. Based on the worst-case operating scenario (refer section 5.1), cumulative predicted noise levels from ash placement activities will comfortably comply with the *Lamberts North Ash Placement Project – Operational Environmental Management Plan (May 2013)*, at both the representative residential receiver locations 1 and 2.

8 References

The following documents were referenced as part of this assessment:

- Lamberts North Ash Placement Project – Operational Environmental Management Plan (OEMP) May 2013.
- Lamberts North Operational Noise Assessment September 2018 report, revision 2.
- *Delta Electricity Project Conditions of Approval for Mt Piper Power Station Ash Repository Extension Project (approved on 16 February 2012).*
- *Mt Piper Power Station Ash Placement Project – Lamberts North Construction Noise monitoring 14-15 January 2013 (Revision 2, dated 11 February 2013)*
- Australian Standard *AS 1055 1997: Acoustics – Description and measurement of environmental noise*.

Appendix A
Glossary of terms

Term	Definition
dB and A-weighting (dBA)	The decibel is a logarithmic unit used to measure sound level. A-weighting is a frequency weighting added to sound level measurements to replicate response of human ear, typically between 500Hz and 8kHz.
L_{Aeq}	The time averaged A-weighted sound pressure level for a time interval, as defined in AS1055.1. It is generally described as the equivalent continuous A-weighted sound pressure level that has the same mean square pressure level as a sound that varies over time. It can be considered as the average sound pressure level over the measurement period.
L_{Amax}	The RMS maximum A-weighted sound level during a measurement period or noise event. It refers to the maximum ambient noise detected.
L_{A10}	A-weighted noise level which is exceeded for only 10% of the measuring period. It is usually used as the descriptor for intrusive noise level and represents ambient road traffic noise in general.
L_{A90}	A-weighted noise level which is exceeded for 90% of the measuring period. It is usually used as the descriptor for background noise level during the measurement period.
L_{Amin}	Minimum A-weighted noise level detected during the measuring period. It refers to the minimum background noise detected.

Appendix B
Photos of noise monitored locations at Blackmans Flat and Wallerawang

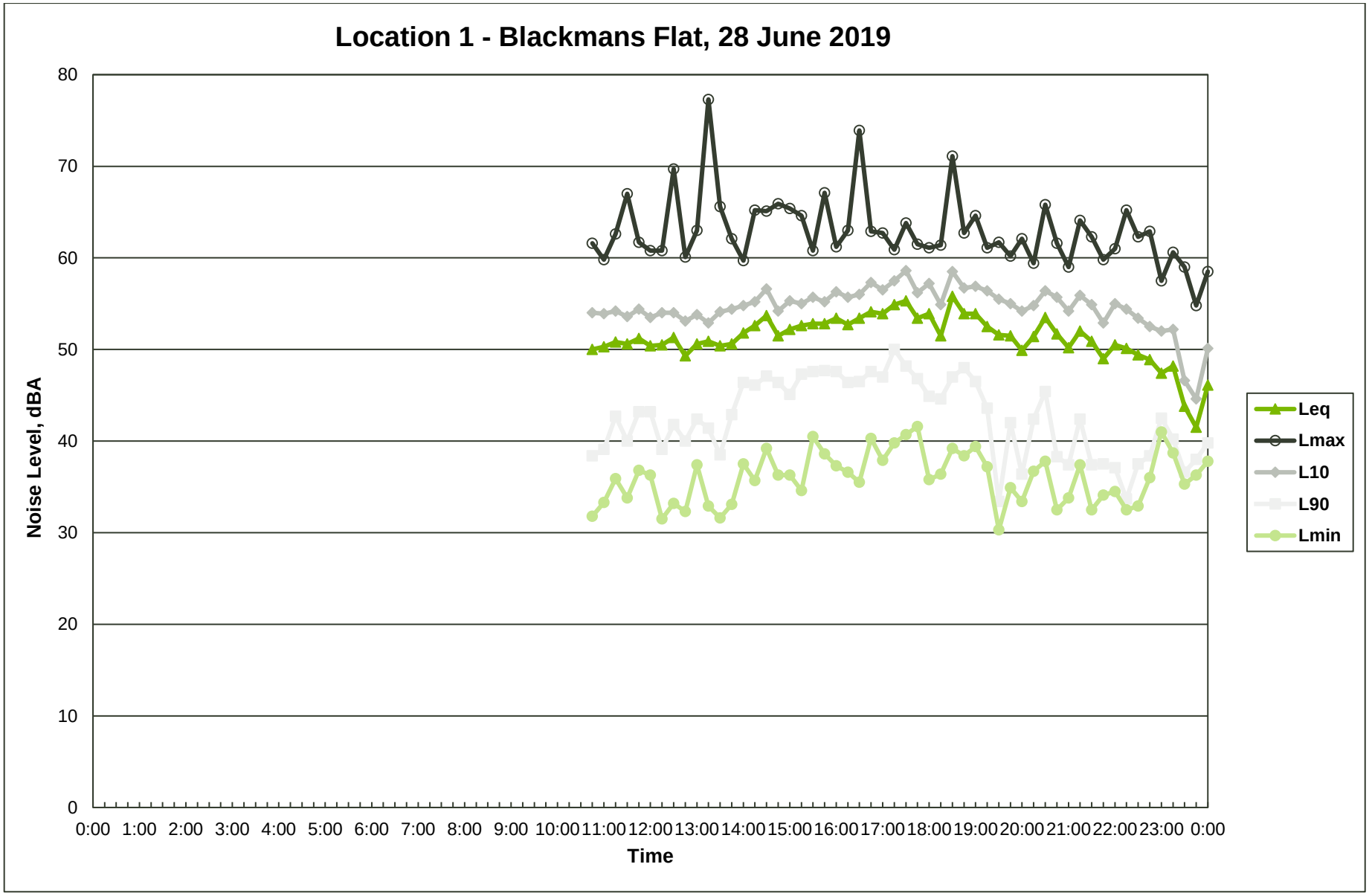
Figure 2 | Photograph of Measurement Location 1 (Blackmans Flat) – 28 June 2019

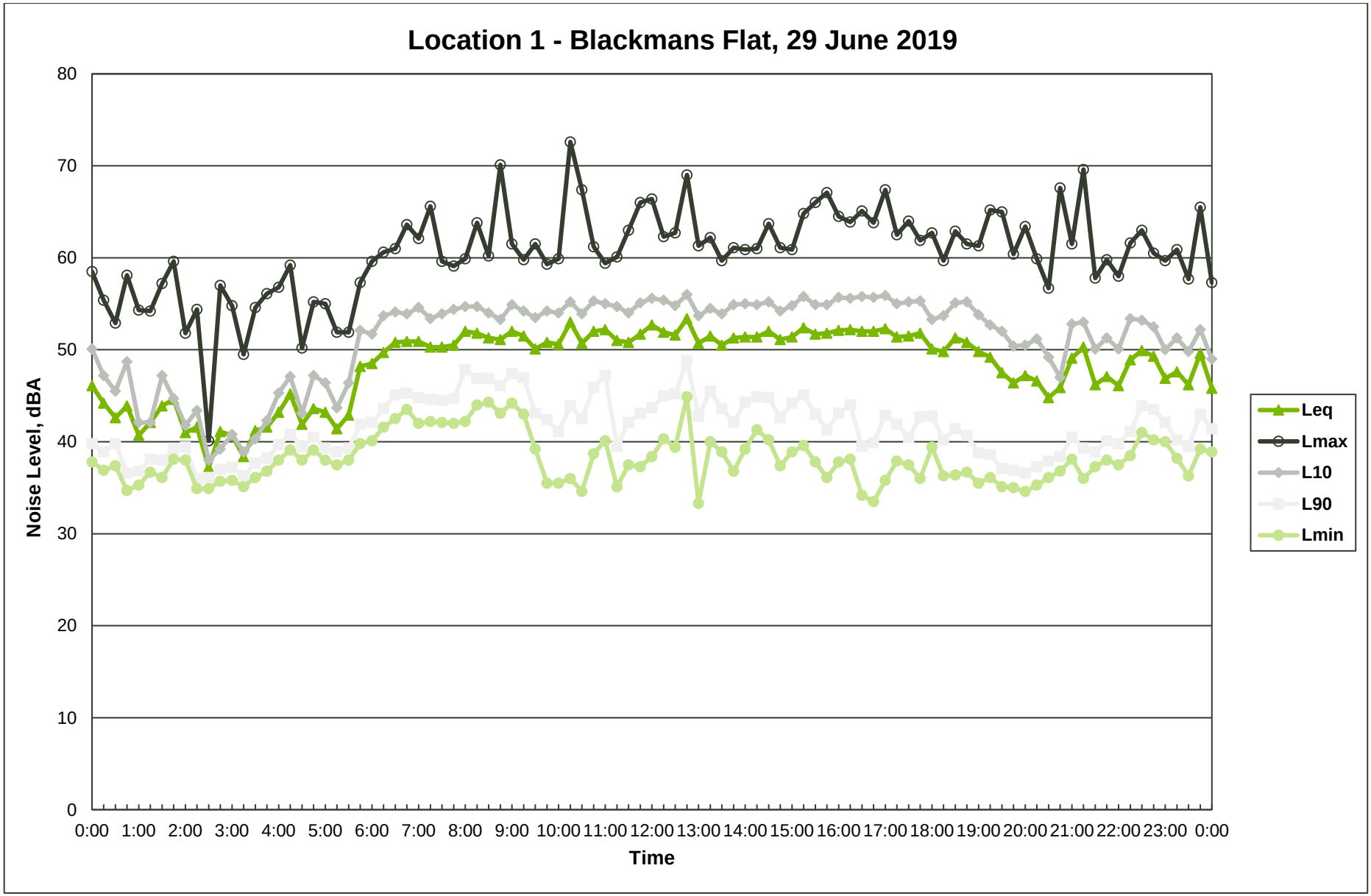
Figure 3 | Photograph of Machinery/Equipment operating on Springvale Coal Services site at 1613 Castlereagh Highway – 28 June 2019, measured from Location 1 looking west

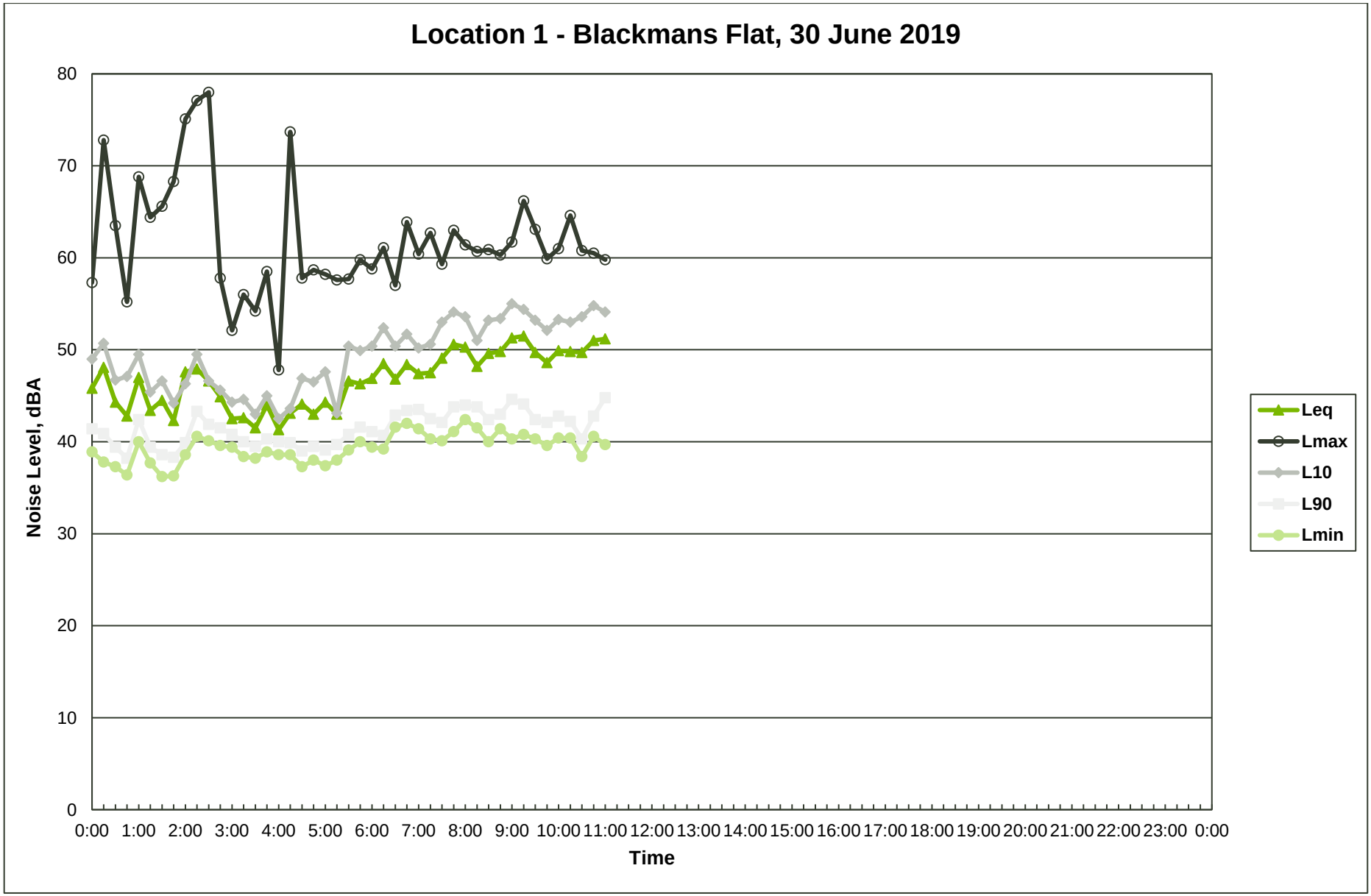
Figure 4 | Photograph of Measurement Location 2 (Wallerawang) – 28 June 2019 looking west and north-west

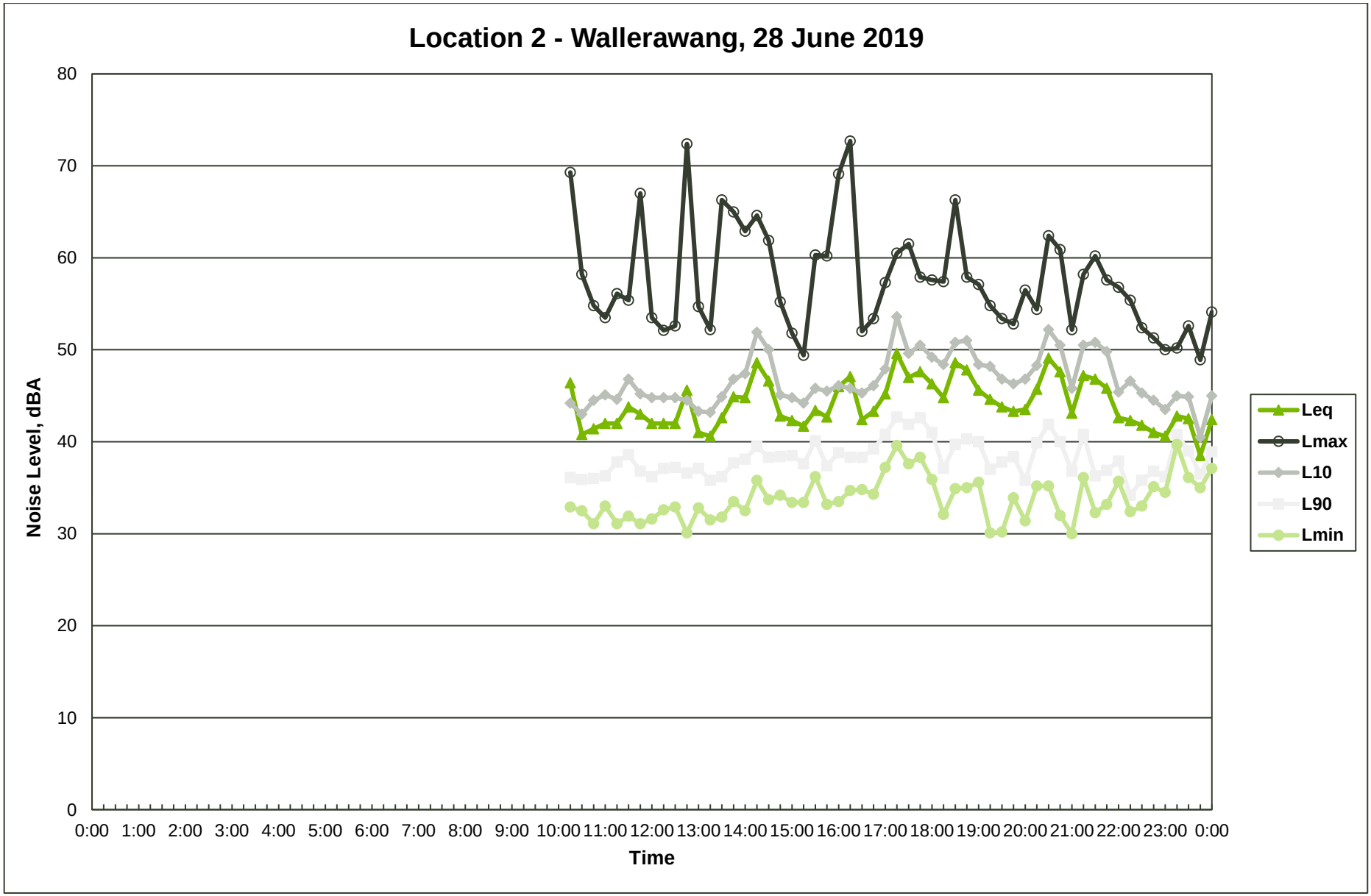
Figure 5 | Photographs of Machinery Operating at the Ash Sediment Basin (Area 1) on the 29 June 2019

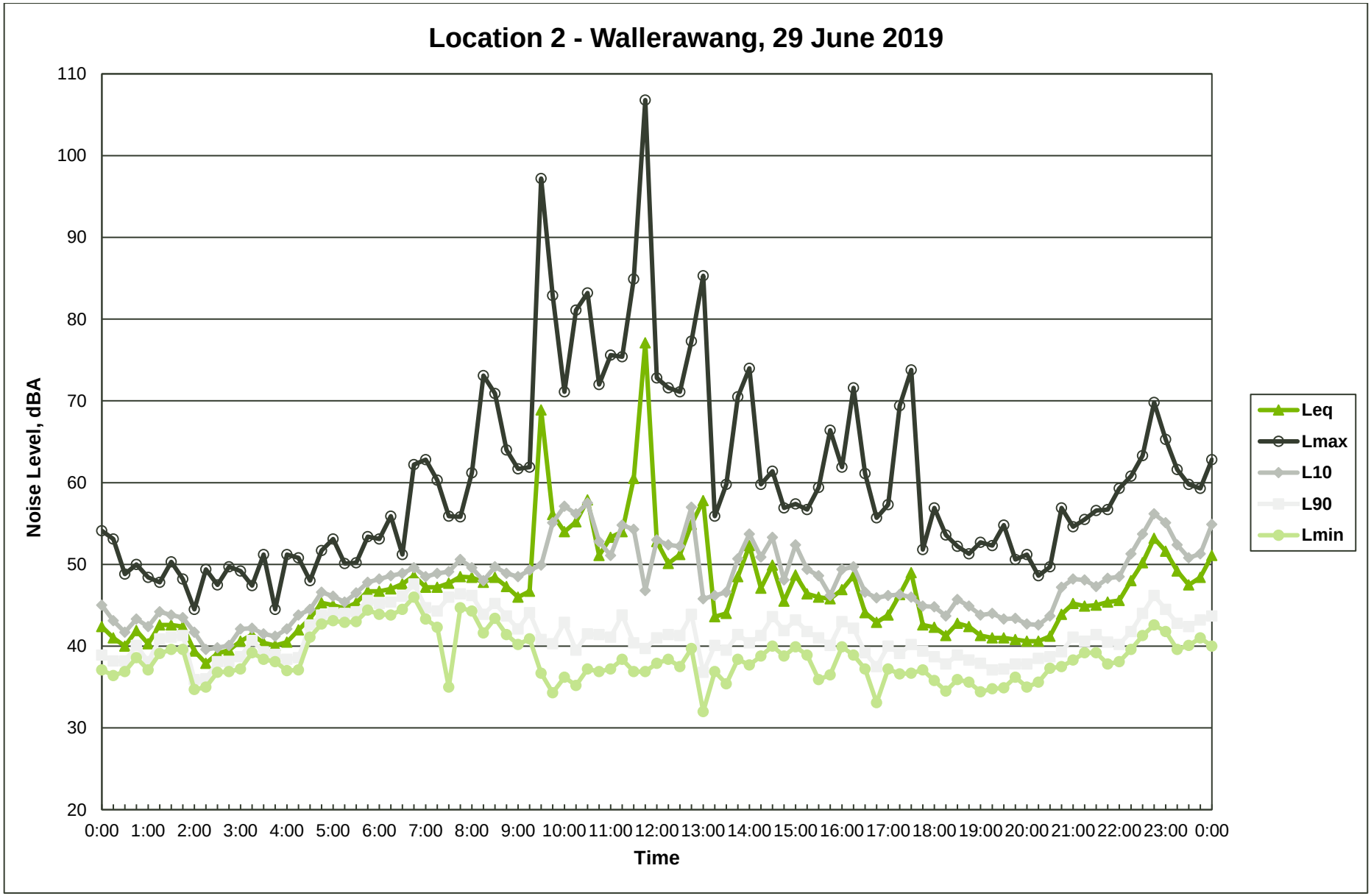
Appendix C
Noise Monitoring Graphs

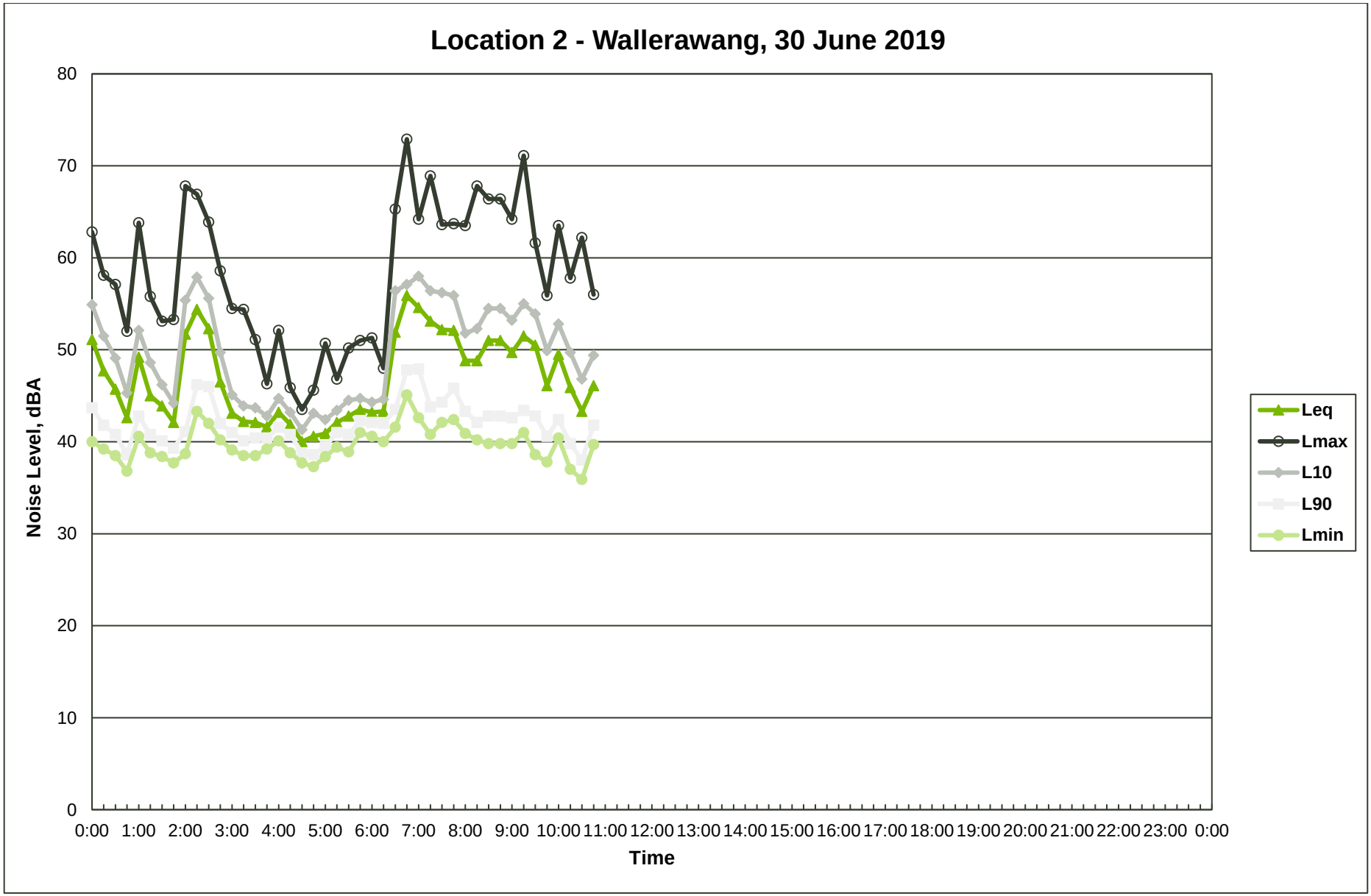

Location 1 - Blackmans Flat, 28 June 2019
Noise Level, dBA
80
70
60
50
40
30
20
10
0
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time
Leq
Lmax
L10
L90
Lmin


Location 1 - Blackmans Flat, 29 June 2019
Noise Level, dBA
80
70
60
50
40
30
20
10
0
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time
Leq
Lmax
L10
L90
Lmin


Location 1 - Blackmans Flat, 30 June 2019
Noise Level, dBA
80
70
60
50
40
30
20
10
0
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time
Leq
Lmax
L10
L90
Lmin


Location 2 - Wallerawang, 28 June 2019
Noise Level, dBA
80
70
60
50
40
30
20
10
0
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time
Leq
Lmax
L10
L90
Lmin


Location 2 - Wallerawang, 29 June 2019
Noise Level, dBA
110
100
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time
Leq
Lmax
L10
L90
Lmin


Location 2 - Wallerawang, 30 June 2019
Noise Level, dBA
80
70
60
50
40
30
20
10
0
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time
Leq
Lmax
L10
L90
Lmin

Appendix D

Area 1 - Traffic Route and Machinery Operations during Monitoring Period

Appendix E
Weather summary

Note: Highlighted rows indicate periods with rainfall or wind speeds > 5m/s. Corresponding noise levels measured during these periods are excluded from this assessment.

Date	Time	Rainfall (mm)	Temperature (°C)	Wind Speed (m/s)	Wind Direction (deg.)
28/06/2019	7:00:00 AM	0	7	1	195
28/06/2019	7:05:00 AM	0	7	1	153
28/06/2019	7:10:00 AM	0	7	1	214
28/06/2019	7:15:00 AM	0	7	1	173
28/06/2019	7:20:00 AM	0	7	1	177
28/06/2019	7:25:00 AM	0	7	1	201
28/06/2019	7:30:00 AM	0	7	1	275
28/06/2019	7:35:00 AM	0	8	1	180
28/06/2019	7:40:00 AM	0	8	1	280
28/06/2019	7:45:00 AM	0	8	1	169
28/06/2019	7:50:00 AM	0	8	2	142
28/06/2019	7:55:00 AM	0	8	1	192
28/06/2019	8:00:00 AM	0	8	2	142
28/06/2019	8:05:00 AM	0	9	2	141
28/06/2019	8:10:00 AM	0	9	2	220
28/06/2019	8:15:00 AM	0	9	2	243
28/06/2019	8:20:00 AM	0	9	2	238
28/06/2019	8:25:00 AM	0	9	2	311
28/06/2019	8:30:00 AM	0	9	2	180
28/06/2019	8:35:00 AM	0	9	2	126
28/06/2019	8:40:00 AM	0	9	2	310
28/06/2019	8:45:00 AM	0	9	2	258
28/06/2019	8:50:00 AM	0	9	1	89
28/06/2019	8:55:00 AM	0	9	2	119
28/06/2019	9:00:00 AM	0	10	2	69
28/06/2019	9:05:00 AM	0	10	2	150
28/06/2019	9:10:00 AM	0	10	2	53
28/06/2019	9:15:00 AM	0	10	2	57
28/06/2019	9:20:00 AM	0	10	3	62
28/06/2019	9:25:00 AM	0	10	2	85
28/06/2019	9:30:00 AM	0	11	2	101
28/06/2019	9:35:00 AM	0	11	2	155
28/06/2019	9:40:00 AM	0	11	2	190
28/06/2019	9:45:00 AM	0	11	2	253
28/06/2019	9:50:00 AM	0	12	2	125
28/06/2019	9:55:00 AM	0	12	2	70
28/06/2019	10:00:00 AM	0	12	2	42
28/06/2019	10:05:00 AM	0	11	2	70

Date	Time	Rainfall (mm)	Temperature (°C)	Wind Speed (m/s)	Wind Direction (deg.)
28/06/2019	10:10:00 AM	0	11	2	34
28/06/2019	10:15:00 AM	0	12	2	60
28/06/2019	10:20:00 AM	0	12	3	74
28/06/2019	10:25:00 AM	0	12	2	128
28/06/2019	10:30:00 AM	0	12	2	57
28/06/2019	10:35:00 AM	0	12	3	63
28/06/2019	10:40:00 AM	0	12	3	70
28/06/2019	10:45:00 AM	0	12	3	49
28/06/2019	10:50:00 AM	0	13	3	58
28/06/2019	10:55:00 AM	0	13	2	109
28/06/2019	11:00:00 AM	0	13	2	62
28/06/2019	11:05:00 AM	0	13	2	152
28/06/2019	11:10:00 AM	0	13	2	196
28/06/2019	11:15:00 AM	0	13	2	40
28/06/2019	11:20:00 AM	0	13	2	51
28/06/2019	11:25:00 AM	0	13	3	79
28/06/2019	11:30:00 AM	0	14	2	176
28/06/2019	11:35:00 AM	0	13	2	239
28/06/2019	11:40:00 AM	0	13	2	90
28/06/2019	11:45:00 AM	0	14	2	65
28/06/2019	11:50:00 AM	0	14	2	53
28/06/2019	11:55:00 AM	0	14	2	192
28/06/2019	12:00:00 PM	0	14	1	201
28/06/2019	12:05:00 PM	0	14	2	111
28/06/2019	12:10:00 PM	0	14	3	92
28/06/2019	12:15:00 PM	0	14	2	187
28/06/2019	12:20:00 PM	0	14	2	188
28/06/2019	12:25:00 PM	0	14	2	166
28/06/2019	12:30:00 PM	0	14	2	148
28/06/2019	12:35:00 PM	0	15	2	307
28/06/2019	12:40:00 PM	0	15	1	188
28/06/2019	12:45:00 PM	0	15	2	272
28/06/2019	12:50:00 PM	0	15	2	115
28/06/2019	12:55:00 PM	0	15	2	67
28/06/2019	1:00:00 PM	0	14	2	65
28/06/2019	1:05:00 PM	0	14	3	103
28/06/2019	1:10:00 PM	0	15	2	120
28/06/2019	1:15:00 PM	0	15	2	309
28/06/2019	1:20:00 PM	0	15	2	212
28/06/2019	1:25:00 PM	0	15	3	97
28/06/2019	1:30:00 PM	0	15	2	262
28/06/2019	1:35:00 PM	0	15	2	252
28/06/2019	1:40:00 PM	0	15	2	196
28/06/2019	1:45:00 PM	0	15	2	227
28/06/2019	1:50:00 PM	0	15	2	236
28/06/2019	1:55:00 PM	0	15	2	309
28/06/2019	2:00:00 PM	0	15	2	230
28/06/2019	2:05:00 PM	0	15	2	250

Date	Time	Rainfall (mm)	Temperature (°C)	Wind Speed (m/s)	Wind Direction (deg.)
28/06/2019	2:10:00 PM	0	15	2	301
28/06/2019	2:15:00 PM	0	15	2	283
28/06/2019	2:20:00 PM	0	15	2	272
28/06/2019	2:25:00 PM	0	14	2	272
28/06/2019	2:30:00 PM	0	15	2	246
28/06/2019	2:35:00 PM	0	15	2	288
28/06/2019	2:40:00 PM	0	15	3	308
28/06/2019	2:45:00 PM	0	15	2	320
28/06/2019	2:50:00 PM	0	14	2	254
28/06/2019	2:55:00 PM	0	14	2	291
28/06/2019	3:00:00 PM	0	14	1	136
28/06/2019	3:05:00 PM	0	14	1	234
28/06/2019	3:10:00 PM	0	14	2	222
28/06/2019	3:15:00 PM	0	14	2	81
28/06/2019	3:20:00 PM	0	14	2	72
28/06/2019	3:25:00 PM	0	14	2	55
28/06/2019	3:30:00 PM	0	14	2	58
28/06/2019	3:35:00 PM	0	14	2	75
28/06/2019	3:40:00 PM	0	14	2	59
28/06/2019	3:45:00 PM	0	14	2	79
28/06/2019	3:50:00 PM	0	14	3	41
28/06/2019	3:55:00 PM	0	13	2	62
28/06/2019	4:00:00 PM	0	13	2	61
28/06/2019	4:05:00 PM	0	13	2	58
28/06/2019	4:10:00 PM	0	13	2	44
28/06/2019	4:15:00 PM	0	13	2	38
28/06/2019	4:20:00 PM	0	13	2	122
28/06/2019	4:25:00 PM	0	12	2	72
28/06/2019	4:30:00 PM	0	12	2	69
28/06/2019	4:35:00 PM	0	12	2	65
28/06/2019	4:40:00 PM	0	11	2	76
28/06/2019	4:45:00 PM	0	11	1	215
28/06/2019	4:50:00 PM	0	10	1	277
28/06/2019	4:55:00 PM	0	10	1	276
28/06/2019	5:00:00 PM	0	9	1	303
28/06/2019	5:05:00 PM	0	8	1	266
28/06/2019	5:10:00 PM	0	8	1	249
28/06/2019	5:15:00 PM	0	8	1	241
28/06/2019	5:20:00 PM	0	7	2	238
28/06/2019	5:25:00 PM	0	7	1	244
28/06/2019	5:30:00 PM	0	7	1	253
28/06/2019	5:35:00 PM	0	6	2	266
28/06/2019	5:40:00 PM	0	6	1	273
28/06/2019	5:45:00 PM	0	6	1	251
28/06/2019	5:50:00 PM	0	6	1	240
28/06/2019	5:55:00 PM	0	5	2	240
28/06/2019	6:00:00 PM	0	5	1	256
28/06/2019	6:05:00 PM	0	6	1	269

Date	Time	Rainfall (mm)	Temperature (°C)	Wind Speed (m/s)	Wind Direction (deg.)
28/06/2019	6:10:00 PM	0	6	1	261
28/06/2019	6:15:00 PM	0	6	1	260
28/06/2019	6:20:00 PM	0	6	1	260
28/06/2019	6:25:00 PM	0	6	1	275
28/06/2019	6:30:00 PM	0	6	1	290
28/06/2019	6:35:00 PM	0	6	1	279
28/06/2019	6:40:00 PM	0	6	1	256
28/06/2019	6:45:00 PM	0	6	1	308
28/06/2019	6:50:00 PM	0	6	1	246
28/06/2019	6:55:00 PM	0	6	1	203
28/06/2019	7:00:00 PM	0	6	1	265
28/06/2019	7:05:00 PM	0	6	1	260
28/06/2019	7:10:00 PM	0	6	1	185
28/06/2019	7:15:00 PM	0	6	1	266
28/06/2019	7:20:00 PM	0	5	1	227
28/06/2019	7:25:00 PM	0	5	1	295
28/06/2019	7:30:00 PM	0	5	1	243
28/06/2019	7:35:00 PM	0	6	1	262
28/06/2019	7:40:00 PM	0	6	1	256
28/06/2019	7:45:00 PM	0	6	2	252
28/06/2019	7:50:00 PM	0	5	2	247
28/06/2019	7:55:00 PM	0	5	2	264
28/06/2019	8:00:00 PM	0	5	2	259
28/06/2019	8:05:00 PM	0	5	2	257
28/06/2019	8:10:00 PM	0	5	1	255
28/06/2019	8:15:00 PM	0	5	2	256
28/06/2019	8:20:00 PM	0	5	2	276
28/06/2019	8:25:00 PM	0	5	2	268
28/06/2019	8:30:00 PM	0	5	2	266
28/06/2019	8:35:00 PM	0	5	1	254
28/06/2019	8:40:00 PM	0	5	1	249
28/06/2019	8:45:00 PM	0	5	1	257
28/06/2019	8:50:00 PM	0	4	1	261
28/06/2019	8:55:00 PM	0	4	1	278
28/06/2019	9:00:00 PM	0	4	1	281
28/06/2019	9:05:00 PM	0	5	1	262
28/06/2019	9:10:00 PM	0	5	2	248
28/06/2019	9:15:00 PM	0	5	1	265
28/06/2019	9:20:00 PM	0	5	1	292
28/06/2019	9:25:00 PM	0	5	1	262
28/06/2019	9:30:00 PM	0	5	1	255
28/06/2019	9:35:00 PM	0	5	2	249
28/06/2019	9:40:00 PM	0	5	2	252
28/06/2019	9:45:00 PM	0	5	2	249
28/06/2019	9:50:00 PM	0	5	2	252
28/06/2019	9:55:00 PM	0	5	1	243
28/06/2019	10:00:00 PM	0	5	1	243
28/06/2019	10:05:00 PM	0	4	1	270

Date	Time	Rainfall (mm)	Temperature (°C)	Wind Speed (m/s)	Wind Direction (deg.)
28/06/2019	10:10:00 PM	0	5	1	287
28/06/2019	10:15:00 PM	0	5	1	272
28/06/2019	10:20:00 PM	0	5	1	276
28/06/2019	10:25:00 PM	0	4	2	272
28/06/2019	10:30:00 PM	0	5	1	293
28/06/2019	10:35:00 PM	0	5	1	281
28/06/2019	10:40:00 PM	0	5	1	250
28/06/2019	10:45:00 PM	0	5	1	248
28/06/2019	10:50:00 PM	0	5	1	244
28/06/2019	10:55:00 PM	0	4	1	243
28/06/2019	11:00:00 PM	0	3	1	242
28/06/2019	11:05:00 PM	0	3	1	239
28/06/2019	11:10:00 PM	0	4	1	243
28/06/2019	11:15:00 PM	0	4	1	243
28/06/2019	11:20:00 PM	0	3	1	240
28/06/2019	11:25:00 PM	0	3	1	249
28/06/2019	11:30:00 PM	0	4	1	253
28/06/2019	11:35:00 PM	0	3	2	251
28/06/2019	11:40:00 PM	0	3	1	242
28/06/2019	11:45:00 PM	0	3	1	246
28/06/2019	11:50:00 PM	0	3	1	240
28/06/2019	11:55:00 PM	0	3	1	240
29/06/2019	12:00:00 AM	0	3	1	239
29/06/2019	12:05:00 AM	0	3	1	257
29/06/2019	12:10:00 AM	0	3	1	253
29/06/2019	12:15:00 AM	0	3	1	259
29/06/2019	12:20:00 AM	0	2	1	257
29/06/2019	12:25:00 AM	0	3	1	250
29/06/2019	12:30:00 AM	0	3	1	239
29/06/2019	12:35:00 AM	0	2	1	267
29/06/2019	12:40:00 AM	0	2	1	292
29/06/2019	12:45:00 AM	0	2	1	220
29/06/2019	12:50:00 AM	0	2	1	149
29/06/2019	12:55:00 AM	0	2	0	275
29/06/2019	1:00:00 AM	0	2	0	241
29/06/2019	1:05:00 AM	0	2	0	80
29/06/2019	1:10:00 AM	0	2	1	45
29/06/2019	1:15:00 AM	0	2	1	47
29/06/2019	1:20:00 AM	0	2	1	106
29/06/2019	1:25:00 AM	0	1	1	324
29/06/2019	1:30:00 AM	0	1	0	267
29/06/2019	1:35:00 AM	0	1	0	242
29/06/2019	1:40:00 AM	0	1	1	209
29/06/2019	1:45:00 AM	0	1	1	121
29/06/2019	1:50:00 AM	0	1	1	94
29/06/2019	1:55:00 AM	0	1	1	28
29/06/2019	2:00:00 AM	0	1	1	197
29/06/2019	2:05:00 AM	0	1	0	230

Date	Time	Rainfall (mm)	Temperature (°C)	Wind Speed (m/s)	Wind Direction (deg.)
29/06/2019	2:10:00 AM	0	1	0	77
29/06/2019	2:15:00 AM	0	1	0	290
29/06/2019	2:20:00 AM	0	1	1	261
29/06/2019	2:25:00 AM	0	1	1	311
29/06/2019	2:30:00 AM	0	1	1	237
29/06/2019	2:35:00 AM	0	1	0	242
29/06/2019	2:40:00 AM	0	2	1	210
29/06/2019	2:45:00 AM	0	2	1	247
29/06/2019	2:50:00 AM	0	2	0	236
29/06/2019	2:55:00 AM	0	2	0	210
29/06/2019	3:00:00 AM	0	2	1	246
29/06/2019	3:05:00 AM	0	2	1	260
29/06/2019	3:10:00 AM	0	1	1	266
29/06/2019	3:15:00 AM	0	1	0	166
29/06/2019	3:20:00 AM	0	1	1	229
29/06/2019	3:25:00 AM	0	1	1	252
29/06/2019	3:30:00 AM	0	1	1	240
29/06/2019	3:35:00 AM	0	1	1	219
29/06/2019	3:40:00 AM	0	1	1	236
29/06/2019	3:45:00 AM	0	0	1	250
29/06/2019	3:50:00 AM	0	0	1	252
29/06/2019	3:55:00 AM	0	0	1	251
29/06/2019	4:00:00 AM	0	0	1	244
29/06/2019	4:05:00 AM	0	0	1	232
29/06/2019	4:10:00 AM	0	0	2	232
29/06/2019	4:15:00 AM	0	0	1	236
29/06/2019	4:20:00 AM	0	0	1	244
29/06/2019	4:25:00 AM	0	0	1	240
29/06/2019	4:30:00 AM	0	0	1	243
29/06/2019	4:35:00 AM	0	0	1	231
29/06/2019	4:40:00 AM	0	0	1	239
29/06/2019	4:45:00 AM	0	0	1	250
29/06/2019	4:50:00 AM	0	0	1	254
29/06/2019	4:55:00 AM	0	0	0	300
29/06/2019	5:00:00 AM	0	0	0	259
29/06/2019	5:05:00 AM	0	0	1	253
29/06/2019	5:10:00 AM	0	0	0	232
29/06/2019	5:15:00 AM	0	0	0	231
29/06/2019	5:20:00 AM	0	0	1	245
29/06/2019	5:25:00 AM	0	0	1	239
29/06/2019	5:30:00 AM	0	0	1	237
29/06/2019	5:35:00 AM	0	0	1	238
29/06/2019	5:40:00 AM	0	0	1	237
29/06/2019	5:45:00 AM	0	0	1	207
29/06/2019	5:50:00 AM	0	0	1	21
29/06/2019	5:55:00 AM	0	0	1	28
29/06/2019	6:00:00 AM	0	0	1	38
29/06/2019	6:05:00 AM	0	0	1	32

Date	Time	Rainfall (mm)	Temperature (°C)	Wind Speed (m/s)	Wind Direction (deg.)
29/06/2019	6:10:00 AM	0	0	1	29
29/06/2019	6:15:00 AM	0	0	1	191
29/06/2019	6:20:00 AM	0	-1	1	254
29/06/2019	6:25:00 AM	0	-1	1	234
29/06/2019	6:30:00 AM	0	-1	1	218
29/06/2019	6:35:00 AM	0	0	1	246
29/06/2019	6:40:00 AM	0	0	1	240
29/06/2019	6:45:00 AM	0	0	1	245
29/06/2019	6:50:00 AM	0	0	1	242
29/06/2019	6:55:00 AM	0	0	1	230
29/06/2019	7:00:00 AM	0	0	1	223
29/06/2019	7:05:00 AM	0	0	1	232
29/06/2019	7:10:00 AM	0	0	1	227
29/06/2019	7:15:00 AM	0	0	1	233
29/06/2019	7:20:00 AM	0	1	0	264
29/06/2019	7:25:00 AM	0	1	0	324
29/06/2019	7:30:00 AM	0	1	0	246
29/06/2019	7:35:00 AM	0	1	0	191
29/06/2019	7:40:00 AM	0	1	1	256
29/06/2019	7:45:00 AM	0	2	1	247
29/06/2019	7:50:00 AM	0	2	1	230
29/06/2019	7:55:00 AM	0	2	1	229
29/06/2019	8:00:00 AM	0	2	1	246
29/06/2019	8:05:00 AM	0	3	1	293
29/06/2019	8:10:00 AM	0	4	1	293
29/06/2019	8:15:00 AM	0	5	1	301
29/06/2019	8:20:00 AM	0	6	1	300
29/06/2019	8:25:00 AM	0	6	1	309
29/06/2019	8:30:00 AM	0	7	1	308
29/06/2019	8:35:00 AM	0	7	1	277
29/06/2019	8:40:00 AM	0	8	1	299
29/06/2019	8:45:00 AM	0	8	1	304
29/06/2019	8:50:00 AM	0	8	1	202
29/06/2019	8:55:00 AM	0	8	1	287
29/06/2019	9:00:00 AM	0	9	2	298
29/06/2019	9:05:00 AM	0	9	1	263
29/06/2019	9:10:00 AM	0	10	2	294
29/06/2019	9:15:00 AM	0	10	1	160
29/06/2019	9:20:00 AM	0	10	2	78
29/06/2019	9:25:00 AM	0	11	2	154
29/06/2019	9:30:00 AM	0	11	2	76
29/06/2019	9:35:00 AM	0	10	2	90
29/06/2019	9:40:00 AM	0	11	2	154
29/06/2019	9:45:00 AM	0	11	2	76
29/06/2019	9:50:00 AM	0	11	2	99
29/06/2019	9:55:00 AM	0	11	2	176
29/06/2019	10:00:00 AM	0	11	2	265
29/06/2019	10:05:00 AM	0	11	2	146

Date	Time	Rainfall (mm)	Temperature (°C)	Wind Speed (m/s)	Wind Direction (deg.)
29/06/2019	10:10:00 AM	0	12	2	151
29/06/2019	10:15:00 AM	0	12	3	156
29/06/2019	10:20:00 AM	0	12	2	130
29/06/2019	10:25:00 AM	0	12	2	120
29/06/2019	10:30:00 AM	0	12	2	258
29/06/2019	10:35:00 AM	0	12	3	145
29/06/2019	10:40:00 AM	0	12	3	157
29/06/2019	10:45:00 AM	0	13	4	124
29/06/2019	10:50:00 AM	0	13	4	174
29/06/2019	10:55:00 AM	0	13	3	308
29/06/2019	11:00:00 AM	0	13	3	298
29/06/2019	11:05:00 AM	0	13	4	289
29/06/2019	11:10:00 AM	0	13	4	105
29/06/2019	11:15:00 AM	0	13	4	224
29/06/2019	11:20:00 AM	0	14	3	169
29/06/2019	11:25:00 AM	0	14	4	114
29/06/2019	11:30:00 AM	0	14	2	236
29/06/2019	11:35:00 AM	0	14	4	106
29/06/2019	11:40:00 AM	0	14	4	229
29/06/2019	11:45:00 AM	0	15	3	174
29/06/2019	11:50:00 AM	0	15	3	81
29/06/2019	11:55:00 AM	0	14	3	241
29/06/2019	12:00:00 PM	0	14	4	200
29/06/2019	12:05:00 PM	0	15	3	212
29/06/2019	12:10:00 PM	0	15	4	159
29/06/2019	12:15:00 PM	0	14	6	110
29/06/2019	12:20:00 PM	0	14	4	144
29/06/2019	12:25:00 PM	0	15	4	169
29/06/2019	12:30:00 PM	0	15	4	123
29/06/2019	12:35:00 PM	0	15	3	187
29/06/2019	12:40:00 PM	0	15	6	173
29/06/2019	12:45:00 PM	0	15	4	238
29/06/2019	12:50:00 PM	0	15	3	143
29/06/2019	12:55:00 PM	0	15	4	154
29/06/2019	1:00:00 PM	0	15	4	207
29/06/2019	1:05:00 PM	0	15	5	222
29/06/2019	1:10:00 PM	0	15	5	79
29/06/2019	1:15:00 PM	0	15	6	176
29/06/2019	1:20:00 PM	0	15	6	111
29/06/2019	1:25:00 PM	0	15	5	144
29/06/2019	1:30:00 PM	0	15	4	147
29/06/2019	1:35:00 PM	0	15	4	154
29/06/2019	1:40:00 PM	0	15	5	200
29/06/2019	1:45:00 PM	0	15	5	145
29/06/2019	1:50:00 PM	0	15	4	156
29/06/2019	1:55:00 PM	0	15	6	111
29/06/2019	2:00:00 PM	0	15	5	182
29/06/2019	2:05:00 PM	0	15	5	175

Date	Time	Rainfall (mm)	Temperature (°C)	Wind Speed (m/s)	Wind Direction (deg.)
29/06/2019	2:10:00 PM	0	15	5	162
29/06/2019	2:15:00 PM	0	15	4	138
29/06/2019	2:20:00 PM	0	15	4	188
29/06/2019	2:25:00 PM	0	15	4	201
29/06/2019	2:30:00 PM	0	15	4	205
29/06/2019	2:35:00 PM	0	15	4	147
29/06/2019	2:40:00 PM	0	15	5	87
29/06/2019	2:45:00 PM	0	15	4	146
29/06/2019	2:50:00 PM	0	14	5	179
29/06/2019	2:55:00 PM	0	14	5	124
29/06/2019	3:00:00 PM	0	14	6	173
29/06/2019	3:05:00 PM	0	14	5	135
29/06/2019	3:10:00 PM	0	14	5	84
29/06/2019	3:15:00 PM	0	14	4	96
29/06/2019	3:20:00 PM	0	14	4	60
29/06/2019	3:25:00 PM	0	14	5	72
29/06/2019	3:30:00 PM	0	14	4	63
29/06/2019	3:35:00 PM	0	14	5	102
29/06/2019	3:40:00 PM	0	14	5	182
29/06/2019	3:45:00 PM	0	14	4	157
29/06/2019	3:50:00 PM	0	14	3	105
29/06/2019	3:55:00 PM	0	13	5	47
29/06/2019	4:00:00 PM	0	13	5	51
29/06/2019	4:05:00 PM	0	13	6	49
29/06/2019	4:10:00 PM	0	13	5	117
29/06/2019	4:15:00 PM	0	13	5	70
29/06/2019	4:20:00 PM	0	13	5	49
29/06/2019	4:25:00 PM	0	13	4	64
29/06/2019	4:30:00 PM	0	13	4	108
29/06/2019	4:35:00 PM	0	13	4	101
29/06/2019	4:40:00 PM	0	13	3	212
29/06/2019	4:45:00 PM	0	12	4	172
29/06/2019	4:50:00 PM	0	12	4	103
29/06/2019	4:55:00 PM	0	12	4	126
29/06/2019	5:00:00 PM	0	12	4	142
29/06/2019	5:05:00 PM	0	12	4	73
29/06/2019	5:10:00 PM	0	12	3	123
29/06/2019	5:15:00 PM	0	12	4	123
29/06/2019	5:20:00 PM	0	11	3	98
29/06/2019	5:25:00 PM	0	11	3	161
29/06/2019	5:30:00 PM	0	11	3	94
29/06/2019	5:35:00 PM	0	11	4	128
29/06/2019	5:40:00 PM	0	11	3	70
29/06/2019	5:45:00 PM	0	11	3	135
29/06/2019	5:50:00 PM	0	11	4	69
29/06/2019	5:55:00 PM	0	11	2	163
29/06/2019	6:00:00 PM	0	11	3	204
29/06/2019	6:05:00 PM	0	11	3	219

Date	Time	Rainfall (mm)	Temperature (°C)	Wind Speed (m/s)	Wind Direction (deg.)
29/06/2019	6:10:00 PM	0	11	3	131
29/06/2019	6:15:00 PM	0	11	3	111
29/06/2019	6:20:00 PM	0	11	3	116
29/06/2019	6:25:00 PM	0	11	4	164
29/06/2019	6:30:00 PM	0	11	3	122
29/06/2019	6:35:00 PM	0	11	3	88
29/06/2019	6:40:00 PM	0	11	3	105
29/06/2019	6:45:00 PM	0	11	3	135
29/06/2019	6:50:00 PM	0	11	3	240
29/06/2019	6:55:00 PM	0	11	2	225
29/06/2019	7:00:00 PM	0	11	2	162
29/06/2019	7:05:00 PM	0	10	2	136
29/06/2019	7:10:00 PM	0	10	3	145
29/06/2019	7:15:00 PM	0	10	3	146
29/06/2019	7:20:00 PM	0	10	2	127
29/06/2019	7:25:00 PM	0	10	2	69
29/06/2019	7:30:00 PM	0	10	3	55
29/06/2019	7:35:00 PM	0	10	3	91
29/06/2019	7:40:00 PM	0	10	3	121
29/06/2019	7:45:00 PM	0	10	2	91
29/06/2019	7:50:00 PM	0	10	2	161
29/06/2019	7:55:00 PM	0	9	2	119
29/06/2019	8:00:00 PM	0	9	2	103
29/06/2019	8:05:00 PM	0	9	2	49
29/06/2019	8:10:00 PM	0	9	2	78
29/06/2019	8:15:00 PM	0	9	1	69
29/06/2019	8:20:00 PM	0	9	2	58
29/06/2019	8:25:00 PM	0	9	2	94
29/06/2019	8:30:00 PM	0	9	3	83
29/06/2019	8:35:00 PM	0	10	3	71
29/06/2019	8:40:00 PM	0	10	3	104
29/06/2019	8:45:00 PM	0	10	4	74
29/06/2019	8:50:00 PM	0	10	4	71
29/06/2019	8:55:00 PM	0	10	4	87
29/06/2019	9:00:00 PM	0	10	3	68
29/06/2019	9:05:00 PM	0	10	3	115
29/06/2019	9:10:00 PM	0	10	3	160
29/06/2019	9:15:00 PM	0	10	3	154
29/06/2019	9:20:00 PM	0	10	3	215
29/06/2019	9:25:00 PM	0	10	3	111
29/06/2019	9:30:00 PM	0	10	2	146
29/06/2019	9:35:00 PM	0	10	3	127
29/06/2019	9:40:00 PM	0	10	3	100
29/06/2019	9:45:00 PM	0	10	3	153
29/06/2019	9:50:00 PM	0	11	3	100
29/06/2019	9:55:00 PM	0	11	4	114
29/06/2019	10:00:00 PM	0	11	4	83

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