Dunloe Sand Quarry

2024 Annual Review

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Site Details

Name of operation	Dunloe Sand Quarry
Name of operator	Holcim (Australia) Pty Ltd
Project Approval	Project Approval 06 - 0030
Document version	A
Name of holder of Project Approval	Holcim (Australia) Pty Ltd
Annual review start date	January 1, 2024
Annual review end date	December 31, 2024

I, **Matt Kelly**, certify that this audit report is a true and accurate record of the compliance status of the **DUNLOE SAND QUARRY** for the period of **1 JANUARY 2024 - 31 DECEMBER 2024** and that I am authorised to make this statement on behalf of **HOLCIM (AUSTRALIA) PTY LTD**.

Note.

a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Name of authorised reporting officer	Matt Kelly
Title of authorised reporting officer	Quarry Manager
Signature of authorised reporting officer	
Date	31/03/2025

1 Statement of Compliance

The statement of commitments for the 2024 Annual Review, herein referred to as the reporting period, for the Dunloe Sand Quarry is provided in **Table 1**. **Table 3** details the non-compliances of Project Approval (PA) 06_0030 identified within the 2024 reporting period, with the compliance status key provided in **Table 2**.

Table 1: Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
PA 06_0030	No
EPL 13077	Yes

Table 2: Compliance Status Key

Risk level	Colour code	Description
High	Non-compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-compliant	Non-compliance with: • Potential for serious environmental consequences, but is unlikely to occur; or • Potential for moderate environmental consequences, but is likely to occur
Low	Non-compliant	Non-compliance with: • Potential for moderate environmental consequences, but is unlikely to occur; or • Potential for low environmental consequences, but is likely to occur
Administrative Non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

Table 3: Non-Compliances for this Reporting Period

Approval	Condition	Description of Non-Compliance	Compliance Status	Section Addressed in Annual Review
PA 06_0030	**Schedule 3, Condition 7A – Air Quality Management Plan** *Within three months of the approval of Modification 2, the Proponent must prepare an Air Quality Management Plan for the project to the satisfaction of the Secretary. This plan must:* *(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Secretary;* *(b) be prepared in consultation with the EPA;* *(c) describe the measures to be implemented to ensure:* *(i) compliance with the air quality criteria and operating conditions in this approval;* *(ii) best practice management is being employed; and* *(iii) air quality impacts of the project are minimised during adverse meteorological conditions and extraordinary events;* *(d) describe the air quality management system; and* *(e) include an air quality monitoring program that:* *(i) is capable of evaluating the performance of the project against the air quality criteria;* *(ii) adequately supports the air quality management system; and* *(iii) includes a protocol for identifying any air quality-related exceedance, incident or noncompliance and for notifying the Department and relevant stakeholders of these events.* *The Project must implement the Air Quality Management Plan as approved by the Secretary.*	There were three invalid depositional dust monitoring samples during the reporting period. These include: • Invalidated sample at DDG4 in March 2024 due to damage from a cow impacting the sample bottle. • Invalidated sample at DDG4 in July 2024 due to sample bottle being damaged from strong winds causing the stand to blow over, smashing the bottle, and • Lost sample at DDG1 in September 2024 due being lost in transit by the laboratory courier. Therefore, there are no valid results for depositional dust for those months at those locations. Dunloe Sand Quarry did not receive any dust or air quality complaints in 2024, so have recorded this as a low non-compliance.	Non-Compliance	**Section 6.3.3**

2 Introduction

Holcim Australia (Holcim) own and operate the Dunloe Sand Quarry (Dunloe Sands, the site) which was granted PA 06_0030 on 24 November 2008, with subsequent modifications to this approval granted on 28 August 2009 (Mod 1) and 6 November 2018 (Mod 2).

Dunloe Sands is located at Pottsville, within the Tweed Shire, NSW (refer to **Figure 1** and **Figure 2**). The site is located adjacent to Mooball Creek and is approximately 4 km upstream of the creek mouth. Surrounding land use is agriculture; primarily sugar cane farming and grazing. The site produces a very high quality, fine concrete sand as well as a variety of other sand products including plasterer sand, bunker sand, and fill sand.

Figure 1: Aerial view of the Dunloe Sand Quarry located at Dunloe Park, Pottsville (Source: Near maps, December 2022).

Figure 2: Site Location and Layout (Source EMS GHD: 2019)

Holcim commenced operations on the site on 1 August 2016 with all previous responsibilities falling under the management of Ramtech Pty Ltd (Ramtech). Ramtech were responsible for the commencement and operation of the site since Project Approval was granted in 2007.

In accordance with Schedule 5, Condition 5 of the modified PA 06_0030 the site is required to undertake an Annual Review of the site in accordance with the conditions provided in **Table 4.**

Table 4: Annual Review Requirements

Condition	Section Addressed in Annual Review
5. ANNUAL REVIEW Within 12 months of the date of this approval, and annually thereafter, the Proponent shall submit an Annual Review to the Secretary and relevant agencies. This report must:	
a) identify the standards and performance measures that apply to the project;	**Sections 4 and 6**
b) describe the works carried out in the last 12 months;	**Sections 4 and 6**
c) describe the works that will be carried out in the next 12 months;	**Section 13**
d) include a summary of the complaints received during the past year, and compare this to the complaints received in previous years;	**Section 12**
e) include a summary of the monitoring results for the project during the past year;	**Sections 6 and 7**
f) include an analysis of these monitoring results against the relevant: impact assessment criteria/limits; monitoring results from previous years; and predictions in the documents listed in condition 2 of Schedule 2.	**Sections 6 and 7**
g) identify any trends in the monitoring results over the life of the project;	**Sections 6 and 7**
h) identify any non-compliance during the previous year; and	**Sections 6, 7 and 12**
i) describe what actions were, or are being, taken to ensure compliance.	**Sections 6, 7 and 12**

This Annual Review has been prepared in accordance with the *Annual Review Guideline: Post-Approval Requirements for State Significance Mining Developments (October 2015).*

This report documents the environmental performance of the site from 1 January to 31 December 2024.

2.1 Key Contact Details

The key contact details for the site are outlined below in **Table 5**.

Table 5: Key Contact Details

Staff Member and Position	Contact Details
Quarry Manager Matt Kelly	Mob: +61 429 790 895 Email: matt.kelly@holcim.com
Site Supervisor Jade O'Brien	Mob: 0484 063 221 Email: jade.obrien@holcim.com
Area Manager Aggregates NSW North Chris Hamilton	Work: +61 2 6656 8620 Mob: +61 429 790 213 Email: chris.s.hamilton@holcim.com
Environment Manager – NSW & ACT Dozie Egeonu	Mob: +61 429 557 493 Email: dozie.egeonu@holcim.com

3 Approvals

The site operates under the approvals listed in **Table 6**.

Table 6: Approvals for the Dunloe Sand Quarry Operations

Approval	Regulatory Authority
PA 06_0030	NSW Department of Planning, Housing, and Infrastructure (DPHI – the Department)
EPL No. 13077	NSW Environment Protection Authority (EPA)
Bore Licence 30BL183076, 30BL183077, 30BL183078, 30BL183079, 30BL183080, 30BL183081, 30BL183082, 30BL183084 and 30BL183086	NSW Department of Industry - Water

Holcim holds Environment Protection Licence (EPL) 13077 which covers its activities at the Dunloe Sand Quarry. **Table 7** outlines the licensing limits contained in EPL 13077.

Table 7: EPL Fee-Based Activity at the Dunloe Sand Quarry

Scheduled Activity	Fee Based Activity	Scale
Extractive Activities	Land-based extractive activity	>100,000 – 500,000 T annual capacity to extract, process, or store

4 Operations Summary

4.1 Exploration

There was no exploration undertaken at the Dunloe Sand Quarry during the reporting period.

4.2 Land Preparation

There was no land clearing during the reporting period.

4.3 Construction Activities

There were no construction activities undertaken during the reporting period.

4.4 Quarry Operations

Activities undertaken in 2024 included:

- Stripping of topsoil and overburden within the existing extraction limit boundary;
- Load and haul activities;
- Washing, screening, and stockpiling of product;
- Overburden removal and stockpiling;
- Maintenance of rehabilitation in the north and eastern areas of the site; and
- Load out and sales of topsoil, brickies loam and concrete sands to the local market.

A like-for-like Wash Plant replacement is planned for 2025 with Holcim completing planning activities in 2024. This follows plant issues in the previous reporting periods.

All activities during the reporting period took place within the approved operating hours of:

- 7am to 5pm, Monday to Friday; and
- 7am to12pm on Saturdays.

Table 8 includes a summary of the operations undertaken during the reporting period against the Project Approval conditions regarding product transported from Dunloe Sand's.

Table 8: Total Product Distributed (Tonnes)

Material	Approval Limit (Tonnes/Annum)	2019	2020	2021	2022	2023	2024	Proposed 2025
Product Distributed Total	300,000	186,280	156,918	127,515	175,010	153,044	137,445	157,740

The total production volume in 2024 was within the approved limits.

Schedule 3, Condition 45 states the proponent must report annual productions to the DPHI using the standard form and include a copy of this in the Annual Review. Note that the annual return that Holcim submit are financial (July-June), therefore total products will not align completely. **Table 9** details the annual productions.

Table 9: Extractive production data – Dunloe Sands

Material	Mining Type	Production[1] (tonnes)
Construction Sand (Filling/Packing Sand)	Construction sand	157,740
Fill & Crusher Fines (under 5mm)	Construction sand	0
Natural Sand	Construction sand	0
	Total	157,740

Note: [1]Production total has been rounded.

4.5 Next Reporting Period

Activities proposed at the Dunloe Sand Quarry in 2025, include:

- Stripping of topsoil and overburden within the existing extraction limit boundary;
- Load and haul activities;
- Washing, screening, and stockpiling of product;
- Replacement of wash plant;
- Overburden removal and stockpiling;
- Maintenance of rehabilitation within the north-eastern area; and
- Load out and sales of topsoil, brickies loam and concrete sands to the local market.

The planned washed plant replacement will occur in the existing disturbance area, with like-for-like materials with no proposed additional impacts.

5 Actions Required from Previous Annual Review

5.1 Actions from 2023 Annual Review – DPE Actions

Holcim submitted the 2023 Annual Review by 31 March 2023. On 8 April 2024, DPHI responded:

NSW Planning has reviewed the Report and considers it to generally satisfy the reporting requirements of the Approval and the NSW Planning Annual Review Guideline (October 2015).

However, the DPHI requested that for future reviews, non-compliances and incidents be presented separately rather than combined into a single table. This request has been addressed in **Sections 6** and **12**.

5.2 Actions from 2023 Annual Review – Holcim Proposed Actions

Table 10 outlines the proposed actions for 2024 from the 2023 Annual Review and the works undertaken.

Table 10: Holcim Actions Proposed from Previous Annual Review

Action from Previous Annual Review	Works Undertaken	Section of this Annual Review
Ensure all water quality monitoring is completed in accordance with the EMS, with a focus on correct monitoring frequencies.	All water quality monitoring in 2024 was undertaken in accordance with the EMS.	**Section 7**
Holcim will implement water monitoring recommendations from Section 7.5.	Holcim has engaged specialists to assist in suitably updating the plan. It is expected the Soil and Water Management Plan will be finalised in 2026.	**Section 7.5**
Ensure dust monitoring is completed in accordance with the EMS. Holcim will liaise with the monitoring contractor to improve monitoring notes.	The full dust monitoring program was completed in 2024. PM10 monitoring not undertaken as Quarry productions below 200,00 tonnes per annum.	**Section 6.3**
Weed spraying will continue at site during the next Annual Review period.	Quarterly monitoring was undertaken during the 2024 reporting period. Weed spraying was routinely conducted.	**Section 6.5**
Annual fauna box monitoring continues.	Fauna box monitored continued in 2024. Routine monitoring took place in July and December.	**Section 6.5**

6 Environmental Performance

6.1 Meteorological Monitoring

This report uses 2024 rainfall data collected from the onsite Meteorological Station. These meteorological results are presented in **Table 11**.

Table 11: Meteorological Monitoring Results

Month	Total Rainfall (mm)	Minimum Temperature (°C)	Maximum Temperature (°C)
January	289.4	18.2	34.5
February	246.2	18.6	33.8
March	286.4	17.4	31.8
April	308.2	13.6	30.7
May	216.0	10.2	24.9
June	20.2	4.7	25.4
July	125	1.8	25.6
August	232.4	7.0	33.2
September	213.6	8.3	34.4
October	115.6	11.9	30.9
November	30.0	16.3	31.1
December	48.2	16.3	34.9
Annual TOTAL	**2131.2**	1.8 (July)	34.9 (January)

Dunloe Sand's recorded a total of 2131.2 mm rainfall in 2024. This is higher than the 2023 period, where the site recorded 1270 mm. Bureau of Meteorological Station 058198 at the Ballina Airport details the annual average since 1992 as 1772.4 mm.

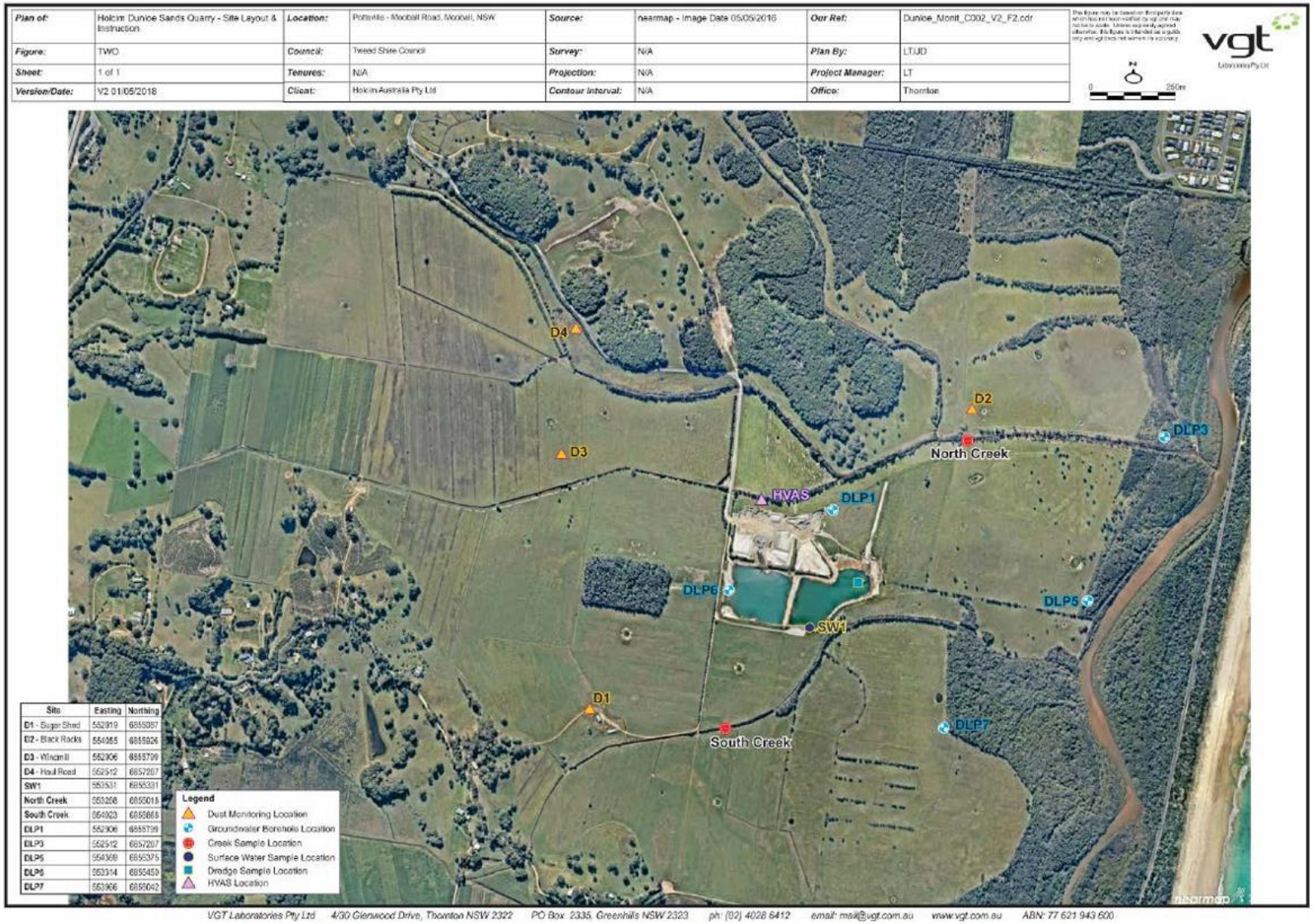

Figure 3: Environmental Monitoring Locations (source: VGT)

6.2 Noise

6.2.1 EIS Predictions

The site Environmental Impact Statement (EIS) (2007) states that based on noise modelling the operations within the southwest corner of the southern extraction pond (stage 2) may generate levels which exceed the relevant noise impact requirements.

The EIS (2007) stated that to mitigate this minor impact, the dredge is to have acoustical treatment when operating within the southern extraction pond.

6.2.2 Approved Criteria

In accordance with Schedule 3 Condition 2 of PA 06_0030, the approved noise criteria for the Dunloe Sand Quarry are outlined below.

Schedule 3 Condition 2 states:

"The Proponent must ensure that the noise generated by the project does not exceed the criteria in Table 1 at any residence on privately-owned land.

Table 1: Noise Impact Assessment Criteria

Receiver Location	*Day LAeq (15 min) dB(A)*
R6 and R7	*42*
R8	*48*
All other residences	*41*

Noise generated by the project must be monitored and measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Noise Policy for Industry (EPA, 2017).

The noise criteria in Table 1 do not apply if the Proponent has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and the Proponent has advised the Department in writing of the terms of this agreement."

6.2.3 Key Environmental Performance

Attended noise monitoring was undertaken quarterly at the Dunloe Sand Quarry in 2024 by Ramboll Australia Pty Ltd (Ramboll) on the following dates:

- 11 January 2024.
- 07 May 2024,
- 11 September 2024, and
- 11 December 2024.

The compliance assessments for each receiver (R6, R7, and R8) are presented in **Table 12**. Quarry noise was inaudible during all monitoring periods, with ambient environmental noise primarily influenced by wind, trees, passing cars, and birds. The assessments identified that noise emissions generated by the Dunloe Sand Quarry were compliant with relevant statutory noise criteria specified in the Project Approval on all occasions at all assessed residential receivers.

Table 12 Noise Monitoring Assessment for the Dunloe Sand Quarry

Assessment Period	Receiver No.	Quarrying Noise Criteria LAeq (15min)	Q1		Q2		Q3		Q4	
			Quarry Noise Contribution LAeq (15min)	Compliance Status	Quarry Noise Contribution LAeq (15min)	Compliance Status	Quarry Noise Contribution LAeq (15min)	Compliance Status	Quarry Noise Contribution LAeq (15min)	Compliance Status
Day	R6	42	42	Compliant	42	Compliant	42	Compliant	<31	Compliant
	R7	42	42	Compliant	42	Compliant	42	Compliant	<48[1]	Compliant
	R8	48	48	Compliant	48	Compliant	48	Compliant	<36	Compliant

Note: [1] Measured LA90 value of 57.9 was dominated by wind, trees and insects so unable to estimate contribution for the quarry at the assessment location

6.2.4 Management Measures

Management measures relating to noise are outlined within the Dunloe Sand Environmental Management Strategy (2021) and the Noise Management Plan (2020). These include:

- Restriction of operation hours of the Dunloe Sand Quarry to Monday to Friday 7.00 am to 5.00 pm and Saturday 7.00 am to 12.00 pm;
- No work on Sundays or Public Holidays;
- All trucks to be well maintained and fitted with residential mufflers;
- Acoustic testing at commencement of quarry operations to ensure compliance with noise limit criteria;
- Dredge to be fitted with suitable mufflers if noise limit criteria is exceeded;
- Trucks to be limited to a speed of 25 kilometre per hour (km/h) on internal roads;
- Prescribed buffer zones around the extraction ponds to be planted and maintained;
- Cessation of excessively noisy activities during unfavourable meteorological conditions (refer to EPA's 2017 *NSW Noise Policy for Industry*); and
- Signage at the entrance of the site detailing a phone number and permanent site contact to ensure noise complaints are received and addressed in a timely manner.

Additionally, Holcim considered a noise enclosure for a dredger as an additional noise reduction measure. However, given compliant noise results for 2024, Holcim is still currently evaluating its feasibility.

6.2.5 Proposed Improvements

There are no further improvements proposed for noise management at the site. Dunloe Sand's is committed to continuing to identify areas of improvement within noise management procedures.

6.3 Air Quality

6.3.1 EIS Predictions

The EIS (2017) Executive Summary states the following:

"Airborne particulate matter concentrations and dust deposition from the proposed development were predicted to exceed the relevant requirements prescribed by the Office of Environment and Heritage (OEH) at three of the eight monitoring locations.

Exceedances are expected as a result of dust generated from the use of unsealed access roads by haul vehicles. To meet prescribed requirements, proposed dust controls include sealing of the entire internal roadway length, planting of a vegetated buffer along the southern boundary adjoining Warwick Park Road and the proposed outbound internal road."

6.3.2 Approved Criteria

Air quality monitoring conducted at Dunloe Sand Quarry is compared to the monitoring criteria stipulated in PA 06_0030 and listed in **Table 13**, **Table 14**, and **Table 15**.

Table 13: Long Term Impact Assessment Criteria for Deposited Dust

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
Deposited Dust	Annual	2 g/m^2/month	4 g/m^2/month

Table 14: Short Term Impact Assessment Criteria for Particulate Matter

Pollutant	Averaging Period	Criterion
Particulate Matter < 10 µm (PM_{10})	24 Hour	50 $\mu g/m^3$

Table 15: Long Term Impact Assessment Criteria for Particulate Matter

Pollutant	Averaging Period	Criterion
Total suspended particulate (TSP) matter	Annual	90 $\mu g/m^3$
Particulate Matter < 10 µm (PM_{10})	Annual	30 $\mu g/m^3$

6.3.3 Key Environmental Performance

Depositional Dust

Dust deposition monitoring was undertaken at four locations during the 2024 reporting period (see **Table 16**).

Table 16: Dust Monitoring (Depositional Dust) at Dunloe Sand Quarry

Date	Insoluble Solids (g/m^2/month)			
	Haul Road DDG1	Windmill DDG2	Sugar Shed DDG3	Black Rock DDG4
January	0.5	0.6	0.8	0.2
February	0.2	0.8	0.5	0.4
March	0.2	1.2	0.3	-[1]
April	0.8	2.3	0.8	0.6
May	0.6	0.7	0.6	3.9
June	0.2	0.1	0.1	0.1
July	0.6	0.1	0.1	-[2]
August	0.3	2.7	0.1	0.2
September	-[3]	0.6	0.3	0.3
October	0.2	1.1	0.3	0.1
November	0.4	3.8	0.4	0.5
December	0.6	16	0.8	0.7
Minimum	0.2	0.1	0.1	0.1
Maximum	0.8	16	0.8	3.9
Average	0.42	2.50	0.43	0.70

Notes: [1] March results for Black Rock DDG – sample invalidated due to smashed funnel from a cow
[2] July Results for Black Rock DDG – sample in validated due to smashed funnel and bottle after falling from the stand
[3] September result for Haul Road DDG – sample collected and submitted to the laboratory and lost in transit by the laboratory courier.

The depositional dust monitoring results at all locations were well below the annual average criteria (4g/m2/month) and compliant with project approval.

There were three invalid samples during the reporting period. These include:

- Invalidated sample at DDG4 in March 2024 due to damage from a cow impacting the sample bottle. After this Holcim reported this to the landowner of Dunloe (Ramtech) who made changes to their processes to minimise access to this access,
- Invalidated sample at DDG4 in July 2024 due to sample bottle being damaged from strong winds causing the stand to blow over, smashing the bottle. After this the stand and bottle were replaced and made more robust and
- Lost sample at DDG1 in September 2024 due being lost in transit by the laboratory courier. Holcim prompted an investigation by Ramboll for the lost sample by the courier to ensure that recurrence is not ongoing.

Dunloe Sand Quarry did not receive any dust or air quality complaints in 2024. Therefore these invalid depositional dust results have been recorded as a low non-compliance with Schedule 3 Condition 7A (Air Quality Management Plan).

A comparison of results from 2016 to 2024 has been undertaken in **Table 17**.

Table 17: Depositional Dust Monitoring Summary (2016-2024)

Depositional Dust Gauge	Monitoring Summary for Annual Review Period	Monitoring Period								
		2016	2017	2018	2019	2020	2021	2022	2023	2024
		(g/m^2/month)								
DDG1 Haul Road	Min. Insoluble Solids	0.13	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2
	Max. Insoluble Solids	0.8	0.8	2.7	1.8	2.3	1.1	0.7	1.1	0.8
	Insoluble Solids Annual Average	0.4	0.4	0.6	0.7	0.89	0.4	0.3	0.33	0.42
DDG2 Windmill	Min. Insoluble Solids	0.4	<0.1	0.1	0.2	0.4	0.1	0.1	0.1	0.1
	Max. Insoluble Solids	4.7	0.9	0.7	1.8	3.6	0.9	3.7	3.5	16
	Insoluble Solids Annual Average	1.23	0.32	0.31	0.6	1.44	0.5	0.7	1.46	2.50
DDG3 Sugar Shed	Min. Insoluble Solids	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.1
	Max. Insoluble Solids	1.6	2.4	1.6	1.6	1.3	2.5	2.2	4.3	0.8
	Insoluble Solids Annual Average	0.5	0.8	0.8	0.6	0.53	1.0	0.6	0.78	0.43
DDG4 Black Rock	Min. Insoluble Solids	0.3	<0.1	0.1	0.2	0.6	0.5	0.1	0.1	0.1
	Max. Insoluble Solids	1.6	0.9	0.7	1.8	7.7	18.0	3.6	1.1	3.9
	Insoluble Solids Annual Average	0.6	0.4	0.4	0.9	2.94	6.6	1.3	0.36	0.70

Long-term Trends

The annual averages at all locations were generally consistent with the 2023 annual averages, as shown in **Table 17**. At DDG 2, the annual average increased from 1.46 g/m²/month in 2023 to 2.5 g/m²/month in 2024, primarily due to a single high reading of 16 g/m²/month in December 2024. All locations are within criteria, and consistent with EIS predictions and trends.

Comparison to EIS Predictions

All results for depositional dust were below the predicted limits of the EIS predictions (see **Section 6.3.1**).

PM_{10} Monitoring

With the approval of the Dust Monitoring Program by the DPHI on 27 July 2018, Holcim is no longer required to monitor for PM_{10} unless the annual production rates increase to 200,000 tonnes or above.

Annual production was 137,445 tonnes in 2024, therefore no PM_{10} monitoring was undertaken. Regardless of production volumes, the site has maintained dust suppression measures throughout the reporting period in accordance with the requirements of the EMS. Since 2019, Holcim has not exceeded 200,000 tonnes per annum, and PM_{10} monitoring has not been carried out

Long-term Trends relating to PM_{10} monitoring are outlined in **Table 18**.

Table 18: PM_{10} Monitoring Trends

Monitoring Summary	Monitoring Period		
	2017	2018	2019 – 2024
PM_{10} Reporting Period Average	10.97	24.9	NS
Max. PM_{10}	35.9	125	NS
Min. PM_{10}	1.2	2	NS

NS – Not Sampled

6.3.4 Management Measures

Management measures relating to air quality are outlined within the *Dunloe Sand Quarry Environmental Management Strategy* and *Air Quality Management Plan.* These measures include:

- Sealing access and egress road from the Quarry to Pottsville Road;
- The wheel shaker screen is to be utilised by all traffic leaving the quarry;
- The route for trucks within the quarry will be wet down daily by a water sprinkler/spray system;
- Additional vegetation rehabilitation areas throughout the site contributing as a buffer to Mooball Creek and surrounding areas;
- Loaded trucks will be covered before exiting the site;
- Dust that is transported onto the access road immediately outside the active quarry area will be removed from the road at least once per month using a local street sweeper;
- Visual daily inspections of all stockpiles will be undertaken to ensure that dust emissions are mitigated where possible.
- Visual review of exposed areas, and whether these areas are generating dust, should be undertaken daily;

- Dust generation is generally limited to freshly disturbed areas and stockpiles. A portable hose or water spray/sprinkler system has been installed to dampen the surface and supress dust. The system installed is capable of servicing the entire site;
- Topsoil will not be stripped during windy weather conditions; and
- Six monthly audits of dust levels are to be undertaken by management.

6.3.5 Proposed Improvements

No proposed improvements for 2025. Dunloe Sand Quarry continues to complete management measures and monitoring in accordance with the Air Quality Management Plan, Environmental Management Strategy, and Project Approval requirements.

6.4 Traffic Management

6.4.1 EIS Predictions

The proposed operational times outlined within the EIS are shown in **Table 19** below.

Table 19: Estimated Operational Times, Periods and Truck Movements (EIS 2007)

Yearly Operation	Days Per Week	Hours per Week	Daily Times Operating	Truck Movements per Hour
50 weeks/year	5.5	46	Mon-Fri: 7:30am -5:00pm Sat: 7:30am -12:30pm	4

6.4.2 Approved Criteria

As per the Project Approval (Schedule 3, Condition 3), operations will be conducted Monday to Saturday (see **Table 20** below). No operations are to be undertaken on Sunday or public holidays.

Table 20: Operational Times, Periods and Truck Movements

Yearly Operation	Days Per Week	Hours per Week	Daily Times Operating	Truck Movements per Hour
52 weeks/year	5.5	55	Mon-Fri: 7:00am – 5:00pm Sat: 7:00am – 12:00pm	24*

** Not to exceed more than 24 heavy vehicle movements (in and out) per hour*

The *Traffic Management Plan* (2019) states that truck speeds are limited to a maximum of 40km/hr within the site, however, internal roads are signposted to a 25-30 km/h speed limit.

6.4.3 Key Environmental Performance

Schedule 2 Condition 8 of the Project Approval allows for 24 truck movements per hour (12 trucks per hour).

Daily records of truck movements are recorded by Holcim. During the reporting period, Holcim recorded a daily average of five trucks. This is within the criteria. See **Appendix B** for the full log of truck movements.

6.4.4 Management Measures

Management measures relating to transport are outlined within the Dunloe Sand Quarry Environmental Management Strategy (2020) and the Traffic Management Plan (2019), including:

- Construction of a dedicated haulage road (sealed) to provide vehicular access between the sand extraction area and Pottsville-Mooball Road;
- Average truck movements limited to 24 movements per hour
- All vehicles to observe speed limits for public roads;
- No trucks are to leave the site via Warwick Park Road;
- Appropriate advisory signage placed on public roads to notify of trucks entering Pottsville – Mooball Road;
- Appropriate relevant advisory signage placed along the haulage road (especially approaches to the intersections with Kelleher's Road and Pottsville – Mooball Road);
- Truck speed on the internal roads is to be limited to a maximum of 40km/h;
- All loaded vehicles entering or leaving the site are to have their loads covered; and
- Holcim shall ensure that all loaded vehicles leaving the site are cleaned of materials that may fall on the road before they leave the site.

6.4.5 Proposed Improvements

There are no proposed changes to transport management. Truck movements will continue to be monitored and recorded in the oncoming reporting period to ensure that they remain within the approved criteria.

6.5 Biodiversity

6.5.1 EIS Predictions

As part of the EIS (2007), a number of threatened species were identified within the surrounding vegetated areas of the site with none being found or expected to occur within the previously disturbed areas of the site (including proposed extraction areas).

Rehabilitation and revegetation measures proposed will provide improved flora and fauna links, additional food resources for identified threatened species, improved opportunities for breeding through the installation of breeding boxes and other benefits associated with visual screening and the like.

No clearing of vegetation is required in respect of the project, inclusive of haulage routes and operational areas.

6.5.2 Approved Criteria

There are no specific criteria associated with biodiversity management for the site. Activities need to be completed in accordance with the EIS.

Biodiversity management measures are undertaken in accordance with the *Landscape Management Plan*.

6.5.3 Key Environmental Performance

There were no biodiversity issues identified during this reporting period.

Weed control continued in 2024 and will continue to occur in 2025 to control weed growth in established rehabilitation.

Biodiversity and rehabilitation monitoring was undertaken throughout 2024 as per the approved *Landscape Management Plan* and Project Approval. Routine rehabilitation monitoring occurred at each rehabilitation zone and investigated site conditions, forest structure, floristic composition, and fauna nest boxes. Site weeds, fire management, biodiversity, and general management were also assessed. Vegetation performance was reported as satisfactory.

Routine monitoring took place in April, July, October and December 2024. Common weeds which have been established within the rehabilitation zones include:

- Senna (*Senna septemtrionalis*);
- Camphor Laurel (*Cinnamomum camphora*);
- Slash Pine (*Pinus elliottii*);
- Lantana (*Lantana* camara); and
- Ground Asparagus (*Asparagus aethiopicus)*

Weed control has been undertaken in each rehabilitation zone by qualified and experienced bush regenerators to manage and eradicate these weeds using industry best practice methods. In 2024, observations indicated a significant reduction in weed species compared to previous assessments. evaluations. All management zones were reported to contain healthy and resilient vegetation communities, generally in good condition, following rehabilitation works. The rehabilitation is progressing as planned and remains on track to achieve its intended outcomes.

From 2020 it was found that the use of nest boxes by fauna was limited. During 2024 there were no signs of native fauna using the boxes.

See **Appendix C** for the full 2024 Rehabilitation and Revegetation Monitoring Report.

6.5.4 Management Measures

Management measures relating to biodiversity are outlined in the Landscape Management Plan and the Environmental Management Strategy. These include:

- Detailed clearing protocol;
- Weed management;
- Maintenance of nest boxes; and
- Rehabilitation/Ecological monitoring program.

6.5.5 Proposed Improvements

The implementation of commitments within the Dunloe Sand Quarry Rehabilitation and Revegetation Management Plan, the Dunloe Sand Landscape Management Plan, and Environmental Management Strategy will continue to occur in the 2025 reporting period. Biodiversity management measures will continue in 2025 and focus on the maintenance of native vegetation species.

6.6 Heritage

6.6.1 EIS Predictions

A heritage assessment focusing on both Aboriginal and non-Aboriginal heritage was completed for the EIS (2007). An area of potential Aboriginal heritage significance was cordoned off.

6.6.2 Approved Criteria

There are no specific criteria associated with heritage relating to the project.

6.6.3 Key Environmental Performance

There were no issues relating to Aboriginal and historic heritage during the reporting period. An area of potential Aboriginal heritage significance was reviewed in 2018 with the assistance of Aboriginal Groups. It was not found to be an area of heritage significance.

The Dunloe Sand Quarry Aboriginal Cultural Heritage Management Plan (ACHMP) manages Aboriginal heritage. The site continued to act in accordance with the ACHMP in this reporting period.

6.6.4 Management Measures

Management measures relating to heritage are outlined within the ACHMP. These include:

- Training of all staff and contractors through the induction process;
- Detailed excavation strategy and control of any finds; and
- Procedure for impacts of unexpected finds.

6.6.5 Proposed Improvements

There are no proposed improvements to heritage management in 2025.

6.7 Acid Sulphate Soils Management and Management of Fines

Holcim undertakes fines management in accordance with Schedule 3 of Conditions 10 and 11 of the Project Approval in the following manner:

Condition 10
"The Proponent shall ensure that all excavated potential acid sulphate soil fines material is returned back to below the water table as soon as possible to prevent oxidation. No potential acid sulphate soil shall be removed from the site, unless adequately neutralised in accordance with methods approved under the Soil and Water Management Plan."

Condition 11
"The Proponent shall ensure that all potential acid sulphate soil fines material is discharged into the pond at a depth of no less than 3 metres from the water surface, and that all fines are deposited to a final depth of at least 8 metres from the water surface, unless an alternative method(s) is approved by OOW and the Director-General."

Under the operation of Holcim, the site has undertaken a number of improvement works to ensure the effective management of **Acid Sulphate Soils (ASS) and Potential Acid Sulphate Soils (PASS)** during extraction, processing, and sales operations. Details of specific management measures are outlined below.

6.7.1 Acid Sulphate Soils Sampling

Holcim undertakes acid sulphate soils sampling prior to extraction of materials. The drilling program was developed and undertaken in line with the following activities:

- A minimum of 2 sand cores are drilled per hectare;
- All samples are sent to a NATA Accredited lab for immediate testing in accordance with the ASSMAC Guidelines;
- A NATA Accredited lab provides a volume per m^2 for lime to be seeded across each hectare before stripping takes place;
- Stockpiled topsoil is tested by a NATA accredited laboratory to confirm there is no presence of PASS.

The ongoing management of acid sulphate soils during extraction in the sampled area is undertaken in accordance with the site's EMS and Acid Sulphate Soil Management Plan (2020).

In accordance with Schedule 3 Condition 10, where lime dosing is required based on chromium suite testing results, the material is treated according to required buffering concentrations and retested prior to sales (or alternatively reused within confines of Dunloe Park).

Where topsoil results showed high ASS concentration, the material was instead stockpiled within the confines of Dunloe Park and not sold.

For concrete sand, the material was buffered and stockpiled as a white sand and given sufficient time to oxidise, after which it was buffered and retested for ASS/PASS prior to sale.

Where Fill sand was found to have high ASS/PASS it was either reused within confines of Dunloe Park for haul road maintenance or safety bunding or buffered and retested before sales.

Monitoring and management of ASS and PASS will continue into 2025.

6.7.2 Extraction

Excavation of loam, dredging and washing activities is undertaken in accordance with the EMS and has been developed in line with the following activities:

1. Excavated loam is stockpiled and tested by NATA accredited laboratory to confirm there is no presence of PASS;
2. In the event that PASS is present in loam stockpiles a NATA accredited laboratory will provide a detailed report with liming rates for lime to be added by Holcim staff to screened loam to ensure no presence of PASS;
3. All dredged material is sent through the plant with fines re-interned below the 3 metre water mark at a depth of 8 metres in the returns pond; and
4. Testing of stockpiles to ensure that no PASS are present in concrete sands.

6.7.3 Stockpiling & Sales

Holcim have developed and implemented a testing regime using a NATA accredited laboratory to ensure compliance with PASS requirements for all sales of sand materials. This process includes:

1. Routine sampling of sales material stockpiles at designated locations; and
2. Implementation of a series of sales and production stockpiles to ensure any materials that have not been tested are isolated until tests confirm no presence of PASS thereafter sales loading occurs.

7 Water Management

7.1 EIS Predictions

The site is located within the Mooball Creek catchment and Sheens Creek sub-catchment areas. Detailed flood modelling confirms that the proposal will have no significant impact upon existing drainage regimes within the catchment.

Extraction operations have been designed in conformity with best practice environmental management procedures, including the use of appropriate sediment and water quality devices and the retention of ground cover in areas outside of the extraction ponds.

No negative impacts to water are predicted with controls in place.

7.2 Criteria

The site has the requirement to monitor discharges from the two Licenced Discharge Points (LDP)per the criteria listed in EPL 13077 (reproduced in **Table 21** and **Table 22**). LDP001 refers to Silt Pond discharge and monitoring point (Point 1) and LDP002 refers to Dredge Pond discharge and monitoring point (Point 2).

Table 21: Discharge Criteria – LDP001 and LDP002

POINT 1

Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Oil and Grease	Visible				nil
pH	pH				6.5 - 8.5
TSS	milligrams per litre				50

POINT 2

Pollutant	Units of Measure	50 Percentile concentration limit	90 Percentile concentration limit	3DGM concentration limit	100 percentile concentration limit
Oil and Grease	Visible				nil
pH	pH				6.5 - 8.5
TSS	milligrams per litre				50

Exceedance of quality limits specified in EPL 13077 is permitted if the discharge from LDP001 or LDP002 occurs solely as the result of rainfall on site exceeding a total of 82.5 mm over any consecutive five-day period. Holcim undertakes all practical measures to avoid or minimise TSS, pH and Oil and Grease exceedances in wet weather discharges.

Table 22: LDP001 and LDP002 monitoring requirements from EPL 13077

POINT 1,2

Pollutant	Units of measure	Frequency	Sampling Method
Oil and Grease	Visible	Special Frequency 1	Visual Inspection
pH	pH	Special Frequency 1	Probe
TSS	milligrams per litre	Special Frequency 1	Grab sample

Condition M2.3 of the EPL details that Special Frequency 1:

"*sampling once <24 hours prior to; and sampling the discharge daily during each discharge event arising from rainfall of less than 82.5 mm falling in total over a period of up to five days duration.*"

The site also has criteria outlined within the Soil and Water Management Plan. This includes commitments to undertaking monthly and quarterly monitoring at the Dredge Pond (Dam 1) and Silt Pond (Dam 2) (see **Table 23**, **Table 24**, and **Table 25**).

Table 23: Monthly Surface Water Quality Criteria – Dam 1 and Dam 2

Parameter	Interim Target Criteria	Baseline Data
pH	5.0 – 8.5	3.55-8.44 (6.49)
Electrical conductivity	<5.50 mS/cm	0.286-45 (11.930mS/cm)
Dissolved oxygen	>4.00 mg/L	0.81-7.49 (4.34) mg/L
Turbidity	<20 NTU	3-67 (14.4) NTU
Oil and grease	<10 mg/L	NA

Table 24: Quarterly Surface Water Quality Criteria – Dam 1 and Dam 2

Parameter	Interim Target Criteria	Baseline Data
Manganese	0.15 mg/L	0.01-0.56 mg/L
Magnesium	40 mg/L	0.8-173.0 (20) mg/L
Sodium	280 mg/L	7-1770 (213) mg/L
Potassium	17.5 mg/L	0-71(12) mg/L
Bicarbonate	400 mg/CaCO3	NA
Chloride	285 mg/L	15-3500 (356) mg/L
Sulfate	175 mg/L	9-753 (100) mg/L
Aluminium	0.75 mg/L	<0.01-4.96 (0.50) mg/L
Arsenic	<0.005 mg/L	<0.005-0.027 (0.01) mg/L
Iron	<7.5 µg/L	0.03-43 (6.12) µg/L
Chlorophyll a	2-10 µg/L	2-10 µg/L

Table 25: Quarterly Vertical Profile Water Quality Criteria – Dam 1 and Dam 2

Pollutant	*Unit of Measure*	*Water Quality Objectives*
Turbidity	NTU	5 – 20 NTU
pH	pH	6.5 – 8.5
Oil and Grease	mg/L	10 mg/L
Salinity	µS/cm	<3,000 µS/cm
Dissolved oxygen	mg/L	>6 mg/L
Chorophyll-a	µg/L	2-10 µg/L
Faecal coliforms	Median No./100mL	<1000 cfu/100mL
Enterococci	Median No./100mL	<230 cfu/100mL
Algae and blue-green algae	No.cells/mL (M.aeruginosa)	<50,000 cells/mL
	mm^3/L (total biovolume)	<4 mm^3/L
Sodium	mg/L	500mg/L
Potassium ion	mg/L	40mg/L
Magnesium ion	mg/L	100mg/L
Chloride ion	mg/L	1000mg/L
Sulphate ion	mg/L	800mg/L
Bicarbonate ion	mg/L	400mg/L
Soluble iron	mg/L	20mg/L
Soluble aluminium ion	mg/L	0.5mg/L
Ammonium ion	mg/L	20mg/L

1) *The Department acknowledges that short term exceedances of these objectives may occur during natural events such as flooding.*

2) *The Department acknowledges that pre-existing water quality may not meet the objectives for some analytes, including salinity. The proponent shall strive to meet the water quality objectives through implementation of the Soil and Water Management Plan (see condition 18 below), as far as is reasonable and feasible and within the Proponent's control, to the satisfaction of the Secretary.*

The site has a commitment to Blue Green Algae monitoring within the extraction ponds in accordance with the criteria listed in **Table 26**.

Table 26: Monthly Monitoring Criteria – Blue Green Algae

Algae and Blue-green algae	No.cells/mL (M.aeruginosa)	<50,000
	mm^3/L (total biovolume)	<4

The site has a commitment to complete quarterly creek water monitoring within the surrounding environment in accordance with the criteria listed in **Table 27**.

Table 27: Quarterly Surface Water Quality Criteria – Surrounding Environment

Pollutant	*Unit of Measure*	*Interim Target Criteria*	*Baseline Monitoring 9/06-8/07*
pH	pH	5.5 – 7.5	3.55-8.44 (6.49)
Electrical Conductivity	uS/cm	1800-24000	286-45000 (11930)
Dissolved Oxygen	mg/L	>6	0.81-7.49 (4.34)
Turbidity	NTU	<20	3-67 (14.4)
Suspended Solids	mg/L	<25	1.5-48 (19)

Groundwater

The site has an annual requirement to monitor water quality from the five on site groundwater bores per the criteria listed in EPL 13077 and reproduced in **Table 28**.

Table 28: Groundwater monitoring requirements (DLP3-DLP7) from EPL 13077

POINT 3,4,5,6,7

Pollutant	Units of measure	Frequency	Sampling Method
Ammonia	milligrams per litre	Yearly	Grab sample
Chloride	milligrams per litre	Yearly	Grab sample
Electrical conductivity	microsiemens per centimetre	Yearly	Grab sample
Oil and Grease	milligrams per litre	Yearly	Grab sample
pH	pH	Yearly	Grab sample
Standing Water Level	metres (Australian Height Datum)	Yearly	No method specified
Sulfate	milligrams per litre	Yearly	Grab sample

The site has a commitment to complete monthly groundwater monitoring within the surrounding environment in accordance with the criteria listed in **Table 29**.

Table 29: Monthly Groundwater Quality Criteria – Surrounding Environment

Parameter	Interim Target Criteria	Baseline Data
pH	4.2-7.0	3.58-7.54 (5.43)
Electrical conductivity	<2.0 mS/cm	0.07-6.47 (1.24) mS/cm)
Dissolved oxygen	<1.50 mg/L	0.16-4.83 (0.84) mg/L
REDOX Potential	<20 NTU	3-67 (14.4) NTU
Groundwater level	M (AHD)	0.25-1.52 (0.68)

The site has a commitment to complete quarterly groundwater monitoring within the surrounding environment in accordance with the criteria listed in **Table 30**.

Table 30: Quarterly Groundwater Quality Criteria – Surrounding Environment

Parameter	Interim Target Criteria	Baseline Data
Calcium	55 mg/L	0.7-144 (26)
Manganese	0.15 mg/L	0.01-0.56 mg/L
Magnesium	40 mg/L	0.8-173.0 (20) mg/L
Sodium	280 mg/L	7-1770 (213) mg/L
Potassium	17.5 mg/L	0-71(12) mg/L
Bicarbonate	400 mg/CaCO3	NA
Chloride	285 mg/L	15-3500 (356) mg/L
Alkalinity	185 mg/L	0-534 (109) mg/L
Sulfate	175 mg/L	9-753 (100) mg/L
Dissolved Aluminium	0.75 mg/L	<0.01-4.96 (0.50) mg/L
Dissolved Arsenic	<0.005 mg/L	<0.005-0.027 (0.01) mg/L
Dissolved Iron	7.5 mg/L	0.03-43 (6.12) mg/L

7.3 Surface Water Results

There were no surface water discharges in 2024. Therefore, criteria related to **Table 23** have not been triggered.

A summary of results obtained from monthly sampling in the ponds is provided in **Table 31**.

Table 31: Monthly Dredge Pond and Silt Pond Monitoring 2024 Results

Parameter	Interim Target Criteria	Dredge Pond (Dam 2)			Silt Pond (Dam 1)		
		Min	Max	Average	Min	Max	Average
pH	6.5-8.5	**4.9**	**8.6**	6.9	**2.6**	**9.1**	6.5
EC (uS/cm)	<2000	218	276	248.6	240	316	279.1
DO (mg/L)	>4	6.5	20.8	9.8	**2.7**	9.7	6.1
Turbidity (NTU)	<20	2.5	**686**	**96.2**	7.2	**1000**	**288.3**
Oil and Grease (mg/L)	10	5	**39**	**11.9**	5	**20**	8.6

Note: Values in **bold** do not satisfy the interim target criteria.

When comparing monthly surface water quality results to criteria (**Table 23** and **Table 24**), the 2024 monitoring found the following:

- **pH:** The Dredge Pond and the Silt Pond reported pH within the interim target criteria, with an annual average of pH 6.9, and pH 6.5, respectively.
- **Electrical Conductivity (EC):** The Dredge Pond and Silt Pond did not have any EC exceedances during the 2024 reporting period.
- **Turbidity:** There were multiple (10) exceedances for Turbidity at the Silt Pond location with the maximum exceedance of 1000 NTU in October. As a result, the annual average exceeded the criteria for turbidity with an average of 288.3 NTU. The Dredge Pond location recorded four exceedances with the maximum turbidity of 686 NTU, and an annual average of 96.2 NTU.
- **Oil and Grease:** Oil and grease levels at both the Dredge Pond and Silt Pond saw maximum exceedances of 39mg/L and 20mg/L, respectively. The annual average at the Dredge Pond was above the interim target criteria, recording an average of 11.9mg/L. However, the Silt Pond was within the interim target criteria with an annual average of 8.6 mg/L.
- **Dissolved Oxygen (DO):** Both the Silt Pond and Dredge Pond were within criteria for DO during the 2024 period.

While exceedances in criteria were recorded during the reporting period, there was no discharge from site and no non-compliances. See **Appendix D** for complete monitoring data.

Long-term monitoring results for the Dredge Pond and Silt Pond from the 2020 reporting periods onwards are presented in **Table 32**.

Table 32: Long-term Average Results for Dredge Pond (Dam 1) and Silt Pond (Dam 2)

Parameter	Interim Target Criteria	Baseline (2006/2007)	Dredge Pond (Dam 1)					Silt Pond (Dam 2)				
			2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
pH	6.5-8.5	3.55-8.44	**4.2**	**5.7**	**5.8**	**5.8**	6.9	**5.2**	**6.3**	7.1	**6.3**	6.5
EC (uS/cm)	<2000	286-450	573.1	604.8	145	207.3	248.6	645.3	834.1	178	272.7	279.1
DO (mg/L)	>4	0.81-7.49	6.4	7.2	6.3	7.4	9.8	6.7	6.5	6.3	6.7	6.1
Turbidity (NTU)	<20	3.0-67.0	12.1	12.0	91	9.2	**96.2**	83.7	17.9	95	233.4	**288.3**
Oil and Grease (mg/L)	10	-	7.1	11.2	6.8	10.2	**11.9**	6.9	12.2	11.6	11.5	8.6

*Note: exceedances are in highlighted in **BOLD**.*

Long-term Trends

- **pH:** As shown in **Table 32** the comparison from 2018 to 2024 indicates that the Dredge Pond has consistently exhibited acidic conditions, with pH levels outside the interim target criteria. However, in 2024, the average pH for both the Dredge Pond and the Silt Pond fell within the interim target criteria.
- **EC:** Average values of EC in both the Dredge Pond and the Silt Pond are similar in comparison to previous years. The 2024 averages were within baseline criteria.
- **Dissolved oxygen (DO):** DO levels at the Silt Pond remained consistent with previous years. At the Dredge Pond, the annual average DO was reported above the interim target criteria (>4 mg/L) but was above the baseline criteria, measuring 9.8 mg/L.
- **Turbidity:** The 2024 average turbidity at the Dredge Pond increased significantly compared to the 2023 annual average, reaching its highest level since 2019. Similarly, turbidity at the Silt Pond remained consistent with the 2023 average but also recorded its highest level since 2019. NTU values exceeded the interim target criteria (<20 NTU) and fell outside the baseline criteria.
- **Oil and Grease:** Oil and grease levels at the Dredge Pond have increased compared to the 2023 annual average, exceeding the interim target criteria. In contrast, levels at the Silt Pond have decreased and remain within the interim target criteria.

A summary of the long-term chemical analysis results from the years 2020 to 2024 is provided in **Table 33**.

Table 33: Long-term Analyte Monitoring Results

Parameter (mg/L)	Interim Target Criteria	Baseline Target (2006/07)	Dredge Pond (Dam 1)					Silt Pond (Dam 2)				
			2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
Manganese	0.15	0.01-0.56	0.2	0.2	0.2	0.3	0.1	0.3	0.2	0.1	0.1	0.1
Magnesium	40	0.8-173.0	10.2	20.0	3.7	2.7	4.0	10.0	11.3	4.0	3.2	4.3
Sodium	280	7-1,770	45.3	50.8	16.1	8.9	13	45.0	50.8	18.2	9.7	13
Potassium	17.5	0-71	4.8	4.5	2.3	1.9	2.4	4.7	4.0	2.4	2.1	2.4
Bicarbonate	400	-	21.7	20.0	98.8	20.0	30	20.0	20.0	110	22.8	36
Chloride	285	15-3,500	85.7	92.3	29.7	13.0	16	92.5	93.8	31.7	16.0	16
Sulphate	175	9-753	185.3	210.0	79.3	62.0	91	210.0	212.5	85.7	75.5	91
Aluminium (soluble)	0.75	<0.01-4.96	1.1	0.1	0.26	0.3	0.1	1.2	0.3	0.3	0.8	0.3
Arsenic	0.005	<0.005-0.027	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iron (Soluble)	7.5	0.03-43	0.4	0.1	0.1	0.4	0.2	0.2	0.2	0.1	0.7	0.3
Chlorophyll a	2-10	2 - 10	5.7	6.0	5.0	7.8	5.2	5.0	5.8	5.0	8.3	11
Faecal Coliforms Median No./1000mL	NA	<1000 CFU/100mL	-	252.5	42.5	50	**1212.5**	-	32.5	52.5	662.5	481
Enterococci Median No./1000mL	NA	<230 CFU/100mL	-	62.5	52.5	125	**895**	-	180	17.5	530	215.5
Ammonium		20	-	0.02		0.02	0.0	-	0.02	0.07	0.05	0.0

The results from the quarterly chemical analysis indicate the results are generally below both the baseline and interim target criteria. In 2024, the average levels of Manganese, Aluminium, Iron, and Chlorophyll a in the Dredge Pond showed a decrease compared to previous years, remaining below the target criteria and consistent with historical results. The annual averages of Faecal Coliforms and Enterococci exceeded the target criteria, primarily due to elevated measurements recorded in Q1 and Q3.

The Silt Pond experienced slight increases in the average levels of most parameters, but all remained within the baseline target, except for Chlorophyll a, which had an average of 11, slightly exceeding the baseline target range of 2-10. Arsenic levels were consistent with previous years and remained below the target criteria.

Annual averages for the Quarterly Vertical Profile for Pond 2, are shown below in **Table 34.** See **Appendix D** for complete monitoring data. Results from the vertical profile monitoring show that parameters within this water body generally did not exceed the objective values.

Table 34: Quarterly Vertical Profile Results for 2024

Parameter	Unit of Measure	Interim Trigger Values	Pond 2 Dredge Pond
			Annual Average
pH	pH units	5.0-8.5	6.7
Electrical conductivity	µS/cm	<5.50 mS/cm	254.6
Dissolved Oxygen	mg/L	>4.00 mg/L	9.25
Turbidity	NTU	<20 NTU	4.73
Oil and grease	mg/L	<10 mg/L	17

The site has committed to completing quarterly creek monitoring within the surrounding environment in accordance with the EMS. A summary of results obtained from quarterly water quality monitoring is provided in **Table 35** to **Table 37**.

Results obtained from quarterly water quality monitoring show the results are generally reported within the baseline criteria and below the interim target criteria of the EMS.

Table 35: Quarterly Northern Creek Water Quality Monitoring for 2024 and Previous Years

Parameter (mg/L)	Interim Target Criteria	Baseline (2006/07)	SW3							SW4						
			2024 Min	2024 Max	2024 Average	2023 Average	2022 Average	2021 Average	2020 Average	2024 Min	2024 Max	2024 Average	2023 Average	2022 Average	2021 Average	2020 Average
pH	5.5-7.5	3.55-8.44	5.3	7.1	6.1	7.0	5.65	6.3	4.3	5.7	7.5	6.9	6.9	6	7.10	5.8
EC	1800-24000	286-45000	185	5230	**1663.5**	10702.5	3583	11701	2942	246	15800	6721.5	6432.5	5339	22	6742
DO	>6	0.81-7.49	0	6.5	**3.2**	4.4	3.4	5.3	4.6	1.9	8	4.8	4.7	4.2	6.1	558.8
Turbidity	<20	3-67	-	**-**	**-**	**254.7**	12	14	37	-	**-**	**-**	**262.2**	15	87	15
Suspended Solids	<25	1.5-48	10	38	**21.5**	**30.8**	17	35	97	12	27	21.0	**44.8**	13	27	18

Note Monitoring of turbidity was discontinued in 2024 as it is not required by the Soil and Water Management Plan

Table 36: Quarterly Southern Creek Water Quality Monitoring 2024 and Previous Years

Parameter (mg/L)	Interim Target Criteria	Baseline (2006/07)	SW9							SW10						
			2024 Min	2024 Max	2024 Average	2023 Average	2022 Average	2021 Average	2020 Average	2024 Min	2024 Max	2024 Average	2023 Average	2022 Average	2021 Average	2020 Average
pH	5.5-7.5	3.55-8.44	5.5	7.9	6.5	7.1	6.4	7.1	7.2	4.8	6.4	5.9	7.1	5.6	6.725	4.47
EC	1800-24000	286-45000	1440	12500	4467.5	14277.5	4522.5	22872.5	14100	332	10500	3458.0	11615.5	2335	12957.5	3079
DO	>6	0.81-7.49	0	7.2	**4.4**	4.8	4	5.16	6.54	0	4.4	**2.9**	4.9	4.2	4.23	3.21
Turbidity	<20	03-67	-	**-**	**-**	7.9	47	18.53	9.05	-	**-**	**-**	**70.65**	43	27.43	74.1
Suspended Solids	<25	1.5-48	7.4	16	11.9	48.0	11.7	13.6	37	28	60	**44.3**	38.0	36	14.85	38

Note Monitoring of turbidity was discontinued in 2024 as it is not required by the Soil and Water Management Plan

Table 37: Quarterly Total Nitrogen and Total Phosphorus Monitoring for 2024

				SW3			SW4			SW9			SW10		
Description	**Lower Criteria**	**Upper criteria**	**Unit**	**Minimum**	**Maximum**	**Average**	**Minimum**	**Maximum**	**Average**	**Minimum**	**Maximum**	**Average**	**Minimum**	**Maximum**	**Average**
Total Nitrogen	0	1	mg/L	0.5	1.6	0.95	0.50	1.60	1.02	0.2	0.9	0.575	0.6	2	**1.2**
Total Phosphorus	0	0.08	mg/L	0.01	0.1	0.05	0.01	0.10	0.05	0.01	0.1	0.06	0.01	0.16	0.08

The results of the monthly algae monitoring for the 2024 reporting period are displayed within **Table 38**.

Table 38: Surface Water Quality Monitoring 2024 Results – Blue Green Algae

Date	Dredge Pond		Silt Pond	
	M. aeruginosa (cells/mL)	Total Biovolume (mm^3/L)	M. aeruginosa (cells/mL)	Total Biovolume (mm^3/L)
	Criteria: <50,000	Criteria: <4	Criteria: <50,000	Criteria: <4
11/01/2024	1	0.01	1	0.01
15/01/2024	1	0.01	1	0.01
13/02/2024	1	0.01	1	0.01
19/02/2024	1	0.01	1	0.01
14/03/2024	1	0.01	1	0.01
25/03/2024	1	0.01	1	0.01
11/04/2024	1	0.01	1	0.01
29/04/2024	1	0.01	1	0.01
08/05/2024	1	0.01	1	0.01
12/06/2024	1	0.1	1	0.1
10/07/2024	1	0.1	1	0.1
13/08/2024	1	0.1	1	0.1
11/09/2024	1	0.1	1	0.1
10/10/2024	1	0.1	1	0.1
21/10/2024	1	0.1	1	0.1
12/11/2024	1	0.1	1	0.1
25/11/2024	1	0.1	1	0.1
11/12/2024	1	0.1	1	0.1
16/12/2024	1	0.1	1	0.1
Average	**1**	**0.1**	**1**	**0.1**

Monitoring for Blue Green Algae was conducted fortnightly from October to April, and monthly from May to September (as per Section 6.2 of the EMS). Both the algal cell counts and total biovolume for the Dredge Pond and Silt Pond fell considerably below the criteria level committed to in the EMS and the Soil and Water Management Plan.

The total algae count results gathered at site across several years are variable. It is noted that variations in total algae count results are not identified as exceedances of the monitoring criteria listed in the EMS and the key to monitoring Blue Green Algae activity generally lies with total algae count readings.

Long-term Trends:
Key parameters continued to follow long-term trends, including:

- There was no surface water discharge in 2024;
- Generally acidic pH readings;
- High variability of turbidity;
- Consistent levels of total algae within long-term trends; and
- EC was variable, but within long-term trends.

Comparison to EIS Predictions:
There was no evidence of any detrimental impact from the Quarry on surface water. This is consistent with the EIS predictions.

7.4 Groundwater Results

Monthly groundwater monitoring was undertaken at 5 locations (DLP 1, DLP 3, DLP 5, DLP 6 and DLP 7) during the 2024 reporting period.

DLP 7 sits immediately adjacent to the existing wetland, which act as a ‘drawer’ of permanently saline conditions in order to sustain its dominant vegetative makeup. It is therefore considered likely that some localised salinisation of surficial groundwater has occurred within the vicinity of DLP3 and DLP 7 due to tidal influences within these nearby waterways and wetlands. This trend has previously been identified in Annual Reports prepared under the previous operator and is considered to be consistent with the natural salinity levels in the local environment.

A summary of monthly groundwater results for pH and EC is provided in **Table 39**.

Table 39: Monthly Groundwater Quality Monitoring 2024 Results Summary (pH and EC)

Location	Parameter	Interim Target Criteria	2024 Minimum	2024 Maximum	2024 Average	2023 Average	2022 Average	2021 Average	2020 Average
DLP1	pH	4.2-7.0	4.5	**7.6**	6.4	**7.1**	6.8	5.9	5.7
	EC (uS/cm)	<2000	123.0	1930.0	725.0	1585	1258.3	346.6	214.5
DLP3	pH	4.2-7.0	5.6	**7.5**	6.2	5.8	6.1	6.0	6.1
	EC (uS/cm)	<2000	**7234.0**	**9070.0**	**8290.6**	**3750**	7615	7997.5	7639.2
DLP5	pH	4.2-7.0	4.2	5.8	5.1	4.05	4.6	5.4	5.5
	EC (uS/cm)	<2000	405.0	1050.0	734.9	**2115**	1783.8	307.4	1121.1
DLP6	pH	4.2-7.0	4.7	**8.4**	5.7	5	5.1	4.5	5.1
	EC (uS/cm)	<2000	155.0	385.0	224.9	210	130	260.8	546.1
DLP7	pH	4.2-7.0	6.4	7.4	6.9	6.9	6.95	7.0	6.8
	EC (uS/cm)	<2000	**2390.0**	**3520.0**	**3080.5**	**2563**	3085	3551.7	2939.7

Note: Values in **bold** do not satisfy the interim target criteria.

- **pH:** From 2017 to 2024 pH annual averages were slightly acidic across all locations with the exception of DLP7 which has remained relatively neutral. DLP1, DLP3 and DLP 6 exceeded the maximum interim target criteria range, recording pH 7.6, 7.5 and 8.4 respectively
- **EC:** DLP3 and DLP7 present annual average EC above the maximum interim target criteria of 2000 µS/cm stated within the EMS, with this also being the case in previous years. EC displayed high variability across locations, from DLP1's minimum of 123 µS/cm to DLP3's maximum of 9070 µS/cm. DLP3 and DLP7 exceeded the criteria with the respective values of 9070 µS/cm and 3520 respectively.

Holcim does not view these exceedances as a non-compliance, as DPHI (then DPI&E) stated

"DPI&E acknowledges that pre-existing water quality may not meet the objectives for some analytes, including salinity. Holcim must strive to meet the water quality objectives through implementation of the Soil and Water Management Plan, as far as is reasonable and feasible and within the Proponent's control, to the satisfaction of the Secretary."

Holcim will continue to monitor groundwater data in the 2025 period and make observations regarding trends. A summary of quarterly monitoring for Manganese and Magnesium is outlined in **Table 40**. See **Appendix D** for complete monitoring data.

Table 40: Quarterly Groundwater Quality Monitoring 2024 Results (Manganese and Magnesium)

Location	Parameter	Interim Target Criteria	Q1	Q2	Q3	Q4	2024 Average	2023 Average	2022 Average	2021 Average	2020 Average
DLP1	Manganese (mg/L)	0.15	**0.34**	0.012	0.036	0.076	0.12	0.19	0.3	0.13	0.12
	Magnesium (mg/L)	100	37	3.5	4	2.8	11.83	29.00	28	12.35	5.03
DLP3	Manganese (mg/L)	0.15	**0.75**	**0.62**	**0.61**	**0.66**	**0.66**	0.79	0.65	0.68	0.71
	Magnesium (mg/L)	100	**140**	**130**	**130**	**130**	**132.50**	147.50	120	130.00	125.00
DLP5	Manganese (mg/L)	0.15	0.13	0.059	0.029	**0.28**	0.12	0.16	0.28	0.01	0.21
	Magnesium (mg/L)	100	19	6.1	3.8	40	17.23	26.25	40.3	3.65	31.75
DLP6	Manganese (mg/L)	0.15	**0.23**	0.09	0.079	0.14	0.13	0.13	0.13	0.12	0.22
	Magnesium (mg/L)	100	4	1.9	2.1	3.4	2.85	2.23	1.75	7.63	3.63
DLP7	Manganese (mg/L)	0.15	0.077	0.052	0.052	0.08	0.07	0.06	0.059	0.07	0.06
	Magnesium (mg/L)	100	40	35	35	26	34	33.25	31.5	35.00	36.75

Annual averages for Manganese and Magnesium in the 2024 reporting period are generally consistent with 2023 results. DLP3 values for 2024 follow the long-term trend of exceeding the interim target criteria for both Manganese and Magnesium.

Long-term Trends

Results for Manganese and Magnesium are similar to previous years. DLP3 has consistently been reported above the interim target criteria.

Comparison to EIS Predictions

There was no evidence of any detrimental impact from the Quarry on groundwater. This is consistent with the EIS predictions.

7.5 Proposed Water Management Improvements

Holcim will continue to monitor and implement all water monitoring commitments.

The *Soil and Water Management Plan* continued to be updated in line with the requested amendments in 2023, and in consultation with DPHI in 2024. Holcim has engaged specialists to assist in suitably updating the plan. It is expected the Soil and Water Management Plan will be finalised in 2026.

7.6 Flood Storage Capacity

In accordance with Schedule 3 Condition 17 of the Project Approval, this Annual Review reports on the flood storage capacity of the site.

The site has been constructed in accordance with the extraction plans approved by the DPHI. The entire northern extraction area has been bunded to a height of approximately 1 metre along the perimeter of disturbance.

Due to no significant changes to the infrastructure or landform of the site in 2024, there has been no changes to the flood storage capacity at the site. The flood capacity at the site would be no less than the capacity at the commencement of the project.

7.7 Water Take

There is no water take associated with the Dunloe Sand Quarry.

8 Rehabilitation and Landscape Management

8.1 Rehabilitation Performance

As part of the site's approved EMS, revegetation and regenerative landscaping is required. Ongoing management of the surrounding vegetation is being carried out by Ramtech Pty Ltd over the lifetime of the Dunloe Sand Quarry operations.

The regenerative works have been undertaken via a combination of assisted and natural regrowth and all areas have been fenced so as to limit the intrusion of cattle. In this regard, depending on soil types and topography, each of the areas has been very successful in establishing quality regrowth.

Rehabilitation and revegetation monitoring took place in 2024 as per Condition 28 in Schedule 3 of the Project Approval and to fulfill the requirements of the Rehabilitation and Revegetation Management Plan (RRMP). Fauna box monitoring was completed in July and December 2024.

A summary of rehabilitation at the Dunloe Sand Quarry is outlined in **Table 41**.

Table 41: Rehabilitation Performance in Reporting Period

Guideline Requirement	Site Comment
Extent of the operations and rehabilitation at completion of the reporting period	There was no rehabilitation at site in 2024.
Agreed post-rehabilitation land use	The proposed rehabilitation aims to return the land to an endangered ecological community (EEC) Swamp Sclerophyll plus Eucalypt Open Forest species and EEC Coastal Wetland within the localised she-oaks.
Key rehabilitation performance indicators	Criteria are outlined in the *Landscape Management Plan*.
Renovation or removal of buildings	None during reporting period.
Any other Rehabilitation taken including: ● Exploration activities; ● Infrastructure; ● Dams; and ● The installation or maintenance of fences, bunds, and any other works.	No rehabilitation of these features was completed.
Any rehabilitation areas which have received formal sign off from the Resources Regulator.	None.
Variations to activities undertaken to those proposed (including why there were variations and whether Resources Regulator was notified)	No variations to the *Rehabilitation and Revegetation Management Plan*.
Outcomes of trials, research projects and other initiatives	No specific trials done.

Guideline Requirement	Site Comment
Key issues that may affect successful rehabilitation	There are several potential issues including availability of material, seed stock, climatic events, tidal inundation, and rehabilitation methodology which are considered in the *Rehabilitation and Revegetation Management Plan*.

8.2 Summary of Current Rehabilitation and Performance

A summary of the rehabilitation and disturbance status is outlined in **Table 42**.

Table 42: Rehabilitation and Disturbance Status

Quarry Area Type	2019	2020	2021	2022	2023	2024	2025 (proposed)
	(ha)						
A. Total Quarry Footprint	32.2	32.2	32.2	32.2	32.2	32.2	32.2
B. Total Active Disturbance	18.8	18.8	18.8	18.8	18.8	18.8	18.8
C. Land Being Prepared for Rehabilitation	0	0	0	0	0	0	0
D. Land Under Active Rehabilitation	13.4	13.4	13.4	13.4	13.4	13.4	13.4
E. Completed Rehabilitation	0	0	0	0	0	0	0

At the end of 2024 there was approximately 18.8 Ha of active disturbance and 13.4 Ha of active rehabilitation. This has remained on consistent since 2019, with operations remaining in existing footprint (see **Figure 4**).

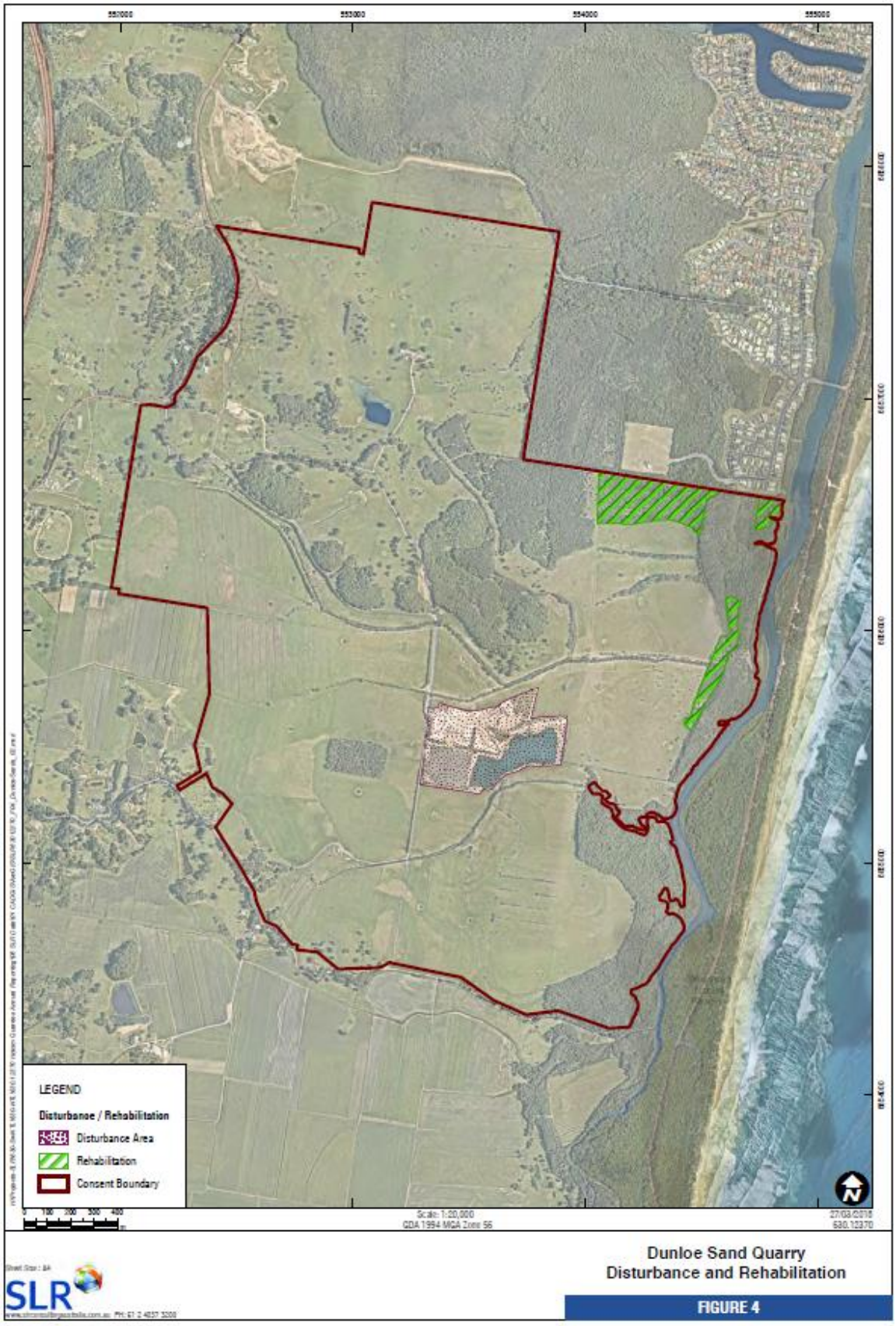

Figure 4: Rehabilitation and Disturbance 2024

Quarterly rehabilitation monitoring of established rehabilitation areas found:

- No evidence of fauna using the nest boxes was observed in 2024, consistent with findings from 2023.
- All management zones contain healthy and resilient vegetation communities, generally in good condition. Ongoing rehabilitation efforts remain on track to meet rehabilitation targets.
- Dominant species continued to be Coast Banksia, Broad-leaved Paperbark, and Swamp Oak.
- Routine weed control continued in 2024 targeting Lantana, Senna, Umbrella Tree, Camphor Laurel, Corky Passionfruit, White Passionfruit, Five-leaved Morning Glory, Tobacco Bush, Silverleaf Desmodium, and Blue Billygoat Weed.
- Koala activity across the site remains classified as "low." Fresh, moderately fresh, and moderately old Koala scats were found beneath mature Swamp Mahogany trees in areas with previous positive records.
- There was no evidence of any threatened flora or fauna across the site.
- Native fauna observed during monitoring including the Rufous Fantail, Brush turkeys, Wallabies, bandicoots, Lace Monitors and several predatory bird species.

Rehabilitation areas are generally on track to achieving rehabilitation outcomes.

8.3 Actions for the Next Reporting Period

The *Annual Review Guidelines (DPE 2015)* require the Annual Review to outline the rehabilitation actions proposed during the next reporting period (1 January 2025 to 31 December 2025). These actions are detailed in **Table 43**.

Table 43: Rehabilitation Actions for the Next Reporting Period

Rehabilitation activities category	Site Comment
Outline proposed rehabilitation trials, research projects and other initiatives to be undertaken during the next reporting period.	Rehabilitation inspections/monitoring to continue as per the Rehabilitation and Revegetation Management Plan and the Dunloe Sand Environmental Management Strategy.
Summary of rehabilitation activities proposed for next report period.	No specific rehabilitation proposed for 2025. The three rehabilitation zones will continue to be managed and monitored in accordance with the approved EMS including invasive species removal and monitoring.

9 Summary of Environmental Performance

A summary of the performance of environmental management measures and sampling results for 2024 are detailed in **Table 44** below.

Table 44: Environmental Performance at the Dunloe Sand Quarry in 2024

Aspect	Approval Criteria / EIS Prediction	Performance during reporting period	Trend / key management implications	Implemented / proposed management actions
Meteorological	N/A	Meteorological data collected from the on-site meteorological station.	Full monitoring continued in 2024.	No further improvement measures.
Noise	EIS predictions are all below Project Approval criteria.	Quarterly monitoring has met the Project Approval Criteria.	Consistently meets criteria.	No further improvement measures.
Air Quality	EIS predictions are all below Project Approval criteria.	Three invalid samples during the reporting period: • Two at DDG4 in March and July 2024, and • One at DDG1 in September 2024. All valid monitoring results below target criteria.	Consistent with EIS predictions and trends.	Continue to implement air quality monitoring is done in accordance with the Air Quality Management Plan. Holcim will ensure monthly monitoring is undertaken for depositional dust.
Traffic Management	EIS predictions are all below Project Approval criteria.	Met operating criteria (number of trucks per day).	Continual improvement from some past years.	None Required.
Water Management	EIS predictions are all below Project Approval criteria.	Monitoring data meets EIS, EPL and Project Approval criteria. Exceedances occurred in the surface water target levels in the Dredge Dam and Slit Pond however no discharges occurred from these during the reporting period. There were no non-compliances in 2024.	Water monitoring results were generally consistent with trend data.	Continue to implement the approved Soil and Water Management Plan. Holcim will identify any emerging trends in future Annual Reviews, as data capture and implementation of the Monitoring Program improves.
Biodiversity	No impacts to threatened species. No Project Approval criteria.	Biodiversity monitoring was undertaken in 2024.	Rehabilitation and biodiversity monitoring continued from 2019 to 2024.	Biodiversity monitoring will continue in 2025.
Heritage	No impacts to Aboriginal Heritage. No Project Approval criteria.	No impacts were recorded in 2024.	Consistently no impacts.	None required.

10 Community

10.1 Community Engagement Activities

The site implemented a Community Consultative Committee (CCC) when under the operation of Ramtech as part of the conditions of Approval.

Holcim has maintained community engagement measures, including:

- Maintenance of a website (containing publicly available documents);
- A telephone number, email, and postal address (on the website) for community complaints and feedback;
- A copy of the Complaints Register is maintained on the company website; and

All documents and items displayed on the website are regularly updated by Holcim staff.
During the 2024 reporting period, Holcim conducted two CCC meetings. The CCC meetings were held on 8 February and 28 July 2024.

10.2 Community Contributions

Holcim did not engage in any community activities during the reporting period.

10.3 Complaints

There were no community complaints for the site during 2024. This trend has continued since 2018. Community complaints reports are published on the Holcim website quarterly.

11 Independent Audit

The next IEA is due July 2026.

12 Incidents and Non-compliances

Table 45 summarises the incidents and non-compliances at the Dunloe Sand Quarry in 2024.

Table 45: Summary of Incidents

Date	Incident	Action/Comment
Multiple Dates	**Schedule 3, Condition 7A Air Quality Management Plan** There were three invalid depositional dust monitoring samples during the reporting period. These include: • Invalidated sample at DDG4 in March 2024 due to damage from a cow impacting the sample bottle. • Invalidated sample at DDG4 in July 2024 due to sample bottle being damaged from strong winds causing the stand to blow over, smashing the bottle, and • Lost sample at DDG1 in September 2024 due being lost in transit by the laboratory courier.	Holcim will continue to monitor air quality and record invalidated or lost samples in Annual Reviews.

13 Activities to be completed in the next reporting period

Holcim staff will undertake the following works and improvement measures and projects in 2025 to ensure that effective environmental management controls are in place and operating in accordance with the requirements of the Approval. See **Table 46** for an outline of improvement measures and associated activities for 2025.

Table 46: Improvement Actions for 2025

Improvement Measure	Activities
Dust Monitoring	Ensure dust monitoring is completed in accordance with the EMS. Holcim will liaise with the monitoring contractor to improve monitoring system.
Biodiversity	Rehabilitation monitoring continues as per the Rehabilitation and Revegetation Management Plan.

APPENDIX A
2024 Quarterly Noise Monitoring Reports

Intended for
Holcim (Australia) Pty Ltd

Document type
Report

Date
May 2024

Dunloe Sand Quarry Quarterly Noise Monitoring Assessment

Quarter 1 2024

RAMBOLL Bright ideas. Sustainable change.

Dunloe Sand Quarry Quarterly Noise Monitoring Assessment

Quarter 1 2024

Project name	**NSW Environmental Monitoring 2023-2024**
Project no.	**318001799**
Recipient	**Matt Kelly**
Document type	**Report**
Version	**1**
Date	**06/05/2024**
Prepared by	**Jake Bourke, Matilda Englert**
Checked by	**Arnold Cho**
Approved by	**Belinda Sinclair**
Description	**Data collected on 11 January 2023 for Dunloe Quarry during Quarter 1 2024 at Pottsville, NSW, as part of the routine noise monitoring program**

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Abbreviations and Definitions

Ambient Noise	The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor (see below).
dB	Abbreviation for decibel, a measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm of a given sound power to a reference power.
dB(A)	A measure of A-weighted sound levels. A Weighting is an adjustment made to the sound level measurement to approximate the response of the human ear.
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods. Normal daily traffic is not extraneous noise.
LA1	The noise level, measured in dB(A), which is exceeded for 1 per cent of the measurement period.
LA1(1min)	The noise level, measured in dB(A), which is exceeded for 1 per cent of the time over a 1-minute measurement period, i.e., is exceeded for 0.6 seconds. This measure can approximate to the maximum noise level but may be less if there is more than 1 noise event during this 0.6 second period.
LA10	The noise level, measured in dB(A), which is exceeded for 10 per cent of the time.
LA90	The noise level, measured in dB(A), which is exceeded for 90 per cent of the time, referred to as the background noise level. This is considered to represent the background noise (see above).
LAeq	The level of noise equivalent to the energy average of noise levels occurring over a defined measurement period.
LAeq (period)	The average equivalent noise level, measured in dB(A), during a measurement period (e.g., 15-minute, day, evening, or night).
LAmax	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan
SPL	The Sound Pressure Level. Sound pressure is the fluctuation in air pressure, from the steady atmospheric pressure, created by sound. The sound pressure level is the sound pressure expressed on a decibel scale.

Source: Noise Guide for Local Government (NSW EPA, 2023)

1. Overview

1.1 Project Driver

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Dunloe Sands Quarry ("the quarry") at Pottsville, NSW.

This NMA was done in accordance with the following documents:

- Noise Policy for Industry (NPfI) (NSW EPA, 2017).
- Dunloe Sand Quarry Noise Management Plan (NMP) (GHD, 2020).
- Environment Protection Licence (EPL) number 13077 (NSW EPA, 2020).
- Development Consent No. 06_0030, MOD2 (NSW EPA, 2018)
- Australian Standard AS 1055:2018 Acoustics—Description and measurement of environmental noise (Standards Australia, 2018).
- IEC 60942 Ed. 3.0 b:2003 Electroacoustics - Sound calibrators (Standards Australia, 2003).

This NMA has been undertaken for the quarterly period January to March 2024, and forms part of the monitoring program to determine compliance with conditions of the Environmental Protection License (EPL).

1.2 Site Location and Sensitive Receptors

The quarry is approximately 2.5 km south of Pottsville, NSW, a town in the Northern Rivers region in Tweed Shire. Sensitive receptors surrounding the quarry are primarily rural and residential properties in coastal bushland with elevated and undulating topography.

Three monitoring locations have been selected as part of the NMA and in accordance with the EPL and are shown in **Table 1-1**.

Table 1-1: Monitoring locations locality and sensitive receptors

Monitoring Locations	Locality and Sensitive Receptors
R6	West of the quarry situated at a rural residential property at 157 Warwick Park Road.
R7	West of the quarry situated at a rural residential property at 129 Warwick Park Road.
R8	Northwest of the quarry situated at a rural residential property at 679 Pottsville Road.

The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1**. It should be noted that while the NMP states monitoring locations be measured from the most affected points within surrounding residential property boundaries or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary, this has not been possible for this NMA due to access restrictions. Monitoring was completed at the property boundary of each location where accessible and in each case the property dwelling was approximately 40 to 100 metres from the boundary. This would have resulted in a conservative assessment as the monitoring locations were closer to the site.

Legend

- Noise monitoring location
- Property dwelling

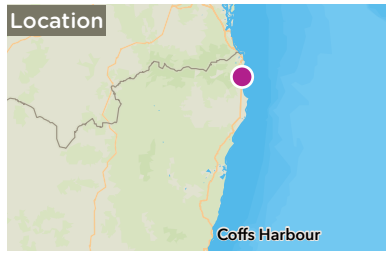

Figure 1 : Noise monitoring locations at Dunloe Sands Quarry

2. Noise Criteria

Table 2-1 summarises the applicable noise criteria outlined in the NMP for residential receivers (R6, R7 and R8) surrounding the quarry. The noise criteria apply when the site is operational within the permitted operating hours Monday to Friday 7am - 5pm, Saturday 7am - 12pm with no operations on Sunday.

Compliance with the noise criteria below would also determine compliance with the noise limits outlined in the sites EPL (EPL 13077) which requires that the quarry's noise contribution will not exceed 48 dB LAeq(15min) at any of the residential receivers.

Table 2-1: Monitoring locations and noise criteria

Receiver	Monitoring Locations	Day[1]
		LAeq (15min)
		dB(A)
157 Warwick Park Road	R6	42
129 Warwick Park Road	R7	42
679 Pottsville Road	R8	48
All other residences		41
[1] 7 am–6 pm Monday to Saturday Note: no operations on Sundays and public holidays		

3. Methodology

The monitoring program was developed in accordance with the procedures described in *Australian Standard AS 1055:2018* and the Approval Documents referenced in Section 1. The measurements were completed using a RION Sound Level Meter NL-52 on Thursday 11 January 2024. The acoustic instrumentation used carried a current NATA calibration and that complied with *AS/NZS IEC 61672-1:2013/2002 class 1*. Calibration of all instrumentation was checked prior to and following measurements using a Pulsar Acoustic Calibrator 105 which carried a current NATA calibration and complies with *IEC 60942:2003*. Drift in calibration did not exceed ±0.3 dBA.

Each attended noise measurement was conducted for 15-minutes in duration at each monitoring location during the day period over one day. Where possible, throughout each measurement the operator(s) quantified the contribution of each significant noise source.

Where the quarry was not distinctly audible during the attended monitoring, the quarry contribution was estimated to be at least 10 dBA below the ambient noise level, as determined by the LA90.

3.1 Meteorology

Meterology has an important influence on noise monitoring assessment. Where an onsite meterological station with data recorded at 10m height has not been available, the nearest Bureau of Meteorology data has been adopted to inform this assessment and modelled using The Air Pollution Model (TAPM) to determine the atmospheric stability category as outline in **Table 3-1**.

Table 3-1: Classification of Atmospheric Stability (NSW EPA, 2014)

Stability Classification	Pasquill Stability Category	Ambient temperature change with height (°C/100m)
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

The meteorological conditions recorded at the time of the noise monitoring were reviewed. The attended noise monitoring results presented in Section 4 were not found to be influenced by the following adverse meteorological conditions:

- During periods of rain or hail.
- Average wind speed at microphone height exceeding 5 m/s.
- Wind speeds greater than 3 m/s measured at 10 m above ground level.
- Temperature inversion conditions greater than 3°C/100m.

4. Results and Discussion

4.1 Location R6

Noise monitoring at location R6 was completed on Thursday 11 January 2024. The quarry was inaudible during the monitoring periods, and the ambient environment was dominated by insects, wind, trees, and passing cars. These results meet the noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance during the monitoring period. The results and observations taken during the monitoring event at Location R6 are presented in **Table 4-1.**

Table 4-1: Noise survey results and observations for Location R6

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	BOM Station at 10m (ID 94592)	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
11-01-24	2:29pm to 2:44pm (Day)	75.0	50.0	44.4	WD: 190º WS: 2.7 m/s Rain: Nil	WD: 122º WS: 3.1 m/s Rain: nil Stability Category: B[1]	Background insects/wind/trees 43-59 Passing cars (three) 61-75 Quarry inaudible	<34	42

[1] Modelled using TAPM to determine Stability Category.

4.2 Location R7

Noise monitoring at location R7 was completed on Thursday 11 January 2024. The quarry was inaudible during the monitoring periods, and the ambient environment was dominated by birds, insects, trees, and a passing car. These results meet the established noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location R7 are presented in **Table 4-2**.

Table 4-2: Noise survey results and observations for Location R7

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	BOM Station at 10m (ID 94592)	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
11-01-24	2:47pm to 3:02pm (Day)	70.5	56.5	45.0	WD: 190º WS: 1.3 m/s Rain: Nil	WD: 125º WS: 3.0 m/s Rain: nil Stability Category: B[1]	Background birds/insects/trees 44-60 Passing car (one) 70 Quarry inaudible	<35	42

[1] Modelled using TAPM to determine Stability Category.

4.3 Location R8

Noise monitoring at location R8 conducted on Thursday 11 January 2024. The quarry was inaudible during the monitoring periods, and the ambient environment was dominated by insects, trees and passing cars on Pottsville Road. These results meet the established noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location R8 are presented in **Table 4-3.**

Table 4-3: Noise survey results and observations for Location R8

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	BOM Station at 10m (ID 94592)	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
11-01-24	1:59pm to 2:14pm (Day)	75.2	60.5	47.7	WD: 190º WS: 0.9 m/s Rain: Nil	WD: 122º WS: 3.1 m/s Rain: nil Stability Category: B[1]	Insects (occasional) 42-60 Passing cars (occasional) 62-75 Trees 45 Quarry inaudible	<38	48

[1] Modelled using TAPM to determine Stability Category.

5. Conclusion

This NMA was completed by Ramboll at the Holcim Dunloe Sands Quarry, Pottsville, NSW as a quarterly requirement of the NMP showed compliance with the relevant noise criteria. Monitoring was carried out on Thursday 11 January 2024 at three locations selected as representative to the sensitive receptors at the surroundings to Dunloe Sands Quarry. No audible quarry noise was recorded at any of the selected monitoring locations.

As monitoring was completed at the property boundary of each location and each property dwelling was approximately 40 to 100 metres from the boundary, it is recommended that permission from the property owners be sought to access their property to complete future noise monitoring within 30 metres of the property dwellings. The results presented in this NMA show compliance with the relevant noise criteria at the Holcim Dunloe Sands Quarry, Pottsville, NSW.

6. References

GHD (2020). Dunloe Sand Quarry Noise Management Plan.
NSW EPA (2018). Development Consent No. 06_0030, MOD2 (November 2018)

NSW EPA (2020). Environment Protection Licence number 13077.

NSW EPA (2013) *Noise Guide for Local Government*. Sydney NSW: NSW Environment Protection Authority. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/20130127nglg.pdf (Accessed: 25 October 2022).

NSW EPA (2014) Discussion Paper. Validation of Inversion Strength Estimation Method.

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Standards Australia (2018) *AS 1055:2018 Acoustics—Description and measurement of environmental noise*. Australian Standard. Available at: https://infostore.saiglobal.com/preview/825367946534.pdf?sku=1131503_SAIG_AS_AS_2626154 (Accessed: 19 January 2023).

Standards Australia (2003) *AS 60942:2003 Electroacoustics - Sound calibrators.* Australian Standard.

Intended for
Holcim (Australia) Pty Ltd

Document type
Report

Date
January 2025

Dunloe Sand Quarry Quarterly Noise Monitoring Assessment

Quarter 4 2024

RAMBOLL

Bright ideas.
Sustainable change.

Dunloe Sand Quarry Quarterly Noise Monitoring Assessment

Quarter 4 2024

Project name	**NSW Environmental Monitoring 2024-2025**
Project no.	**318001800**
Recipient	**Matt Kelly**
Document type	**Report**
Version	**1**
Date	**31/01/2025**
Prepared by	**Jake Bourke, Brodie Wood**
Checked by	**Arnold Cho**
Approved by	**Gavan Butterfield**
Description	**Data collected on 11 December 2024 for Dunloe Quarry during Quarter 4 2024 at Pottsville, NSW, as part of the routine noise monitoring program**

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Abbreviations and Definitions

	Description
ΔT	Vertical Temperature Difference, i.e. the measured difference in ambient temperature between two elevations on the same tower. It is defined as the upper-level temperature measurement minus the lower-level temperature measurement.
°	Degree
Ambient Noise	The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor (see below).
C	Celcius
CCAM	Conformal Cubic Atmospheric Model
CSIRO	Commonwealth Scientific and Industrial Research Organisation
dB	Abbreviation for decibel, a measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm of a given sound power to a reference power.
dB(A)	A measure of A-weighted sound levels. A Weighting is an adjustment made to the sound level measurement to approximate the response of the human ear.
EPA	Environment Protection Authority
EPL	Environment Protection Licence
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods. Normal daily traffic is not extraneous noise.
m	Metre
LA1	The noise level, measured in dB(A), which is exceeded for 1 per cent of the measurement period.
LA1(1min)	The noise level, measured in dB(A), which is exceeded for 1 per cent of the time over a 1-minute measurement period, i.e., is exceeded for 0.6 seconds. This measure can approximate to the maximum noise level but may be less if there is more than 1 noise event during this 0.6 second period.
LA10	The noise level, measured in dB(A), which is exceeded for 10 per cent of the time.
LA90	The noise level, measured in dB(A), which is exceeded for 90 per cent of the time, referred to as the background noise level. This is considered to represent the background noise (see above).
LAeq	The level of noise equivalent to the energy average of noise levels occurring over a defined measurement period.
LAeq (period)	The average equivalent noise level, measured in dB(A), during a measurement period (e.g., 15-minute, day, evening, or night).
LAmax	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NATA	National Association of Testing Authorities
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan
NPfI	Noise Policy for Industry 2017

	Description
NSW	New South Wales
s	Second
SPL	The Sound Pressure Level. Sound pressure is the fluctuation in air pressure, from the steady atmospheric pressure, created by sound. The sound pressure level is the sound pressure expressed on a decibel scale.
TAPM	The Air Pollution Model

Source: Noise Guide for Local Government (NSW EPA, 2023)

1. Overview

1.1 Project Driver

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Dunloe Sands Quarry ("the quarry") at Pottsville, NSW.

This NMA was done in accordance with the following documents:

- Noise Policy for Industry (NPfI) (NSW EPA, 2017)
- Dunloe Sand Quarry Noise Management Plan (NMP) (GHD, 2020)
- Environment Protection Licence (EPL) number 13077 (NSW EPA, 2020)
- Development Consent No. 06_0030, MOD2 (NSW EPA, 2018)
- Australian Standard AS 1055:2018 Acoustics—Description and measurement of environmental noise (Standards Australia, 2018)
- Australian Standard AS/NZS IEC 61672.1:2019 Electroacoustics – Sound level meters, Part 1: Specifications (Standards Australia and Standards New Zealand, 2019)
- IEC 60942:2017 Electroacoustics - Electroacoustics – Sound calibrators (International Standard, 2017).

This NMA has been undertaken for the quarterly period October to December 2024, and forms part of the monitoring program to determine compliance with conditions of the Environmental Protection License (EPL).

1.2 Site Location and Sensitive Receptors

The quarry is approximately 2.5 km south of Pottsville, NSW, a town in the Northern Rivers region in Tweed Shire. Sensitive receptors surrounding the quarry are primarily rural and residential properties in coastal bushland with elevated and undulating topography.

Three monitoring locations have been selected as part of the NMA and in accordance with the EPL and are shown in **Table 1-1**.

Table 1-1: Monitoring locations locality and sensitive receptors

Monitoring Locations	Locality and Sensitive Receptors
R6	West of the quarry situated at a rural residential property at 157 Warwick Park Road.
R7	West of the quarry situated at a rural residential property at 129 Warwick Park Road.
R8	Northwest of the quarry situated at a rural residential property at 679 Pottsville Road.

The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1**. It should be noted that while the NMP states monitoring locations be measured from the most affected points within surrounding residential property boundaries or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary, this has not been possible for this NMA due to access restrictions. Monitoring was completed at the property boundary of each location where accessible and in each case the property dwelling was approximately 40 to 100 metres from the boundary. This would have resulted in a conservative assessment as the monitoring locations were closer to the site.

Legend

- Noise monitoring location
- Property dwelling

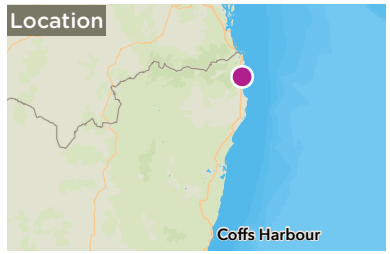

Figure 1 : Noise monitoring locations at Dunloe Sands Quarry

2. Noise Criteria

Table 2-1 summarises the applicable noise criteria outlined in the NMP for residential receivers (R6, R7 and R8) surrounding the quarry. The noise criteria apply when the site is operational within the permitted operating hours Monday to Friday 7am - 5pm, Saturday 7am - 12pm with no operations on Sunday.

Compliance with the noise criteria below would also determine compliance with the noise limits outlined in the sites EPL (EPL 13077) which requires that the quarry's noise contribution will not exceed 48 dB LAeq(15min) at any of the residential receivers.

Table 2-1: Monitoring locations and noise criteria

Receiver	Monitoring Locations	Day[1] LAeq (15min) dB(A)
157 Warwick Park Road	R6	42
129 Warwick Park Road	R7	42
679 Pottsville Road	R8	48
All other residences	-	41

[1] 7 am–6 pm Monday to Saturday
Note: no operations on Sundays and public holidays

3. Methodology

The monitoring program was developed in accordance with the procedures described in *Australian Standard AS 1055:2018* and the Approval Documents referenced in Section 1. The measurements were completed using a RION Sound Level Meter NL-52 on Wednesday 11 December 2024. The acoustic instrumentation used carried a current National Association of Testing Authorities (NATA) calibration and that complied with *AS/NZS IEC 61672-1:2019 class 1*. Calibration of all instrumentation was checked prior to and following measurements using a Pulsar Acoustic Calibrator 105 which carried a current NATA calibration and complies with *IEC 60942:2017.* Drift in calibration did not exceed ±0.3 dBA.

Each attended noise measurement was conducted for 15-minutes in duration during the day period over one day at each monitoring location. Where possible, throughout each measurement the operator(s) quantified the contribution of each significant noise source. Where the quarry was not distinctly audible during the attended monitoring, the quarry contribution was estimated to be at least 10 dBA below the ambient noise level, as determined by the LA90.

3.1 Meteorology

Meterology has an important influence on noise monitoring assessment. Where an onsite meterological station with data recorded at 10m height has not been available, the Holcim Teven Quarry onsite meteorological station located approximately 50km south of site has been used to adopt wind direction, wind speed and rain data to inform this assessment. Temperature data has been adopted from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Conformal Cubic Atmospheric Model (CCAM) and modelled using The Air Pollution Model (TAPM) to determine the atmospheric category as outline in **Table 3-1**.

Table 3-1: Classification of Atmospheric Stability (NSW EPA, 2014)

Stability Classification	Pasquill Stability Category	Ambient temperature change with height (°C/100m)
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

The meteorological conditions recorded at the time of the noise monitoring were reviewed. The attended noise monitoring results presented in Section 4 were not found to be influenced by the following adverse meteorological conditions:

- During periods of rain or hail
- Average wind speed at microphone height exceeding 5 m/s
- Wind speeds greater than 3 m/s measured at 10 m above ground level
- Temperature inversion conditions greater than 3°C/100m.

4. Results and Discussion

4.1 Location R6

Noise monitoring at location R6 was conducted on Wednesday 11 December 2024 with results presented in **Table 4-1**. The quarry was inaudible at R6 during the monitoring period, and the ambient environment was dominated by wind, trees, insects, birds and passing cars. These results meet the noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance during the monitoring period.

Table 4-1: Noise survey results and observations for Location R6

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (10m height)[1]	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
11-12-24	2:46pm to 3:01pm (Day)	61.5	45.2	41.2	WD: 30° WS: 0.6 m/s Rain: Nil	WD: NW WS: 4 m/s Rain: n/a Stability Category: E[2]	Background wind/trees/insects and birds 37-50 Car passing 50-61 Quarry inaudible	<31	42

[1] Data obtained from Holcim Teven Quarry onsite meteorological station, located approximately 50km south of site.

[2] Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

4.2 Location R7

Noise monitoring at location R7 was conducted on Wednesday 11 December 2024 with results presented in **Table 4-2**. The quarry was inaudible during the monitoring period, and the ambient environment was dominated by wind, trees, and insects. These results meet the established noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance.

Table 4-2: Noise survey results and observations for Location R7

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station (10m height)[1]	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
11-12-24	3:04pm to 3:19pm (Day)	71.6	59.7	57.9	WD: 30° WS: 0.6 m/s Rain: Nil	WD: NW WS: 3.6 m/s Rain: n/a Stability Category: E[2]	Background wind/trees/insects 54-71 Quarry inaudible	<48[3]	42

[1] Data obtained from Holcim Teven Quarry onsite meteorological station, located approximately 50km south of site.

[2] Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

[3] Measured LA90 value of 57.9 was dominated by wind, trees, and insects so unable to estimate contribution for quarry at assessment location.

4.3 Location R8

Noise monitoring at location R8 was conducted on Wednesday 11 December 2024 with results presented in **Table 4-3**. The quarry was inaudible at R8 during the monitoring period, and the ambient environment was dominated by wind, trees and passing cars on Pottsville Road. These results meet the established noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance.

Table 4-3: Noise survey results and observations for Location R8

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station[1] (10m height)	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
11-12-24	3:27pm to 3:42am (Day)	80	59.5	46.2	WD: 30° WS: 2.2 m/s Rain: Nil	WD: WNW WS: 3.1 m/s Rain: n/a Stability Category: E[2]	Background wind/trees 43-55 Passing cars 50-80 Quarry inaudible	<36	48

[1] Data obtained from Holcim Teven Quarry onsite meteorological station, located approximately 50km south of site.

[2] Temperature data sourced from CSIRO CCAM and modelled using TAPM to determine Stability Category.

5. Conclusion

This NMA was completed by Ramboll at the Holcim Dunloe Sands Quarry, Pottsville, NSW as a quarterly requirement of the NMP showed compliance with the relevant noise criteria. Monitoring was carried out on Wednesday 11 December 2024 at three locations selected as representative to the sensitive receptors at the surroundings to Dunloe Sands Quarry.

No audible quarry noise was recorded at any of the selected monitoring locations. As monitoring was completed at the property boundary of each location and each property dwelling was approximately 40 to 100 metres from the boundary, it is recommended that permission from the property owners be sought to access their property to complete future noise monitoring within 30 metres of the property dwellings. The results presented in this NMA show compliance with the relevant noise criteria at the Holcim Dunloe Sands Quarry, Pottsville, NSW.

6. References

GHD (2020). Dunloe Sand Quarry Noise Management Plan.
NSW EPA (2018). Development Consent No. 06_0030, MOD2 (November 2018)

International Electrotechnical Commission *IEC 60942:2017 Electroacoustics – Sound calibrators*

NSW EPA (2020). Environment Protection Licence number 13077.

NSW EPA (2013) *Noise Guide for Local Government*. Sydney NSW: NSW Environment Protection Authority. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/20130127nglg.pdf (Accessed: 25 October 2022).

NSW EPA (2014) Discussion Paper. Validation of Inversion Strength Estimation Method.

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Standards Australia (2018) *AS 1055:2018 Acoustics—Description and measurement of environmental noise*. Australian Standard. Available at: https://infostore.saiglobal.com/preview/825367946534.pdf?sku=1131503_SAIG_AS_AS_2626154 (Accessed: 19 January 2023).

Standards Australia and Standards New Zealand (2019) *AS/NZS IEC 61672.1:2019 Electroacoustics—Sound level meters, Part 1: Specifications*. Australian/New Zealand Standard. Available at: https://infostore.saiglobal.com/preview/825343328243.pdf?sku=1142059_SAIG_AS_AS_270564 4 (Accessed: 28 September 2022).

Intended for
Holcim (Australia) Pty Ltd

Document type
Report

Date
October 2024

Dunloe Sand Quarry Quarterly Noise Monitoring Assessment

Quarter 3 2024

RAMBOLL Bright ideas. Sustainable change.

Dunloe Sand Quarry Quarterly Noise Monitoring Assessment

Quarter 3 2024

Project name	**NSW Environmental Monitoring 2023-2024**
Project no.	**318001800**
Recipient	**Matt Kelly**
Document type	**Report**
Version	**1**
Date	**25/10/2024**
Prepared by	**Jake Bourke, Matilda Englert**
Checked by	**Arnold Cho**
Approved by	**Gavan Butterfield**
Description	**Data collected on 11 September 2024 for Dunloe Quarry during Quarter 3 2024 at Pottsville, NSW, as part of the routine noise monitoring program**

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Abbreviations and Definitions

Ambient Noise	The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor (see below).
dB	Abbreviation for decibel, a measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm of a given sound power to a reference power.
dB(A)	A measure of A-weighted sound levels. A Weighting is an adjustment made to the sound level measurement to approximate the response of the human ear.
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods. Normal daily traffic is not extraneous noise.
LA1	The noise level, measured in dB(A), which is exceeded for 1 per cent of the measurement period.
LA1(1min)	The noise level, measured in dB(A), which is exceeded for 1 per cent of the time over a 1-minute measurement period, i.e., is exceeded for 0.6 seconds. This measure can approximate to the maximum noise level but may be less if there is more than 1 noise event during this 0.6 second period.
LA10	The noise level, measured in dB(A), which is exceeded for 10 per cent of the time.
LA90	The noise level, measured in dB(A), which is exceeded for 90 per cent of the time, referred to as the background noise level. This is considered to represent the background noise (see above).
LAeq	The level of noise equivalent to the energy average of noise levels occurring over a defined measurement period.
LAeq (period)	The average equivalent noise level, measured in dB(A), during a measurement period (e.g., 15-minute, day, evening, or night).
LAmax	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan
SPL	The Sound Pressure Level. Sound pressure is the fluctuation in air pressure, from the steady atmospheric pressure, created by sound. The sound pressure level is the sound pressure expressed on a decibel scale.

Source: Noise Guide for Local Government (NSW EPA, 2023)

1. Overview

1.1 Project Driver

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Dunloe Sands Quarry ("the quarry") at Pottsville, NSW.

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- Development Consent No. 06_0030, MOD2 (NSW EPA, 2018)
- Australian Standard AS 1055:2018 Acoustics—Description and measurement of environmental noise (Standards Australia, 2018).
- Australian Standard AS/NZS IEC 61672.1:2019 Electroacoustics – Sound level meters, Part 1: Specifications (Standards Australia and Standards New Zealand, 2019)
- IEC 60942:2017 Electroacoustics - Electroacoustics – Sound calibrators (International Standard, 2017).

This NMA has been undertaken for the quarterly period July to September 2024, and forms part of the monitoring program to determine compliance with conditions of the Environmental Protection License (EPL).

1.2 Site Location and Sensitive Receptors

The quarry is approximately 2.5 km south of Pottsville, NSW, a town in the Northern Rivers region in Tweed Shire. Sensitive receptors surrounding the quarry are primarily rural and residential properties in coastal bushland with elevated and undulating topography.

Three monitoring locations have been selected as part of the NMA and in accordance with the EPL and are shown in **Table 1-1**.

Table 1-1: Monitoring locations locality and sensitive receptors

Monitoring Locations	Locality and Sensitive Receptors
R6	West of the quarry situated at a rural residential property at 157 Warwick Park Road.
R7	West of the quarry situated at a rural residential property at 129 Warwick Park Road.
R8	Northwest of the quarry situated at a rural residential property at 679 Pottsville Road.

The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1**. It should be noted that while the NMP states monitoring locations be measured from the most affected points within surrounding residential property boundaries or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary, this has not been possible for this NMA due to access restrictions. Monitoring was completed at the property boundary of each location where accessible and in each case the property dwelling was approximately 40 to 100 metres from the boundary. This would have resulted in a conservative assessment as the monitoring locations were closer to the site.

Legend

- Noise monitoring location
- Property dwelling

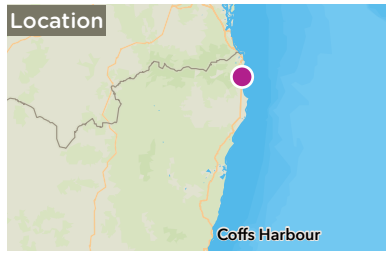

Figure 1 : Noise monitoring locations at Dunloe Sands Quarry

2. Noise Criteria

Table 2-1 summarises the applicable noise criteria outlined in the NMP for residential receivers (R6, R7 and R8) surrounding the quarry. The noise criteria apply when the site is operational within the permitted operating hours Monday to Friday 7am - 5pm, Saturday 7am - 12pm with no operations on Sunday.

Compliance with the noise criteria below would also determine compliance with the noise limits outlined in the sites EPL (EPL 13077) which requires that the quarry's noise contribution will not exceed 48 dB LAeq(15min) at any of the residential receivers.

Table 2-1: Monitoring locations and noise criteria

Receiver	Monitoring Locations	Day[1] LAeq (15min) dB(A)
157 Warwick Park Road	R6	42
129 Warwick Park Road	R7	42
679 Pottsville Road	R8	48
All other residences	-	41

[1] 7 am–6 pm Monday to Saturday
Note: no operations on Sundays and public holidays

3. Methodology

The monitoring program was developed in accordance with the procedures described in *Australian Standard AS 1055:2018* and the Approval Documents referenced in Section 1. The measurements were completed using a RION Sound Level Meter NL-52 on Wednesday 11 September 2024. The acoustic instrumentation used carried a current NATA calibration and that complied with *AS/NZS IEC 61672-1:2019 class 1*. Calibration of all instrumentation was checked prior to and following measurements using a Pulsar Acoustic Calibrator 105 which carried a current NATA calibration and complies with *IEC 60942:2017.* Drift in calibration did not exceed ±0.3 dBA.

Each attended noise measurement was conducted for 15-minutes in duration during the day period over one day at each monitoring location. Where possible, throughout each measurement the operator(s) quantified the contribution of each significant noise source.

Where the quarry was not distinctly audible during the attended monitoring, the quarry contribution was estimated to be at least 10 dBA below the ambient noise level, as determined by the LA90.

3.1 Meteorology

Meterology has an important influence on noise monitoring assessment. Where an onsite meterological station with data recorded at 10m height has not been available, the nearest Bureau of Meteorology data has been adopted to inform this assessment and modelled using The Air Pollution Model (TAPM) to determine the atmospheric stability category as outline in **Table 3-1**.

Table 3-1: Classification of Atmospheric Stability (NSW EPA, 2014)

Stability Classification	Pasquill Stability Category	Ambient temperature change with height (°C/100m)
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

The meteorological conditions recorded at the time of the noise monitoring were reviewed. The attended noise monitoring results presented in Section 4 were not found to be influenced by the following adverse meteorological conditions:

- During periods of rain or hail.
- Average wind speed at microphone height exceeding 5 m/s.
- Wind speeds greater than 3 m/s measured at 10 m above ground level.
- Temperature inversion conditions greater than 3°C/100m.

4. Results and Discussion

4.1 Location R6

Noise monitoring at location R6 was completed on Wednesday 11 September 2024. The quarry was inaudible during the monitoring period, and the ambient environment was dominated by a pressure cleaner at a nearby residence, birds and a passing car. These results meet the noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance during the monitoring period. The results and observations taken during the monitoring event at Location R6 are presented in **Table 4-1.**

Table 4-1: Noise survey results and observations for Location R6

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station[1] (10m height)	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
11-09-24	7:40am to 7:55am (Day)	67.8	53.4	46.8	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: 0 m/s Rain: n/a Stability Category: E[2]	Pressure cleaner operating at nearby residence 45-53 Birds 59 Passing car 58-62 Quarry inaudible	<37	42

[1] Data obtained from Holcim Teven Quarry onsite meteorological station, located approximately 50km south of site.

[2] Modelled using TAPM to determine Stability Category.

4.2 Location R7

Noise monitoring at location R7 was completed on Wednesday 11 September 2024. The quarry was inaudible during the monitoring period, and the ambient environment was dominated by motorway and birds. These results meet the established noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location R7 are presented in **Table 4-2**.

Table 4-2: Noise survey results and observations for Location R7

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station[1] (10m height)	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
11-09-24	7:18am to 7:33am (Day)	59.1	37.4	33.1	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: 0 m/s Rain: n/a Stability Category: E[2]	Background road noise 30-36 Birds 34-59 Quarry inaudible	<23	42

[1] Data obtained from Holcim Teven Quarry onsite meteorological station, located approximately 50km south of site.

[2] Modelled using TAPM to determine Stability Category.

4.3 Location R8

Noise monitoring at location R8 conducted on Wednesday 11 September 2024. The quarry was inaudible during the monitoring period, and the ambient environment was dominated by motorway, birds and passing cars on Pottsville Road. These results meet the established noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location R8 are presented in **Table 4-3.**

Table 4-3: Noise survey results and observations for Location R8

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	Onsite Met Station[1] (10m height)	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
11-09-24	8:21am to 8:36am (Day)	74.7	58.7	40.1	WD: n/a WS: 0 m/s Rain: Nil	WD: n/a WS: 0 m/s Rain: n/a Stability Category: E[2]	Background road noise 35-36 Passing cars 35-74 Birds 35-47 Quarry inaudible	<30	48

[1] Data obtained from Holcim Teven Quarry onsite meteorological station, located approximately 50km south of site.

[2] Modelled using TAPM to determine Stability Category.

5. Conclusion

This NMA was completed by Ramboll at the Holcim Dunloe Sands Quarry, Pottsville, NSW as a quarterly requirement of the NMP showed compliance with the relevant noise criteria. Monitoring was carried out on Wednesday 11 September 2024 at three locations selected as representative to the sensitive receptors at the surroundings to Dunloe Sands Quarry. No audible quarry noise was recorded at any of the selected monitoring locations.

As monitoring was completed at the property boundary of each location and each property dwelling was approximately 40 to 100 metres from the boundary, it is recommended that permission from the property owners be sought to access their property to complete future noise monitoring within 30 metres of the property dwellings.

The results presented in this NMA show compliance with the relevant noise criteria at the Holcim Dunloe Sands Quarry, Pottsville, NSW.

6. References

GHD (2020). Dunloe Sand Quarry Noise Management Plan.
NSW EPA (2018). Development Consent No. 06_0030, MOD2 (November 2018)

International Electrotechnical Commission *IEC 60942:2017 Electroacoustics – Sound calibrators*

NSW EPA (2020). Environment Protection Licence number 13077.

NSW EPA (2013) *Noise Guide for Local Government*. Sydney NSW: NSW Environment Protection Authority. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/20130127nglg.pdf (Accessed: 25 October 2022).

NSW EPA (2014) Discussion Paper. Validation of Inversion Strength Estimation Method.

NSW EPA (2017) *Noise Policy for Industry (NPfI)*. Sydney NSW: NSW Environment Protection Authority. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/17p0524-noise-policy-for-industry.pdf (Accessed: 25 October 2022).

Standards Australia (2018) *AS 1055:2018 Acoustics—Description and measurement of environmental noise*. Australian Standard. Available at: https://infostore.saiglobal.com/preview/825367946534.pdf?sku=1131503_SAIG_AS_AS_2626154 (Accessed: 19 January 2023).

Standards Australia and Standards New Zealand (2019) *AS/NZS IEC 61672.1:2019 Electroacoustics—Sound level meters, Part 1: Specifications*. Australian/New Zealand Standard. Available at: https://infostore.saiglobal.com/preview/825343328243.pdf?sku=1142059_SAIG_AS_AS_2705644 (Accessed: 28 September 2022).

Intended for
Holcim (Australia) Pty Ltd

Document type
Report

Date
July 2024

Dunloe Sand Quarry Quarterly Noise Monitoring Assessment

Quarter 2 2024

RAMBOLL Bright ideas. Sustainable change.

Dunloe Sand Quarry Quarterly Noise Monitoring Assessment

Quarter 2 2024

Project name	**NSW Environmental Monitoring 2023-2024**
Project no.	**318001799**
Recipient	**Matt Kelly**
Document type	**Report**
Version	**1**
Date	**12/07/2024**
Prepared by	**Jake Bourke, Matilda Englert**
Checked by	**Arnold Cho**
Approved by	**Gavan Butterfield**
Description	**Data collected on 7 May 2024 for Dunloe Quarry during Quarter 2 2024 at Pottsville, NSW, as part of the routine noise monitoring program**

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Contents

Tables

Abbreviations and Definitions

Ambient Noise	The all-encompassing noise within a given environment. It is the composite of sounds from many sources, both near and far.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the LA90 descriptor (see below).
dB	Abbreviation for decibel, a measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm of a given sound power to a reference power.
dB(A)	A measure of A-weighted sound levels. A Weighting is an adjustment made to the sound level measurement to approximate the response of the human ear.
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods. Normal daily traffic is not extraneous noise.
LA1	The noise level, measured in dB(A), which is exceeded for 1 per cent of the measurement period.
LA1(1min)	The noise level, measured in dB(A), which is exceeded for 1 per cent of the time over a 1-minute measurement period, i.e., is exceeded for 0.6 seconds. This measure can approximate to the maximum noise level but may be less if there is more than 1 noise event during this 0.6 second period.
LA10	The noise level, measured in dB(A), which is exceeded for 10 per cent of the time.
LA90	The noise level, measured in dB(A), which is exceeded for 90 per cent of the time, referred to as the background noise level. This is considered to represent the background noise (see above).
LAeq	The level of noise equivalent to the energy average of noise levels occurring over a defined measurement period.
LAeq (period)	The average equivalent noise level, measured in dB(A), during a measurement period (e.g., 15-minute, day, evening, or night).
LAmax	The A-weighted sound pressure level that represents the maximum noise level measured over the time that a given sound is measured.
NMA	Noise Monitoring Assessment
NMP	Noise Management Plan
SPL	The Sound Pressure Level. Sound pressure is the fluctuation in air pressure, from the steady atmospheric pressure, created by sound. The sound pressure level is the sound pressure expressed on a decibel scale.

Source: Noise Guide for Local Government (NSW EPA, 2023)

1. Overview

1.1 Project Driver

Ramboll Australia Pty Ltd (Ramboll) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for Dunloe Sands Quarry ("the quarry") at Pottsville, NSW.

This NMA was done in accordance with the following documents:

- Noise Policy for Industry (NPfI) (NSW EPA, 2017).
- Dunloe Sand Quarry Noise Management Plan (NMP) (GHD, 2020).
- Environment Protection Licence (EPL) number 13077 (NSW EPA, 2020).
- Development Consent No. 06_0030, MOD2 (NSW EPA, 2018)
- Australian Standard AS 1055:2018 Acoustics—Description and measurement of environmental noise (Standards Australia, 2018).
- Australian Standard AS/NZS IEC 61672.1:2019 Electroacoustics – Sound level meters, Part 1: Specifications (Standards Australia and Standards New Zealand, 2019)
- IEC 60942:2017 Electroacoustics - Electroacoustics – Sound calibrators (International Standard, 2017).

This NMA has been undertaken for the quarterly period April to June 2024, and forms part of the monitoring program to determine compliance with conditions of the Environmental Protection License (EPL).

1.2 Site Location and Sensitive Receptors

The quarry is approximately 2.5 km south of Pottsville, NSW, a town in the Northern Rivers region in Tweed Shire. Sensitive receptors surrounding the quarry are primarily rural and residential properties in coastal bushland with elevated and undulating topography.

Three monitoring locations have been selected as part of the NMA and in accordance with the EPL and are shown in **Table 1-1**.

Table 1-1: Monitoring locations locality and sensitive receptors

Monitoring Locations	Locality and Sensitive Receptors
R6	West of the quarry situated at a rural residential property at 157 Warwick Park Road.
R7	West of the quarry situated at a rural residential property at 129 Warwick Park Road.
R8	Northwest of the quarry situated at a rural residential property at 679 Pottsville Road.

The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1**. It should be noted that while the NMP states monitoring locations be measured from the most affected points within surrounding residential property boundaries or at the most affected point within 30 metres of the dwelling where the dwelling is more than 30 metres from the boundary, this has not been possible for this NMA due to access restrictions. Monitoring was completed at the property boundary of each location where accessible and in each case the property dwelling was approximately 40 to 100 metres from the boundary. This would have resulted in a conservative assessment as the monitoring locations were closer to the site.

Legend

- Noise monitoring location
- Property dwelling

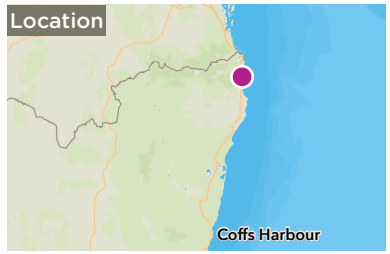

Figure 1 : Noise monitoring locations at Dunloe Sands Quarry

2. Noise Criteria

Table 2-1 summarises the applicable noise criteria outlined in the NMP for residential receivers (R6, R7 and R8) surrounding the quarry. The noise criteria apply when the site is operational within the permitted operating hours Monday to Friday 7am - 5pm, Saturday 7am - 12pm with no operations on Sunday.

Compliance with the noise criteria below would also determine compliance with the noise limits outlined in the sites EPL (EPL 13077) which requires that the quarry's noise contribution will not exceed 48 dB LAeq(15min) at any of the residential receivers.

Table 2-1: Monitoring locations and noise criteria

Receiver	Monitoring Locations	Day[1]
		LAeq (15min)
		dB(A)
157 Warwick Park Road	R6	42
129 Warwick Park Road	R7	42
679 Pottsville Road	R8	48
All other residences		41
[1] 7 am–6 pm Monday to Saturday Note: no operations on Sundays and public holidays		

3. Methodology

The monitoring program was developed in accordance with the procedures described in *Australian Standard AS 1055:2018* and the Approval Documents referenced in Section 1. The measurements were completed using a RION Sound Level Meter NL-52 on Tuesday 7 May 2024. The acoustic instrumentation used carried a current NATA calibration and that complied with *AS/NZS IEC 61672-1:2019 class 1*. Calibration of all instrumentation was checked prior to and following measurements using a Pulsar Acoustic Calibrator 105 which carried a current NATA calibration and complies with *IEC 60942:2017.* Drift in calibration did not exceed ±0.3 dBA.

Each attended noise measurement was conducted for 15-minutes in duration during the day period over one day at each monitoring location. Where possible, throughout each measurement the operator(s) quantified the contribution of each significant noise source.

Where the quarry was not distinctly audible during the attended monitoring, the quarry contribution was estimated to be at least 10 dBA below the ambient noise level, as determined by the LA90.

3.1 Meteorology

Meterology has an important influence on noise monitoring assessment. Where an onsite meterological station with data recorded at 10m height has not been available, the nearest Bureau of Meteorology data has been adopted to inform this assessment and modelled using The Air Pollution Model (TAPM) to determine the atmospheric stability category as outline in **Table 3-1**.

Table 3-1: Classification of Atmospheric Stability (NSW EPA, 2014)

Stability Classification	Pasquill Stability Category	Ambient temperature change with height (°C/100m)
Extremely unstable	A	$\Delta T \leq -1.9$
Moderately unstable	B	$-1.9 < \Delta T \leq -1.7$
Slightly unstable	C	$-1.7 < \Delta T \leq -1.5$
Neutral	D	$-1.5 < \Delta T \leq -0.5$
Slightly stable	E	$-0.5 < \Delta T \leq 1.5$
Moderately stable	F	$1.5 < \Delta T \leq 4.0$
Extremely stable	G	$\Delta T > 4.0$

The meteorological conditions recorded at the time of the noise monitoring were reviewed. The attended noise monitoring results presented in Section 4 were not found to be influenced by the following adverse meteorological conditions:

- During periods of rain or hail.
- Average wind speed at microphone height exceeding 5 m/s.
- Wind speeds greater than 3 m/s measured at 10 m above ground level.
- Temperature inversion conditions greater than 3°C/100m.

4. Results and Discussion

4.1 Location R6

Noise monitoring at location R6 was completed on Tuesday 7 May 2024. The quarry was inaudible during the monitoring period, and the ambient environment was dominated by wind, trees, and passing cars. These results meet the noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance during the monitoring period. The results and observations taken during the monitoring event at Location R6 are presented in **Table 4-1.**

Table 4-1: Noise survey results and observations for Location R6

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	BOM Station at 10m (ID 058158)	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
7-05-24	12:21pm to 12:36pm (Day)	61.6	47.7	42.5	WD: 320º WS: 1.1 m/s Rain: Nil	WD: S WS: 2.5 m/s Rain: 10.2 mm Stability Category: E[1]	Background wind/trees 39-48 Car passing 58 Quarry inaudible	<33	42

[1] Modelled using TAPM to determine Stability Category.

4.2 Location R7

Noise monitoring at location R7 was completed on Tuesday 7 May 2024. The quarry was inaudible during the monitoring period, and the ambient environment was dominated by wind, trees, and a passing car. These results meet the established noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location R7 are presented in **Table 4-2**.

Table 4-2: Noise survey results and observations for Location R7

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	BOM Station at 10m (ID 058158)	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
7-05-24	12:39pm to 12:54pm (Day)	71.1	53.7	48.5	WD: 320⁰ WS: 1.1 m/s Rain: Nil	WD: S WS: 2.5 m/s Rain: 10.2 mm Stability Category: E[1]	Background wind/trees 45-53 Cars passing 53-71 Quarry inaudible	<39	42

[1] Modelled using TAPM to determine Stability Category.

4.3 Location R8

Noise monitoring at location R8 conducted on Tuesday 7 May 2024. The quarry was inaudible during the monitoring period, and the ambient environment was dominated by wind, trees and passing cars on Pottsville Road. These results meet the established noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance. The results and observations taken during the monitoring events at Location R8 are presented in **Table 4-3.**

Table 4-3: Noise survey results and observations for Location R8

Date	Time	Descriptor (dBA)			Meteorology (handheld at microphone height)	BOM Station at 10m (ID 058158)	Apparent Noise Source, Description and SPL (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90					
7-05-24	1:01pm to 1:16pm (Day)	75.4	58.9	44.0	WD: 320⁰ WS: 1.1 m/s Rain: Nil	WD: S WS: 2.5 m/s Rain: 10.2 mm Stability Category: E[1]	Background wind/trees 45-53 Birds 75 Quarry inaudible	<34	48

[1] Modelled using TAPM to determine Stability Category.

5. Conclusion

This NMA was completed by Ramboll at the Holcim Dunloe Sands Quarry, Pottsville, NSW as a quarterly requirement of the NMP showed compliance with the relevant noise criteria. Monitoring was carried out on Tuesday 7 May 2024 at three locations selected as representative to the sensitive receptors at the surroundings to Dunloe Sands Quarry. No audible quarry noise was recorded at any of the selected monitoring locations.

As monitoring was completed at the property boundary of each location and each property dwelling was approximately 40 to 100 metres from the boundary, it is recommended that permission from the property owners be sought to access their property to complete future noise monitoring within 30 metres of the property dwellings.

The results presented in this NMA show compliance with the relevant noise criteria at the Holcim Dunloe Sands Quarry, Pottsville, NSW.

6. References

GHD (2020). Dunloe Sand Quarry Noise Management Plan.
NSW EPA (2018). Development Consent No. 06_0030, MOD2 (November 2018)

International Electrotechnical Commission *IEC 60942:2017 Electroacoustics – Sound calibrators*

NSW EPA (2020). Environment Protection Licence number 13077.

NSW EPA (2013) *Noise Guide for Local Government*. Sydney NSW: NSW Environment Protection Authority. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/20130127nglg.pdf (Accessed: 25 October 2022).

NSW EPA (2014) Discussion Paper. Validation of Inversion Strength Estimation Method.

NSW EPA (2017) *Noise Policy for Industry (NPfI)*. Sydney NSW: NSW Environment Protection Authority. Available at: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/noise/17p0524-noise-policy-for-industry.pdf (Accessed: 25 October 2022).

Standards Australia (2018) *AS 1055:2018 Acoustics—Description and measurement of environmental noise*. Australian Standard. Available at: https://infostore.saiglobal.com/preview/825367946534.pdf?sku=1131503_SAIG_AS_AS_2626154 (Accessed: 19 January 2023).

Standards Australia and Standards New Zealand (2019) *AS/NZS IEC 61672.1:2019 Electroacoustics—Sound level meters, Part 1: Specifications*. Australian/New Zealand Standard. Available at: https://infostore.saiglobal.com/preview/825343328243.pdf?sku=1142059_SAIG_AS_AS_270564 4 (Accessed: 28 September 2022).

APPENDIX B –
2024 Truck Movement Log

JAN '24	TRUCK MOVEMENTS	SPLIT LOADS
01 Mon		
02 Tue		
03 Wed		
04 Thu		
05 Fri		
06 Sat		
07 Sun		
08 Mon	9	
09 Tue	8	
10 Wed	8	
11 Thu	10	
12 Fri	20	
13 Sat		
14 Sun		
15 Mon	14	
16 Tue	9	
17 Wed	6	
18 Thu	10	
19 Fri	29	
20 Sat		
21 Sun		
22 Mon	19	
23 Tue	15	
24 Wed	21	
25 Thu	24	
26 Fri		
27 Sat		
28 Sun		
29 Mon	14	
30 Tue	16	
31 Wed	15	
Total	247.00	0
Actual Moth Average Truck movements		
15		

February 2024	TRUCK MOVEMENTS	SPLIT LOADS
01 Thu	23	
02 Fri	24	
03 Sat		
04 Sun		
05 Mon	21.00	
06 Tue	26	1.00
07 Wed	36	
08 Thu	25	
09 Fri	20	1
10 Sat		
11 Sun		
12 Mon	15.00	
13 Tue	23	
14 Wed	35	
15 Thu	36	
16 Fri	12	
17 Sat		
18 Sun		
19 Mon	12	
20 Tue	13	
21 Wed	33	1
22 Thu	23	
23 Fri	24	
24 Sat		
25 Sun		
26 Mon	23	
27 Tue	34	
28 Wed	15	
29 Thu	25.00	
Product Totals	498	3

Actual Moth Average Truck movements
24

March 2024	TRUCK MOVEMENTS	SPLIT LOADS
01 Fri	22	
02 Sat		
03 Sun		
04 Mon	23	
05 Tue	18	
06 Wed	16	
07 Thu	17	
08 Fri	19	
09 Sat		
10 Sun		
11 Mon	19	
12 Tue	24	
13 Wed	23	
14 Thu	16	
15 Fri	31	
16 Sat		
17 Sun		
18 Mon	19	
19 Tue	13	
20 Wed	22	
21 Thu	28	
22 Fri	17	
23 Sat		
24 Sun		
25 Mon	17	
26 Tue	9	
27 Wed	6	
28 Thu	11	
29 Fri		
30 Sat		
31 Sun		
Product Totals	370.00	0.00
Actual Month Average Truck movements		
19		

April 2024	TRUCK MOVEMENTS	SPLIT LOADS
01 Mon		
02 Tue	13	
03 Wed	16	
04 Thu	14	
05 Fri	10	
06 Sat		
07 Sun		
08 Mon	14	
09 Tue	21	
10 Wed	36	
11 Thu	19	
12 Fri	17	
13 Sat		
14 Sun		
15 Mon	22	
16 Tue	19	
17 Wed	24	
18 Thu	35	
19 Fri	29	
20 Sat		
21 Sun		
22 Mon	23	
23 Tue	14	
24 Wed	20	
25 Thu		
26 Fri	16	
27 Sat		
28 Sun		
29 Mon	14	
30 Tue	16	
Totals	392	0
Total	247.00	0
Actual Month Average Truck movements		
20		

May 2024	TRUCK MOVEMENTS	SPLIT LOADS
01 Wed	12	
02 Thu	25	
03 Fri	23	
04 Sat		
05 Sun		
06 Mon	7	
07 Tue	22	
08 Wed	19	
09 Thu	13	
10 Fri	16	
11 Sat		
12 Sun		
13 Mon	11	
14 Tue	8	
15 Wed	12	
16 Thu	9	
17 Fri	5	
18 Sat		
19 Sun		
20 Mon	11	
21 Tue	15	
22 Wed	16	
23 Thu	17	
24 Fri	13	
25 Sat		
26 Sun		
27 Mon	16	
28 Tue	15	
29 Wed	15	
30 Thu	19	
31 Fri	14	
Totals	333.00	0.00

Actual Moth Average Truck movements
24

June 24	TRUCK MOVEMENTS	SPLIT LOADS
01 Sat		
02 Sun		
03 Mon	15	
04 Tue	20	
05 Wed	17	
06 Thu	21	
07 Fri	25	
08 Sat		
09 Sun		
10 Mon		
11 Tue	9	
12 Wed	12	
13 Thu	12	
14 Fri	14	
15 Sat		
16 Sun		
17 Mon	12	
18 Tue	9	
19 Wed	4	
20 Thu	3	
21 Fri	11	
22 Sat		
23 Sun		
24 Mon	13	
25 Tue	17	
26 Wed	15	
27 Thu	17	
28 Fri	13	
29 Sat		
30 Sun		
Totals	259.00	0.00

Actual Month Average Truck movements
14

July 2024	TRUCK MOVEMENTS	SPLIT LOADS
01 Mon	22	
02 Tue	8	
03 Wed	11	
04 Thu	13	
05 Fri	9	
06 Sat		
07 Sun		
08 Mon	6	
09 Tue	15	
10 Wed	16	
11 Thu	17	
12 Fri	13	
13 Sat		
14 Sun		
15 Mon	25	
16 Tue	25	
17 Wed	11	
18 Thu	14	
19 Fri	21	1
20 Sat		
21 Sun		
22 Mon	23	
23 Tue	15	1
24 Wed	20	
25 Thu	43	
26 Fri	26	
27 Sat		
28 Sun		
29 Mon	17	
30 Tue	20	
31 Wed	16	
Totals	406	2
Total	247.00	0
Actual Month Average Truck movements		
18		

August 2024	TRUCK MOVEMENTS	SPLIT LOADS
01 Thu	12	
02 Fri	25	
03 Sat		
04 Sun		
05 Mon	19	
06 Tue	17	
07 Wed	28	
08 Thu	12	
09 Fri	16	
10 Sat		
11 Sun		
12 Mon	10	
13 Tue	10	
14 Wed	5	
15 Thu	10	
16 Fri	11	
17 Sat		
18 Sun		
19 Mon	15	
20 Tue	28	1
21 Wed	20	
22 Thu	20	
23 Fri	21	
24 Sat		
25 Sun		
26 Mon	25	
27 Tue	24	
28 Wed	25	
29 Thu	22	
30 Fri	8	
31 Sat		
Totals	383.00	1.00

Actual Moth Average Truck movements
17

September 2024	TRUCK MOVEMENTS	SPLIT LOADS
01 Sun		
02 Mon	14	
03 Tue	39	
04 Wed	17	
05 Thu	11	
06 Fri	22	
07 Sat		
08 Sun		
09 Mon	22	
10 Tue	16	
11 Wed	22	
12 Thu	23	
13 Fri	18	
14 Sat		
15 Sun		
16 Mon	21	
17 Tue	28	1
18 Wed	19	
19 Thu	19	
20 Fri	17	
21 Sat		
22 Sun		
23 Mon	18	
24 Tue	30	
25 Wed	15	
26 Thu	18	
27 Fri	9	
28 Sat		
29 Sun		
30 Mon	12	
Totals	410	1
Actual Month Average Truck movements		
20		

October 2024	TRUCK MOVEMENTS	SPLIT LOADS
01 Tue	17	
02 Wed	24	
03 Thu	20	
04 Fri	20	
05 Sat		
06 Sun		
07 Mon		
08 Tue	24	
09 Wed	18	
10 Thu	10	
11 Fri	11	
12 Sat		
13 Sun		
14 Mon	16	
15 Tue	15	
16 Wed	19	
17 Thu	19	
18 Fri	20	
19 Sat		
20 Sun		
21 Mon	12	
22 Tue	22	1
23 Wed	17	
24 Thu	18	
25 Fri	18	
26 Sat		
27 Sun		
28 Mon	17	
29 Tue	21	
30 Wed	18	
31 Thu	12	
Totals	388	1
Total	247.00	0

Actual Month Average Truck movements

18

November 2024	TRUCK MOVEMENTS	SPLIT LOADS
01 Fri	18	
02 Sat		
03 Sun		
04 Mon	19	
05 Tue	18	
06 Wed	14	
07 Thu	22	
08 Fri	20	
09 Sat		
10 Sun		
11 Mon	24	
12 Tue	28	
13 Wed	16	
14 Thu	15	
15 Fri	16	
16 Sat		
17 Sun		
18 Mon	18	
19 Tue	15	
20 Wed	16	
21 Thu	17	
22 Fri	15	
23 Sat		
24 Sun		
25 Mon	19	
26 Tue	13	
27 Wed	23	
28 Thu	21	
29 Fri	18	
30 Sat		
Totals	385	0

Actual Moth Average Truck movements
18

December 2024	TRUCK MOVEMENTS	SPLIT LOADS
01 Sun		
02 Mon	24	
03 Tue	21	
04 Wed	29	
05 Thu	25	
06 Fri	25	
07 Sat		
08 Sun		
09 Mon	21	
10 Tue	19	
11 Wed	25	
12 Thu	29	
13 Fri	30	
14 Sat		
15 Sun		
16 Mon	26	
17 Tue	17	
18 Wed	19	
19 Thu	17	
20 Fri	12	
21 Sat		
22 Sun		
23 Mon		
24 Tue		
25 Wed		
26 Thu		
27 Fri		
28 Sat		
29 Sun		
30 Mon		
Totals	339	0

Actual Month Average Truck movements
23

APPENDIX C –
2024 Rehabilitation and Revegetation Monitoring Report

Annual Report
2024 Rehabilitation and Revegetation Monitoring Program,
Dunloe Sands Quarry Pottsville NSW

Prepared for: Holcim Australia

Date: 28 December 2024

Prepared By: Michael Hallinan

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Introduction

This annual report for the Dunloe Sands Quarry 2024 Rehabilitation and Revegetation Monitoring Program aims to address all annual report requirements outlined in the site Rehabilitation & Revegetation Management Plan (RRMP)[1]. Schedule 5 *Environmental Management and Monitoring Conditions* of the plan notes annual report requirements as follows:

- Visual monitoring results and photographs
- Monitoring forms A, B, C and D
- Any incidents of non-compliance with performance criteria set out in the Management Plan
- Corrective actions implemented in response to performance criteria non-compliance and
- A work log of all monitoring, maintenance and corrective actions (where required) activities performed during the 2023 reporting period.

Appendix 1 contains visual monitoring photo point photographs taken quarterly at established photo points as per the RRMP; forest structure monitoring (December 2023); and 2023 general flora & fauna observations and monitoring photos.

Also appended to this report are monitoring forms completed for each rehabilitation zone at intervals outlined in the RRMP as follows:

- Form A: Routine Rehabilitation Monitoring (quarterly), **Appendix 2**
- Form B: Site Condition (six-monthly), **Appendix 3**
- Form C: Forest Structure (annually), **Appendix 4**
- Form D: Floristic Composition (annually), **Appendix 4**
- Routine Fauna Nest Box Monitoring (six-monthly), **Appendix 5**

Additionally, a 2024 work log of monitoring, maintenance and corrective actions is included as **Appendix 6.**

Figure 1 shows locations of rehabilitation zones; photo-point monitoring; threatened species; priority weed control work directions; search locations for hollow-bearing trees and signs of Koala use and occupation; and three positive Koala scat records indicating low Koala use.

[1] Planit Consulting 2009, *Rehabilitation & Revegetation Management Plan, Dunloe Park Sand Quarry*, prepared for Ramtech Pty Ltd, unpublished.

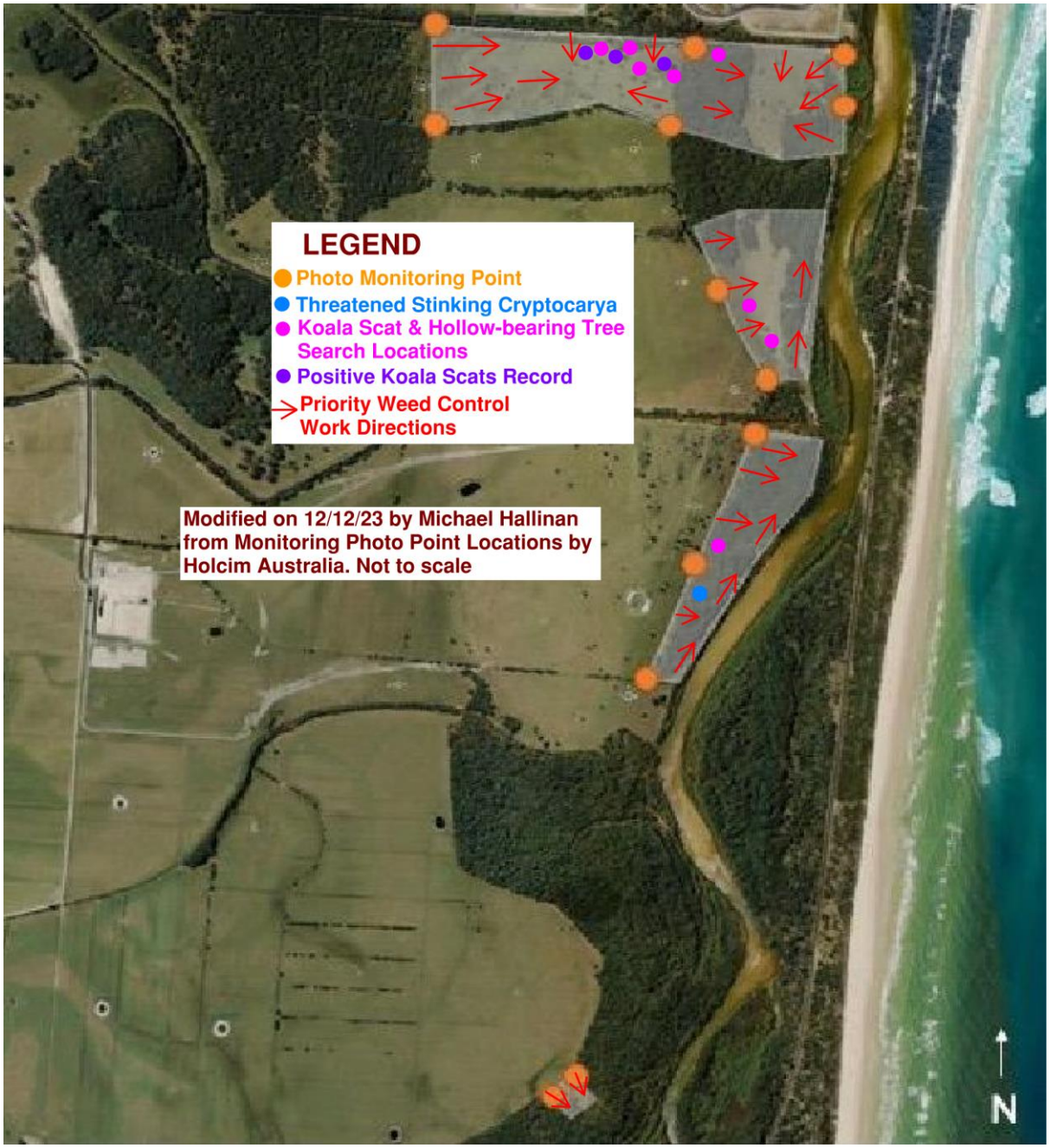

Figure 1. Locations of rehabilitation zones; photo-point monitoring; threatened species; priority weed control work directions; search locations for hollow-bearing trees and signs of Koala use and occupation; and three positive Koala scats records indicating low Koala use.

Information summaries from each of the monitoring data forms is outlined as follows:

Routine Rehabilitation Monitoring (Form A), refer to Appendix 2

Zone 1

General Management

No fires, rubbish dumping, plant theft, cattle grazing, stockpiling or unauthorised person or vehicle access. A record of slashing of bushfire access trails is outlined in the 2023 Work Log (**Appendix 6**).

Fauna

A diverse range of naturally occurring, regenerating, and planted floodplain swamp sclerophyll plant communities in Zone 1 support an expanded range of predatory, frugivorous, honeyeater and insectivorous birdlife and other fauna.

A detailed formal Koala scat search in line with Phillips and Callaghan 2011)[2] was undertaken in four locations of the main areas of remnant Koala food trees and Koala food tree plantings. Fresh, moderately fresh and moderately old Koala scats were detected beneath mature Swamp Mahogany trees, a primary Koala food tree species, in the area of previous positive records, refer to **Figure 1**. Swamp Mahogany appears to be the only species used by Koala on site. Binocular scans of tree crowns found no signs of Koala presence.

The level of Koala activity/usage over the site remains as "low". As noted by Phillips and Callaghan (2011), where the results of a SAT site returns a low activity level, the level of use by the Koala is likely to be transitory. The results indicate that a resident/sedentary population is not currently present on the site. It is considered that koalas may occasionally traverse the site as they move or disperse through the broader locality. It should be noted that the environmental rehabilitation areas represents a small proportion of vegetation on the entire property. Other locations on the property may have higher levels of Koala activity.

No fauna were observed occupying fauna nest boxes and tree hollows are rare in the environmental rehabilitation areas. A range of birds were observed including new species such as Olive-backed Oriole, refer to **Appendix 2**.

Observations of fauna and signs of their use and occupation is characteristic of the flora diversity which varies considerably across management zones, particularly in association with changes in elevation and saline influences with proximity to tidal watercourses in the north and east.

Weeds

As per previous years, various weed species continue to regenerate in Zone 1 plant communities including infestations of Lantana, Camphor Laurel, Ground Asparagus, Winter Senna, Umbrella Tree, Bitou Bush, Groundsel Bush, Ochna, Slash Pine and Corky Passionfruit.

Weed infestations occur mostly along vegetation edges and in relatively open areas in the north and central eastern portions; and in existing vegetation portions where there is no active weed control program in adjacent bushland. Priority weed control work directions are shown in **Figure 1.**

[2] Phillips S and Callaghan J, 2011, *The Spot Assessment Technique: a tool for determining localised levels of habitat use by Koalas Phascolarctos cinereus*. Australian Zoologist 35, 774-780.

As the largest of the three rehabilitation zones, isolated weeds and weed infestations continue to be found despite primary weed control works being completed and secondary follow-up works continuing. Works continue to target new weed infestations and weeds that are difficult to eradicate such as Corky Passionfruit and Five-leaved Morning Glory.

Qualified and experienced bush regenerators continued to undertake weed control throughout the year using industry best practice methods for weed control and chemical handling in line with DPI (2018)[3], BSRLG (2019)[4], the North Coast Regional Strategic Weed Management Plan 2023-2027 (North Coast Local Land Services, 2022) and the site Rehabilitation & Revegetation Management Plan (RRMP).

Modifications

No structural modifications or illegal modifications were made within Zone 1 apart from a partly constructed and apparently abandoned shelter likely made by children from the adjacent residential development to the north. All fences were noted to be in good condition apart from a fence repair requirement in the far northeast of the site (Zone 1C) where there is no threat of stock access to rehabilitation areas.

Vegetation Regeneration

Excellent natural regeneration and recruitment of native plants continues to be observed in Zone 1. Healthy growth and cover occur of primary canopy species Broad-leaved Paperbark, Coast Banksia, Swamp Oak, Swamp Mahogany; and in Zone 1C to the east Mangrove species. Vegetation cover of canopy species continue to increase at representative monitoring points under generally good growing conditions. Regular high rainfall events has created good growing conditions throughout 2024.

A range of mostly rainforest shrub, grass and wetland species were recorded from open and closed forest environments as shown in Routine Rehabilitation Monitoring Sheets for Zone 1A, 1B and 1C. Weed control continues to effectively reduce weed pressure and promote natural regeneration of native species. No performance criteria were exceeded in Zone 1.

Zone 2

General Management

No fires, rubbish dumping, plant theft, cattle grazing, stockpiling or unauthorised person or vehicle access.

Fauna

Diverse floodplain plant communities in Zone 2 support a range of predatory, frugivorous, honeyeater and insectivorous birdlife and other fauna.

No fauna were observed occupying fauna nest boxes and tree hollows are very rare with some small sized hollow openings only. Animals and signs of animals continue to be observed such as bandicoots, Lace Monitors, Brush Turkeys and wallabies. Several bird species, such as the Rufous Fantail were recorded in addition to those recorded in previous years, refer to **Appendix 2**.

[3] NSW Department of Primary Industries (DPI) 2018, *Weed Control Handbook – A guide to weed control in non-crop, aquatic and bushland situations 7th Edition*.

[4] Big Scrub Rainforest Landcare Group (BSRLG) 2019, *Subtropical Rainforest Restoration – A practical manual and data source for Landcare groups, land managers and rainforest regenerators, 3rd Ed*. Big Scrub Rainforest Landcare Group, Mullumbimby NSW.

A detailed formal Koala scat search in line with Phillips and Callaghan 2011) undertaken of the main areas of Koala food tree plantings found no signs of Koala use or occupation.

Weeds
Weed pressure was observed to be low in most of the western portions of Zone 2. Weed infestations of Camphor Laurel, Ground Asparagus, Umbrella Tree, Lantana, Corky Passionfruit, Ochna, Senna and Five-leaved Morning Glory are concentrated in the eastern portions. Camphor Laurel and Ochna are particularly problematic outside and adjacent to the southeast of Zone 2. A range of weed species are problematic adjacent to the northeast of Zone 2.

Weed control efforts continue to be focussed to the east of Zone 2 including areas outside and adjacent to the rehabilitation zones within existing vegetation areas. Follow up works include weeds such as Five-leaved Morning Glory and Corky Passionfruit that are difficult to eradicate. Priority weed control work directions are shown on **Figure 1.**

Qualified and experienced bush regenerators continued to undertake weed control throughout the year using industry best practice methods for weed control and chemical handling.

Modifications
No structural modifications or illegal modifications were made within Zone 2. All fences were noted to be in a good condition with no fencing repairs required.

Vegetation Regeneration
Natural regeneration/ recruitment of a relatively limited range of native plants occurs in Zone 2 areas with saline influences in the north and east. In contrast, a reasonably diverse range of plant species recruit in more elevated areas to the south of Zone 2 with rainforest understory. Vegetation cover of canopy species continues to increase at representative monitoring points, particularly of primary canopy species Broad-leaved Paperbark, Coast Banksia and Swamp Oak under high rainfall and good growing conditions throughout 2024.

A relatively simple range of understory and groundcover species were recorded in brackish water influenced environments in the north dominated by dense cover of Swamp Oak, Rushes (Juncus spp.) and Common Reed.

Strategic weed control continues to promote conditions favourable for natural regeneration and recruitment of native species without the need for further plantings. No performance criteria were exceeded in Zone 2.

Zone 3
General Management
No fires, rubbish dumping, plant theft, cattle grazing, stockpiling or unauthorised person or vehicle access.

Fauna
The diverse vegetation in the relatively small area of Zone 3 supports a range of fauna. Signs of mammals such as bandicoots, Lace Monitors and wallabies continue to be observed. A range of bird species continue to be observed in the zone.

Weeds
Weed species, mostly along vegetation edges, include infestations of Lantana, Camphor Laurel, Winter Senna, Umbrella Tree, Five-leaved Morning Glory, White Passionfruit,

Tobacco Bush, Blue Billygoat Weed and Corky Passionfruit. Priority weed control work directions are shown on **Figure 1.**

As the smallest of the three rehabilitation zones, primary control of isolated weeds and weed infestations is complete. Secondary follow-up weed control continues concentrating on weeds mostly recruited from surrounding bushland that does not have an active weed control program and weeds such as Five-leaved Morning Glory and Corky Passionfruit that are difficult to eradicate.

Qualified and experienced bush regenerators continue to undertake weed control throughout the year using industry best practice methods for weed control.

Modifications
No structural modifications or illegal modifications were made within Zone 3. All fences were noted to be in a good condition.

Vegetation Regeneration
High natural regeneration and recruitment of native plants continues to be observed in Zone 3. Vegetation cover of canopy species continues to increase at representative monitoring points, particularly of primary canopy species Broad-leaved Paperbark, Coast Banksia and Swamp Oak under good growing conditions. Regular high rainfall events has created excellent growing conditions throughout 2024.

A diverse range of mostly closed rainforest understory shrub and groundcover species continue to benefit from ongoing weed control works. No performance criteria were exceeded in Zone 3.

Site Condition (Form B), refer to Appendix 3
Zone 1
Past plantings continue to grow and thrive under good growing conditions, and native plant recruitment rates are high. Vegetation cover varies with generally high levels of leaf litter and native grass and forb cover in parts.

Weed pressure, mostly along vegetation edges and open areas to the north, central east and southeast where weeds are recruited from surrounding existing vegetation. Minor infestations continue to be observed of Lantana, Camphor Laurel, Ground Asparagus, Winter Senna, Umbrella Tree, Bitou Bush, Ochna, Groundsel Bush, Slash Pine, and Corky Passionfruit. All of Zone 1 continues to be rated as A, i.e. on track towards target but dependent on continuing weed control.

Zone 2
High levels of past planting survival and growth rates were observed along with continued native plant growth and recruitment under generally good growing conditions. Vegetation cover remains variable with high levels of rainforest grass and forb cover in relatively elevated floodplain areas unaffected by saline/ brackish conditions.

Weed pressure is highest to the southeast and northeast where weed control works continue to target infestations from adjacent existing vegetation of Camphor Laurel, Ground Asparagus, Umbrella Tree, Lantana, Bitou Bush, Slash Pine, Ochna, Senna, Corky Passionfruit and Five-leaved Morning Glory.

All of Zone 2 continues to be rated as A, i.e. on track towards target but dependent on continuing weed control.

Zone 3
Past plantings continue to grow and thrive along with the surrounding naturally occurring existing vegetation.

Vegetation cover varies with mostly high levels of leaf litter and native grass cover, particularly Ottochloa. Weed pressure continues to be concentrated along vegetation edges with adjacent bushland. Targeted weed control includes Lantana, Camphor Laurel, Winter Senna, Five-leaved Morning Glory, White Passionfruit, Tobacco Bush, Blue Billygoat Weed and Corky Passionfruit.

All of Zone 3 continues to be rated as A, i.e. on track towards target but dependent on continued weed control.

Forest Structure and Floristic Composition (Forms C & D), refer to Appendix 4
Monitoring is undertaken annually at established 50m x 20m monitoring plots in Zones 1, 2 and 3.

Zone 1
Groundcover was assessed in 1m x 1m quadrats at 5m, 25m and 45m along the established 50m transect. Leaf litter cover remains stable averaging 66%. Native tree and shrub seedlings, herbs and Bracken Fern dominated vegetation groundcover. No bare soil was recorded. Fine and coarse woody debris along the 50m transect did not vary substantially from that of the previous two years. No other substantial change was noted from transect monitoring results from previous years.

Canopy foliage cover was both visually estimated and estimated against canopy cover range photographs in 10m x 10m quadrats at 5m, 25m and 45m along the established 50m transect. Canopy cover ranged between 75% and 80%, similar to that of 2023.

Canopy height was recorded by estimating the height of the tallest tree within each 10m x 10m quadrat at 5m, 25m and 45m along the established 50m transect. No emergent trees were noted, and canopy height was visually estimated to be greater than 18m, stable and mostly unchanged from 2023 monitoring. The canopy consists entirely of endemic native vegetation.

Special life forms were recorded within each 10m x 10m quadrat at 5m, 25m and 45m along the established 50m transect. Special life form records were similar to that of the previous two years. Slender vines included Twining Guinea Flower, Coastal Cynanchum and Snake Vine. Ground ferns included Bracken, Gristle Fern, Bungwall and Climbing Fishbone. Blueberry Lilly as a strap-leaved life form and Lantana plants continue to be recorded as thorny scramblers. Non-threatened Giant Boat-lip Orchid (*Cymbidium madidum*) was recorded in flower as an epiphyte on a paperbark.

Floristic composition assessments were made for each vegetation strata in 10m x 10m quadrats at 5m, 25m and 45m along the established 50m transect. Broad-leaved Paperbark, Swamp Oak, Coast Banksia and Swamp Mahogany were recorded as the main canopy species. A range of mostly rainforest species were recorded in the midstory and understory/ groundcover (refer to **Appendix 4**).

High native growth and regeneration was noted in all strata. Notable common species included Swamp Oak, Coast Banksia, Wattle spp., Celerywood, Corkwood, Swamp

Turpentine, Macaranga, Bracken, Slender Panic Grass, Blueberry Lily, Ottochloa, Broad-leaved Ballart, Twining Guinea Flower, Guioa and Bungwall Fern in relatively low lying and open areas.

Continued routine weed control targeted Lantana, Camphor Laurel, Bitou Bush, Corky Passionfruit, Groundsel Bush, Slash Pine, Ochna, Ground Asparagus, Umbrella Tree and Senna.

Zone 2

Groundcover was assessed in 1m x 1m quadrats at 5m, 25m and 45m along the established 50m transect. Leaf litter varied between 15% and 35% due to mostly native grass, herb and Bracken Fern cover. There was no bare soil. Fine and coarse woody debris along the 50m transect did not vary substantially from that of the previous two years. No other substantial change was noted from transect monitoring results from previous years.

Canopy foliage cover was both visually estimated and estimated against canopy cover range photographs in 10m x 10m quadrats at 5m, 25m and 45m along the established 50m transect. Canopy cover ranged between 60% and 70%, similar to 2023.

Canopy height was recorded by estimating the height of the tallest tree within each 10m x 10m quadrat at 5m, 25m and 45m along the established 50m transect. No emergent trees were noted, and canopy height was visually estimated to be greater than 18m, slightly increasing from 2023 monitoring.

Special life forms were recorded within each 10m x 10m quadrat at 5m, 25m and 45m along the established 50m transect. Slender and robust vines included Twining Guinea Flower and Silkpod. Ground ferns included Bracken and Bungwall in the western portion. Blueberry Lilly was recorded as a strap-leaved life form. Special life form records were similar to that of 2023.

Floristic composition assessments were made for each vegetation strata in 10m x 10m quadrats at 5m, 25m and 45m along the established 50m transect. Broad-leaved Paperbark, Swamp Oak and Coast Banksia were recorded as the main canopy species. A range of species were recorded in the midstory and understory/ groundcover (refer to **Appendix 4**).

High native recruitment and development was noted in all strata. Notable common species included Swamp Oak, Coast Banksia, Corkwood, Bracken, Slender Panic Grass, Blueberry Lily, Twining Guinea Flower, Bungwall Fern, Whiteroot and Indian Pennywort.

Continued routine weed control targeted Camphor Laurel, Ground Asparagus, Umbrella Tree, Lantana, Bitou Bush, Corky Passionfruit, Ochna, Senna and Five-leaved Morning Glory.

Zone 3

Groundcover was assessed in 1m x 1m quadrats at 5m, 25m and 45m along the established 50m transect. The shade-tolerant native Slender Panic Grass remains the dominant groundcover. Leaf litter cover varied substantially between 5% and 50%. Ferns, herbs and tree and shrub seedlings made up minor components. There was no bare soil. Fine and coarse woody debris along the 50m transect did not vary substantially from that of the previous two years. No other substantial change was noted from transect monitoring results from previous years.

Canopy foliage cover was both visually estimated and estimated against canopy cover range photographs in 10m x 10m quadrats at 5m, 25m and 45m along the established 50m transect. Canopy cover ranged between 55% and 70%, similar to that of 2023.

Canopy height was recorded by estimating the height of the tallest tree within each 10m x 10m quadrat at 5m, 25m and 45m along the established 50m transect. No emergent trees were noted, and canopy height was visually estimated to be greater than 18m, slightly increasing from previous years monitoring.

Special life forms were recorded within each 10m x 10m quadrat at 5m, 25m and 45m along the established 50m transect. Slender and robust vines included Silkpod, Twining Guinea Flower and Snake Vine; ground ferns included Bracken, Blueberry Lilly recorded as a strap-leaved life form and Red-fruited Saw Sedge recorded as a thorny scrambler. Special life form records were similar to that of previous years of monitoring.

Floristic composition assessments were made for each vegetation strata in 10m x 10m quadrats at 5m, 25m and 45m along the established 50m transect. Broad-leaved Paperbark, Swamp Oak and Coast Banksia were recorded as the main canopy species. A range of species were recorded in the midstory and understory/ groundcover (refer to **Appendix 4**).

High native recruitment, growth and development was noted in all strata. Notable common species included Broad-leaved Paperbark, Swamp Oak, Coast Banksia, Corkwood, Bracken, Slender Panic Grass, Blady Grass, Ottochloa, Blueberry Lily, Twining Guinea Flower, Whiteroot, Indian Pennywort, Native Peach, Cheese Tree and Breynia.

Routine weed control commenced on 12/03/20 targeting Lantana, Senna, Umbrella Tree, Camphor Laurel, Corky Passionfruit, White Passionfruit, Five-leaved Morning Glory, Tobacco Bush, Silverleaf Desmodium, Silverleaf Desmodium and Blue Billygoat weed.

Routine Fauna Nest Box Monitoring (six-monthly), refer to Appendix 5

Monitoring of fauna nest boxes was performed on two occasions during the year using a ladder and snake-eye inspection camera. No fauna were detected once again using nest boxes and there were no new fauna scratch marks detected. Nest boxes were opened where necessary to clear spiders and ants. Several nest boxes are weathered and showing signs of wear.

The apparent limited fauna use of nest boxes by fauna may be indicative of the availability of hollow habitat resources for hollow-dependent fauna in mature and over-mature trees in surrounding forested areas. Searches for substantial hollows found only small size opening hollows (2cm to 4cm opening sizes), mostly in mature Swamp Mahoganies at the northern extent of the site. The dominant canopy species Broad-leaved Paperbark, Coast Banksia, and Swamp Oak were not observed to be substantially hollow in mature and over mature trees.

Predatory birds and Lace Monitors continue to be observed on site. These prey on nesting birds, reptiles and small mammals; and are indicative of their presence in the broader locality.

Environmental Protection Zone Performance Criteria

Performance criteria are considered to have been achieved in relation to

- Existing native vegetation and areas of natural regeneration to be retained.
- All rubbish/vegetation dumping, non-approved structures, etc are removed from the EPZs. Part construction of shelter/ cubby house apparently abandoned in NW of Zone 1c, likely by children from the adjacent residential subdivision.
- Cattle and domestic animals are excluded.
- A survival rate of the following minimum standards apply to all planted trees, shrubs and groundcovers:
    - One year following planting: 90%
    - Three years following planting: 90%
    - Five years following planting: 85%
- Planted tubestock to exhibit fair or healthy conditions and meet minimum growth rate standards set out in the RRMP.
- No substantial impacts have been detected in relation to:
    - Inappropriate public access, apart from likely children from the adjacent residential subdivision in the NW of Zone 1c.
    - Litter and/or rubbish dumping
    - Stock theft
    - Bicycle/pedestrian tracks/trails
    - Soil compaction
    - Fence signage vandalism/removal
    - Cattle access and associated damage (i.e. grazing, trampling etc)
- Canopy coverage, density and diversity performance requirements for trees and shrubs.
- Groundcover and natural regeneration including bare ground cover.

Management zones contain a mosaic of variable plant communities and levels of tree cover and species mixes. High levels of native recruitment and plant development and growth was observed in all strata, and it is considered that there is no requirements for any further supplementary plantings to achieve rehabilitation objectives.

Routine weed control works by Arbor Ecological commenced on 12/03/20 to address weed occurrences and ensure performance criteria are achieved, i.e:

- No weeds listed as Prevent[5] or Eradicate[6] under the North Coast Regional Strategic Weed Management Plan 2017-2022 (North Coast Local Land Services, 2017) which identifies regional priority weeds of risk and outlines recommended responses to achieve desirable weed management outcomes in line with NSW Biosecurity Act 2015 following repeal of the Noxious Weeds Act 1993. Supporting detailed information regarding specific weeds is provided on the NSW Department of Primary Industries WeedWise website.
- A significant reduction in the presence of weed species is evident. In practice it is noted that the removal of all individuals of all weed species for 100% of the time is unachievable. Therefore, it is considered appropriate that works aim to achieve the following performance criteria:
    - All large weed/ornamental trees are treated
    - No weed shrubs/trees older than three months of age are present
    - Densities of such shrubs/trees is not to exceed 1 per 20m^2

[5] Prevent listed weed species are not known to be present in the region. They have a high to very high weed risk (highly invasive and high threat) and have a high likelihood of arriving in the region due to potential distribution and/ or an existing high risk pathway.

[6] Eradicate listed weed species are present in the region to a limited extent only and the risk of re-invasion is either minimal or can be easily managed. They have a high to very high weed risk and high feasibility of coordinated control.

- Scattered groundcover weed species may occur but not in any covering an area greater than 5m^2

A detailed formal Koala scat search in line with Phillips and Callaghan (2011) was undertaken of the main areas of remnant Koala food trees and Koala food tree plantings. Fresh and moderately aged (i.e. non-fresh) Koala scats were detected beneath mature Swamp Mahogany trees, a primary Koala food tree species, in the area of previous records near the northern extent of the site, refer to **Figure 1**. No characteristic Koala pock marks were observed on smooth-barked trees. Binocular scans of tree crowns found no signs of Koala presence.

The level of Koala activity/usage over the site continues to be "low". As noted by Phillips and Callaghan (2011), where the results of a SAT site returns a low activity level, the level of use by the Koala is likely to be transitory. The results indicate that a resident/sedentary population is not currently present on the site. It is considered that koalas may occasionally traverse the site as they move or disperse through the broader locality. It should be noted that the subject site represents a small proportion of the entire property and other locations on the property may have higher levels of Koala activity.

In conclusion, all management zones consist of healthy and resilient vegetation communities in mostly good condition following continuing rehabilitation works which are on-track to achieve rehabilitation targets. No further revegetation planting works are considered necessary. This follows continuing strategic weed control works to improve community health, diversity and resilience.

Rehabilitation zones remain relatively remote from the approved extraction areas and are not obviously affected by direct or indirect environmental impacts associated with extraction activities.

APPENDIX D -
Long Term Monitoring Results

Long-term Algae Monitoring at Dunloe Sands Quarry

Data located	Date	Location	Cyanophyta (Blue Green Algae)	Chlorophyta (Total Algae Count)	Diatoms (Bacillariophyta)	Dinophyta (Dinoflagellates)	Euglenophyta (Euglenoids)	M. Aeruginosa	Total Biovolume
			cells/mL	cells/mL	cells/mL	cells/mL	cells/mL	cells/mL	mm3/L
2011/2012 AEMR	30/11/2011	Extraction Pond	240						
	22/12/2012	Extraction Pond	800						
	2/02/2012	Extraction Pond	<100						
	20/02/2012	Extraction Pond	700						
	28/02/2012	Extraction Pond	14375						
	27/03/2012	Extraction Pond	1200						
	30/05/2012	Extraction Pond	<100						
	27/06/2012	Extraction Pond	130	0.01					
	26/07/2012	Extraction Pond	16360	2520					
	27/08/2012	Extraction Pond	24640	3720					
	27/09/2012	Extraction Pond	68000	35000					
	29/10/2012	Extraction Pond	<100	7900					
2012/2013 AEMR	28/11/2012	Extraction Pond	<100	80670					
	24/12/2012	Extraction Pond	<100						
	17/01/2013	Extraction Pond	<100						
	1/02/2013	Extraction Pond	<100						
	15/02/2013	Extraction Pond	<100						
	8/03/2013	Extraction Pond	<100	215					
	30/05/2013	Extraction Pond	<100	880					
	30/06/2013	Extraction Pond	<100						
	30/07/2013	Extraction Pond	<100	34000					
	28/08/2013	Extraction Pond	<100	205					
	30/09/2013	Extraction Pond	<100						
	25/10/2013	Extraction Pond	<100	17430					
2013/2014 AEMR	25/11/2013	Extraction Pond				480			
	12/12/2013	Extraction Pond	1150	39500					
	19/12/2013	Extraction Pond		22000					
	9/01/2014	Extraction Pond		123000					
	29/01/2014	Extraction Pond		34000					
	31/03/2014	Extraction Pond			295				
	28/04/2014	Extraction Pond		7700	45				
	29/05/2014	Extraction Pond	ND	7600					
	26/06/2014	Extraction Pond	ND	52000					
	31/07/2014	Extraction Pond	ND	28000					
	28/10/2014	Extraction Pond	ND	168000					
Appendix of 2015 AEMR	28/11/2014	Extraction Pond	ND	123000	260	60			
	16/12/2014	Extraction Pond	ND	106500	220	35			
	22/01/2015	Extraction Pond	ND	37000					
	26/02/2015	Extraction Pond	ND						
	26/03/2015	Extraction Pond	ND	8750					
	24/04/2015	Extraction Pond	ND	8000					
	29/05/2015	Extraction Pond	ND	76000	4200				
	29/06/2015	Extraction Pond	ND	211000	6300				
	21/10/2015	Extraction Pond	ND	18330	65	35	155		
	26/11/2015	Extraction Pond	ND	4850		5			
	11/12/2015	Extraction Pond	ND	11900	30	10			
2016 AEMR	25/01/2016	Extraction Pond	ND	34000					
	8/02/2016	Extraction Pond	ND	0					
	24/02/2016	Extraction Pond	ND	3700					
	10/03/2016	Extraction Pond	ND	1575					
	24/03/2016	Extraction Pond	ND	7600					
	7/04/2016	Extraction Pond	ND	9700					
	29/04/2016	Extraction Pond	ND	11800					
	24/05/2016	Extraction Pond	ND	5700					
	30/06/2016	Extraction Pond	ND	28930					
	31/08/2016	Extraction Pond	840	61500					
	30/09/2016	Extraction Pond	ND	920					
	4/10/2016	Extraction Pond	ND	920					
	28/10/2016	Extraction Pond	ND	29000					
	21/12/2016	Extraction Pond	ND	10830					
2017 Q1 Env Monitoring report	30/01/2017	Extraction Pond	ND	1480					
	27/02/2017	Extraction Pond	ND	640					
	22/03/2017	Extraction Pond	ND	175					
	19/04/2017	Extraction Pond	ND	600					
	17/05/2017	Extraction Pond	ND	2820					
	14/06/2017	Extraction Pond	ND	1830					
	12/07/2017	Extraction Pond	ND	5260					
	9/08/2017	Extraction Pond	ND	41500					
	6/09/2017	Extraction Pond	ND	99800					
	4/10/2017	Extraction Pond	ND	128000					
	1/11/2017	Extraction Pond	ND	38600					
	29/11/2017	Extraction Pond	ND	8150					
	28/12/2017	Extraction Pond	ND	1890					
2018 Env Monitoring	24/01/2018	Extraction Pond	<5	350					
	21/02/2018	Extraction Pond	<5	100					
	21/03/2018	Extraction Pond	<5	3,960					
	18/04/2018	Extraction Pond	<5	4,580					
	16/05/2018	Extraction Pond	<5	250					
	13/06/2018	Extraction Pond	<5	5,820					
	11/07/2018	Extraction Pond	<5	16,100					
	8/08/2018	Extraction Pond	<5	13,800					
	5/09/2018	Extraction Pond	ND	ND					
	5/10/2018	Extraction Pond	<5	ND					
	6/11/2018	Extraction Pond	ND	ND					
	7/12/2018	Extraction Pond	ND	ND					
2019 Env Monitoring	8/03/2019	Point 1 Silt Pond (Dam 2)	<0.001	<5					
	4/06/2019	Point 1 Silt Pond (Dam 2)	<0.001	500					
	29/08/2019	Point 1 Silt Pond (Dam 2)	<0.001	525					
	22/11/2019	Point 1 Silt Pond (Dam 2)	2.13	10800					
	8/03/2019	Point 2 Dredge Pond	<0.001	<5					
	4/06/2019	Point 2 Dredge Pond	<0.001	550					
	29/08/2019	Point 2 Dredge Pond	0.002	30900					
	22/11/2019	Point 2 Dredge Pond	0.002	900					
	14/02/2020	Silt Pond (Dam 2)						5	0.001

	18/03/2020	Dredge Pond (Dam 1)						735	1.0199
	18/03/2020	Silt Pond (Dam 2)						727	1.032
	16/04/2020	Dredge Pond (Dam 1)						430	0.0166
	16/04/2020	Silt Pond (Dam 2)						0	0
	14/05/2020	Dredge Pond (Dam 1)						90	0.0043
	14/05/2020	Silt Pond (Dam 2)						270	0.115
	11/06/2020	Dredge Pond (Dam 1)						0	0
	11/06/2020	Silt Pond (Dam 2)						0	0
	9/07/2020	Dredge Pond (Dam 1)						0	0
	9/07/2020	Silt Pond (Dam 2)						110	0.0011
2020 Annual Review	10/08/2020	Dredge Pond (Dam 1)						210	0.0153
	10/08/2020	Silt Pond (Dam 2)						170	0.0151
	8/09/2020	Dredge Pond (Dam 1)						326	0.00171
	8/09/2020	Silt Pond (Dam 2)						2252	0.0089
	8/10/2020	Dredge Pond (Dam 1)						0	0
	8/10/2020	Silt Pond (Dam 2)						148	0.00186
	9/11/2020	Dredge Pond (Dam 1)						1	0.01
	9/11/2020	Silt Pond (Dam 2)						1	0.01
	24/11/2020	Dredge Pond (Dam 1)						1	0.01
	24/11/2020	Silt Pond (Dam 2)						1	0.01
	10/12/2020	Dredge Pond (Dam 1)						1	0.01
	10/12/2020	Silt Pond (Dam 2)						1	0.01
	1/01/2021	Dredge Pond (Dam 1)						1	0.01
	22/01/2021	Dredge Pond (Dam 1)						1	0.01
	11/02/2021	Dredge Pond (Dam 1)						1	0.01
	3/03/2021	Dredge Pond (Dam 1)						1	0.01
	16/03/2021	Dredge Pond (Dam 1)						1	0.01
	22/03/2021	Dredge Pond (Dam 1)						1	0.01
	3/04/2021	Dredge Pond (Dam 1)						1	0.01
	12/05/2021	Dredge Pond (Dam 1)						1	0.01
	10/06/2021	Dredge Pond (Dam 1)						1	0.01
	8/07/2021	Dredge Pond (Dam 1)						1	0.01
	9/08/2021	Dredge Pond (Dam 1)						1	0.01
	9/09/2021	Dredge Pond (Dam 1)						1	0.01
	11/10/2021	Dredge Pond (Dam 1)						1	0.01
	22/10/2021	Dredge Pond (Dam 1)						1	0.01
	10/11/2021	Dredge Pond (Dam 1)						1	0.01
	10/12/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	1/01/2021	Silt Pond (Dam 2)						1	0.01
	22/01/2021	Silt Pond (Dam 2)						1	0.01
	11/02/2021	Silt Pond (Dam 2)						1	0.01
	3/03/2021	Silt Pond (Dam 2)						1	0.01
	16/03/2021	Silt Pond (Dam 2)						1	0.01
	22/03/2021	Silt Pond (Dam 2)						1	0.01
	3/04/2021	Silt Pond (Dam 2)						1	0.01
	12/05/2021	Silt Pond (Dam 2)						1	0.01
	10/06/2021	Silt Pond (Dam 2)						1	0.01
	8/07/2021	Silt Pond (Dam 2)						1	0.01
	9/08/2021	Silt Pond (Dam 2)						1	0.01
	9/09/2021	Silt Pond (Dam 2)						1	0.01
	11/10/2021	Silt Pond (Dam 2)						1	0.01
	22/10/2021	Silt Pond (Dam 2)						1	0.01
	10/11/2021	Silt Pond (Dam 2)						1	0.01
	10/12/2021	Silt Pond (Dam 2)						1	0.01
	12/01/2022	Dredge Pond (Dam 1)							0.01
	9/02/2022	Dredge Pond (Dam 1)							0.01
	14/03/2022	Dredge Pond (Dam 1)							0.01
	13/04/2022	Dredge Pond (Dam 1)							0.01
	11/05/2022	Dredge Pond (Dam 1)							0.01
	8/06/2022	Dredge Pond (Dam 1)							0.01
	11/07/2022	Dredge Pond (Dam 1)							0.01
	10/08/2022	Dredge Pond (Dam 1)							0.01
	12/09/2022	Dredge Pond (Dam 1)							0.01
	14/11/2022	Dredge Pond (Dam 1)							0.01
	14/12/2022	Dredge Pond (Dam 1)							0.01
2022 Env Monitoring	12/01/2022	Silt Pond (Dam 2)							0.01
	9/02/2022	Silt Pond (Dam 2)							0.01
	14/03/2022	Silt Pond (Dam 2)							0.02
	13/04/2022	Silt Pond (Dam 2)							0.01
	11/05/2022	Silt Pond (Dam 2)							0.01
	8/06/2022	Silt Pond (Dam 2)							0.01
	11/07/2022	Silt Pond (Dam 2)							0.01
	10/08/2022	Silt Pond (Dam 2)							0.01
	12/09/2022	Silt Pond (Dam 2)							0.01
	12/10/2022	Silt Pond (Dam 2)							0.01
	14/11/2022	Silt Pond (Dam 2)							0.01
	14/12/2022	Silt Pond (Dam 2)							0.01
	11/01/2023	Dredge Pond						1	0.01
	20/01/2023	Dredge Pond						1	0.01
	13/02/2023	Dredge Pond						1	0.01
	20/02/023	Dredge Pond						1	0.01
	15/03/2023	Dredge Pond						1	0.01
	20/03/2023	Dredge Pond						1	0.01
	11/04/2023	Dredge Pond						1	0.01
	19/04/2023	Dredge Pond						1	0.01
	11/05/2023	Dredge Pond						1	0.01
	14/06/2023	Dredge Pond						1	0.01
	11/07/2023	Dredge Pond						1	0.01
	8/08/2023	Dredge Pond						1	0.01
	11/09/2023	Dredge Pond						1	0.01
	11/10/2023	Dredge Pond						1	0.01
	20/10/2023	Dredge Pond						1	0.01
	13/11/2023	Dredge Pond						1	0.01
	20/11/2023	Dredge Pond						1	0.01
	12/12/2023	Dredge Pond						1	0.01
2023 Env Monitoring	11/01/2023	Silt Pond						1	0.01
	20/01/2023	Silt Pond						1	0.01
	13/02/2023	Silt Pond						1	0.01
	20/02/023	Silt Pond						1	0.01
	15/03/2023	Silt Pond						1	0.01
	20/03/2023	Silt Pond						1	0.01

	11/04/2023	Silt Pond						1	0.01
	19/04/2023	Silt Pond						1	0.01
	11/05/2023	Silt Pond						1	0.01
	14/06/2023	Silt Pond						1	0.01
	11/07/2023	Silt Pond						1	0.01
	8/08/2023	Silt Pond						1	0.01
	11/09/2023	Silt Pond						1	0.01
	11/10/2023	Silt Pond						1	0.01
	20/10/2023	Silt Pond						1	0.01
	13/11/2023	Silt Pond						1	0.01
	20/11/2023	Silt Pond						1	0.01
	12/12/2023	Silt Pond						1	0.01
	11/01/2024	Dredge Pond						1	0.10
	15/01/2024	Dredge Pond						1	0.10
	13/02/2024	Dredge Pond						1	0.10
	19/02/2024	Dredge Pond						1	0.10
	14/03/2024	Dredge Pond						1	0.10
	25/03/2024	Dredge Pond						1	0.10
	11/04/2024	Dredge Pond						1	0.10
	29/04/2024	Dredge Pond						1	0.10
	8/05/2024	Dredge Pond						1	0.10
	12/06/2024	Dredge Pond						1	0.10
	10/07/2024	Dredge Pond						1	0.10
	13/08/2024	Dredge Pond						1	0.10
	11/09/2024	Dredge Pond						1	0.10
	10/10/2024	Dredge Pond						1	0.10
	21/10/2024	Dredge Pond						1	0.10
	12/11/2024	Dredge Pond						1	0.10
	25/11/2024	Dredge Pond						1	0.10
	11/12/2024	Dredge Pond						1	0.10
	16/12/2024	Dredge Pond						1	0.10
2024 Env Monitoring	11/01/2024	Silt Pond						1	0.01
	15/01/2024	Silt Pond						1	0.01
	13/02/2024	Silt Pond						1	0.01
	19/02/2024	Silt Pond						1	0.01
	14/03/2024	Silt Pond						1	0.01
	25/03/2024	Silt Pond						1	0.01
	11/04/2024	Silt Pond						1	0.01
	29/04/2024	Silt Pond						1	0.01
	8/05/2024	Silt Pond						1	0.01
	12/06/2024	Silt Pond						1	0.10
	10/07/2024	Silt Pond						1	0.10
	13/08/2024	Silt Pond						1	0.10
	11/09/2024	Silt Pond						1	0.10
	10/10/2024	Silt Pond						1	0.10
	21/10/2024	Silt Pond						1	0.10
	12/11/2024	Silt Pond						1	0.10
	25/11/2024	Silt Pond						1	0.10
	11/12/2024	Silt Pond						1	0.10
	16/12/2024	Silt Pond						1	0.10
		Minimum	**0.002**	**0**	**30**	**5**	**155**	**1**	**0**
		Maximum	**68000**	**211000**	**6300**	**480**	**155**	**2252**	**1.032**
		Average	**9174.1**	**26700.4**	**1426.9**	**104.2**	**155.0**	**43.3**	**0.0**

Long-term Depositional Dust Monitoring at Dunloe Sands Quarry						
Data located	**Date**	**Location**	**D1**	**D2**	**D3**	**D4**
			g/m2/month	**g/m2/month**	**g/m2/month**	**g/m2/month**
Appendix of 2015 AEMR	17/07/2015	Dunloe Sands	0.3	0.2	0.7	0.4
	19/08/2015	Dunloe Sands	0.3	0.3	0.2	0.2
	17/09/2015	Dunloe Sands	0.5	1.6	0.4	0.5
	21/10/2015	Dunloe Sands	0.1	0.6	0.2	0.1
	25/11/2015	Dunloe Sands	0.3	1.7	0.6	0.5
	16/12/2015	Dunloe Sands	0.7	0.8	0.4	0.6
2016 AEMR	Jan-16	Dunloe Sands	0.3	0.4	0.5	0.6
	Feb-16	Dunloe Sands	0.4	0.6	0.5	0.5
	Mar-16	Dunloe Sands	0.2	4.7	0.3	0.5
	Apr-16	Dunloe Sands	0.2	1.6	0.2	0.8
	May-16	Dunloe Sands	0.3	1.2	0.3	1.6
	Jun-16	Dunloe Sands	0.3	1.1	1.6	0.5
	Jul-16	Dunloe Sands	0.13	0.52	0.41	0.39
	Aug-16	Dunloe Sands	0.6	0.5	0.3	0.4
	Sep-16	Dunloe Sands	0.8	0.5	0.4	0.3
	Oct-16	Dunloe Sands	0.8	0.5	0.4	0.3
	Nov-16	Dunloe Sands	0.4	1.9	0.3	0.4
	Dec-16	Dunloe Sands	0.5	1.7	0.6	0.5
2017 Environmental Monitoring	30/01/2017	Dunloe Sands	0.3	0.2	0.5	0.3
	27/02/2017	Dunloe Sands	0.3	0.2	0.2	0.3
	22/03/2017	Dunloe Sands	0.2	0.1	2.4	0.3
	19/04/2017	Dunloe Sands	0.2	0.9	1	0.3
	17/05/2017	Dunloe Sands	0.8	0.8	1.4	0.7
	14/06/2017	Dunloe Sands	0.2	0.2	0.2	0.2
	12/07/2017	Dunloe Sands	0.3	0.1	0.2	0.3
	9/08/2017	Dunloe Sands	0.1	0.1	0.2	0.5
	6/09/2017	Dunloe Sands	0.5	0.2	0.5	0.5
	4/10/2017	Dunloe Sands	0.7	0.6	2.4	0.9
	1/11/2017	Dunloe Sands	0.5	0.3	0.8	0.5
	29/11/2017	Dunloe Sands	0.1	0.2	0.3	0.1
	28/12/2017	Dunloe Sands	0.4	0.3	0.2	0.2
2018 Enviro Monitoring	24/01/2018	Dunloe Sands	0.1	0.1	0.1	0.1
	21/02/2018	Dunloe Sands	2.7	0.7	1.6	0.6
	21/03/2018	Dunloe Sands	0.4	4.9c	11.8c	7.1c
	18/04/2018	Dunloe Sands	0.4	0.1	0.3	0.2
	16/05/2018	Dunloe Sands	0.2	0.4	0.6	0.3
	13/06/2018	Dunloe Sands	0.3	0.2	5.2c	0.4
	11/07/2018	Dunloe Sands	0.5	0.4	0.5	0.2
	8/08/2018	Dunloe Sands	0.4	0.5	0.3	0.2
	5/09/2018	Dunloe Sands	NS	NS	NS	NS
	5/10/2018	Dunloe Sands	0.1	0.4	0.3	0.7
	6/11/2018	Dunloe Sands	0.1	0.1	1.5	0.7
	7/12/2018	Dunloe Sands	1	0.2	1.6	0.3
2019 Enviro Monitoring	8/01/2019	Dunloe Sands	0.5	0.6	0.5	0.3
	5/02/2019	Dunloe Sands	0.2	0.2	0.2	0.2
	8/03/2019	Dunloe Sands	1.1	1	1.2	0.9
	5/04/2019	Dunloe Sands	0.5	0.2	0.2	0.9
	7/05/2019	Dunloe Sands	0.1	0.4	0.2	1.2
	4/06/2019	Dunloe Sands	0.2	0.4	0.7	0.2
	4/07/2019	Dunloe Sands	0.3	0.3	0.2	1.1
	29/08/2019	Dunloe Sands	0.5	0.5	0.4	1.8
	26/09/2019	Dunloe Sands	0.7	0.6	0.5	1.5
	24/10/2019	Dunloe Sands	1.2	0.7	0.5	1.4
	22/11/2019	Dunloe Sands	0.8	0.5	0.8	0.5
	20/12/2019	Dunloe Sands	1.8	1.8	1.6	1
	17/01/2020	Dunloe Sands	2.3	2.5	1.3	NS
	14/02/2020	Dunloe Sands	0.3	NS	NS	NS
	18/03/2020	Dunloe Sands	0.4	6.1*	0.5*	5.4*
	16/04/2020	Dunloe Sands	1	0.6	0.5	0.6
	14/05/2020	Dunloe Sands	2	3.6	0.3	0.6

2020 Enviro Monitoring Portal	11/06/2020	Dunloe Sands	0.1	0.9	0.3	2.5*
	9/07/2020	Dunloe Sands	0.1	2.1	0.2	4
	10/08/2020	Dunloe Sands	1.4	0.7	0.2	3
	10/09/2020	Dunloe Sands	0.5	0.6	0.7	0.8
	8/10/2020	Dunloe Sands	0.5	0.4	1	7.7
	9/11/2020	Dunloe Sands	1.1	1.6	0.4	3
	10/12/2020	Dunloe Sands	1	NS	0.4	3.8
2021 Enviro Monitoring Portal	11/01/2021	Dunloe Sands	0.2	NS	0.7	0.5
	11/02/2021	Dunloe Sands	0.5	0.3	2.5	1.1
	15/03/2021	Dunloe Sands	0.2	0.6	0.7	12
	13/04/2021	Dunloe Sands	0.4	0.6	1.3	1.5
	12/05/2021	Dunloe Sands	0.3	0.5	1.9	14
	10/06/2021	Dunloe Sands	0.2	0.2	0.2	7
	8/07/2021	Dunloe Sands	0.2	0.1	0.3	NS
	9/08/2021	Dunloe Sands	0.3	0.4	0.3	18
	9/09/2021	Dunloe Sands	0.8	0.4	0.5	8.2
	11/10/2021	Dunloe Sands	1.1	0.7	1.2	1.2
	13/12/2021	Dunloe Sands	0.5	0.9	1.3	3.7
2022 Environmental Monitoring	12/01/2022	Dunloe Sands	0.4	3.7	0.9	3.6
	10/02/2022	Dunloe Sands	0.7	0.5	0.9	0.4
	14/03/2022	Dunloe Sands	0.2	NS	2.2	1.0
	13/04/2022	Dunloe Sands	0.4	0.5	0.3	0.4
	11/05/2022	Dunloe Sands	0.4	1.2	0.5	3.2
	9/06/2022	Dunloe Sands	0.4	0.4	0.4	1.8
	11/07/2022	Dunloe Sands	0.3	0.3	0.3	2.8
	11/08/2022	Dunloe Sands	0.2	0.2	0.3	1.6
	12/09/2022	Dunloe Sands	0.2	0.2	0.1	0.7
	13/10/2022	Dunloe Sands	0.1	0.1	0.1	0.1
	14/11/2022	Dunloe Sands	0.1	0.2	0.6	0.2
	14/12/2022	Dunloe Sands	0.1	0.3	0.1	0.1
2023 Environmental Monitoring	January 2023	Dunloe Sands	0.1	0.1	0.1	0.2
	February 2023	Dunloe Sands	0.2	0.3	0.5	0.1
	March 2023	Dunloe Sands	0.5	3.1	0.3	0.1
	April 2023	Dunloe Sands	1.3	0.2	0.8	0.2
	May 2023	Dunloe Sands	0.4	0.5	4.3	0.5
	June 2023	Dunloe Sands	0.1	0.1	0.7	1.1
	July 2023	Dunloe Sands	0.1	3.5	0.2	0.3
	August 2023	Dunloe Sands	0.2	0.4	0.2	0.1
	September 2023	Dunloe Sands	0.2	2.2	0.5	0.3
	October 2023	Dunloe Sands	0.3	2.3	0.2	0.1
	November 2023	Dunloe Sands	1.1	2.0	0.7	1.0
	December 2023	Dunloe Sands	0.5	2.8	0.8	0.3
2024 Environmental Monitoring	January 2024	Dunloe Sands	0.5	0.6	0.8	0.2
	February 2024	Dunloe Sands	0.2	0.8	0.5	0.4
	March 2024	Dunloe Sands	0.2	1.2	0.3	
	April 2024	Dunloe Sands	0.8	2.0	0.8	0.6
	May 2024	Dunloe Sands	0.6	2.3	0.6	3.9
	June 2024	Dunloe Sands	0.6	0.7	0.1	0.1
	July 2024	Dunloe Sands	0.6	0.1	0.1	
	August 2024	Dunloe Sands	0.3	0.1	0.1	0.2
	September 2024	Dunloe Sands		0.6	0.3	0.3
	October 2024	Dunloe Sands	0.2	1.1	0.3	0.1
	November 2024	Dunloe Sands	0.4	3.8	0.4	0.5
	December 2024	Dunloe Sands	0.6	16.0	0.8	0.7
		Minimum	**0.1**	**0.1**	**0.1**	**0.1**
		Maximum	**2.7**	**4.7**	**4.3**	**18**
		Average	**0.49**	**1.00**	**0.64**	**1.40**

Long-term Groundwater Depth Monitoring at Dunloe Sands Quarry

Date	DPL1	DPL3	DPL5	DPL6	DPL7
Nov-13	0.61	0.57	0.67	0.59	0.61
Apr-14	0.61	0.58	0.68	0.61	0.62
Nov-14	1.30	1.90	1.20	1.40	1.90
Dec-14	1.20	1.80	1.20	1.40	1.80
Jan-15	1.10	1.40	0.90	1.20	1.40
Feb-15	0.30	1.00	0.20	0.80	1.50
Mar-15	0.70	1.00	0.40	1.00	1.20
Apr-15	0.90	1.00	0.80	1.20	1.40
May-15	1.10	1.70	0.80	1.40	1.20
Jun-15	1.40	1.40	0.80	1.20	1.30
Jul-15	1.00	1.50	1.10	1.10	1.00
Aug-15	1.30	1.50	0.90	1.10	1.60
Sep-15	1.30	1.80	1.30	1.20	1.70
Oct-15	1.40	1.70	1.10	1.20	1.80
Nov-15	1.20	1.40	1.20	1.30	1.70
Dec-15	1.10	1.20	0.90	1.20	1.60
22/03/2017	1.58	1.28	1.38	1.95	1.20
19/04/2017	1.53	1.46	1.51	1.26	
17/05/2017	1.64	1.44	1.54	1.51	1.51
14/06/2017	0.89			1.08	
12/07/2017	1.69	1.52	1.60	1.54	1.47
9/08/2017	1.83	1.60	1.68	1.77	1.69
6/09/2017	1.90	1.61	1.67	1.85	1.80
4/10/2017	1.91	1.54	1.61	1.81	1.69
1/11/2017	1.92	1.64	1.72	1.81	1.72
29/11/2017	1.93	1.65	1.74	1.81	1.77
28/12/2017	1.94	1.66	1.74	1.97	1.78
24/01/2018	2.03	1.70	1.77	1.88	1.9
21/02/2018	1.94	1.52	1.62	1.87	1.89
21/03/2018	1.68	1.38	1.49	1.62	1.4
18/04/2018	1.6	1.33	1.41	1.52	1.24
16/05/2018	1.62	1.23	1.36	1.65	1.37
13/06/2018	1.74	1.42	1.56	1.78	1.55
11/07/2018	1.78	1.48	1.56	1.71	1.62
8/08/2018	1.98	1.72	1.80	1.78	1.78
5/09/2018		1.36	1.74	1.6	1.78
5/10/2018	1.73	1.39	1.39	1.73	1.64
6/11/2018	1.74	1.74	1.54	1.62	1.52
7/12/2018		1.39	1.46	1.58	1.34
8/01/2019	1.75	1.63	1.60	1.91	1.8
5/02/2019	1.99	1.64	1.71	2.1	1.93
8/03/2019	1.97	1.83	1.88	1.51	1.59
5/04/2019	1.58	1.35	1.39	1.48	1.56
7/05/2019	NA	NA	NA	NA	NA
4/06/2019	1.75	1.35	1.75	1.64	1.6
4/07/2019	1.68	1.26	1.42	1.49	1.31
1/08/2019	1.85	1.49	1.59	1.58	1.61
26/09/2010	2.45	2.74	2.77	1.64	2.75
24/10/2019	NR	NR	NR	NR	NR
22/11/2019	2.03	2.02	1.81	2.01	1.99
20/12/2019	2.13	1.79	1.83	1.68	2.01
17/01/2020	2.03				
18/03/2020	0.7	1.2	1.25	1	1.15
16/04/2020	1.7	1.4	1.50	1.4	1.4
14/05/2020	1.9	1.7	1.8	1.8	1.7
11/06/2020	1.8	1.5	1.65	1.55	1.7
9/07/2020	2.05	1.7	1.65	1.65	1.8
10/08/2020	1.05	1.5		1.6	1.55
10/09/2020					
24/09/2020	1.94	1.75	1.75	1.43	1.66
8/10/2020	2.07	1.79	1.7	1.72	1.82
9/11/2020	2.15	1.68	1.64	1.71	1.71
10/12/2020	2.25	1.87	1.76	2.3	1.97
11/01/2021	1.8	1.44	1.58	1.7	1.46

11/02/2021	1.75	1.52	1.53	1.65	1.61
15/03/2021	1.78	1.4	1.43	1.46	1.26
13/04/2021	1.4	1.25	1.23	1.03	1.33
11/05/2021	1.61	1.45	1.48	1.33	1.19
10/06/2021	1.91	1.59	1.77	1.76	1.69
8/07/2021	1.68	1.35	1.49	1.56	1.37
9/08/2021	1.89	1.49	1.58	1.73	1.53
9/09/2021	1.97	1.66	1.73	2.02	1.96
11/10/2021	2.08	1.8	1.83	2.1	1.86
11/11/2021	2.03	1.64	1.71	1.92	1.67
13/12/2021	1.82	1.34	1.44	1.62	1.36
12/01/2022	1.79	1.4	1.45	1.58	1.41
9/02/2022	1.58	1.26	1.34	1.48	1.29
14/03/2022	1.48	1.29	1.36	1.06	1.26
13/04/2022	1.37	1.28	1.36	1.09	1.29
11/05/2022	1.34	1.18	1.3	1.14	1.17
9/06/2022	1.46	1.46	1.52	1.2	1.32
11/07/2022	1.77	1.58	1.52	1.38	1.37
10/08/2022	1.75	1.67	1.68	1.49	1.61
13/09/2022	1.9	1.63	1.7	1.6	1.57
13/10/2022	1.71	1.5	1.57	1.48	1.47
14/11/2022	1.87	1.64	1.65	1.59	1.62
14/12/2022	1.92	1.61	1.59	1.54	1.62
11/01/2024	0.37	0.65	0.47	0.92	0.44
13/02/2024	0.39	0.67	0.45	0.91	0.42
25/03/2024	0.39	0.67	0.48	0.5	0.43
11/04/2024	0.37	0.90	0.46	0.5	0.7
8/05/2024	0.34	0.80	0.8	1.22	0.42
12/06/2024	-	-	-	-	-
11/07/2024	0.72	0.77	0.62	1.12	1.2
13/08/2024	0.9	0.90	0.92	1.12	1.36
11/09/2024	0.91	0.43	0.9	1.12	1.34
10/10/2024	0.81	0.32	0.92	1.27	1.38
12/11/2024	0.81	0.31	0.93	1.27	1.37
11/12/2024	-	0.86	-	-	-
Minimum	**0.3**	**0.31**	**0.2**	**0.50**	**0.42**
Maximum	**2.45**	**2.74**	**2.77**	**2.3**	**2.75**
Average	**1.52**	**1.40**	**1.38**	**1.47**	**1.48**

Long-term Groundwater Quality Monitoring at Dunloe Sands Quarry

Data located	Date	Location	pH	EC	DO (membrane electrode)	*Redox Potential	Alkalinity as CaCO3	Bicarbonate as CaCO3	Chloride	Total Phosphorus-P	Total-N	Ammonia	Calcium	Magnesium	Sodium	Potassium	Sulfur as Sulfate	Aluminium (Total)	Arsenic (Total)	Iron (Total)	Manganese (Total)
			pH	µScm-1	mg/L	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2011/2012 AEMR	Dec-11	DPL1							13				0.2	0.4	4	<5	3.5		<0.005	1.34	<0.01
	Mar-12	DPL1							17				0.2	0.4	5.4	<5	4.8		<0.005	1.32	<0.01
	30/05/2012	DPL1	4.2	98	3.3	435															
	Jun-12	DPL1	4.2	105	3.8	405	<1	<1	20				0.6	0.6	11	<5	5.3		<0.005	2.49	<0.01
	26/07/2012	DPL1	4.3	87	5.1	374															
	27/08/2012	DPL1	4.2	98	2.1	365															
	27/09/2012	DPL1	4.2	94	2.6	305	<1	<1	15				0.5	0.3	8.4	<5	6.7		<0.005	3.25	<0.01
	29/10/2012	DPL1	4.6	96	5.8	208															
2012/2013 AEMR	Dec-12	DPL1							36				1	0.7	6.3	<5	4.9		<0.005	4.32	<0.01
	Mar-13	DPL1							12				0.2	0.1	9.2	<5	7.3		<0.005	1.68	<0.01
	Jun-13	DPL1							19				0.1	<0.1	0.1	<5	5.9		<0.005	1.5	<0.01
	Sep-13	DPL1							16				0.4	0.2	7.5	<5			<0.005	5.82	<0.01
	12/12/2013	DPL1	4.8	86	3.5	91	3	2	20				0.4	0.2	0.2	<5	6.2		<0.005	3.83	0.02
	29/01/2014	DPL1	4	279	5.7	264															
	24/02/2014	DPL1	4.6	76	3.8	242															
	31/03/2014	DPL1	4.9	72	6.3	136	3	2	15				0.6	0.1	0.1	<5	3.5		<0.005	2.44	<0.01
	24/04/2014	DPL1	4	75		204															
	28/05/2014	DPL1	4.2	95		307															
	25/06/2014	DPL1	4.1	98	2	350	<1	<1	16				0.5	0.3	9.7	<5	6.4		<0.005	0.76	<0.01
	30/07/2014	DPL1	4.1	112	3.9	174	<1	<1	19				0.4	0.2	11	<5	7.7	0.77	<0.005	0.62	<0.01
	29/08/2014	DPL1	4.4	97	4.3	185	NP	NP	20				0.2	<0.1	9.6	<5	4.3		<0.005	3.93	<0.01
	29/09/2014	DPL1	4	108	3.5	177															
Appendix of 2015 AEMR	28/11/2014	DPL1	4.7	81	3.3	110															
	15/12/2014	DPL1	4.6	94	1.5	160	NP	<1	15				1.6	0.4	10	<5	6.1	0.32	<0.005	2.55	0.02
	22/01/2015	DPL1	4.8	80	3.8	110															
	25/02/2015	DPL1	4.2	110	1.1	160															
	26/03/2015	DPL1	4	109	4	245	NP	NP													
	24/04/2015	DPL1	4.1	131	2.7	253															
	28/05/2015	DPL1	3.8	164	2	256															
	17/09/2015	DPL1	4.1	135	3.9	195	NP		18			<0.02	0.7	0.8	12	<5	10	0.64	<0.001	0.95	0.017
	21/10/2015	DPL1	4.3	116	2.9	217															
	25/11/2015	DPL1	4.2	102	6.1	170															
	11/12/2015	DPL1	4.6	86	2.4	232	1	1	14				0.3	0.2	11	<5	10	0.32	<0.001	3.21	0.009
Appendix of 2016 AEMR	25/01/2016	DPL1	4.7	95	1.6	165															
	24/02/2016	DPL1	4.8	98	5.7	138															
	24/03/2016	DPL1	4.6	104	3.8	268	2	2	17				0.37	0.23	10.21	<5	9.403	0.727	0.001	4.224	0.007
	29/04/2016	DPL1	4.3	96	6.4	388															
	24/05/2016	DPL1	4.2	106	2.7	255															
	30/06/2016	DPL1	4.9	101.1	3.6	283							3.503	0.353	10.561	<5	9.636	0.471	0.001	2.508	0.14
	21/07/2016	DPL1	3.9	142.2	6.8	384															
	31/08/2016	DPL1	4	140	6.5	321															
	29/09/2016	DPL1	3.9	151	2.5	366															
	27/10/2016	DPL1	4	151	2.5	366															
	29/11/2016	DPL1	4.7	116	1.9	108															
	20/12/2016	DPL1	4.7	131	5.2	307.1															
Q1 2017 Env monitoring report	30/01/2017	DPL1	4.2	121																	
	27/02/2017	DPL1	4.6	103																	
	22/03/2017	DPL1	4.4	116			<5		18	0.09	1.1	0.056		<0.5	12	1	12	0.48	<0.001	4.8	0.018
	19/04/2017	DPL1	4.2	180																	
	17/05/2017	DPL1	4.4	135																	
	14/06/2017	DPL1	4.3	197			<5		22	<0.05	0.5	0.039		1	14	1	39	1.6	<0.001	13	0.039
	12/07/2017	DPL1	4.1	137																	
	9/08/2017	DPL1	4.3	123																	
	6/09/2017	DPL1	4	124			<5		18	<0.05	1.2	0.031		<0.5	11	1	10	0.73	<0.001	3.4	0.017
	4/10/2017	DPL1	4.3	123																	
	1/11/2017	DPL1	4.4	121																	
	29/11/2017	DPL1	4.5	129																	
	28/12/2017	DPL1	4.5	130			<5		21	<0.05	0.4	0.071		0.6	12	2.1	44	0.53	<0.001	5	0.02
2018 Env Monitoring	24/01/2018	DPL1	4.49	138.4																	
	21/02/2018	DPL1	4.46	120.5																	
	21/03/2018	DPL1	4.35	159			<5		21	0.06	0.2	0.062		0.8	13	1.5	44	0.76	<0.001	5.5	0.028
	18/04/2018	DPL1	4.49	153																	
	16/05/2018	DPL1	4.4	146.3																	
	13/06/2018	DPL1	4.33	167.1			<5		19	<0.05	0.4	0.057		0.7	14	1.4	28	0.76	<0.001	6.2	0.024
	11/07/2018	DPL1	4.31	146.3																	
	8/08/2018	DPL1	3.91	204																	
	5/09/2018	DPL1	4.12	114	4.52		<1		18			0.07		<1	22	1	26	1.08	<0.001	0.05	0.001
	5/10/2018	DPL1	4.53	143	7																
	6/11/2018	DPL1	4.51	142	4.8																
	7/12/2018	DPL1	4.49	120	4.8	44.3	<1		17			0.06		1	11	<1	36	0.88	0.001	10.7	0.003
2019 Env Monitoring	8/01/2019	DPL1	4.4	178.36	3.52	-2.5															
	5/02/2019	DPL1	4.48	142.5	0.26	-64.1															
	8/03/2019	DPL1	4.12	224	0.11	1.6		<1					4	2	13	1	68	2.58	<0.001	19.5	0.05
	5/04/2019	DPL1	4.14	122	0.2	NR		<1						1					<0.001		0.038
	7/05/2019	DPL1	6.6	3570	0.3	0.1		<1											<0.001		0.033
	4/06/2019	DPL1	4.14	126	0.5	31.9		<1					2	1	11	1	38	1.27	<0.001	10.9	0.034
	4/07/2019	DPL1	6.6	3570	0.3	0.1															
	1/08/2019	DPL1	4.32	94	8.1	54.1		<1					2	<1	10	<1	20	1.1	<0.001	8.63	0.033
	26/09/2019	DPL1	5.01	38	9.6	-29.4		<1													0.034
	24/10/2019	DPL1	5.01	138	1.8	<0.1		<1													
	22/11/2019	DPL1	4.59	94	15.6	71.1		<1					2	<1	11	<1	31	0.98	<0.001	8.34	0.034
	20/12/2019	DPL1	4.86	84	15.5	110															
2020 Env Monitoring	17/01/2020	DPL1	4.57	132	2.5																
	14/02/2020	DPL1																			
	18/03/2020	DPL1	5.39	188	0.04	63		19.9	71		0.19	0.21		3.1	16	2.5	38	0.049	0.025		0.1
	16/04/2020	DPL1	4.43	196	0.11	162															
	14/05/2020	DPL1	5.77	198	0	-13															
	11/06/2020	DPL1	5.59	191	0.62	83		25	27				10	3.9	20	3	44	0.05	0.017		0.11
	9/07/2020	DPL1	5.84	204	4.7	187															
	10/08/2020	DPL1	4.91	187	2.74	283															
	24/09/2020	DPL1	5.3	190	0			20	28			0.26	9.5	5	16	5	42	0.05	0.005		
	8/10/2020	DPL1	5.96	213	0	98															
	9/11/2020	DPL1	7.78	209	2.7			260	120			1.13	22	8.1	53	5	84	0.05	0.007		0.14

	10/12/2020	DPL1	6.63	451	0.09	-14															
2021 Env Monitoring	11/01/2021	DPL1	4.85	185	0	214															
	11/02/2021	DPL1	7.1	133	0.4	47		20	16			0.06	9.9	5	5.2	5	48	0.12		0.12	0.087
	15/03/2021	DPL1	4.3	124	0.2	323															
	13/04/2021	DPL1	4.7	105	0.1	205															
	11/05/2021	DPL1	4.6	103	0	274		20	10			0.07	6.1	1.8	4.7	1.3	27	0.1		0.26	0.061
	10/06/2021	DPL1	7.1	676	0																
	8/07/2021	DPL1	5.1	95	0	228															
	9/08/2021	DPL1	5.5	124	0	203		270	130			1.4	15	4.6	29	2.8	90	0.05		0.08	0.079
	9/09/2021	DPL1	7.2	709	0.1	28															
	11/10/2021	DPL1	7.3	1300	0.6	-104															
	11/11/2021	DPL1	7.4	489		-36		480	220			2	84	38	250	13	180	0.05		4	0.31
	13/12/2021	DPL1	5.7	116	2.3	183															
2022 Env Monitoring	12/01/2022	DPL1	5.2	96	1.7	165.0															
	9/02/2022	DPL1	5.0	73	1.1	204.0		78	44			0.04	11	5.7	47	3.4	39	0.09		0.08	0.087
	14/03/2022	DPL1	6.4	353	0.3	79.0															
	13/04/2022	DPL1	7.2	1590	0.0	-90.0															
	11/05/2022	DPL1	7.5	1800	0.0	-142.0		690	250			3	81	39	280	14	190	0.05		3.5	0.33
	9/06/2022	DPL1	7.4	1830	0.0	-167.0															
	11/07/2022	DPL1	7.8	1790	0.0																
	10/08/2022	DPL1	7.4	1540	0.2	-106.0		640	210			2.6	77	35	250	12	170	0.05		4.2	0.33
	13/09/2022	DPL1	7.6	1570	0.1	-146.0															
	13/10/2022	DPL1	7.3	1680	1.0	-148.0															
	14/11/2022	DPL1	7.3	1620	0.1	-105.0		500	240			2	72	33	280	12	150	0.05		2.5	0.23
	14/12/2022	DPL1	7.4		0.3																
2023 Env Monitoring	12/01/2023	DPL1	7.3	920	1.5	-147.0															
	13/02/2023	DPL1	7.0	845	0.0	-72.0		530.0	240.0			2.6	68.0	36.0	270.0	13.0	180.0	0.05	0.001	0.08	0.18
	15/03/2023	DPL1	7.1	158	0.1	-57.0															
	11/04/2023	DPL1	6.4	1630	0.7	55.0															
	11/05/2023	DPL1	6.6	514	2.1	-57.0															
	14/06/2023	DPL1	7.3	1010	0.6	-147.0		530.0	240.0			2.8	79.0	37.0	270.0	13.0	190.0	0.05	0.001	0.07	0.29
	11/07/2023	DPL1	7.4	930	0.5	-55.0															
	8/08/2023	DPL1	7.3	2800	0.0	-134.0		540.0	230.0			2.6	78.0	40.0	300.0	14.0	200.0	0.05	0.003	3.7	0.28
	11/09/2023	DPL1	7.4	2800	0.0	-56.0															
	12/10/2023	DPL1	7.4	2875	0.0	-71.0															
	13/11/2023	DPL1	7.6	2956	0.0	-71.0															
	12/12/2023	DPL1	6.2	311	3.0	58.0		28.0	20.0			0.02	8.1	3.0	18.0	1.7	28.0	0.05	0.001	0.05	0.005
2024 Env Monitoring	11/01/2024	DPL1	7.5	1530	0.0	-117.0															
	13/02/2024	DPL1	7.6	1930	1.2	-1.0		500.0	220.0			0.1	75.0	37.0	270.0	14.0	210.0	0.1	0.001	1.2	0.34
	25/03/2024	DPL1	7.5	1675	0.0	-92.0															
	11/04/2024	DPL1	7.5	1596	0.0	-90.0															
	8/05/2024	DPL1	5.3	123	6.7	143.0															
	12/06/2024	DPL1	7.1	214	0.5	151.0		40.0	23.0			0.0	11.0	3.5	24.0	2.1	26.0	0.09	0.001	0.24	0.012
	11/07/2024	DPL1	6.1	147	4.3	256.0															
	13/08/2024	DPL1	4.5	159	0.0	201.0															
	11/09/2024	DPL1	4.7	167	0.0	141.0		53.0	23			0.0	11.0	4.0	24.0	2.8	34.0	0.1	0.001	0.05	0.036
	10/10/2024	DPL1	5.6	212	0.0	139.0															
	12/11/2024	DPL1	6.7	626	6.1	31.0															
	11/12/2024	DPL1	6.2	321	3.8	84.0		23.0	11.0			0.01	13.0	2.8	12.0	3.6	43.0	0.06	0.001	0.05	0.076
No of Samples			**135**	**134**	**111**	**103**	**4**	**24**	**45**	**2**	**7**	**28**	**41**	**45**	**52**	**29**	**49**	**35**	**14**	**42**	**36**
Minimum			**3.8**	**38**	**0**	**-167**	**1**	**1**	**10**	**0.06**	**0.19**	**0.000**	**0.1**	**0.1**	**0.1**	**1**	**3.5**	**0.049**	**0.001**	**0.05**	**0.001**
Maximum			**7.80**	**3570**	**15.6**	**435**	**3**	**690**	**250**	**0.09**	**1.2**	**3**	**84**	**40**	**300**	**14**	**210**	**2.58**	**0.025**	**19.5**	**0.33**
Average			**5.29**	**470.88**	**2.42**	**115.98**	**2.25**	**219.75**	**62.87**	**0.08**	**0.57**	**0.76**	**18.59**	**8.57**	**63.45**	**5.32**	**51.44**	**0.49**	**0.00**	**3.84**	**0.09**
2011/2012 AEMR	Dec-11	DPL3							2300				72	119	842	72	136		<0.005	0.74	0.53
	Mar-12	DPL3							2400				66	109	1081	<5	126		<0.005	1.25	0.51
	30/05/2012	DPL3	6.6	7074	2.3	317															
	Jun-12	DPL3	6.7	7057	6.6	315	150	94	2220				70	112	1119	48	143		<0.005	1.94	0.53
	26/07/2012	DPL3	6.6	7093	3.6	284															
	27/08/2012	DPL3	6.7	7343	1.8	193															
	27/09/2012	DPL3	6.4	7130	2.4	249	120	75	2280				63	100	1060	50	147		<0.005	2.11	0.51
	29/10/2012	DPL3	6.3	7177	4.8	146															
2012/2013 AEMR	Dec-12	DPL3							2270				68	103	946	61	132		<0.005	2.46	0.52
	Mar-13	DPL3							2280				74	115	1296	48	149		<0.005	1.78	0.58
	Jun-13	DPL3							2310				66	105	66	44	169		<0.005	1.63	0.52
	Sep-13	DPL3							2280				60	93	1003	38			<0.005	3.05	0.52
2013/2014 AEMR	12/12/2013	DPL3	6.2	7140	2.4	116	120	73	2340				66	104	104	43	168		<0.005	3.16	0.57
	29/01/2014	DPL3	6.3	6964	4.4	201															
	24/02/2014	DPL3	6.3	6677	3.6	245															
	31/03/2014	DPL3	6.4	7234	4.2	118	120	74	120				63	109	109	43	175		<0.005	2.86	0.56
	24/04/2014	DPL3	6.5	7448		136															
	28/05/2014	DPL3	6.6	7484		318															
	25/06/2014	DPL3	6.6	7370	5.9	260	110	70	2290				82	125	1320	44	180		<0.005	6.47	0.93
	30/07/2014	DPL3	6.6	7431	4.9	122	110	66	2420				74	114	1200	46	177	0.03	<0.005	3.97	0.58
	29/08/2014	DPL3	6.5	7643	3.9	184	110	68	2370				71	110	1140	43	168		<0.005	4.22	0.56
	29/09/2014	DPL3	6.1	7558	3	188															
Appendix of 2015 AEMR	28/11/2014	DPL3	6.1	7491	4.2	100															
	15/12/2014	DPL3	6.2	7280	2.6	130	130	77	2370				82	118	1240	48	146	0.04	<0.005	3.53	0.59
	22/01/2015	DPL3	6.1	7473	2.2	136															
	25/02/2015	DPL3	6.4	7478	3.2	150															
	26/03/2015	DPL3	6.1	7542	2.9	195	130	128													
	24/04/2015	DPL3	6.6	7540	4.8	246															
	28/05/2015	DPL3	6.5	7483	5.2	182															
	17/09/2015	DPL3	6.4	7422	3.7	150	120		2380			0.04	68	102	1220	41	152	0.22	<0.001	3.09	0.641
	21/10/2015	DPL3	6.2	7310	2.4	157															
	25/11/2015	DPL3	6.2	7562	6.9	205															
	11/12/2015	DPL3	6.3	7321	2.6	182	120	120	2370				68	108	1220	40	181	0.13	0.001	2.99	6.23
Appendix of 2016 AEMR	25/01/2016	DPL3	6.1	7395	2.8	147															
	24/02/2016	DPL3	6.2	7372	5.7	58															
	24/03/2016	DPL3	6.4	7406	3.5	155	123	123	2650				78.03	117.11	1284.98	44.19	176.114	0.07	0.001	2.183	0.625
	29/04/2016	DPL3	6.4	7417	6.4	196															
	24/05/2016	DPL3	6.5	7394	5.4	180															
	30/06/2016	DPL3	6.6	7250.2	6.4	180															
	21/07/2016	DPL3	6.5	6868.2	6.6	262															
	31/08/2016	DPL3	6.5	7281	5.8	170	121		2650				78	121	1350	46	170		0.001	3.33	0.541
	29/09/2016	DPL3	6.1	7313	2.5	221															
	27/10/2016	DPL3	6.1	7313	399	1738															
	29/11/2016	DPL3	6.1	7376	1.8	67															

	20/12/2016	DPL3	6	7673	4	315.9	121		2700				75	114	1.28	43	182		0.001	2.4	0.541
Q1 2017 Env Monitoring report	30/01/2017	DPL3	6.1	7119																	
	27/02/2017	DPL3	6.1	7013																	
	22/03/2017	DPL3	5.9	7570			130		2300	0.1	4.1	2.9		130	1500	54	230	0.04	<0.001	15	0.67
	19/04/2017	DPL3	5.9	7660																	
	17/05/2017	DPL3	5.9	7410																	
	14/06/2017	DPL3																			
	12/07/2017	DPL3	6.2	7060																	
	9/08/2017	DPL3	6.2	7490																	
	6/09/2017	DPL3	6.1	7490			140		2000	<0.05	3	2		120	1600	55	140	0.04	<0.001	2.8	0.6
	4/10/2017	DPL3	6	7530																	
	1/11/2017	DPL3	5.9	7970																	
	29/11/2017	DPL3	5.9	7680																	
	28/12/2017	DPL3	6	7570			130		2400	0.05	3.8	2.8		130	1700	53	190	0.09	<0.001	13	0.62
2018 Env Monitoring	24/01/2018	DPL3	5.94	7640																	
	21/02/2018	DPL3	5.94	7240																	
	21/03/2018	DPL3	5.87	8230			140		2500	<0.05	3.7	2.9		150	1400	53	200	0.09	<0.001	9.9	0.64
	18/04/2018	DPL3	5.94	7580																	
	16/05/2018	DPL3	5.97	7670																	
	13/06/2018	DPL3	6.02	7930			130		2300	<0.05	4.1	2.7		120	1500	56	180	0.08	<0.001	11	0.61
	11/07/2018	DPL3	6.18	7280																	
	8/08/2018	DPL3	6.1	7880																	
	5/09/2018	DPL3	5.38	3760	69.8	211	134		2760			2.46		137	1380	49	191	0.66	0.002	24	0.715
	5/10/2018	DPL3	5.87	7540	7.8																
	6/11/2018	DPL3	5.81	7580																	
	7/12/2018	DPL3	5.82	7520	3.4		151		2470			2.29		118	130	45	158	0.32	<0.001	12.9	0.658
2019 Env Monitoring	8/01/2019	DPL3	5.84	7562.2	10.2	-25.8															
	5/02/2019	DPL3	5.76	8597.1	0.38	-88.9															
	8/03/2019	DPL3	3.88	680	0.27	39.3		120	3500				134	193	1720	56		0.07	<0.01	15.8	0.988
	5/04/2019	DPL3	5.83	8790	0.3	NR															
	7/05/2019	DPL3	4.08	568	8.5	278															
	4/06/2019	DPL3	5.72	9200	0.4	56.8		133	2810				92	142	1400	47		0.18	<0.001	12.2	0.789
	4/07/2019	DPL3	4.08	568	8.5	278															
	1/08/2019	DPL3	5.99	7560	7.6	2.9		138	2610				84	130	1240	41		0.46	<0.001	14	0.797
	26/09/2019	DPL3	6.4	8790	4.3	106															
	24/10/2019	DPL3	6.16	8580	16	48															
	22/11/2019	DPL3	6.03	9480	19.9	<0.1		115	3840				150	236	1910	64		0.21	<0.001	17.6	1.11
	20/12/2019	DPL3	6.26	10400	40.4	<0.1															
2020 Env Monitoring	17/01/2020	DPL3	6.47	8880	6.8																
	14/02/2020	DPL3																			
	18/03/2020	DPL3	5.64	7660	0.98	-33		160	2800			2.2		160	1600	56	220	0.08	0.0009	12	0.8
	16/04/2020	DPL3	6.08	7170	0.89	-38															
	14/05/2020	DPL3	5.79	6800	0.23	-67															
	11/06/2020	DPL3	5.9	6800	1.02	-62		220	2400				85	120	1300	43	210	0.09	0.001	12	0.68
	9/07/2020	DPL3	5.73	7590	1.46	-38															
	10/08/2020	DPL3	6.33	7620	0.97	13															
	10/09/2020	DPL3	6.26	7550	1.62	-109		150	2300			2.2	79	120	1200	42	180	0.08	0.001	10	
	10/09/2020	DPL3	6.26	7550	1.62			150	2300			2.2	79	120	1200	42	180	0.08	0.001	10	
	8/10/2020	DPL3	7.64	7200	1.74	-70															
	9/11/2020	DPL3	5.97	7930	0.03			180	10000			2.64	79	100	1200	42	210	0.09	0.001	12	0.66
	10/12/2020	DPL3	5.64	8920	6.09	-130															
2021 Env Monitoring	11/01/2021	DPL3	5.92	8110	1.42	-125															
	11/02/2021	DPL3	5.6	8500	0	-91		170	2500			2.9	93	130	1400	50	210	0.08		12	0.66
	15/03/2021	DPL3	7	7850	4.6	-93															
	13/04/2021	DPL3	5.8	8390	7	-14															
	11/05/2021	DPL3	6	8250	0.7	-41		210	2500			2.7	78	110	1100	38	180	0.07		12	0.64
	10/06/2021	DPL3	5.8	12800	0																
	8/07/2021	DPL3	5.9	11500	0	-151															
	9/08/2021	DPL3	5.8	1120	0	-26		170	2600			3.1	90	130	1400	48	190	0.1		13	0.71
	9/09/2021	DPL3	5.7	6990	0	-35															
	11/10/2021	DPL3	6.1	6950	6.6	-29															
	11/11/2021	DPL3	6.5	7800		-2		180	2900			2.8	110	150	1500	51	220	0.09		12	0.72
	13/12/2021	DPL3	6	7710	0.5	7															
2022 Env Monitoring	12/01/2022	DPL3	5.8	7770	0.3	-13		170	2500			3.2	72	130	1400	50	190	0.07		10	0.62
	9/02/2022	DPL3	5.6	8660	0	14															
	14/03/2022	DPL3	5.9	8720	0	30															
	13/04/2022	DPL3	5.9	8550	0.2	-3		220	2000			3.1	81	120	1300	46	160	0.08		12	0.74
	11/05/2022	DPL3	6.1	7480	0.4	32															
	9/06/2022	DPL3	5.8	8380	0.4	-6															
	11/07/2022	DPL3	6.2	7930	0.28			190	2100			2.6	98	110	1100	40	140	0.1		14	0.7
	10/08/2022	DPL3	6.3	7510	1.9	11															
	13/09/2022	DPL3	6.1	7370	0.5	30															
	13/10/2022	DPL3	6	7170	0.8	58		180	2600			1.5	73	120	1300	40	180	0.05		4.1	0.53
	14/11/2022	DPL3	6.2	6810	0.1	100															
	14/12/2022	DPL3	6.2		0.2																
2023 Env Monitoring	12/01/2023	DPL3	5.8	4630	0	35															
	13/02/2023	DPL3	5.9	5000	0	26		120	3200			3.4	110	180	1500	50	310	0.06	0.001	15	0.87
	15/03/2023	DPL3	5.6	7310	0.7	172															
	11/04/2023	DPL3	6	4460	1.1	-24															
	11/05/2023	DPL3	5.8	4870	0.6	-22															
	14/06/2023	DPL3	6	4880	0	-46		140	2600			3.6	86	130	1400	46	230	0.07	0.001	9.5	0.7
	11/07/2023	DPL3	6.2	5230	2.5	-18															
	8/08/2023	DPL3	5.8	1190	0	-18		130	3100			3.2	93	150	1500	47	280	0.08	0.001	11	0.77
	11/09/2023	DPL3	5.7	1190	0	-28															
	12/10/2023	DPL3	5.6	1199	0	-14															
	13/11/2023	DPL3	5.6	1293	0	-16															
	12/12/2023	DPL3	6.5	7300	0	27		180	2500			3.2	81	130	1300	43	24	0.05	0.001	7.6	0.8
2024 ENV Monitoring	11/01/2024	DPL3	6.2	7560	0.4	37															
	13/02/2024	DPL3	6.1	8490	0	-1		170	2300			3.3	91	140	1400	47	200	0.06	0.001	10	0.75
	25/03/2024	DPL3	6.2	7234	0	42															
	11/04/2024	DPL3	6.1	7741	0	27															
	8/05/2024	DPL3	6.4	8780	0.6	44															
	12/06/2024	DPL3	6.5	8780	1.6	66		170	2600			2.4	85	130	1400	43	160	0.09	0.001	11	0.62
	11/07/2024	DPL3	7.5	8650	2.2	31															
	13/08/2024	DPL3	5.6	7930	0	57															
	11/09/2024	DPL3	5.9	7420	0	49		240	2800			2.5	83	130	1300	47	180	0.05	0.001	5.7	0.61
	10/10/2024	DPL3	5.9	9070	0	38															

	12/11/2024	DPL3	5.9	9022	0	39															
	11/12/2024	DPL3	6.5	8810	8.8	22		200	2600			2.9	84	130	1300	46	160	0.08	0.001	4.9	0.66
No of Samples			**135**	**134**	**111**	**103**	**21**	**36**	**51**	**2**	**5**	**28**	**43**	**51**	**51**	**50**	**46**	**37**	**18**	**51**	**49**
Minimum			**3.88**	**568**	**0**	**-151**	**110**	**66**	**120**	**0.05**	**3**	**0.04**	**60**	**93**	**1.28**	**38**	**24**	**0.03**	**0.0009**	**0.74**	**0.51**
Maximum			**7.64**	**12800**	**399**	**1738**	**151**	**240**	**10000**	**0.1**	**4.1**	**3.6**	**150**	**236**	**1910**	**72**	**310**	**0.66**	**0.002**	**24**	**6.23**
Average			**6.08**	**7208.95**	**7.30**	**91.89**	**126.67**	**143.72**	**2621.37**	**0.08**	**3.74**	**2.63**	**82.19**	**126.36**	**1199.65**	**47.44**	**177.83**	**0.12**	**0.00**	**8.26**	**0.78**
	Dec-11	DPL5																			
	Mar-12	DPL5							14				0.5	1	9.1	<5	5.9		<0.005	2.51	<0.01
	30/05/2012	DPL5	4.7	92	4.6	386															
2011/2012 AEMR	Jun-12	DPL5	4.8	81	6.6	347	2	1	17				0.6	1.3	9.2	<5	4.3		<0.005	1.01	<0.01
	26/07/2012	DPL5	4.7	92	3.7	313															
	27/08/2012	DPL5	4.6	103	3.4	292															
	27/09/2012	DPL5	4.5	102	2.6	266	<1	<1	19				0.7	1.4	10	<5	8.5		<0.005	0.89	<0.01
	29/10/2012	DPL5	4.4	108	2.2	288															
	Dec-12	DPL5							18				0.6	1.2	5.9	<5	3.5		<0.005	2.16	<0.01
2012/2013 AEMR	Mar-13	DPL5							12				0.5	1.3	8.2	<5	4		<0.005	0.09	<0.01
	Jun-13	DPL5							30				0.7	1.9	0.7	<5	8.2		<0.005	0.31	<0.01
	Sep-13	DPL5							640				13	40	243	9			<0.005	15	0.14
	12/12/2013	DPL5	4.8	334	2.3	106	3	2	89				2.3	7.2	7.2	<5	15		<0.005	4.81	0.04
	29/01/2014	DPL5	4.9	314	4.2	161															
	24/02/2014	DPL5	4.1	337	4.1	255															
	31/03/2014	DPL5	5	359	3.3	107	2	1	110				2.4	6.3	6.3	<5	12		<0.005	3.52	<0.01
2013/2014 AEMR	24/04/2014	DPL5	4.7	110		84															
	28/05/2014	DPL5	4	239		313															
	25/06/2014	DPL5	3.6	566	2.1	375	<1	<1	140				4.2	9.9	64	<5	9.8		<0.005	1.73	0.05
	30/07/2014	DPL5	3.7	639	4.6	238	<1	<1	140				13	11	69	<5	47	3.96	<0.005	2	0.11
	29/08/2014	DPL5	3.9	678	2.7	215	NP	NP	170				4.9	12	75	<5	16		<0.005	11	0.03
	29/09/2014	DPL5	3.8	942	1.8	247															
	28/11/2014	DPL5	4.9	706	2.7	105															
	15/12/2014	DPL5	5.2	801	2	115	5	3	220				6.2	15	110	<5	11	0.3	<0.005	14	0.08
	22/01/2015	DPL5	5	811	3.8	160															
	25/02/2015	DPL5	4	433	6.2	178															
Appendix of 2015 AEMR	26/03/2015	DPL5	4.8	1066	3.9	144	2	2													
	24/04/2015	DPL5	3.7	963	4.8	257															
	28/05/2015	DPL5	3.8	611	2.5	325															
	17/09/2015	DPL5	3.9	844	2.4	205	NP		220			0.18	5.5	9.6	113	<5	23	0.67	<0.001	1.4	0.055
	21/10/2015	DPL5	4.3	676	5.4	189															
	25/11/2015	DPL5	5.2	390	6	135															
	11/12/2015	DPL5	5.4	310	2.3	151	7	7	80				2.2	3.9	41	<5	12	0.13	<0.001	7.21	0.027
	25/01/2016	DPL5	5.6	376	3.1	113															
	24/02/2016	DPL5	5.6	335	2.9	76															
	24/03/2016	DPL5	5.3	412	2.4	186	6	6	112				2.99	3.88	42.05	<5	13.372	0.148	<0.001	4.597	0.022
	29/04/2016	DPL5	4.6	285	6.2	259															
	24/05/2016	DPL5	4.5	300	4.7	195															
Appendix of 2016 AEMR	30/06/2016	DPL5	4.3	385.7	2.9	271															
	21/07/2016	DPL5	4.4	321.5	5.2	297															
	31/08/2016	DPL5	4.4	348	4.4	230	<1		89				2.2	2.8	57	<5	28		0.001	11.2	0.012
	29/09/2016	DPL5	4.4	399	2.5	285															
	27/10/2016	DPL5	4.4	399	2.5	285															
	29/11/2016	DPL5	5.4	5.4	1.6	74															
	20/12/2016	DPL5	5.2	298	3.3	244.5	5		50				2.3	2.8	47	<5	21		0.001	4.55	0.012
	30/01/2017	DPL5	5.2	260																	
	27/02/2017	DPL5	5.5	244																	
	22/03/2017	DPL5	5.1	300			<5		63	0.1	1	0.1		2	55	1	22	0.2	<0.001	1.5	0.009
	19/04/2017	DPL5	5.1	203																	
	17/05/2017	DPL5	5.1	226																	
	14/06/2017	DPL5																			
Q1 2017 Env Monitoring report	12/07/2017	DPL5	5.2	189																	
	9/08/2017	DPL5	5.1	200																	
	6/09/2017	DPL5	5.2	179			8		26	<0.05	1.3	0.055		<0.5	35	0.7	18	0.54	<0.001	0.23	<0.005
	4/10/2017	DPL5	5.3	188																	
	1/11/2017	DPL5	5.3	197																	
	29/11/2017	DPL5	5	480																	
	28/12/2017	DPL5	4.5	2200			<5		640	<0.05	0.6	0.24		41	450	6.8	79	2.4	<0.001	7.2	0.11
	24/01/2018	DPL5	4.42	2470																	
	21/02/2018	DPL5	4.53	1392																	
	21/03/2018	DPL5	4.58	1461			11		370	<0.05	0.4	0.14		25	230	5.1	59	1.2	<0.001	4.2	0.066
	18/04/2018	DPL5	4.88	266																	
	16/05/2018	DPL5	4.78	486																	
2018 Env Monitoring	13/06/2018	DPL5	4.69	406			<5		96	<0.05	0.4	0.098		4.8	66	2.1	15	0.28	<0.001	2.1	0.019
	11/07/2018	DPL5	4.73	623																	
	8/08/2018	DPL5	4.61	252																	
	5/09/2018	DPL5	4.67	1880			4		112			0.12		7	58	2	14	0.36	<0.001	3.11	0.0029
	5/10/2018	DPL5	4.96	201																	
	6/11/2018	DPL5	4.99	296																	
	7/12/2018	DPL5	4.84	437		-112.6	2		156			0.16		8	80	2	20	0.31	<0.001	3.66	0.039
	8/01/2019	DPL5	5.13	259.66	12.15	-36.9															
	5/02/2019	DPL5	4.62	1140.4	0.43	-40.9															
	8/03/2019	DPL5	9.89	3168	48	-82.4		4	100				2	5	16	2		0.23	<0.001		0.02
	5/04/2019	DPL5	4.63	1280	0.3	NR															
	7/05/2019	DPL5	6.41	5623	9.5	121															
2019 Env Monitoring	4/06/2019	DPL5	4.43	2310	0.6	2.4		<1	657				1	41	337	7		1.81	<0.001		0.127
	4/07/2019	DPL5	6.41	563	9.5	121															
	1/08/2019	DPL5	4.5	1780	10	46		<1	940				15	56	462	10		2.23	<0.001		0.212
	26/09/2019	DPL5	4.35	657	5.3	-14.4															
	24/10/2019	DPL5	4.63	2380	10.8	61															
	22/11/2019	DPL5	4.63	2200	11.6	66.1		<1	888				14	55	54	10		1.74	<0.01		0.16
	20/12/2019	DPL5	5.71	22	43.1	59.7															
	17/01/2020	DPL5	4.5	2040	8.4																
	14/02/2020	DPL5																			
	18/03/2020	DPL5	4.65	4140	0.84	-89			1500			0.37		96	830	26	180	3.8	0.0009		0.54
	16/04/2020	DPL5	7.92	1770	1.03	63															
	14/05/2020	DPL5	4.15	1210	0.3	147															
2020 Env Monitoring	11/06/2020	DPL5	4.29	847	1.01	333			280				7.7	17	160	4.8	56	0.57	0.001		0.081
	9/07/2020	DPL5	4.3	642	0	380															
	24/09/2020	DPL5	5.68	149	0				25			0.03	5	5	19	5	5	0.17	0.001		
	8/10/2020	DPL5	6.54	123	0.31	184															

	9/11/2020	DPL5	6.24	285	0				110			1.79	21	9	46	1.8	20	0.18	0.001		0.011
	10/12/2020	DPL5	6.62	4.83	0	-216															
	11/01/2021	DPL5	5.67	256	4.99	-94															
	11/02/2021	DPL5	7.3	406	0.22	-108		20	120			0.2	5	5	72	5	72	0.24		1.3	0.02
	15/03/2021	DPL5	5.3	266	0.2	15															
	13/04/2021	DPL5	5.6	349	1.5	220															
	11/05/2021	DPL5	5.4	248	0.2	78		20	42			0.05	0.9	1	40	1.4	28	0.38		0.63	0.005
	10/06/2021	DPL5	5	364	0																
2021 Env Monitoring	8/07/2021	DPL5	5.2	317	0																
	9/08/2021	DPL5	5	386	0	182		20	71			0.07	1.4	2.5	55	2.1	34	0.45		0.49	0.01
	9/09/2021	DPL5	4.6	207	0	234															
	11/10/2021	DPL5	4.6	247	0	161															
	11/11/2021	DPL5	5.9	259		79		20	83			0.16	3.4	6.1	56	2.9	16	0.23		3.8	0.017
	13/12/2021	DPL5	5.3	384	0.3	17															
	12/01/2022	DPL5	5	487	0.4	64		20	110			0.17	1	2.3	77	3.8	28	0.2		0.71	0.024
	9/02/2022	DPL5	5	405	0	51															
	14/03/2022	DPL5	5	1930	0	95															
	13/04/2022	DPL5	4.4	2660	0	25		20	1200			0.86	22	77	600	17	110	2.3		14	0.54
	11/05/2022	DPL5	4.7	2570	0.3	108															
	9/06/2022	DPL5	4.4	4650	0.3	68															
2022 Env Monitoring	11/07/2022	DPL5	4	2370	1.58			20	810			0.54	25	53	390	11	42	1.8		15	0.38
	10/08/2022	DPL5	3.7	2460	0.6	270															
	13/09/2022	DPL5	3.7	2580	0.2	393															
	13/10/2022	DPL5	3.9	2160	0.4	194		580	610			0.59	13	29	280	6.8	37	0.78		12	0.18
	14/11/2022	DPL5	4.9	1700	0.4	81															
	14/12/2022	DPL5	4.5		0.3																
	12/01/2023	DPL5	4.1	890	0	123															
	13/02/2023	DPL5	4.5	1170	0.03	115		20	630			0.65	12	37	290	11	57	1.2	0.001	9.5	0.28
	15/03/2023	DPL5	4.35	2080	0.5	121															
	11/04/2023	DPL5	5.8	8530	0.3	-55															
	11/05/2023	DPL5	3.7	822	2.5	329															
2023 Env Monitoring	14/06/2023	DPL5	3.8	761	0.3	405		20	390			0.3	10	24	210	5.6	29	1.6	0.001	1.2	0.14
	11/07/2023	DPL5	3.7	919	1.1	392															
	8/08/2023	DPL5	3.7	2200	0	346		20	450			0.38	9.5	24	270	7.9	54	1.3	0.001	0.42	0.14
	11/09/2023	DPL5	3.7	2027	0	344															
	12/10/2023	DPL5	3.7	2001	0	351															
	13/11/2023	DPL5	3.6	1870	0	297															
	12/12/2023	DPL5	6.5	7300	0	27		20	300			0.28	7.7	20	160	4.8	28	0.2	0.001	10	0.099
	11/01/2024	DPL5	5.6	1010	0	124															
	13/02/2024	DPL5	4.8	1040	1.3	152		20	310			0.24	7.7	19	170	5.1	6.5	0.58	0.001	1.2	0.13
	25/03/2024	DPL5	5.2	1050	0	156															
	11/04/2024	DPL5	5.4	1045	0.1	134															
	8/05/2024	DPL5	4.2	820	1.6	261															
2024 Env Monitoring	12/06/2024	DPL5	5.2	710	0.1	221		20	210			0.27	2.7	6.1	130	4.5	41	0.33	0.001	1	0.059
	11/07/2024	DPL5	5.7	728	0.1	218															
	13/08/2024	DPL5	4.2	405	0	200															
	11/09/2024	DPL5	4.9	471	0	162		33.4	100			0.1	2.3	3.8	90	2.9	92	0.2	0.001	0.62	0.029
	10/10/2024	DPL5	5.8	425	0	67															
	12/11/2024	DPL5	5.6	462	0	84															
	11/12/2024	DPL5	5.1	653	0.1	108		20	300			0.8	9.3	40	220	12	270	1.2	0.001	0.5	0.28
No of Samples			**133**	**132**	**106**	**100**	**12**	**24**	**49**	**1**	**5**	**27**	**41**	**48**	**49**	**32**	**44**	**36**	**14**	**41**	**40**
Minimum			**3.6**	**4.83**	**0**	**-216**	**2**	**1**	**12**	**0.1**	**0.4**	**0.03**	**0.5**	**1**	**0.7**	**0.7**	**3.5**	**0.13**	**0.0009**	**0.09**	**0.0029**
Maximum			**9.89**	**8530**	**48**	**405**	**11**	**580**	**1500**	**0.1**	**1.3**	**1.79**	**25**	**96**	**830**	**26**	**270**	**3.96**	**0.001**	**15**	**0.54**
Average			**4.87**	**994.33**	**3.07**	**164.82**	**4.75**	**38.31**	**283.04**	**0.10**	**0.74**	**0.33**	**6.42**	**17.79**	**141.34**	**6.22**	**38.07**	**0.95**	**0.00**	**4.45**	**0.11**
	Dec-11	DPL6							14				2.7	3.6	4.9	<5	37		<0.005	9.48	0.02
	Mar-12	DPL6							14				3.3	4.5	8.4	<5	42		<0.005	17	0.02
	30/05/2012	DPL6	3.8	302	1	464															
2011/2012 AEMR	Jun-12	DPL6	4	324	2.8	345	<1	<1	14				7.3	12	10	<5	104		<0.005	17	0.11
	26/07/2012	DPL6	4.6	331	3.3	14															
	27/08/2012	DPL6	4.4	419	2	84															
	27/09/2012	DPL6	4.3	363	2.2	279	<1	<1	15				11	14	12	<5	130		<0.005	24	0.16
	29/10/2012	DPL6	4.4	425	4.9	127															
	Dec-12	DPL6							15				4.7	4.7	13	<5	63		<0.005	15	0.07
	Mar-13	DPL6							14				3.6	2.5	11	<5	34		<0.005	20	0.07
	Jun-13	DPL6							18				3.1	2.1	3.1	<5	40		<0.005	15	0.04
	Sep-13	DPL6							16				2.4	1.6	11	<5			<0.005	10	0.04
	12/12/2013	DPL6	5.2	162	4.4	42	10	6	20				4.5	1.5	1.5	<5	30		<0.005	10	0.06
	29/01/2014	DPL6	4.2	219	5.3	269															
2012/2013 AEMR	24/02/2014	DPL6	4.2	228	4.5	268															
	31/03/2014	DPL6	4.8	165	2.5	130	3	2	22				5.6	1.8	1.8	<5	34		<0.005	10.5	0.06
	24/04/2014	DPL6	5	156		162															
	28/05/2014	DPL6	3.8	198		343															
	25/06/2014	DPL6	3.2	497	6.1	440	<1	<1	17				7	4.5	16	<5	119		<0.005	13	0.2
	29/08/2014	DPL6	4.1	1764	4.9	191	NP	NP	40				45	23	16	9	958		<0.005	388	2.01
	29/09/2014	DPL6	3.5	1699	<1	302															
	28/11/2014	DPL6	4.5	1622	2.6	90															
	15/12/2014	DPL6	3.5	1700	<0.1	290	NP	<1	<3				134	26	24	10	768	10	<0.005	322	1.91
	22/01/2015	DPL6	4.1	1216	3.4	230															
	25/02/2015	DPL6	3.7	951	1.6	213															
Appendix of 2015 AEMR	26/03/2015	DPL6	4.2	1600	5.1	177	NP	NP													
	24/04/2015	DPL6	4.0	1558	2.5	226															
	28/05/2015	DPL6	3.9	2153	5.3	279															
	17/09/2015	DPL6	3.8	2219	2	220	NP		100			1.13	22	24	16	9	1490	147	<0.001	580	3.65
	21/10/2015	DPL6	3.6	2189	2	284															
	25/11/2015	DPL6	3.3	2264	1.7	226															
	11/12/2015	DPL6	3.4	2164	0.9	342	<1	<1	40				50	23	18	10	1520	104	0.011	291	3
	25/01/2016	DPL6	4.5	2056	1.1	52															
	24/02/2016	DPL6	4.4	2056	2.3	78															
	24/03/2016	DPL6	4.1	2031	1.5	183	<1	<1	23				55.48	23.88	17.76	10.27	1382.076	94.142	0.026	428	3.75
	29/04/2016	DPL6	3.9	1997	1.9	183															
	24/05/2016	DPL6	3.8	1974	2.8	199															
Appendix of 2016 AEMR	30/06/2016	DPL6	4.2	1810.2	3.3	275															
	21/07/2016	DPL6	3.5	1731.9	1.3	338															
	31/08/2016	DPL6	3.7	1783	3.8	262	<1		790				24	22	14	<5	1100		0.001	241	1.96
	29/09/2016	DPL6	3.8	1738	1.9	189															
	27/10/2016	DPL6	3.8	1738	1.9	189															
	29/11/2016	DPL6	3.8	3.8	2.3	182															

	20/12/2016	DPL6	3.7	1752	2.1	274.7	<1		<1				21	33	16	9	1080		0.001	259	1.96
	30/01/2017	DPL6	3.6	1745																	
	27/02/2017	DPL6	3.8	1653																	
	22/03/2017	DPL6	3.8	1710			<5		17	0.3	2.5	0.54		21	14	10	1200	59	0.004	370	1.9
	19/04/2017	DPL6	3.9	1540																	
	17/05/2017	DPL6	3.8	1580																	
Q1 2017 Env Monitoring report	14/06/2017	DPL6	3.7	1380			<5		17	0.2	1.6	0.59		17	14	11	990	43	0.003	300	1.4
	12/07/2017	DPL6	3.9	1100																	
	9/08/2017	DPL6	3.9	1050																	
	6/09/2017	DPL6	3.7	977			<5		16	<0.05	1.6	0.51		11	12	8	370	17	0.002	180	0.93
	4/10/2017	DPL6	3.9	1030																	
	1/11/2017	DPL6	3.9	1000																	
	29/11/2017	DPL6	3.9	919																	
	28/12/2017	DPL6	3.9	822			<5		18	0.1	1.6	0.41		8.8	11	8	540	12	0.001	150	0.67
	24/01/2018	DPL6	3.88	866																	
	21/02/2018	DPL6	3.84	822																	
	21/03/2018	DPL6	3.94	655			<5		20	11	1.3	0.3		7.1	11	7.3	410	8.2	0.001	120	0.45
	18/04/2018	DPL6	4.03	472																	
	16/05/2018	DPL6	3.98	469																	
2018 Env Monitoring	13/06/2018	DPL6	3.89	533			<5		25	11	1.4	0.52		5.2	11	6.5	320	6.7	<0.001	74	0.4
	11/07/2018	DPL6	3.92	463																	
	8/08/2018	DPL6	3.93	517																	
	5/09/2018	DPL6	3.82	600	6.82	14.5	<1		20	11		0.25		7	11	6	205	9.31	0.001		0.498
	5/10/2018	DPL6	3.99	641	8.8																
	6/11/2018	DPL6	4.02	634	14.1																
	7/12/2018	DPL6	4.01	618	3.2		<1		17	11		0.28		8	11	6	328	12.1	0.001	123	0.659
	8/01/2019	DPL6	4.07	607.54	10.04	39.9															
	5/02/2019	DPL6	4.07	653.15	0.25	-45.9															
	8/03/2019	DPL6	5.78	10190	0.19	-39.5		<1	18				11	8	11	6	293	9.51	<0.01	99.8	0.576
	5/04/2019	DPL6	3.98	655	0.3	NR															
	7/05/2019	DPL6	5.69	8160	0.6	0.1															
2019 Env Monitoring	4/06/2019	DPL6	3.9	611	0.4	25.6		<1	16				10	8	11	6	288	9.92	0.001	108	0.54
	4/07/2019	DPL6	5.69	8160	0.6	0.1															
	1/08/2019	DPL6	3.93	473	2.8	53.8		<1	17				8	6	10	4	231	8.03	<0.001	92.6	0.538
	26/09/2019	DPL6	3.93	109	0.8	-19.9															
	24/10/2019	DPL6	4.94	393	24.3	<0.1															
	22/11/2019	DPL6	3.96	463	2.5	36.9		<1	16				7	6	12	6	187	3.21	<0.01	45	0.225
	20/12/2019	DPL6	4.84	262	35.9	80.6															
2020 Env Monitoring	17/01/2020	DPL6	4.7	249	7.7																
	14/02/2020	DPL6	4.09										4	4	9	5	127	4.35	0.001	54.8	0.275
	18/03/2020	DPL6	4.99	227	1.42	-39		19.9				0.98		2.1	7	3.6	73	0.8	0.0009	39	0.16
	16/04/2020	DPL6	5.11	2250	1.52	-26															
	14/05/2020	DPL6	4.74	207	0.34	-21															
	11/06/2020	DPL6	4.29	253	0	32		20					2.6	2.2	7.9	4.5	53	1.6	0.001	22	0.15
	9/07/2020	DPL6	4.46	302	0	54															
	10/08/2020	DPL6	4.31	520	0	-13															
	24/09/2020	DPL6	7.14	504	0.46			20				2.4	5	5	28	7.2	160	0.56	0.001	73	
	8/10/2020	DPL6	4.37	507	0	27															
	9/11/2020	DPL6	6.68	490	0.95			20				1.6	3.9	5.2	23	5	140	3.1	0.001	61	0.31
	10/12/2020	DPL6	6.18	498	1.34	-41															
	11/01/2021	DPL6	4.3	444	0	-58															
	11/02/2021	DPL6	4.3	334	0	-71		20	47			0.96	16	5	13	5	110	1.7		24	0.11
	15/03/2021	DPL6	4.6	214	1.5	89															
	13/04/2021	DPL6	4.8	234	0.1	3															
	11/05/2021	DPL6	4.8	243	0	47		20	21			0.9	7.3	2.1	10	3.5	65	0.56		22	0.13
	10/06/2021	DPL6	3.8	265	0																
2021 Env Monitoring	8/07/2021	DPL6	4.22	292	1.93	-12															
	9/08/2021	DPL6	4.1	286	0	71		20	18			0.97	24	21	74	3.9	83	1.5		19	0.11
	9/09/2021	DPL6	5.5	288	0	28															
	11/10/2021	DPL6	3.9	196	0	103															
	11/11/2021	DPL6	4.9	171		110		20	27			1	8.3	2.4	6.6	4	67	1.3		26	0.14
	13/12/2021	DPL6	4.9	163	0.3	1															
	12/01/2022	DPL6	4.6	139	0.5	36		20	21			0.62	2.1	1.4	13	3.1	41	0.47		2.6	0.084
	9/02/2022	DPL6	4.8	109	0	35															
	14/03/2022	DPL6	6.1	109	0	-24															
	13/04/2022	DPL6	5.8	175	0	-97		20	19			0.71	4.4	2.3	10	2.7	46	0.14		19	0.21
	11/05/2022	DPL6	5.5	162	0	4															
	9/06/2022	DPL6	4.8	139	0.2	21															
2022 Env Monitoring	11/07/2022	DPL6	4.6	157	0.6			20	36			0.56	4.2	2.3	10	3	43	0.57		24	0.16
	10/08/2022	DPL6	4.4	133	0	131															
	13/09/2022	DPL6	4	113	0	184															
	13/10/2022	DPL6	5.7	134	0.1	-61		20	25			1	2.1	1	9.2	2.2	26	0.12		13	0.07
	14/11/2022	DPL6	5.7	116	0.1	-62															
	14/12/2022	DPL6	5.5		0.1																
	12/01/2023	DPL6	5.2	69	0.1	-16															
	13/02/2023	DPL6	4.9	59	0	33		20	17			0.63	2.9	1	9.2	2.3	32	0.15	0.001	9.5	0.057
	15/03/2023	DPL6	5.1	102	0	-6															
	11/04/2023	DPL6	5.4	840	0.8	-57															
	11/05/2023	DPL6	4.7	76	1.6	1															
2023 Env Monitoring	14/06/2023	DPL6	5.8	73	0.2	-74		20	20			1.7	2.8	1.2	9.9	2.6	14	0.11	0.001	7.6	0..73
	11/07/2023	DPL6	4.9	93	0	59															
	8/08/2023	DPL6	4.4	296	0	48		20	18			0.89	7.3	3.5	28	7.3	95	0.61	0.001	16	0.2
	11/09/2023	DPL6	4.8	193	0	67															
	12/10/2023	DPL6	4.9	211	0	89															
	13/11/2023	DPL6	4.7	301	0.2	34															
	12/12/2023	DPL6	4.7	242	1.9	121		20	12			0.93	13	3.2	6.6	3.3	110	1	0.001	14	0.2
	11/01/2024	DPL6	5.1	235	0	86															
	13/02/2024	DPL6	5.1	259	0.1	48		20	10			0.83	11	4	7.6	4.1	93	1.2	0.001	30	0.23
	25/03/2024	DPL6	5.1	205	0	75															
	11/04/2024	DPL6	5.2	254	0	81															
	8/05/2024	DPL6	5.8	234	1.5	147															
2024	12/06/2024	DPL6	6.5	240	0.4	-43		49	16			9.2	5.5	1.9	11	5.9	33	0.27	0.001	12	0.09
	11/07/2024	DPL6	8.4	385	2	78															
	13/08/2024	DPL6	5.2	181	0	81															
	11/09/2024	DPL6	4.7	183	0	110		33.4	18			1.2	4.8	2.1	12	3.5	41	0.29	0.001	0.79	0.079
	10/10/2024	DPL6	4.8	168	0	38															
	12/11/2024	DPL6	6.1	155	8.7	25															

	11/12/2024	DPL6	5.9	200	0.1	-5		20	14			2.4	5.8	3.4	13	4.7	48	0.24	0.001	0.5	0.14
No of Samples			**135**	**133**	**108**	**99**	**2**	**22**	**44**	**7**	**6**	**28**	**42**	**51**	**51**	**39**	**50**	**37**	**25**	**50**	**49**
Minimum			**3.2**	**3.8**	**0**	**-97**	**3**	**2**	**10**	**0.1**	**1.3**	**0.25**	**2.1**	**1.0**	**1.5**	**2.2**	**14**	**0.11**	**0.0009**	**0.50**	**0.02**
Maximum			**8.40**	**10190**	**35.9**	**464**	**10**	**49**	**790**	**11**	**2.5**	**9.2**	**134**	**33**	**74**	**11**	**1520**	**147**	**0.026**	**580**	**3.75**
Average			**4.51**	**886.91**	**2.27**	**103.03**	**6.50**	**20.47**	**39.27**	**6.37**	**1.67**	**1.21**	**13.80**	**8.18**	**13.17**	**5.86**	**315.86**	**15.51**	**0.00**	**96.44**	**0.63**
	Dec-11	DPL7							680				**16**	**24**	451	36	207		<0.005	0.34	0.04
	Mar-12	DPL7							710				**16**	**24**	649	28	210		<0.005	0.28	0.03
	30/05/2012	DPL7	7.4	3451	3.6	241															
2011/2012 AEMR	Jun-12	DPL7	7.5	3446	5	249	550	336	700				17	36	561	30	214		<0.005	0.32	0.05
	26/07/2012	DPL7	7.4	3434	3.4	-15															
	27/08/2012	DPL7	7.6	3492	2.5	24															
	27/09/2012	DPL7	7.4	3385	2.1	154	430	256	730				15	32	530	28	226		<0.005	1.11	0.02
	29/10/2012	DPL7	7.2	3416	1.7	52															
	Dec-12	DPL7							730				16	34	673	29	203		<0.005	0.56	0.02
2012/2013 AEMR	Mar-13	DPL7							750				18	38	610	27	223		<0.005	0.72	0.05
	Jun-13	DPL7							740				16	36	16	25	274		<0.005	1.56	0.03
	Sep-13	DPL7							750				16	34	543	23			<0.005	1.2	0.05
	12/12/2013	DPL7	7.2	3341	4.1	52	390	238	750				18	38	38	26	249		<0.005	1.33	0.08
	29/01/2014	DPL7	7.3	3243	3.9	154															
	24/02/2014	DPL7	7.2	3151	2.4	231															
	31/03/2014	DPL7	7.2	3358	2.8	-2	410	250	720				19	39	39	26	253		<0.005	1.52	0.04
2013/2014 AEMR	24/04/2014	DPL7	7.5	3452		116															
	28/05/2014	DPL7	7.3	3468		297															
	25/06/2014	DPL7	4.6	69	2.3	320	1	<1	15				0.3	0.2	9.9	<5	4.2		<0.005	0.85	<0.01
	30/07/2014	DPL7	7.5	3414	3.5	126	390	240	760				19	41	656	27	261	0.41	<0.005	1.42	0.02
	29/08/2014	DPL7	7.5	3477	2.8	128	400	245	740				17	37	611	25	236		<0.005	1.88	0.01
	29/09/2014	DPL7	7.2	3436	4.9	173															
	28/11/2014	DPL7	7.1	3416	4.9	75															
	15/12/2014	DPL7	7.2	3340	2.3	100	400	243	780				22	43	685	29	211	0.34	<0.005	1.62	0.06
	22/01/2015	DPL7	7.1	3404	2.6	77															
	25/02/2015	DPL7	7.4	3396	4.5	30															
Appendix of 2015 AEMR	26/03/2015	DPL7	7.1	3446	3.1	78	420	423	780				18	38	651	26	250	0.51	<0.001	2.62	0.077
	24/04/2015	DPL7	7.5	3438	5.5	53															
	28/05/2015	DPL7	7.5	3417	6	161															
	17/09/2015	DPL7	7.3	3323	2.8	110	380		760			0.06	18	39	644	25	250	0.62	<0.001	2.53	0.025
	21/10/2015	DPL7	7.2	3330	3.5	144															
	25/11/2015	DPL7	7.2	3500	5.8	100															
	11/12/2015	DPL7	7.2	3371	2.7	214	380	380	770				17	37	644	24	272	0.04	0.0002	2.44	0.084
	25/01/2016	DPL7	7.1	3344	1.8	-36.00															
	24/02/2016	DPL7	7.2	3444	5.5	-60.00															
	24/03/2016	DPL7	7.2	3399	4.1	-9.00	363	363	738				18.21	38.01	637.38	26.08	260.218	0.356	<0.001	1.772	0.084
	29/04/2016	DPL7	7.4	3374	6.4	26.00															
	24/05/2016	DPL7	7.4	3382	5.5	-57.00															
Appendix of 2016 AEMR	30/06/2016	DPL7	7.4	3404.7	5.7	98.00															
	21/07/2016	DPL7	7.5	3159	6.5	-31.00															
	31/08/2016	DPL7	7.3	3364	3.7	-22.00	369		760				24	35	604	24	217		0.001	2.07	0.082
	29/09/2016	DPL7	7.2	3558	2.4	44.00															
	27/10/2016	DPL7	7.2	3558	2.4	44.00															
	29/11/2016	DPL7	7.1	7.1	2.4	20.00															
	20/12/2016	DPL7	6.9	3527	4.5	229.3	372		372				18	38	648	25	263		0.001	1.85	0.082
	30/01/2017	DPL7	6.9	3471																	
	27/02/2017	DPL7	7.1	3174																	
	22/03/2017	DPL7	7	3430			350		360	0.1	2.1	0.19		36	830	29	710	0.33	<0.001	1.8	0.076
	19/04/2017	DPL7																			
	17/05/2017	DPL7	6.9	3440																	
Q1 2017 Env Monitoring report	14/06/2017	DPL7																			
	12/07/2017	DPL7	7	3360																	
	9/08/2017	DPL7	7	3480																	
	6/09/2017	DPL7	7	3380			390		640	0.1	2.9	0.67		38	940	31	350	0.33	<0.001	1.3	0.065
	4/10/2017	DPL7	7	3450																	
	1/11/2017	DPL7	6.9	3440																	
	29/11/2017	DPL7	6.8	344																	
2017 Env Monitoring	28/12/2017	DPL7	6.9	3410			380		720	0.1	3.6	2.4		38	930	30	250	0.33	<0.001	1.4	0.063
	24/01/2018	DPL7	6.84	3450																	
	21/02/2018	DPL7	6.83	3310																	
	21/03/2018	DPL7	6.78	3650			400		710	0.2	3.7	2.3		41	750	30	250	0.37	<0.001	1.3	0.065
	18/04/2018	DPL7	6.88	3500																	
	16/05/2018	DPL7	6.89	3480																	
2018 Env Monitoring	13/06/2018	DPL7	6.89	3570			380		680	0.1	3.9	2.3		37	840	31	260	0.35	<0.001	1.6	0.072
	11/07/2018	DPL7	7.08	3220																	
	8/08/2018	DPL7	7.01	3510																	
	5/09/2018	DPL7	3.9	2680	57.6	391	393		783			2.06		40	651	26	232	0.49	<0.001		0.074
	5/10/2018	DPL7	6.88	3340	7.5																
	6/11/2018	DPL7	6.73	3530	4																
	7/12/2018	DPL7	6.76	3310	2.3	-112.6	395		749			2.08		39	635	25	278	0.5	<0.001	1.7	0.659
	8/01/2019	DPL7	6.75	3329.4	14.2	-90.7															
	5/02/2019	DPL7	6.74	3571.4	0.18	-1620															
	8/03/2019	DPL7	5.09	367	0.22	3.2		415					755	39	675	25	267	0.44	<0.01	1.63	0.072
	5/04/2019	DPL7	6.74	3460	0.6	NR															
	7/05/2019	DPL7	4.4	2320	0.7	0.1															
2019 Env Monitoring	4/06/2019	DPL7	6.68	3480	0.4	0.1		380					671	40	656	25	316	0.34	<0.001	1.57	0.078
	4/07/2019	DPL7	4.4	2320	0.7	0.1															
	1/08/2019	DPL7	6.88	3220	7.2	<0.1		393					639	38	607	22	265	0.51	<0.001	1.8	0.082
	26/09/2019	DPL7	7.35	3420	2.2	195															
	24/10/2019	DPL7	7.51	3590	1.3	0.1															
	22/11/2019	DPL7	6.71	3570	5.7	<0.1		388					803	39	637	24	264	0.48	<0.001	1.48	0.074
	20/12/2019	DPL7	6.82	3820	3.1	<0.1															
	17/01/2020	DPL7	7.25	3500	4.1																
	16/01/2020	DPL7																			
	14/02/2020	DPL7																			
	18/03/2020	DPL7	6.83	3110	0	-155		470	840			1.9		44	730	28	270	0.41	0.0009	1.5	0.077
	16/04/2020	DPL7	6.36	3070	1.58	8															
	14/05/2020	DPL7	6.82	2960	0	-63															
2020 Env Monitoring	11/06/2020	DPL7	6.78	2890	0	-46		790	700				18	37	600	23	280	0.5	0.002	0.5	0.05
	9/07/2020	DPL7	7.2	3190	0.5	-69															
	10/08/2020	DPL7	4.75	276	0	113															
	10/08/2020	DPL7	7.12	3290	0.59	-182100															

	24/09/2020	DPL7	6.99	3220	0			6100	650			2.1	16	33	550	23	290	0.29	0.001	1.4	
	8/10/2020	DPL7	7.27	3250	0	-94															
	9/11/2020	DPL7	7.49	3370	0			490	700			0.71	18	33	590	24	260	0.37	0.001	1.4	0.067
	10/12/2020	DPL7	6.79	3150	0	-228															
2021 Env Monitoring	11/01/2021	DPL7	6.82	3440	0	-249															
	11/02/2021	DPL7	7.43	3600	0.47	-152		440	670			1.6	18	34	590	24	320	1		1.2	0.069
	15/03/2021	DPL7	6.9	3290	0.1	-133															
	13/04/2021	DPL7	6.8	3490	0.1	-80															
	11/05/2021	DPL7	6.9	3460	0.4	-65		580	710			2.3	18	33	570	23	270	0.5		1	0.065
	10/06/2021	DPL7	6.8	4770	0																
	8/07/2021	DPL7	6.9	4600	0	-126															
	9/08/2021	DPL7	6.8	4420	0	-179		490	740			2.6	20	41	640	26	270	0.51		1.3	0.075
	9/09/2021	DPL7	6.8	2750	0	-60															
	11/10/2021	DPL7	6.9	2740	0	-99															
	11/11/2021	DPL7	7.6	2890	0	-62		380	780			2.4	14	32	590	24	270	0.5		1.3	0.068
	13/12/2021	DPL7	7	3170	0.3	-52															
2022 Env Monitoring	12/01/2022	DPL7	6.9	3180	0.2	-85															
	9/02/2022	DPL7	6.7	3470	0.1	-51		440	660			2.6	14	33	620	26	270	0.3		1.4	0.062
	14/03/2022	DPL7	7	3250	0	-67															
	13/04/2022	DPL7	6.9	3370	0	-76															
	11/05/2022	DPL7	7	3080	0.2	-60		580	680			2.6	17	35	620	25	240	0.5		1.6	0.065
	9/06/2022	DPL7	6.8	3060	0	-113															
	11/07/2022	DPL7	7.1	2990	0.3																
	10/08/2022	DPL7	6.8	2880	1.2	-10		540	650			2.2	15	30	530	22	220	0.33		1.7	0.064
	13/09/2022	DPL7	7.1	2890	0	-57															
	13/10/2022	DPL7	6.8	2890	0.1	-71															
	14/11/2022	DPL7	7.3	2910	0.1	-29		460	700			0.21	15	28	550	20	260	0.23		0.67	0.043
	14/12/2022	DPL7	7.3		0.1																
2023 Env Monitoring	12/01/2023	DPL7	6.9	1850	1.7	-42															
	13/02/2023	DPL7	7.1	1860	0	-45		410	680			0.87	15	34	560	23	280	1.1	0.001	1.5	0.063
	15/03/2023	DPL7	6.7	3090	0.2	6															
	11/04/2023	DPL7	7	1860	0.2	-69															
	11/05/2023	DPL7	6.8	1900	0.8	-41															
	14/06/2023	DPL7	7.2	1890	0.7	-81		390	620			2.3	16	33	580	23	250	0.5	0.01	1.4	0.069
	11/07/2023	DPL7	7	1930	0.5	-58															
	8/08/2023	DPL7	6.7	4690	0	-96		500	720			2.9	16	35	630	25	260	0.5	0.01	1.6	0.06
	11/09/2023	DPL7	6.7	3019	0	-81															
	12/10/2023	DPL7	6.8	2990	0	-93															
	13/11/2023	DPL7	6.8	3121	0	-84															
	12/12/2023	DPL7	7.6	3120	0.3	7		540	640			14	15	31	570	22	240	0.24	0.001	0.71	0.052
2024 Env Monitoring	11/01/2024	DPL7	7.4	2820	0	-30															
	13/02/2024	DPL7	7	3200	0.1	-15		470	570			2.3	20	40	620	28	290	0.29	0.001	1.5	0.077
	25/03/2024	DPL7	7.4	2390	0	-26															
	11/04/2024	DPL7	7.2	2943	0	-32															
	8/05/2024	DPL7	7.2	3021	0.1	-26															
	12/06/2024	DPL7	7.4	3470	0.7	26		460	620			0.1	18	35	660	24	230	0.24	0.001	1.2	0.052
	11/07/2024	DPL7	7	3520	0.9	22															
	13/08/2024	DPL7	6.4	2980	0	9															
	11/09/2024	DPL7	6.7	3070	0	0		680	720			0.22	17	35	620	27	240	0.23	0.001	0.99	0.052
	10/10/2024	DPL7	6.4	3400	0	-3															
	12/11/2024	DPL7	6.4	3362	0	-2															
	11/12/2024	DPL7	6.5	2790	0.4	87		330	460			0.71	13	26	440	22	180	0.13	0.001	0.61	0.08
No of Samples			**134**	**133**	**113**	**102**	**21**	**34**	**47**	**5**	**5**	**27**	**43**	**51**	**51**	**50**	**50**	**37**	**15**	**50**	**49**
Minimum			**3.9**	**7.1**	**0**	**-182100**	**1**	**238**	**15**	**0.1**	**2.1**	**0.06**	**0.3**	**0.2**	**9.9**	**20**	**4.2**	**0.04**	**0.0002**	**0.28**	**0.01**
Maximum			**7.6**	**4770**	**57.6**	**391**	**550**	**6100**	**840**	**0.2**	**3.9**	**14.0**	**803**	**44**	**940**	**36**	**710**	**1**	**0.010**	**2.62**	**0.659**
Average			**6.93**	**3138.97**	**2.34**	**-1790.51**	**378.24**	**590.88**	**678.45**	**0.12**	**3.24**	**2.10**	**81.85**	**35.06**	**586.50**	**25.78**	**258.31**	**0.42**	**0.00**	**1.36**	**0.07**