Strength. Performance. Passion

Holcim

ANNUAL REVIEW
1 January 2022 – 31 December 2022

Dunloe Sand Quarry

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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
Name of holder of Project Approval	Holcim (Australia) Pty Ltd
Annual review start date	January 1, 2022
Annual review end date	December 31, 2022

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 2022 - 31 DECEMBER 2022** 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	30/03/2023

1 STATEMENT OF COMPLIANCE

The statement of commitments for the 2022 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 2022 reporting period, with the compliance status key provided in **Table 2**.

Table 1: Statement of Commitments

Were all conditions of the relevant approval(s) complied with?	
PA 06_0030	Yes
EPL 13077	Yes

Table 2: DPE 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
Admin NC	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)

The site was fully compliant with PA 06-0030, therefore there are no impacts to report in 2022.

2 INTRODUCTION

The Dunloe Sand Quarry was granted Project Approval (PA06_0030) on 24 November 2008, with subsequent modifications to this approval granted on 28 August 2009 (Mod 1) and 6 November 2018 (Mod 2).

The Dunloe Sand Quarry operations are located approximately 4.5 km south-southwest of Pottsville on the Pottsville Mooball Road, New South Wales (NSW). The site is located adjacent to Mooball Creek, and is approximately 4 km upstream of the creek mouth. Surrounding properties are currently used for agricultural purposes including sugar cane farming and grazing.

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 GHD: 2017)

Figure 3: Environmental Monitoring Locations (Source: VGT)

Holcim commenced operations on the site on August 1, 2016 with all previous responsibilities falling under the management of Ramtech Pty Ltd (Ramtech). Ramtech have previously been 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 Project Approval (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;	Section 4 and 6
b) describe the works carried out in the last 12 months;	Section 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 9.3
e) include a summary of the monitoring results for the project during the past year;	Section 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.*	Section 6 and 7
g) identify any trends in the monitoring results over the life of the project;	Section 6 and 7 Appendix 2
h) identify any non-compliance during the previous year; and	Section 6, 7 and 11
i) describe what actions were, or are being, taken to ensure compliance.	Section 6, 7 and 11

This Annual Review has also 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 2021.

2.1 Name and Contact Details

The key contact details for the site are outlined below:

Quarry Manager

Matt Kelly
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Area Manager Aggregates NSW North

Chris Hamilton
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Acting Environment Manager - NSW

Rob Townsend
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3 APPROVALS

The site operates under the approvals listed in **Table 5.**

Table 5: Approvals for the Dunloe Sand Quarry Operations

Approval	Regulatory Authority
PA 06_0030	NSW Department of Planning, Industry & Environment (DPE)
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 6** outlines these licensing limits.

Table 6: 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 Annual Review period.

4.2 Land Preparation

There was no land clearing during the Annual Review period.

4.3 Construction Activities

There were no construction activities undertaken at the Dunloe Sand Quarry during the 2022 reporting period.

4.4 Quarry Operations

The Dunloe Sand Quarry officially commenced operations under Holcim on August 1, 2016.

Activities undertaken in 2022 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 undertaken 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.

Operating hours in 2022 were undertaken between 7am to 5pm, Monday to Friday and 7am-12pm on Saturdays. These timeframes were applied for all operations on-site with no works occurring outside the approved operating hours. All activities took place within the approved operating hours in 2022.

Table 7 includes a summary of the operations undertaken during the reporting period against the Project Approval conditions regarding product transported from the Dunloe Sand Quarry.

Table 7: Total Product Distributed (Dunloe Sand Quarry)

Material	Approval Limit (Tonnes/Annum)	2018 (Tonnes)	2019 (Tonnes)	2020 (Tonnes)	2021 (Tonnes)	2022 (Tonnes)	Proposed 2023 (Tonnes)
Product Distributed Total	300,000	174,583	186,280	156,918	127,515	175,010	199,859

The total production volume in 2022 was within the approved limits.

4.5 Next Reporting Period

Development activities proposed at the Dunloe Sand Quarry in 2023, include:

- 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 undertaken north-eastern area; and
- Load out and sales of topsoil, brickies loam and concrete sands to the local market.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

5.1 Actions from 2021 Annual Review – DPE Actions

Holcim did not receive a letter from DPE in response to the 2021 Annual Review.

5.2 Actions from 2021 Annual Review – Holcim Proposed Actions

Table 8 outlines the proposed actions for 2022 from the 2021 Annual Review and the works undertaken in 2022.

Table 8: Holcim Actions Proposed from 2021 Annual Review

Action from Previous Annual Review	Works Undertaken	Section of this Annual Review
Water Quality Monitoring Ensure all water quality monitoring is completed in accordance with the EMS, with a focus on correct monitoring frequencies.	The full water quality monitoring program was undertaken in 2022.	Section 7
Dust Monitoring Ensure dust monitoring is completed in accordance with the EMS. Holcim will liaise with the monitoring contractor to improve monitoring notes.	Continued improvement measure identified in 2019. The full dust monitoring program was completed in 2022. Depositional dust at DDG4 decreased significantly in comparison to 2020 and 2021.	Section 6.3
Biodiversity Weed spraying will continue at site during the next Annual Review period.	Weed control continued into 2022 and will continue in 2023.	Section 6.5
Biodiversity Annual fauna box monitoring continues.	Fauna box monitored continued in 2022. Routine monitoring took place in June.	Section 6.5
Biodiversity Rehabilitation monitoring continues as per the Rehabilitation and Revegetation Management Plan.	Rehabilitation and biodiversity monitoring was undertaken in conjunction. The site kept records of the results of this monitoring, tracking positive and negative results as well as emerging trends to inform management measures.	Section 6.5 and 8

6 ENVIRONMENTAL PERFORMANCE

6.1 Meteorological Monitoring

This report uses 2022 weather data collected from the Bureau of Meteorology's Ballina Airport station approximately 5km southeast of the site to provide a summary for the period. These meteorological results are presented in **Table 9.**

Table 9: Meteorological Monitoring Results 2022

Month	Total Rainfall (mm)	Minimum Temperature (°C)	Maximum Temperature (°C)
January	288.0	20.7	27.4
February	577.8	19.6	26.9
March	811.8	19.3	26.4
April	99.2	17.2	25.4
May	278.4	16.8	22.6
June	27.8	8.4	20.2
July	154.4	9.7	19.0
August	42.4	9.4	20.8
September	222.6	12.8	22.2
October	247.2	15.7	24.1
November	27.2	15.3	26.0
December	119.6	17.6	25.8
Annual TOTAL	2896.4		

6.2 Noise

6.2.1 EIS Predictions

The EIS (2007) stated that based on noise modelling the operations within the south west 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 in **Table 11.**

Table 10: Noise Impact Criteria for the Dunloe Sand Quarry (PA 06_0030)

2. 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 2022 by Muller Acoustic Consulting (MAC) on the following dates:

- 2 February 2022;
- 19 May 2022;
- 31 August 2022;
- 15 December 2022.

The compliance assessments for each receiver (R6, R7, and R8) are presented in **Table**. From September 2020, MAC began measuring at receivers R6, R7, and R8 to satisfy the commitment to monitor at these locations for two years following the approval of the Dunloe Sand Noise Management Plan.

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.

It should be noted Noise monitoring at location R7 conducted on 15 December 2022 resulted in inaudible quarry noise during the day. These results meet the established noise criteria and indicate that noise emissions from Dunloe Sands Quarry did not contribute to noise nuisance.

Table 11: Noise Monitoring Assessment for the Dunloe Sand Quarry 2022

Assessment Period	Receiver No.	Quarrying Noise Criteria LAeq (15min)	Q1 2022		Q2 2022		Q3 2022		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	<35	Compliant	<35	Compliant	<30	Compliant	<42	Compliant
	R7	42	<35	Compliant	<35	Compliant	<30	Compliant	<48	Compliant
	R8	48	<35	Compliant	<35	Compliant	<30	Compliant	<41	Compliant

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 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 25km/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.

6.2.5 Proposed Improvements

There are no further improvements proposed for noise management at the site. Dunloe Sand Quarry 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 12, Table 13** and **Table 14.**

Table 12: 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 13: Short Term Impact Assessment Criteria for Particulate Matter

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

Table 14: Long Term Impact Assessment Criteria for Particulate Matter

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

6.3.3 Key Environmental Performance

6.3.3.1 Depositional Dust

Dust deposition monitoring was undertaken at 4 locations during the 2022 reporting period (see **Table 15**).

Table 15: 2022 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	0.4	3.7	0.9	3.6
February	0.7	0.5	0.9	0.4
March	0.2	NS	2.2	1
April	0.4	0.5	0.3	0.4
May	0.4	1.2	0.5	3.2
June	0.4	0.4	0.4	1.8
July	0.3	0.3	0.3	2.8
August	0.2	0.2	0.3	1.6
September	0.2	0.2	0.1	0.7
October	0.1	0.1	0.1	0.1
November	0.1	0.2	0.6	0.2
December	0.1	0.3	0.1	0.1
Minimum	0.1	0.1	0.1	0.1
Maximum	0.7	3.7	2.2	3.6
Average	0.3	0.7	0.6	1.3
Result (compared to 4g/m$_2$/month)	**Within Criteria**	**Within Criteria**	**Within Criteria**	**Within Criteria**

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

The highest annual average at DDG4 “Black Rock” of 1.3 g/m2/month decreased significantly compared to the 2021 annual average (6.6g/m2/month) which exceeded the annual average criteria.

It should be noted that there was an invalidated sample taken at location DDG2 in March. This was due to a lost funnel that is suspected to have been affected by flood water.

A comparison of results from 2016 – 2022 has been undertaken in **Table 16**.

Table 16: Depositional Dust Monitoring Summary (2016-2022)

Depositional Dust Gauge	Monitoring Summary for Annual Review Period	Monitoring Period						
		2022	2021	2020	2019	2018	2017	2016
		(g/m^2/month)						
DDG1	Min. Insoluble Solids	0.1	0.2	0.1	0.1	0.1	0.1	0.13
	Max. Insoluble Solids	0.7	1.1	2.3	1.8	2.7	0.8	0.8
	Insoluble Solids Reporting Period Average	**0.3**	**0.4**	**0.89**	**0.7**	**0.6**	**0.4**	**0.4**
DDG2	Min. Insoluble Solids	0.1	0.1	0.4	0.2	0.1	<0.1	0.4
	Max. Insoluble Solids	3.7	0.9	3.6	1.8	0.7	0.9	4.7
	Insoluble Solids Reporting Period Average	**0.7**	**0.5**	**1.44**	**0.6**	**0.31**	**0.32**	**1.23**
DDG3	Min. Insoluble Solids	0.1	0.2	0.2	0.2	0.1	0.2	0.2
	Max. Insoluble Solids	2.2	2.5	1.3	1.6	1.6	2.4	1.6
	Insoluble Solids Reporting Period Average	**0.6**	**1.0**	**0.53**	**0.6**	**0.8**	**0.8**	**0.5**
DDG4	Min. Insoluble Solids	0.1	0.5	0.6	0.2	0.1	<0.1	0.3
	Max. Insoluble Solids	3.6	18.0	7.7	1.8	0.7	0.9	1.6
	Insoluble Solids Reporting Period Average	**1.3**	**6.6**	**2.94**	**0.9**	**0.4**	**0.4**	**0.6**

Long-term Trends:

The 2022 averages at all locations decreased from the 2021 averages with the exception of location DDG2 (0.7 g/m^2/month) which increased from the 2021 average (0.5 g/m^2/month). All locations are 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**).

6.3.3.2 PM_{10} Monitoring

PM_{10} monitoring is required to be undertaken in accordance with the criteria provided in **Table 13** and **Table 14.**

With the approval of the Dust Monitoring Program by the DPE 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 remained below 300,000 tonnes per annum in 2022 (production was 175,010 tonnes in 2022), therefore no PM_{10} monitoring was undertaken. This was also the case in the 2021, 2020 and 2019 reporting periods. Regardless of production volumes, the site has maintained dust suppression measures throughout the reporting period in accordance with the requirements of the EMS.

Long-term Trends

Trends relating to PM_{10} monitoring are outlined in **Table 17.**

Table 17: PM_{10} Monitoring Trends

Monitoring Summary	Monitoring Results 2022 Period (µg/m^3)	Monitoring Results 2021 Period (µg/m^3)	Monitoring Results 2020 Period (µg/m^3)	Monitoring Results 2019 Period (µg/m^3)	Monitoring Results January – July 2018 Period (µg/m^3)	Monitoring Results November and December 2017 Period (µg/m^3)
PM_{10} Reporting Period Average	NS	NS	NS	NS	24.9	10.97
Max. PM_{10}	NS	NS	NS	NS	125	35.9
Min. PM_{10}	NS	NS	NS	NS	2	1.2

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*, which were updated in this 2020 reporting period. 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 do not occur;
- 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. To facilitate dampening, a portable hose or water spray/sprinkler system has been installed. 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

Dunloe Sand Quarry continued to complete management measures and monitoring in accordance with the updated 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 outlined below:

Table 18: 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. No operations are to be undertaken on Sunday or public holidays.

Table 19: 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*

Truck speeds are limited to a maximum of 40km/hr within the site, with internal roads signposted to a 25-30km/h speed limit.

6.4.3 Key Environmental Performance

Schedule 2 Condition 8 of Mod 2 Project Approval extends truck movements to 24 movements per hour (12 trucks per hour).

Daily records of truck movements are recorded by Holcim.

6.4.4 Management Measures

Management measures relating to transport management 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 (24 in, 24 out);
- 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 proposal, 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 (October 2021).

DPE approved the Landscape Management Plan on 10 May 2022.

6.5.3 Key Environmental Performance

There were no biodiversity issues identified during the Annual Review period.

Weed control continued in 2022 and will continue in 2023 to control weed growth in established rehabilitation.

Biodiversity and rehabilitation monitoring was undertaken throughout 2022 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. The main findings were that vegetation performance was satisfactory.

Routine monitoring took place in April, June and November 2022. Common weeds which have been established within the rehabilitation zones include Senna, Ground Asparagus and Lantana. Weed control has been undertaken in each zone to manage and eradicate these weeds. It should be noted that the rehabilitation zones are on-track to achieve planned rehabilitation however, there were flooding rains in February and March which contributed to a very wet growing season.

In 2020, 2021 and 2022 it was found that the use of nest boxes by fauna was limited. In 2022 there were no signs that native fauna was using the boxes.

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 next 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 the updated Environmental Management Strategy will continue to occur in the 2023 report period. Biodiversity management measures will continue in 2023 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 suspected of Aboriginal heritage significance was reviewed in 2018 with the assistance of Aboriginal Groups. It was not found to be an area of heritage significance. No quarrying activity occurred in 2020 in this area. Excavations in 2018 and 2019 were conducted in accordance with Condition 32(c) of Schedule 3 of the Approval. No Aboriginal objects or places were identified in these activities as is reported in the *Aboriginal Cultural Heritage Assessment Report – Dunloe Sand Quarry, Pottsville, NSW* (RPS 2019).

The Dunloe Sand Quarry Aboriginal Cultural Heritage Management Plan (ACHMP) manges Aboriginal heritage . The site continued to act in accordance with the ACHMP in this report 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 2022.

6.7 Acid Sulphate Soils Management and Management of Fines

Holcim undertakes fines management in accordance with Schedule 3 of Conditions 10 and 11, Project Approval 06_0030, in the following manner:

> *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.*
>
> *11. The Proponent shall ensure that all potential acid suphate 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 in advance of extraction. A sand core drilling program was undertaken in 2016, in accordance with the site's Environmental Management Strategy, for an area of extraction required for the following 2-3 years. The drilling program was developed and undertaken in line with the following activities:

1. A minimum of 2 sand cores are drilled per hectare;
2. All samples are sent to Soil Surveys Australia Pty Ltd for immediate testing in accordance with the ASSMAC Guidelines;
3. Soil Surveys Australia Pty Ltd (NATA Accredited lab) test results provided a volume per m^2 for lime to be seeded across each hectare before stripping takes place;
4. Lime was spread across the reserve and then stripped to expose the loam and sand product; and
5. 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). Further to the 2016 monitoring program, acid sulphate soils monitoring was completed in 2020 in accordance with Acid Sulphate Soil Identification and Treatment procedures.

Monitoring continued into 2022 and found there was no impact resulting from operations of the project.

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) as per the criteria listed in EPL 13077 and reproduced in **Table 20.** LDP001 refers to Silt Pond discharge and monitoring point (Point 1) and LDP002 refers to Dredge Pond discharge and monitoring point (Point 2).

Table 20: 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 for the discharge of TSS, pH or Oil and Grease from LDP001 or LDP002 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 must take all practical measures to avoid or minimise TSS, pH and Oil and Grease exceedances in wet weather discharges.

Table 21: 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

Special Frequency 1 means: 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 T**able 22**, **Table 23** and **Table 24)** Other sampling criteria and commitments from the EMS are outlined within **Tables 25-29**.

Table 22: Monthly Surface Water Quality Criteria – Dam 1 and Dam 2

Parameter	Interim Target Criteria	Baseline monitoring 9/06-8/07
pH	5.0 – 8.5	3.55-8.44 (6.49)
Electrical Conductivity (EC)	<5.50 mS/cm	0.286 - 45mS/cm (11.930mS/cm)
Dissolved Oxygen (DO)	>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	

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

Quarterly monitoring

Quarterly monitoring shall include the above parameters as well as the parameters listed in the table below.

Parameter	Interim Target Criteria	Baseline monitoring 9/06-8/07
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	-
Chloride	285 mg/L	15-3500 (356)mg/L
Sulphate	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 ug/L	0.03-43 (6.12) ug/L
Chlorophyll a	2-10 ug/L	2-10 ug/L

Table 24: 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 mm3/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 at the site in accordance with the criteria listed in **Table 26**.

Table 25: 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 26: 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 the requirement to monitor water quality from the five groundwater bores installed on site annually as per the criteria listed in EPL 13077 and reproduced in **Table 28.**

Table 27: 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 also has a commitment to complete monthly groundwater monitoring within the surrounding environment in accordance with the criteria listed in **Table 29**.

Table 28: Monthly Groundwater Quality Criteria – Surrounding Environment

Monthly Monitoring

Parameter	Interim Target Criteria	Baseline Monitoring 9/06-8/07 Range (mean)
pH	4.2 – 7.0	3.58-7.54 (5.43)
Electrical Conductivity (EC)	<2.0 mS/cm	0.07-6.47 (1.24)
Dissolved Oxygen (DO)	>1.50 mg/L	0.16 – 4.83 (0.84)
REDOX Potential	Maximum (mg/L)	
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 29: Quarterly Groundwater Quality Criteria – Surrounding Environment

Parameter	Interim Target Criteria	Baseline monitoring 9/06-8/07
Calcium	55	0.7-114 (26)
Manganese	0.15	0.01 – 0.56
Magnesium	40	0.8 – 173.0 (20)
Sodium	280	7-1770 (213)
Potassium	17.5	0 – 71 (12)
Bicarbonate	400	-
Chloride	285	15-3500 (356)
Alkalinity	185	0-534 (109)
Sulphate	175	9-753 (100)
Aluminium	0.75	<0.01-4.96 (0.50)
Arsenic	0.005	<0.005 – 0.027 (0.01)
Iron	7.5	0.03-43 (6.12)

7.3 Surface Water Monitoring

It should be noted that there were no surface water discharges in 2022 therefore criteria related to **Table 22** have not been triggered. Therefore, any exceedances of criteria discussed below, do not trigger a non-compliance, they are provided for discussion of site conditions during the reporting period only.

A summary of results obtained from monthly sampling in the ponds is provided in **Table 30**.

Table 30: Monthly Dredge Pond (Dam 1) and Silt Pond (Dam 2) Water Quality Monitoring 2022 Results

Parameter	Interim Target Criteria	Dredge Pond (Dam 1)			Silt Pond (Dam 2)		
		Min	Max	Average	Min	Max	Average
pH	6.5-8.5	**3.9**	8.3	**5.8**	4.3	8.9	7.1
EC (uS/cm)	<2000	56	652	145	94	703	178
DO (mg/L)	>4	4.5	8.7	6.3	4.4	7.7	6.3
Turbidity (NTU)	<20	3.1	**334**	**91**	10.9	266	95
Oil and Grease (mg/L)	10	5	**13**	6.8	2.6	44	11.6

The Dredge Pond did not meet the target criteria for pH, with an annual average of 5.8. The Silt Pond did meet the target criteria, with an average of 7.1. However, during June and July pH was below criteria with a pH of 6.3 and 4.3, respectively.

The Dredge Pond and Silt Pond did not have any Electrical Conductivity exceedances during the 2022 reporting period.

There were multiple exceedances for Turbidity at the Dredge Pond location with the maximum exceedance of 334 NTU in September. As a result, the annual average did not meet the target criteria for turbidity with an average of 91 NTU. The Silt Pond location also had multiple exceedances with the maximum exceedance of 266 NTU and an average of 95. The Dredge Pond nor Silt Pond did not meet the target criteria.

Oil and grease levels at both the Dredge Pond and Silt Pond saw high maximums in 2022. However The Dredge Pond location still was within the target criteria. The Slit Pond had an average of 11.6 mg/L and does not meet the target criteria**.**

Long-term monitoring results for the Dredge Pond and Silt Pond from the 2018 to the 2022 reporting periods are presented in **Table 32.**

Table 31: Long-term 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)			
			2018	2019	2020	2021	2022	2019	2020	2021	2022
pH	6.5-8.5	3.55-8.44	**4.2**	**4.4**	**4.2**	**5.7**	**5.8**	6.9	**5.2**	**6.3**	7.1
EC (uS/cm)	<2000	286-450	388.0	545.0	573.1	604.8	145	508.0	645.3	834.1	178
DO (mg/L)	>4	0.81-7.49	22.4	35.7	6.4	7.2	6.3	33.3	6.7	6.5	6.3
Turbidity (NTU)	<20	3.0-67.0	5.3	7.5	12.1	12.0	**91**	12.2	83.7	17.9	**95**
Oil and Grease (mg/L)	10	-	<5	<5	7.1	11.2	6.8	5.0	6.9	12.2	**11.6**

As seen in the comparison of 2018 to 2022 in **Table 32** the Dredge Pond has been consistently acidic and has not reached target criteria levels. There was an increase in pH annual average at the Silt Pond in this reporting period. The 2022 average did reach criteria levels. It should be noted pH levels in pH fell within the pH baseline values.

There has been a significant decrease in average EC levels in both the Dredge Pond and the Silt Pond in comparison to previous years. However, the 2022 average still met criteria levels.

Dissolved oxygen levels were consistent with those seen in 2020 and 2021 at both the Dredge Pond and Silt Pond. The DO levels are above the target criteria (>4 mg/L) and consistent with the baseline levels from 2006 and 2007.

The 2022 average for turbidity at the Dredge Pond and the Slit Pond increased significantly and was not consistent in comparison to previous years. The turbidity are above the target criteria <20 NTU and are not consistent with the baseline levels.

Oil and grease levels have decreased at the Dredge Pond and more comparable with the 2020 annual average and are within the target criteria. The Slit Pond oil and grease levels have also slightly decreased from the 2021 average, however it is still above previous years and not within the target criteria.

A summary of the long-term chemical analysis results from years 2018 to 2022 is provided in **Table 33**.

Table 32: Long-term Chemical Analysis Monitoring Results

Parameter (mg/L)	Interim Target Criteria	Baseline Target (2006/07)	Dredge Pond (Dam 1)					Silt Pond (Dam 2)			
			2018	2019	2020	2021	2022	2019	2020	2021	2022
Manganese	**0.15**	**0.01-0.56**	0.3	0.3	0.2	0.2	0.2	0.1	0.3	0.2	0.1
Magnesium	**40**	**0.8-173.0**	6.0	10.0	10.2	20.0	3.7	10.0	10.0	11.3	4.0
Sodium	**280**	**7-1,770**	24.0	45.0	45.3	50.8	16.1	42.0	45.0	50.8	18.2
Potassium	**17.5**	**0-71**	3.7	4.8	4.8	4.5	2.3	4.0	4.7	4.0	2.4
Bicarbonate	**400**	**-**	-	1.0	21.7	20.0	98.8	12.0	20.0	20.0	110
Chloride	**285**	**15-3,500**	42.0	79.0	85.7	92.3	29.7	72.0	92.5	93.8	31.7
Sulphate	**175**	**9-753**	114.0	170.0	185.3	210.0	79.3	163.0	210.0	212.5	85.7
Aluminium	**0.75**	**<0.01-4.96**	0.7	0.8	1.1	0.1	0.26	0.2	1.2	0.3	0.3
Arsenic	**0.005**	**<0.005-0.027**	Not detected	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Iron (Dissolved)	**7.5**	**0.03-43**	0.1	0.3	0.4	0.1	0.1	0.1	0.2	0.2	0.1
Chlorophyll a	**2-10**	**2 - 10**	-	1.0	5.7	6.0	5.0	4.0	5.0	5.8	5.0

Results obtained from quarterly chemical analysis of extraction pond water shows results to be generally in accordance with the baseline criteria and interim target criteria of the EMS. Magnesium, sodium, potassium, chloride, sulphate, saw a decrease in 2022 compared to previous years however, were within the target criteria and consistent. Arsenic and Iron had 2022 results similar to previous years and remained within the target criteria.

Bicarbonate and aluminium a remained within the target criteria but saw an increase in 2022 compared to previous years.

Manganese was above the target criteria in 2022 and 2021 at the Dredge Pond and Silt Pond but did not exceed the baseline upper value.

Results for the Quarterly Vertical Profile for Dam 1 and Dam 2 commitments outlined in **Table 25**, is shown below in **Table 34** and **Table 35**.

Table 33: Quarterly Vertical Profile Results for Dam 1

Parameter	Unit of Measure	Objective Values	Dredge Pond - Dam 1			
			Quarter 1 2022	Quarter 2 2022	Quarter 3 2022	Quarter 4 2022
Faecal coliforms	Median No./1000mL	<1000 CFU/100mL	10.00	140.00	10	10
Enterococci	Median No./1000mL	<230 CFU/100mL	10	230	10	10
Soluble iron	mg/L	20	0.05	0.14	0.13	0.11

Ammonium ion	mg/L	20	0.02	0.12	0.03	0.01
Soluble aluminium ion	mg/L	0.5	0.05	0.11	0.5	0.11

Table 34: Quarterly Vertical Profile Results for Dam 2

Parameter	Unit of Measure	Objective Values	Silt Pond - Dam 2			
			Quarter 1 2022	Quarter 2 2022	Quarter 3 2022	Quarter 4 2022
Faecal coliforms	Median No./1000mL	<1000 CFU/100mL	10	10	10	180
Enterococci	Median No./1000mL	<230 CFU/100mL	10	30	20	10
Soluble iron	mg/L	20	0.09	0.09	0.19	0.05
Ammonium ion	mg/L	20	0.03	0.14	0.04	0.06
Soluble aluminium ion	mg/L	0.5	0.05	0.35	0.86	0.05

Results from the vertical profile monitoring at Dams 1 and 2 show that these water bodies generally did not exceed these parameters. Soluble aluminium was exceeded on one occasion during Quarter 3. Results for the excluded parameters are presented in and discussed alongside **Table 31, Table 32, Table 33 and Table 34**.

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** and **Table 36.**

Table 35: Quarterly Northern Creek Water Quality Monitoring for 2022 and Previous Years

Parameter (mg/L)	Interim Target Criteria	Baseline (2006/07)	SW3						SW4					
			2022 Min	2022 Max	2022 Average	2021 Average	2020 Average	2019 Average	2022 Min	2022 Max	2022 Average	2021 Average	2020 Average	2019 Average
pH	5.5-7.5	3.55-8.44	4.3	6.9	5.65	6.3	4.3	6.7	5.2	7.1	6	7.10	5.8	7.2
EC	1800-24000	286-45000	177	12000	3583	11701	2942	19988	312	16500	5339	22	6742	23298
DO	>6	0.81-7.49	1.8	4.9	3.4	5.3	4.6	32.2	1.4	6.4	4.2	6.1	558.8	31.3
Turbidity	<20	3-67	3.4	21	12	14	37	9	3.1	36.2	15	87	15	3
Suspended Solids	<25	1.5-48	9	30	17	35	97	7.0	7.9	16	13	27	18	6.0

Table 36: Quarterly Southern Creek Water Quality Monitoring 2022 and Previous Years

Parameter (mg/L)	Interim Target Criteria	Baseline (2006/07)	SW9						SW10					
			Min	Max	2022 Average	2021 Average	2020 Average	2019 Average	Min	Max	2022 Average	2021 Average	2020 Average	2019 Average
pH	5.5-7.5	3.55-8.44	5.9	6.9	6.4	7.1	7.2	7.1	5	6.4	5.6	6.725	4.47	6.6
EC	1800-24000	286-45000	930	10900	4522.5	22872.5	14100	12907	261	5020	2335	12957.5	3079	15138
DO	>6	0.81-7.49	2.7	5.3	4	5.16	6.54	22.9	2.8	5.9	4.2	4.23	**3.21**	18.3
Turbidity	<20	Mar-67	4.6	142	47	18.53	9.05	2	26.8	58.6	43	27.43	74.1	17
Suspended Solids	<25	1.5-48	6.8	15	11.7	13.6	37	6	13	96	36	14.85	38	10

Results obtained from quarterly water quality monitoring show the results are generally in accordance with the baseline criteria and interim target criteria of the EMS.

The results of the monthly algae monitoring for the 2022 reporting period are displayed within **Table 37**.

Table 37: Surface Water Quality Monitoring 2022 Results – Blue Green Algae

Date	Dredge Pond		Silt Pond	
	M. aeruginosa (cells/mL) Criteria: <50,000	Total Biovolume (mm^3/L) Criteria: <4	M. aeruginosa (cells/mL) Criteria: <50,000	Total Biovolume (mm^3/L) Criteria: <4
12/01/2022	1	0.01	1	0.01
9/02/2022	1	0.01	1	0.01
20/01/2022	1	0.01	1	0.01
21/02/2022	1	0.01	1	0.01
14/03/2022	350	0.01	420	0.02
21/03/2022	1	0.01	1	0.01
13/04/2022	1	0.01	1	0.01
20/04/2022	1	0.01	1	0.01
11/05/2022	1	0.01	1	0.01
8/06/2022	1	0.01	1	0.01
11/07/2022	-	0.01	-	0.01
10/08/2022	1	0.01	1	0.01
12/09/2022	1	0.01	1	0.01
12/10/2022	1	0.01	1	0.01
20/10/2022	1	0.01	1	0.01
14/11/2022	1	0.01	1	0.01
21/11/2022	1	0.01	1	0.01
14/12/2022	1	0.01	1	0.01
21/12/2022	1	0.01	1	0.01
Average	**22.9**	**0.01**	**22.9**	**0.01**

Monitoring for Blue Green Algae was conducted on at least a monthly basis in 2022. Both the algal cell count and total biovolume for the Dredge Pond and Silt Pond fell considerably below the criteria committed to in the Environmental Management Strategy and the Soil and Water Management Plan.

The total algae count results gathered at site across several years have illustrated a large degree of variability. It is noted that variations in total algae count results are not identified as exceedances of the monitoring criteria listed in the Environmental Management Strategy 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 2022;
- Generally acidic pH readings;
- High variability of turbidity;
- Variable levels of total algae, but within long-term trends; and
- EC was highly 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 2022 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 38**.

Table 38: Monthly Groundwater Quality Monitoring 2022 Results Summary (pH and EC)

Location	Parameter	Interim Target Criteria	2022 Minimum	2022 Maximum	2022 Average	2021 Average	2020 Average	2019 Average	2018 Average	2017 Average
DLP1	pH	4.2-7.0	5	**7.5**	6.8	5.9	5.7	4.9	4.4	4.3
	EC (uS/cm)	<2000	73	1800	1258.3	346.6	214.5	698	146	134
DLP3	pH	4.2-7.0	5.6	6.3	6.1	6.0	6.1	5.5	5.9	6
	EC (uS/cm)	<2000	**6810**	**8660**	7615	7997.5	7639.2	6731	7320	7464
DLP5	pH	4.2-7.0	3.7	5	4.6	5.4	5.5	5.4	4.7	5.1
	EC (uS/cm)	<2000	405	**2570**	1783.8	307.4	1121.1	1782	847.5	406
DLP6	pH	4.2-7.0	4.4	5.7	5.1	4.5	5.1	4.6	3.9	3.8
	EC (uS/cm)	<2000	109	162	130	260.8	546.1	2561	607.5	1270
DLP7	pH	4.2-7.0	6.7	**7.3**	6.95	7.0	6.8	6.3	7.0	6.9
	EC (uS/cm)	<2000	**2880**	**3470**	**3085**	3551.7	2939.7	3039	3379	3125

DLP3 and DLP7 present annual average conductivity levels above the maximum interim target of 2000 µS/cm stated within the EMS, with this also being the case in previous years.

From 2017 to 2022 pH annual averages were slightly acidic across all locations with the exception of DLP7 which was neutral. No locations exceeded the interim target criteria range. Electrical conductivity (EC) displayed high variability across locations, from DLP1's minimum of 73 uS/cm to DLP3's maximum of 8660 uS/cm. DLP3 and DLP7 exceeded the criteria with the respective values of 7615.5 uS/cm and 3085.7 uS/cm. The annual average results for pH and EC levels have shown similarity between 2017 and 2022.

A summary of quarterly monitoring for Manganese and Magnesium is outlined in **Table 39.**

Table 39 : Quarterly Groundwater Quality Monitoring 2022 Results (Manganese and Magnesium)

Location	Parameter	Interim Target Criteria	Q1	Q2	Q3	Q4	2022 Average	2021 Average	2020 Average	2019 Average	2018 Average	2017 Average
DLP1	Manganese (mg/L)	0.15	0.087	0.33	0.33	0.23	0.3	0.13	0.12	0.039	0.014	0.024
	Magnesium (mg/L)	40	5.7	39	35	33	28	12.35	5.03	1.25	0.87	0.65
DLP3	Manganese (mg/L)	0.15	0.62	0.74	0.7	0.53	0.65	0.68	0.71	0.92	0.65	0.63
	Magnesium (mg/L)	40	**130**	**120**	**110**	**120**	**120**	**130.00**	125.00	175.3	131.2	126.7
DLP5	Manganese (mg/L)	0.15	0.024	0.54	0.38	0.18	0.28	0.01	0.21	0.13	0.031	0.060
	Magnesium (mg/L)	40	2.3	**77**	**53**	29	**40.3**	3.65	31.75	39.3	11.2	14.5
DLP6	Manganese (mg/L)	0.15	0.087	0.21	0.16	0.07	0.13	0.12	0.22	0.47	0.49	1.12
	Magnesium (mg/L)	40	1.4	2.3	2.3	1	1.75	7.63	3.63	7.0	6.8	14.45
DLP7	Manganese (mg/L)	0.15	0.062	0.065	0.064	0.043	0.059	0.07	0.06	0.077	0.21	0.068
	Magnesium (mg/L)	40	33	35	30	28	31.5	35.00	36.75	39.00	39.25	37.3

Annual averages for Manganese and Magnesium in the 2022 reporting period are generally consistent with 2021 results. DLP3 values for 2022 follow the long-term trend of exceeding the interim target criteria for both Manganese (0.65 mg/L) and Magnesium (120.00 mg/L). DLP5 values for 2022 increase the 2021 results and exceed the interim target criteria for both Manganese (0.28 mg/L) and Magnesium (40.3 mg/L). However, the 2022 results for magnesium at DLP3, DLP6 and DLP7 decreased from 2021 levels.

Long-term Trends:

Results for Manganese and Magnesium are similar to previous years. DLP3 has consistently been above the interim target criteria. However, DLP5 has significantly increased for Manganese and Magnesium compared to 2021 and previous years.

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

There are no proposed improvements to heritage management in 2022.

A *Surface Water Management Plan* is waiting for DPE approval.

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 DPE. 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 site in 2022, 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 during the Reporting Period

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.

The only limiting factors have been some cattle getting in and around existing fences (primarily at low tide where they have been able to traverse the creek lines.

Quarterly rehabilitation and landscape monitoring was undertaken during 2022 as per Condition 28 in Schedule 3 of the Project Approval.

A summary of rehabilitation at the Dunloe Sand Quarry is outlined in **Table 40.**

Table 40: Rehabilitation Performance in 2022

Guideline Requirement	Site Comment
Extent of the operations and rehabilitation at completion of the reporting period	There was no rehabilitation at site in 2022.
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.
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.

8.2 Summary of Current Rehabilitation and Performance

A summary of the rehabilitation and disturbance status is outlined in **Table 42**. This is also shown in **Figure 41**.

Table 41: Rehabilitation and Disturbance Status

Quarry Area Type	2018	2019	2020	2021	2022	2023 (Forecast)
	(ha)					
A. Total Quarry Footprint	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
C. Land Being Prepared for Rehabilitation	0	0	0	0	0	0
D. Land Under Active Rehabilitation	13.4	13.4	13.4	13.4	13.4	13.4
E. Completed Rehabilitation	0	0	0	0	0	0

At the end of 2022 there was approximately 18.8 Ha of active disturbance and 13.4 Ha of active rehabilitation (see **Figure 4**).

Quarterly rehabilitation monitoring of established rehabilitation areas found:

- No evidence of fauna using the nest boxes in 2022.
- Rehabilitation has been occurring primarily as natural regeneration.
- Dominant species continued to be Coast Banksia, Paperbark. Swamp and Swamp Oak.
- Weed control continued in all areas, including to control Camphor Laurel, Lantana, Senna, Ipomoea and Ground Asparagus.
- Native fauna observed during monitoring including the Blue-faced Honeyeater, Rocket Frog, and Australasian Figbird.
- Rehabilitation areas are generally on track to achieving rehabilitation outcomes.

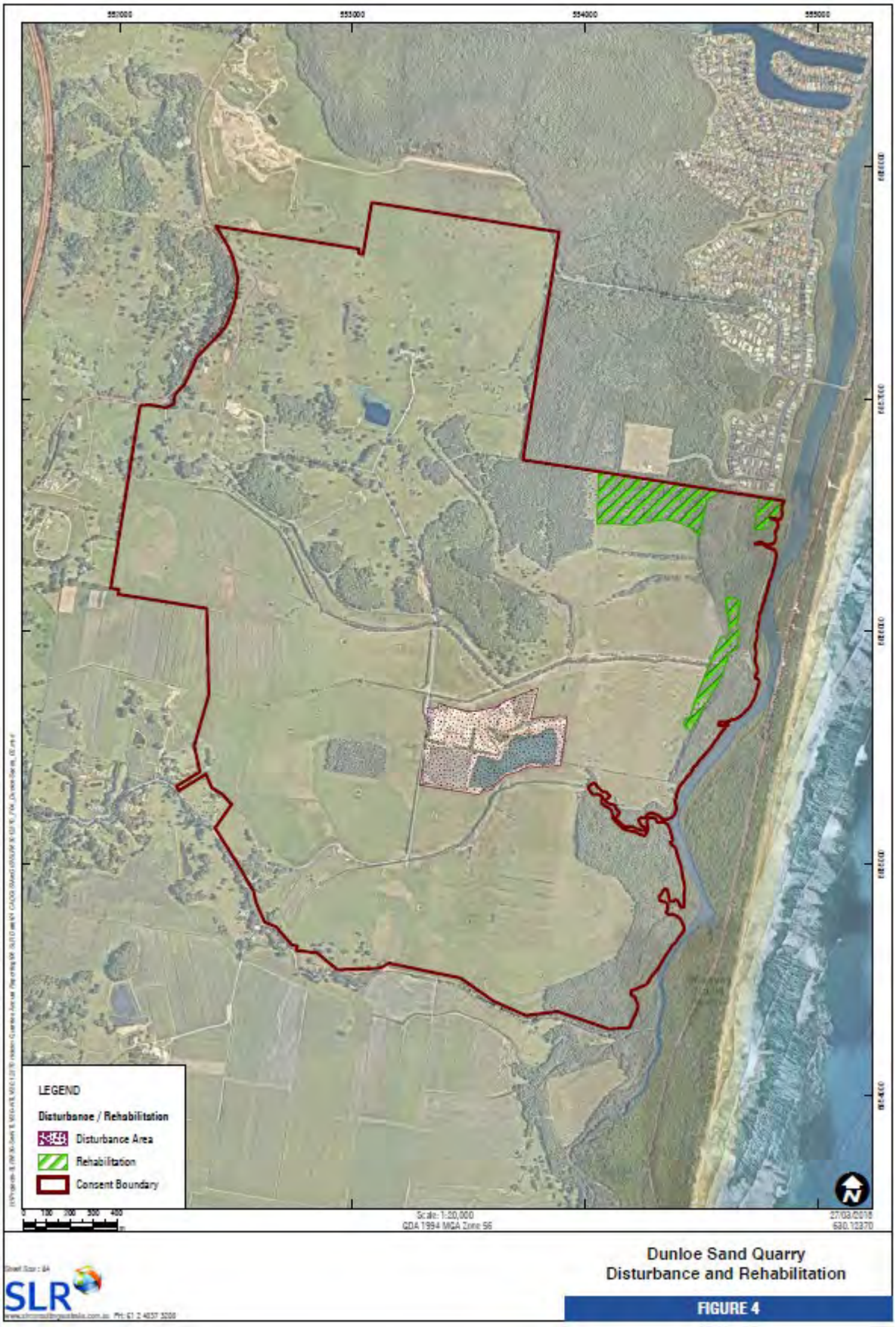

Figure 4: Rehabilitation and Disturbance

8.3 Actions for the Next Reporting Period

The DPE 2015 *Annual Review Guidelines* require the Annual Review to outline the rehabilitation actions proposed during the next reporting period (1 January 2023 to 31 December 2023). These actions are detailed in **Table 42.**

Table 42: Rehabilitation Actions for the Next Reporting Period (2022)

Requirement	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 2023. 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 2022 are detailed in **Table 43** below.

Table 43: Environmental Performance at the Dunloe Sand Quarry in 2022

Aspect	Approval Criteria / EIS Prediction	Performance during 2022 reporting period	Trend / key management implications	Implemented / proposed management actions
Meteorological	EIS predictions are all below Project Approval criteria.	Meteorological data collected from the on-site meteorological station.	Full monitoring continued in 2022. Data collected was verified against BOM data during the report period.	No further improvement measures.
Noise	EIS predictions are all below Project Approval criteria.	Quarterly monitoring has met the Project Approval Criteria.	Consistently meets criteria.	None Required.
Air Quality	EIS predictions are all below Project Approval criteria.	No impacts were recorded in 2022.	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.	Criteria 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 in the period. Therefore, there are no non-compliances to report.	Surface water and Groundwater consistent with trend data. Water monitoring results were generally consistent with trend data.	Ensure water quality monitoring and analysis is completed in accordance with the Soil and Water Management Plan. Holcim will identify any emerging trends in future Annual Reviews, as data capture and

Aspect	Approval Criteria / EIS Prediction	Performance during 2022 reporting period	Trend / key management implications	Implemented / proposed management actions
		Turbidity had multiple exceedances at the Dredge Pond location in 2022 results.		implementation of the Monitoring Program improves.
Biodiversity	No impacts to threatened species. No Project Approval criteria.	Biodiversity monitoring was undertaken in 2022.	Rehabilitation and biodiversity monitoring continued from 2019 to 2022.	Biodiversity monitoring will continue in 2023.
Heritage	No impacts to Aboriginal Heritage. No Project Approval criteria.	No impacts were recorded in 2022.	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.

10.2 Community Contributions

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

10.3 Complaints

There were no community complaints for the site during 2022. This trend has continued since 2018. Community complaints reports are published on the Holcim website quarterly.

11 INDEPENDENT AUDIT

The site undertook an Independent Environmental Audit (IEA) in July 2021 in accordance with the timeframes of the Project Approval. The IEA Report by NGH Consultants is presented in **Appendix C**. Holcim have commenced addressing the improvement actions raised in the IEA Improvement Actions in **Appendix D**.

The next IEA is due August 2024.

12 INCIDENTS AND NON-COMPLIANCE

Table 44 summarises the incidents and non-compliances at the Dunloe Sand Quarry in 2022.

Table 44: Summary of Incidents and Non-Compliances

Date	Incident/Non-Compliance	Action/Comment
Throughout the period	No impacts were recorded in 2022.	None-recorded

13 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Holcim staff will undertake the following works and improvement measures and projects in 2023 to ensure that effective environmental management controls are in place and operating in accordance with the requirements of the Approval. See **Table 45** for an outline of improvement measures and associated activities for 2023. The improvement actions also consider the recommendations of the IEA (**Appendix C**).

Table 45: Improvement Actions for 2023

Improvement Measure	Activities
Water Quality Monitoring	Ensure all water quality monitoring is completed in accordance with the EMS, with a focus on correct monitoring frequencies. Holcim will implement water monitoring recommendations from **Section 7.5**.
Dust Monitoring	Ensure dust monitoring is completed in accordance with the EMS. Holcim will liaise with the monitoring contractor to improve monitoring notes.
Biodiversity	Weed spraying will continue at site during the next Annual Review period.
	Annual fauna box monitoring continues.
	Rehabilitation monitoring continues as per the Rehabilitation and Revegetation Management Plan.

14 APPENDICES

APPENDIX A

DUNLOE SAND QUARRY NOISE MONITORING

Noise Monitoring Assessment

Dunloe Quarry, Pottsville, NSW
Quarter 1 Ending March 2022

Prepared for: Holcim (Australia) Pty Ltd
February 2022
MAC180611-07RP15

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Dunloe Quarry, Pottsville, NSW

Quarter 1 Ending March 2022

Prepared for: Holcim (Australia) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd
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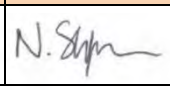
Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180611-07RP15	Final	10 February 2022	Nicholas Shipman		Rod Linnett	

CONTENTS

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for the quarterly period ending March 2022 for Dunloe Quarry (the 'quarry'), Pottsville, NSW.

The monitoring has been conducted in accordance with the Dunloe Project Approval 06_0030, Modification (2018) and Noise Management Plan (2020) at three representative monitoring locations. This assessment represents the operations undertaken during Quarter 1, ending March 2022 and forms part of the annual noise monitoring program to address conditions of the project approval.

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Environment Protection Authority (EPA), Environmental Protection License (EPL), 13077, 2018;
- NSW Department of Planning, Project Approval 06_0030, Modification 2018;
- GHD, Dunloe Sand Quarry Noise Management Plan (NMP), 2020; and
- Australian Standard AS 1055:2018- Acoustics - Description and measurement of environmental noise - General Procedures.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Noise Criteria

Table 4.1 of Dunloe Sand Quarry's NMP, (2020) outlines the updated applicable noise criteria for residential receivers surrounding the quarry site.

The noise criteria are applicable when the site undertakes quarrying operations within the permitted operating hours Monday to Friday 7am – 5pm, Saturday 7am – 12pm with no operations on Sunday.

Table 1 presents the noise criteria for each of the receivers as outlined in Table 4.1 of the NMP (2020).

Table 1 Noise Criteria

Location	Day Criteria dB $LA_{eq(15min)}$[2]
R6 and R7	42
R8	48
All privately-owned receivers[1]	41

Note 1: Receiver locations are shown in Figure 1.

Note 2: Criteria applicable between Monday to Friday 7am – 5pm, Saturday 7am – 12pm with no operations on Sunday as the Table 4.1 of the NMP (2020)

2.1 Environmental Protection License (EPL 13077)

Compliance with the noise criteria in the NMP would also result in compliance with the EPL noise limits (EPL 13077) which requires noise contribution from the quarry not to exceed 48dB $LA_{eq(15min)}$ at any residential receiver.

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3 Methodology

3.1 Locality

The quarry is approximately 2.5km south west of Pottsville, NSW. Receivers surrounding the quarry are primarily rural/residential situated in coastal bushland with elevated and undulating topography. The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1.**

3.2 Noise Monitoring Locations

Three monitoring locations have been selected as part of the NMA and are listed below:

- R6 is located at 157 Warwick Park Road;
- R7 is located at 129 Warwick Park Road; and
- R8 is located at 679 Pottsville Road.

3.3 Assessment Methodology

Attended noise surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise and Dunloe Quarry's Project Approval. Measurements were carried out using a Svantek Type 1, 971 noise analyser on Wednesday 2 February 2022. Acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

One measurement was conducted at each monitoring location during the daytime period. Measurements were of 15 minutes in duration and where possible, throughout each survey the operator quantified the contribution of each significant noise source.

Extraneous noise sources were excluded from the analysis to determine the $LA_{eq(15min)}$ quarry noise contribution for comparison against the relevant criteria. Where the quarry was inaudible, the contribution is estimated to be at least 10dB below the ambient noise level.

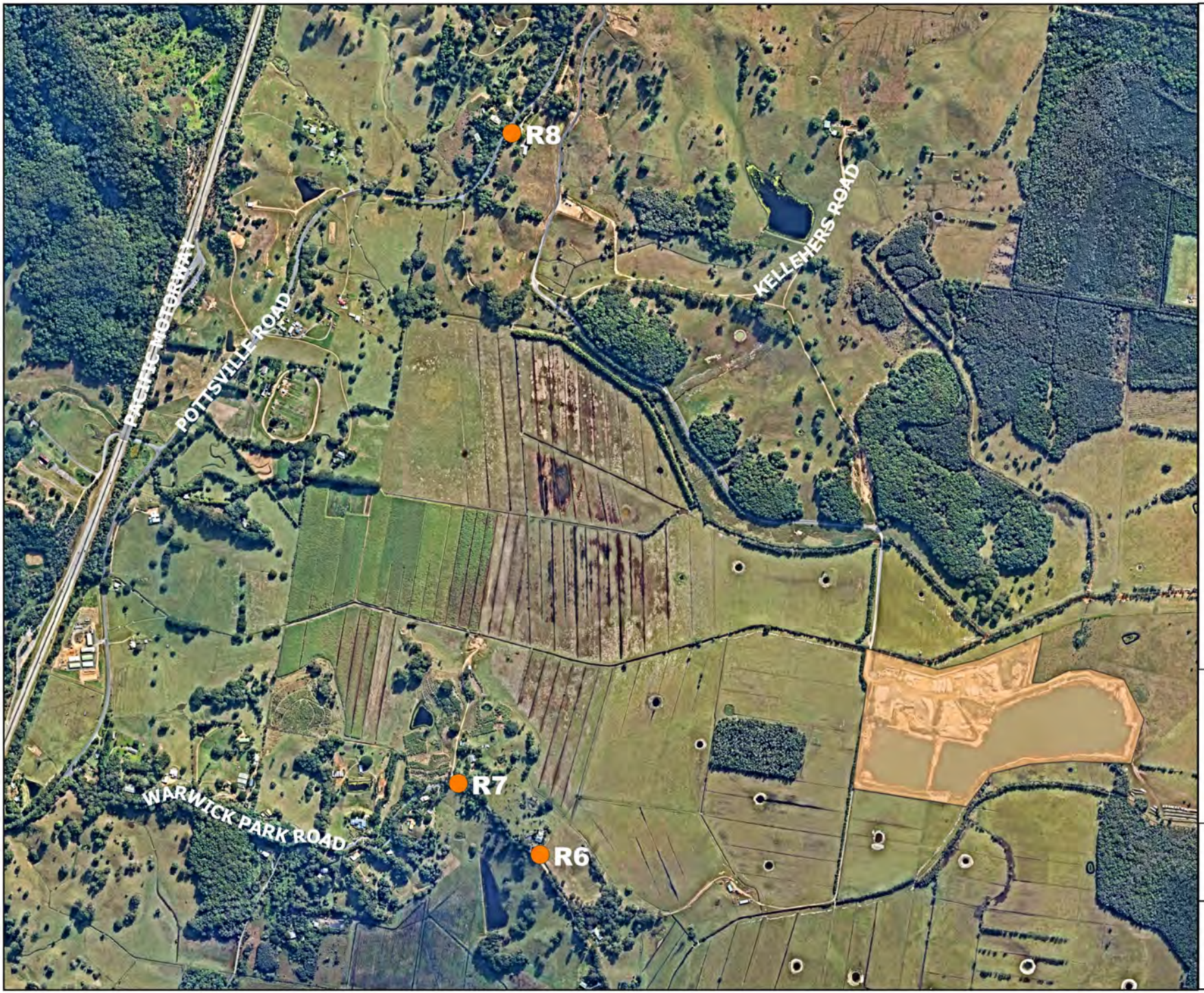

FIGURE 1

Site Locality

MAC180611-07

Holcim Dunloe Quarry

KEY

Receivers

Dunloe Quarry

0 100 200 300 400 500 m

N

MAC
Muller Acoustic Consulting

4 Results

4.1 Assessment Results - Location R6

The monitored noise level contributions and observed meteorological conditions for R6 are presented in **Table 2**.

Table 2 Operator-Attended Noise Survey Results – Location R6

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
02/02/2022	11:22 (Day)	81	62	41	WD: SW WS: 0.1m/s Rain: Nil	Traffic 37-81 Insects 37-46 Birds 39-44 Quarry inaudible
Dunloe Quarry $L_{Aeq(15min)}$ Contribution						<35

4.2 Assessment Results - Location R7

The monitored noise level contributions and observed meteorological conditions for R7 are presented in **Table 3.**

Table 3 Operator-Attended Noise Survey Results – Location R7

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
02/02/2022	11:42 (Day)	79	57	48	WD: SW WS: 0.1m/s Rain: Nil	Insects 44-46 Birds 44-54 Traffic 44-79 Quarry inaudible
Dunloe Quarry $L_{Aeq(15min)}$ Contribution						<35

4.3 Assessment Results - Location R8

The monitored noise level contributions and observed meteorological conditions for R8 are presented in **Table 4.**

Table 4 Operator-Attended Noise Survey Results – Location R8

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
02/02/2022	11:59 (Day)	58	46	44	WD: SW WS: 0.4m/s Rain: Nil	Insects 42-44 Birds 42-58 Local residential noise 42-43 Aircraft <42 Quarry inaudible
Dunloe Quarry $L_{Aeq(15min)}$ Contribution						<35

5 Discussion

5.1 Discussion of Results - Location R6

Quarry noise emissions were inaudible during monitoring conducted on Wednesday 2 February 2022 at location R6. The (in field) estimated quarry noise contribution satisfied the relevant daytime noise limit of 42dB $LA_{eq(15min)}$. Extraneous noise sources include birds, insects, and traffic during the monitoring period.

5.2 Discussion of Results - Location R7

Quarry noise emissions were inaudible during monitoring conducted on Wednesday 2 February 2022 at location R7. The (in field) estimated quarry noise contribution satisfied the relevant daytime noise limit of 42dB $LA_{eq(15min)}$. Extraneous noise sources include insects, traffic and birds during the monitoring period.

5.3 Discussion of Results - Location R8

Quarry noise emissions were inaudible during monitoring conducted on Wednesday 2 February 2022 at location R8. The (in field) estimated quarry noise contribution satisfied the relevant daytime noise limit of 48dB $LA_{eq(15min)}$. Extraneous noise sources include insects, birds, traffic, aircraft and local residential noise during the monitoring period.

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6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at Dunloe Quarry, Pottsville, NSW. The assessment was completed to determine the quarry's compliance with the relevant criteria outlined in the Dunloe Project Approval 06_0030, Modification (2018) at relevant surrounding residential receivers for Quarter 1, ending March 2022.

Attended noise monitoring was undertaken on Wednesday 2 February 2022 at three representative monitoring locations, with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Dunloe Quarry complies with the relevant noise criteria specified in the NMP (2020) and EPL at all assessed residential receivers.

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Appendix A - Glossary of Terms

Table A1 provides a number of technical terms have been used in this report.

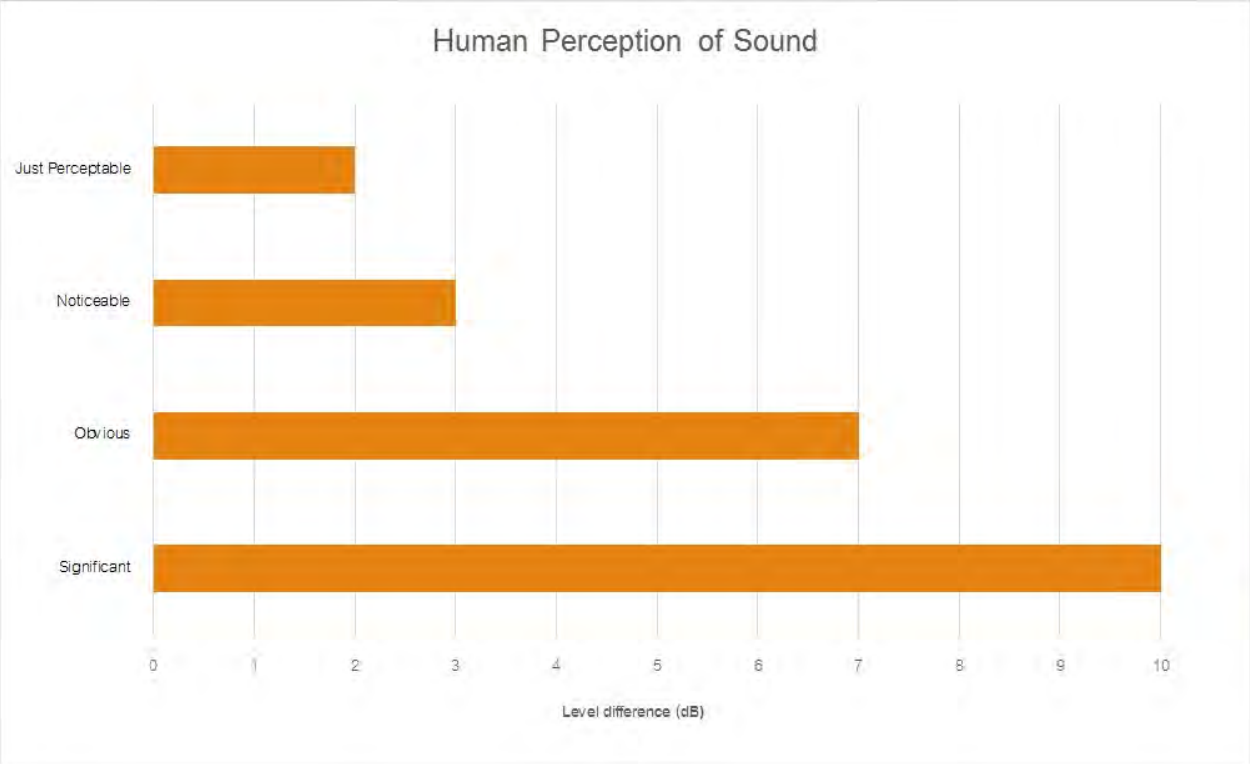
Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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Noise Monitoring Assessment

Dunloe Quarry, Pottsville, NSW
Quarter 2 Ending June 2022

Prepared for: Holcim (Australia) Pty Ltd
May 2022
MAC180611-07RP16

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Dunloe Quarry, Pottsville, NSW

Quarter 2 Ending June 2022

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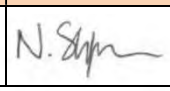
MAC180611-07RP16	30 May 2022	Nicholas Shipman		Rod Linnett	

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2 Noise Criteria

Table 4.1 of Dunloe Sand Quarry's NMP, (2020) outlines the updated applicable noise criteria for residential receivers surrounding the quarry site.

The noise criteria are applicable when the site undertakes quarrying operations within the permitted operating hours Monday to Friday 7am – 5pm, Saturday 7am – 12pm with no operations on Sunday.

Table 1 presents the noise criteria for each of the receivers as outlined in Table 4.1 of the NMP (2020).

Table 1 Noise Criteria

Location	Day Criteria dB $LA_{eq(15min)}$[2]
R6 and R7	42
R8	48
All privately-owned receivers[1]	41

Note 1: Receiver locations are shown in Figure 1.

Note 2: Criteria applicable between Monday to Friday 7am – 5pm, Saturday 7am – 12pm with no operations on Sunday as the Table 4.1 of the NMP (2020)

2.1 Environmental Protection License (EPL 13077)

Compliance with the noise criteria in the NMP would also result in compliance with the EPL noise limits (EPL 13077) which requires noise contribution from the quarry not to exceed 48dB $LA_{eq(15min)}$ at any residential receiver.

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3 Methodology

3.1 Locality

The quarry is approximately 2.5km south west of Pottsville, NSW. Receivers surrounding the quarry are primarily rural/residential situated in coastal bushland with elevated and undulating topography. The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1.**

3.2 Noise Monitoring Locations

Three monitoring locations have been selected as part of the NMA and are listed below:

- R6 is located at 157 Warwick Park Road;
- R7 is located at 129 Warwick Park Road; and
- R8 is located at 679 Pottsville Road.

3.3 Assessment Methodology

Attended noise surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise and Dunloe Quarry's Project Approval. Measurements were carried out using a Svantek Type 1, 971 noise analyser on Thursday 19 May 2022. Acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

One measurement was conducted at each monitoring location during the daytime period. Measurements were of 15 minutes in duration and where possible, throughout each survey the operator quantified the contribution of each significant noise source.

Extraneous noise sources were excluded from the analysis to determine the $LA_{eq(15min)}$ quarry noise contribution for comparison against the relevant criteria. Where the quarry was inaudible, the contribution is estimated to be at least 10dB below the ambient noise level.

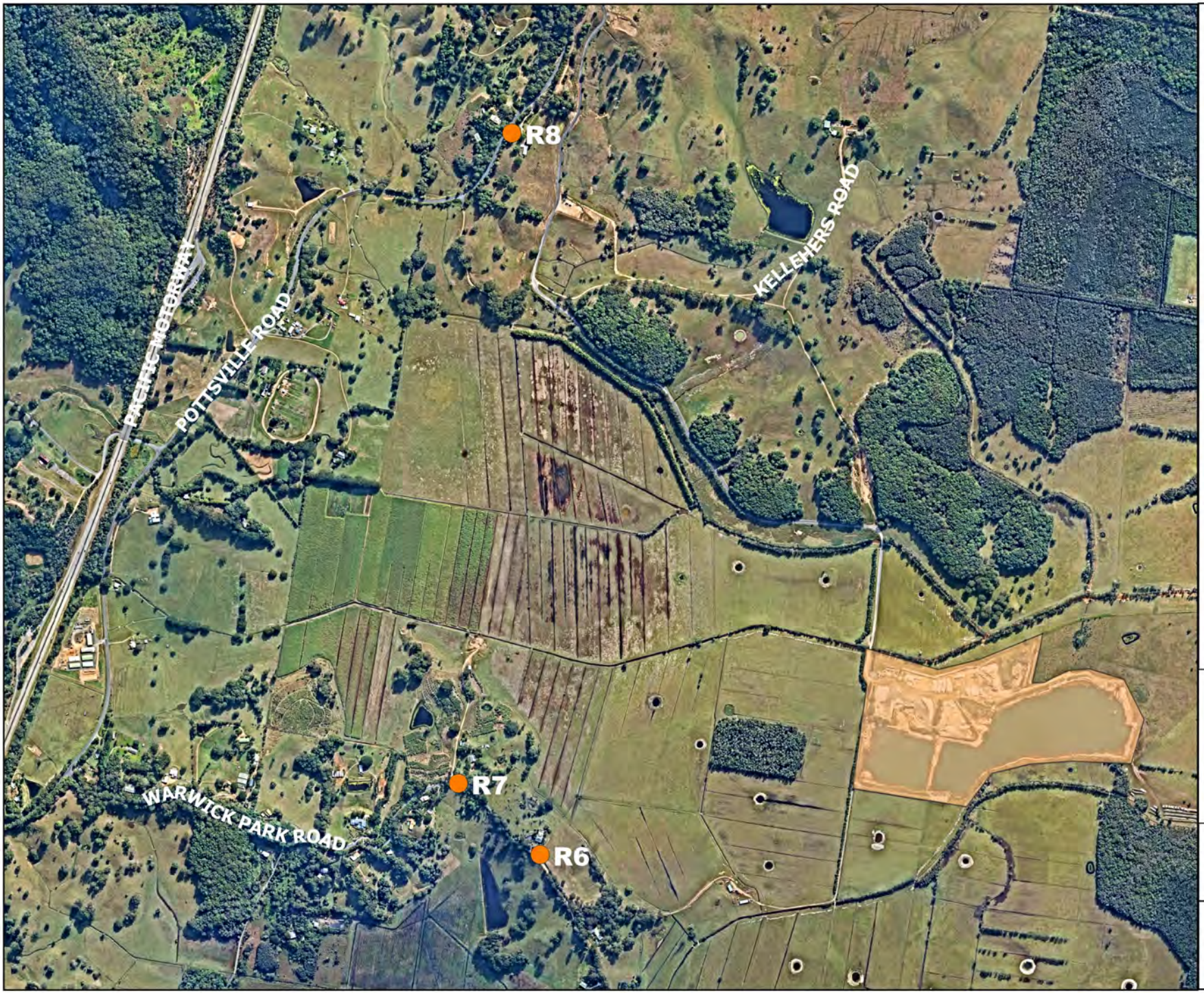

FIGURE 1

Site Locality

MAC180611-07

Holcim Dunloe Quarry

KEY

Receivers

Dunloe Quarry

0 100 200 300 400 500 m

N

MAC
Muller Acoustic Consulting

4 Results

4.1 Assessment Results - Location R6

The monitored noise level contributions and observed meteorological conditions for R6 are presented in **Table 2.**

Table 2 Operator-Attended Noise Survey Results – Location R6

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
19/05/2022	12:50 (Day)	78	58	42	WD: N WS: 1.2m/s Rain: Nil	Traffic 38-78 Birds 45-54 Wind in trees 38-45 Local residential noise 44-46 Aircraft 38-49 Quarry inaudible
Dunloe Quarry $L_{Aeq(15min)}$ Contribution						<35

4.2 Assessment Results - Location R7

The monitored noise level contributions and observed meteorological conditions for R7 are presented in **Table 3.**

Table 3 Operator-Attended Noise Survey Results – Location R7

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
19/05/2022	13:12 (Day)	73	54	39	WD: N WS: 0.5m/s Rain: Nil	Aircraft 44-73 Birds 44-46 Wind in trees 44-46 Traffic 36-68 Dog bark 36-45 Quarry inaudible
Dunloe Quarry $L_{Aeq(15min)}$ Contribution						<35

4.3 Assessment Results - Location R8

The monitored noise level contributions and observed meteorological conditions for R8 are presented in **Table 4.**

Table 4 Operator-Attended Noise Survey Results – Location R8

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
19/05/2022	13:29 (Day)	67	45	36	WD: N WS: 0.4m/s Rain: Nil	Aircraft 38-60 Wind in trees 37-41 Birds 36-48 Traffic 34-67 Quarry inaudible
Dunloe Quarry $L_{Aeq(15min)}$ Contribution						<35

5 Discussion

5.1 Discussion of Results - Location R6

Quarry noise emissions were inaudible during monitoring conducted on Thursday 19 May 2022 at location R6. The (in field) estimated quarry noise contribution satisfied the relevant daytime noise limit of 42dB $LA_{eq(15min)}$. Extraneous noise sources include birds, local residential noise, aircraft, insects, and traffic during the monitoring period.

5.2 Discussion of Results - Location R7

Quarry noise emissions were inaudible during monitoring conducted on Thursday 19 May 2022 at location R7. The (in field) estimated quarry noise contribution satisfied the relevant daytime noise limit of 42dB $LA_{eq(15min)}$. Extraneous noise sources include dog bark, aircraft, wind in trees, traffic and birds during the monitoring period.

5.3 Discussion of Results - Location R8

Quarry noise emissions were inaudible during monitoring conducted on Thursday 19 May 2022 at location R8. The (in field) estimated quarry noise contribution satisfied the relevant daytime noise limit of 48dB $LA_{eq(15min)}$. Extraneous noise sources include birds, traffic, aircraft and wind in trees during the monitoring period.

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6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at Dunloe Quarry, Pottsville, NSW. The assessment was completed to determine the quarry's compliance with the relevant criteria outlined in the Dunloe Project Approval 06_0030, Modification (2018) at relevant surrounding residential receivers for Quarter 2, ending June 2022.

Attended noise monitoring was undertaken on Thursday 19 May 2022 at three representative monitoring locations, with quarry noise contributions compared against the relevant criteria. The assessment has identified that noise emissions generated by Dunloe Quarry complies with the relevant noise criteria specified in the NMP (2020) and EPL at all assessed residential receivers.

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Appendix A - Glossary of Terms

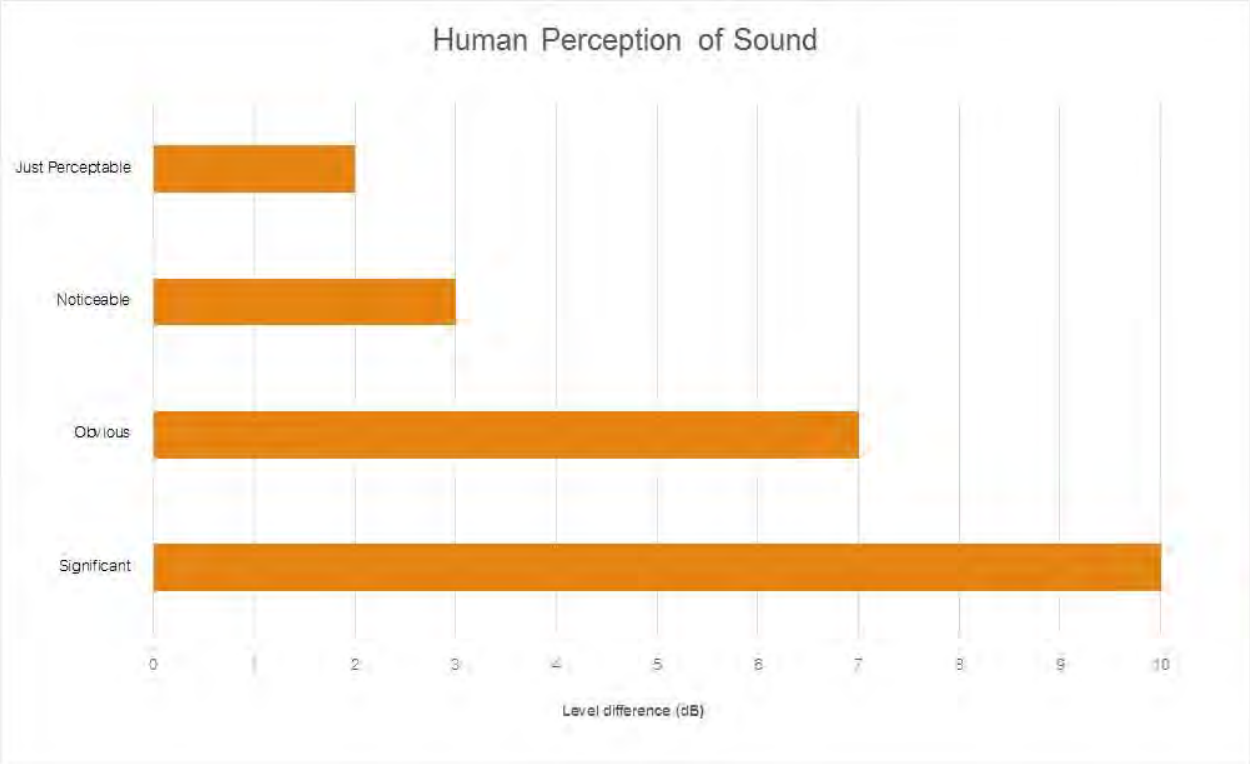
Table A1 provides a number of technical terms have been used in this report.

Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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Muller Acoustic Consulting

Noise Monitoring Assessment

Dunloe Quarry, Pottsville, NSW
Quarter 3 Ending September 2022

Prepared for: Holcim (Australia) Pty Ltd
September 2022
MAC180611-07RP17

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Dunloe Quarry, Pottsville, NSW

Quarter 3 Ending September 2022

Prepared for: Holcim (Australia) Pty Ltd

Prepared by: Muller Acoustic Consulting Pty Ltd
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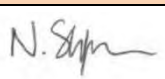
Document ID	Date	Prepared By	Signed	Reviewed By	Signed
MAC180611-07RP17	7 September 2022	Nicholas Shipman		Rod Linnett	

CONTENTS

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Holcim (Australia) Pty Ltd (Holcim) to complete a Noise Monitoring Assessment (NMA) for the quarterly period ending September 2022 for Dunloe Quarry (the 'quarry'), Pottsville, NSW.

The monitoring has been conducted in accordance with the Dunloe Project Approval 06_0030, Modification (2018) and Noise Management Plan (2020) at three representative monitoring locations. This assessment represents the operations undertaken during Quarter 3, ending September 2022 and forms part of the annual noise monitoring program to address conditions of the project approval.

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Environment Protection Authority (EPA), Environmental Protection License (EPL), 13077, 2018;
- NSW Department of Planning, Project Approval 06_0030, Modification 2018;
- GHD, Dunloe Sand Quarry Noise Management Plan (NMP), 2020; and
- Australian Standard AS 1055:2018- Acoustics - Description and measurement of environmental noise - General Procedures.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Noise Criteria

Table 4.1 of Dunloe Sand Quarry's NMP, (2020) outlines the updated applicable noise criteria for residential receivers surrounding the quarry site.

The noise criteria are applicable when the site undertakes quarrying operations within the permitted operating hours Monday to Friday 7am – 5pm, Saturday 7am – 12pm with no operations on Sunday.

Table 1 presents the noise criteria for each of the receivers as outlined in Table 4.1 of the NMP (2020).

Table 1 Noise Criteria

Location	Day Criteria dB $LA_{eq(15min)}$[2]
R6 and R7	42
R8	48
All privately-owned receivers[1]	41

Note 1: Receiver locations are shown in Figure 1.

Note 2: Criteria applicable between Monday to Friday 7am – 5pm, Saturday 7am – 12pm with no operations on Sunday as the Table 4.1 of the NMP (2020)

2.1 Environmental Protection License (EPL 13077)

Compliance with the noise criteria in the NMP would also result in compliance with the EPL noise limits (EPL 13077) which requires noise contribution from the quarry not to exceed 48dB $LA_{eq(15min)}$ at any residential receiver.

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3 Methodology

3.1 Locality

The quarry is approximately 2.5km south west of Pottsville, NSW. Receivers surrounding the quarry are primarily rural/residential situated in coastal bushland with elevated and undulating topography. The monitoring locations with respect to the quarry and assessed receivers are presented in the locality plan shown in **Figure 1.**

3.2 Noise Monitoring Locations

Three monitoring locations have been selected as part of the NMA and are listed below:

- R6 is located at 157 Warwick Park Road;
- R7 is located at 129 Warwick Park Road; and
- R8 is located at 679 Pottsville Road.

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Extraneous noise sources were excluded from the analysis to determine the $LA_{eq(15min)}$ quarry noise contribution for comparison against the relevant criteria. Where the quarry was inaudible, the contribution is estimated to be at least 10dB below the ambient noise level.

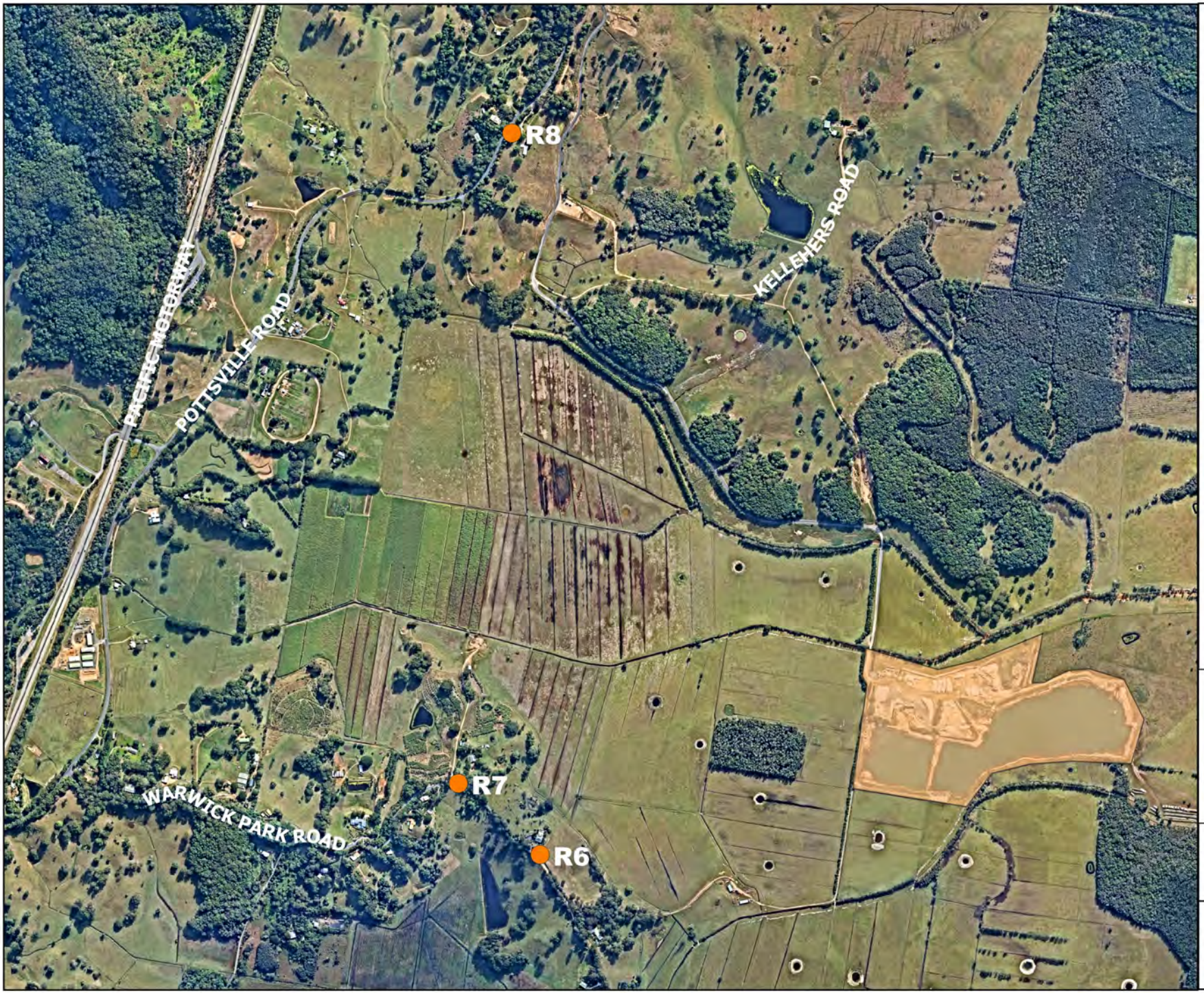

FIGURE 1

Site Locality

MAC180611-07

Holcim Dunloe Quarry

KEY

Receivers

Dunloe Quarry

0 100 200 300 400 500 m

N

MAC
Muller Acoustic Consulting

4 Results

4.1 Assessment Results - Location R6

The monitored noise level contributions and observed meteorological conditions for R6 are presented in **Table 2.**

Table 2 Operator-Attended Noise Survey Results – Location R6

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
31/08/2022	12:36 (Day)	81	63	42	WD: NW WS: 0.2m/s Rain: Nil	Insects <38 Birds 41-54 Traffic 38-81 Aircraft 38-46 Quarry inaudible
Dunloe Quarry $L_{Aeq(15min)}$ Contribution						<30

4.2 Assessment Results - Location R7

The monitored noise level contributions and observed meteorological conditions for R7 are presented in **Table 3.**

Table 3 Operator-Attended Noise Survey Results – Location R7

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
31/08/2022	13:00 (Day)	64	42	37	WD: NW WS: 0.2m/s Rain: Nil	Traffic 34-38 Birds 34-64 Aircraft 34-42 Quarry inaudible
Dunloe Quarry $L_{Aeq(15min)}$ Contribution						<30

4.3 Assessment Results - Location R8

The monitored noise level contributions and observed meteorological conditions for R8 are presented in **Table 4.**

Table 4 Operator-Attended Noise Survey Results – Location R8

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
31/08/2022	13:19 (Day)	64	45	38	WD: NW WS: 0.8m/s Rain: Nil	Wind in trees 36-44 Traffic 36-64 Birds 37-45 Dog bark 38-42 Aircraft 36-46 Quarry inaudible
Dunloe Quarry $L_{Aeq(15min)}$ Contribution						<30

5 Discussion

5.1 Discussion of Results - Location R6

Quarry noise emissions were inaudible during monitoring conducted on Wednesday 31 August 2022 at location R6. The (in field) estimated quarry noise contribution satisfied the relevant daytime noise limit of 42dB $LA_{eq(15min)}$. Extraneous noise sources include insects, birds, traffic and aircraft during the monitoring period.

5.2 Discussion of Results - Location R7

Quarry noise emissions were inaudible during monitoring conducted on Wednesday 31 August 2022 at location R7. The (in field) estimated quarry noise contribution satisfied the relevant daytime noise limit of 42dB $LA_{eq(15min)}$. Extraneous noise sources include traffic, birds and aircraft during the monitoring period.

5.3 Discussion of Results - Location R8

Quarry noise emissions were inaudible during monitoring conducted on Wednesday 31 August 2022 at location R8. The (in field) estimated quarry noise contribution satisfied the relevant daytime noise limit of 48dB $LA_{eq(15min)}$. Extraneous noise sources include wind in trees, traffic, birds, dog bark and aircraft during the monitoring period.

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6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Holcim (Australia) Pty Ltd at Dunloe Quarry, Pottsville, NSW. The assessment was completed to determine the quarry's compliance with the relevant criteria outlined in the Dunloe Project Approval 06_0030, Modification (2018) at relevant surrounding residential receivers for Quarter 3, ending September 2022.

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Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
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dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

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Typical conversation	60
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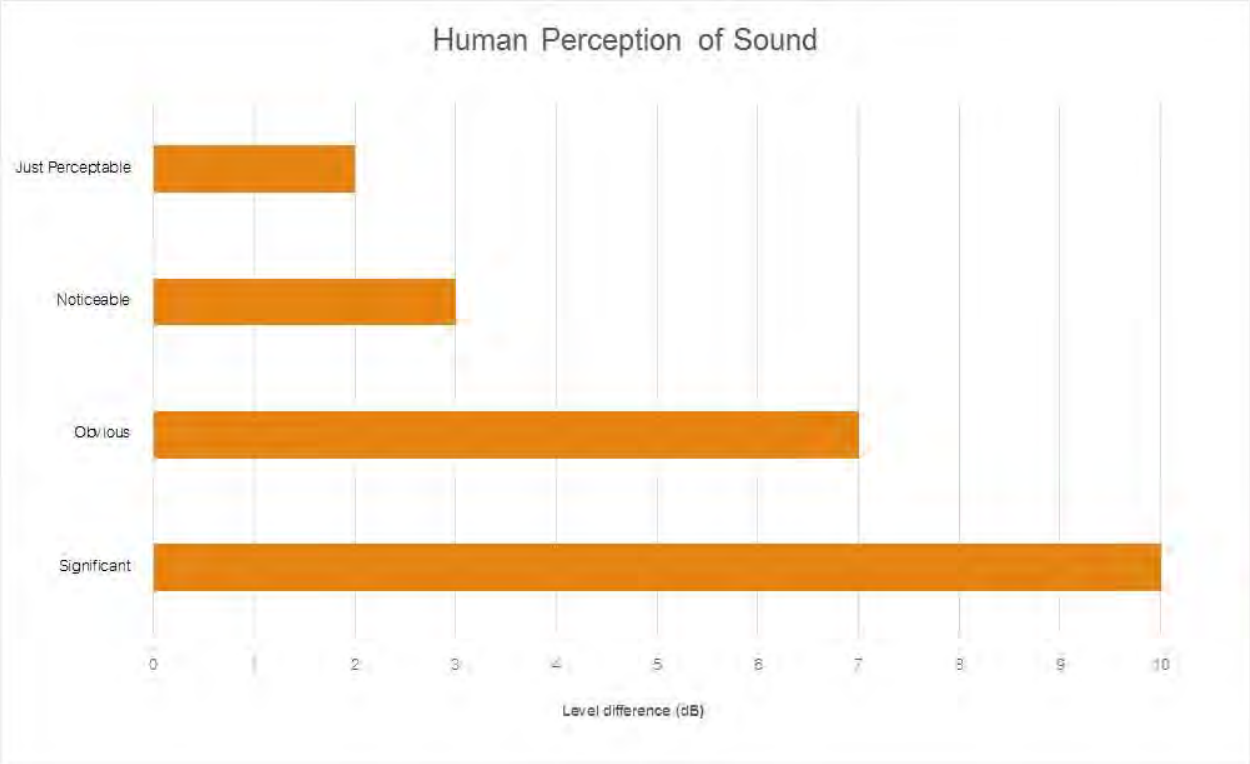
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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Intended for
Holcim (Australia) Pty Ltd

Document type
Report

Date
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Project number
318000911

QUARTERLY NOISE MONITORING ASSESSMENT – QUARTER 4 2022 DUNLOE SANDS QUARRY, POTTSVILLE, NSW

RAMBOLL Bright ideas. Sustainable change.

QUARTERLY NOISE MONITORING ASSESSMENT – QUARTER 4 2022
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Project name	**Quarterly Noise Monitoring Assessment for Dunloe Sands Quarry – Quarter 4 2022**
Project no.	**318000911**
Recipient	**Matt Kelly**
Document type	**Report**
Version	**1**
Date	**24/01/2023**
Prepared by	**Jake Bourke**
Checked by	**Patrick Murray**
Approved by	**Greer Laing**
Description	**Data collected on 15 December 2022 for the quarterly period ending December 2022 at Pottsville, NSW, as part of the noise monitoring program**

Ramboll Australia Pty Ltd.
ACN 095 437 442
ABN 49 095 437 442

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

Source: Noise Guide for Local Government (NSW EPA, 2013)

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 (NPI) (NSW EPA, 2017).
- Dunloe Sand Quarry Noise Management Plan (NMP) (GHD, 2020).
- Environment Protection Licence (EPL) number 13077 (NSW EPA, 2020).
- Notice of Modification (Draft) (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 October to December 2022, 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**.

Figure 1 : Noise monitoring locations at Dunloe Sands Quarry

2. NOISE CRITERIA

Table 2-1 brings the applicable noise criteria outlined in the NMP for residential receivers (R6, R7 and R8) surrounding the quarry. The noise criteria are applicable 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 result in compliance with the noise limits outlined in the sites EPL (EPL 13077) which requires the quarry's noise contribution to 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	48
679 Pottsville Road	R8	41
[1] 7 am–6 pm Monday to Saturday Note: no operations on Sundays and public holidays		

3. METHODOLOGY

The monitoring program was created in accordance with the procedures described in Australian Standard AS 1055:2018 and the Approval Documents referenced in Section 1. The measurements were carried out using a RION Sound Level Meter NL-52 on Thursday 15 December 2022. The acoustic instrumentation used carries current NATA calibration and complies 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 also carried a current NATA calibration and complies with IEC 60942:2003. Drift in calibration did not exceed ±0.3 dBA.

Attended noise monitoring was conducted for 15-minutes at each 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 is estimated to be at least 10 dBA below the ambient noise level, as determined by the LA90, or estimated to be less than criteria value.

4. RESULTS AND DISCUSSION

4.1 Location R6

Noise monitoring at location R6 conducted on Thursday 15 December 2022 resulted in inaudible quarry noise during the day. 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 event at Location R6 are presented in Table 4-1**.**

Noise sources measured included birds. No vehicle traffic occurred on Warwick Park Road during the measurement period.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and LAeq (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90				
15-12-22	7:28 (Day)	69.6	45.9	38	WD: n/a WS: 0 Rain: Nil	Birds 40 Quarry inaudible	<42	42

4.2 Location R7

Noise monitoring at location R7 conducted on Thursday 15 December 2022 resulted in inaudible quarry noise during the day. 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**.**

Noise sources measured included birds and a passing car on Warwick Park Road.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and LAeq (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90				
15-12-22	7:45 (Day)	78.9	57.3	42	WD: n/a WS: 0 Rain: Nil	Car passing 57-67 Birds 50 Quarry inaudible	<48	48

4.3 Location R8

Noise monitoring at location R8 conducted on Thursday 15 December 2022 resulted in inaudible quarry noise during the day. 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**.**

Noise sources measured included birds, highway traffic and a passing car on Pottsville Road.

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

Date	Time	Descriptor (dBA)			Meteorology	Apparent Noise Source, Description and LAeq (dBA)	Dunloe Quarry LAeq(15min) Contribution (dBA)	LAeq(15min) Criteria (dBA)
		LAmax	LAeq	LA90				
15-12-22	8:09 (Day)	77.6	59.6	50	WD: n/a WS: 0 Rain: Nil	Birds Highway traffic 48 Car passing 70-78 Quarry inaudible	<41	41

5. CONCLUSION

Monitoring was carried out on Thursday 15 December 2022 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.

This NMA completed by Ramboll at the Holcim Dunloe Sands Quarry, Pottsville, NSW as a quarterly requirement of the NMP showed compliance to the relevant noise criteria.

6. REFERENCES

GHD (2020) *Dunloe Sand Quarry Noise Management Plan*.

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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).

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

APPENDIX B

DUNLOE SAND QUARRY LONGTERM ENVIRONMENTAL MONITORING

Longterm 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
Appendix of 2015 AEMR	19/08/2015	Dunloe Sands	0.3	0.3	0.2	0.2
Appendix of 2015 AEMR	17/09/2015	Dunloe Sands	0.5	1.6	0.4	0.5
Appendix of 2015 AEMR	21/10/2015	Dunloe Sands	0.1	0.6	0.2	0.1
Appendix of 2015 AEMR	25/11/2015	Dunloe Sands	0.3	1.7	0.6	0.5
Appendix of 2015 AEMR	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
2016 AEMR	Feb-16	Dunloe Sands	0.4	0.6	0.5	0.5
2016 AEMR	Mar-16	Dunloe Sands	0.2	4.7	0.3	0.5
2016 AEMR	Apr-16	Dunloe Sands	0.2	1.6	0.2	0.8
2016 AEMR	May-16	Dunloe Sands	0.3	1.2	0.3	1.6
2016 AEMR	Jun-16	Dunloe Sands	0.3	1.1	1.6	0.5
2016 AEMR	Jul-16	Dunloe Sands	0.13	0.52	0.41	0.39
2016 AEMR	Aug-16	Dunloe Sands	0.6	0.5	0.3	0.4
2016 AEMR	Sep-16	Dunloe Sands	0.8	0.5	0.4	0.3
2016 AEMR	Oct-16	Dunloe Sands	0.8	0.5	0.4	0.3
2016 AEMR	Nov-16	Dunloe Sands	0.4	1.9	0.3	0.4
2016 AEMR	Dec-16	Dunloe Sands	0.5	1.7	0.6	0.5
2017 Q1 Env Mon report	30/01/2017	Dunloe Sands	0.3	0.2	0.5	0.3
2017 Q1 Env Mon report	27/02/2017	Dunloe Sands	0.3	0.2	0.2	0.3
2017 Enviro Monitoring	22/03/2017	Dunloe Sands	0.2	0.1	2.4	0.3
2017 Enviro Monitoring	19/04/2017	Dunloe Sands	0.2	0.9	1	0.3
2017 Enviro Monitoring	17/05/2017	Dunloe Sands	0.8	0.8	1.4	0.7
2017 Enviro Monitoring	14/06/2017	Dunloe Sands	0.2	0.2	0.2	0.2
2017 Enviro Monitoring	12/07/2017	Dunloe Sands	0.3	0.1	0.2	0.3
2017 Enviro Monitoring	9/08/2017	Dunloe Sands	0.1	0.1	0.2	0.5
2017 Enviro Monitoring	6/09/2017	Dunloe Sands	0.5	0.2	0.5	0.5
2017 Enviro Monitoring	4/10/2017	Dunloe Sands	0.7	0.6	2.4	0.9
2017 Enviro Monitoring	1/11/2017	Dunloe Sands	0.5	0.3	0.8	0.5
2017 Enviro Monitoring	29/11/2017	Dunloe Sands	0.1	0.2	0.3	0.1
2017 Enviro Monitoring	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
2018 Enviro Monitoring	21/02/2018	Dunloe Sands	2.7	0.7	1.6	0.6
2018 Enviro Monitoring	21/03/2018	Dunloe Sands	0.4	4.9c	11.8c	7.1c
2018 Enviro Monitoring	18/04/2018	Dunloe Sands	0.4	0.1	0.3	0.2
2018 Enviro Monitoring	16/05/2018	Dunloe Sands	0.2	0.4	0.6	0.3
2018 Enviro Monitoring	13/06/2018	Dunloe Sands	0.3	0.2	5.2c	0.4
2018 Enviro Monitoring	11/07/2018	Dunloe Sands	0.5	0.4	0.5	0.2
2018 Enviro Monitoring	8/08/2018	Dunloe Sands	0.4	0.5	0.3	0.2
2018 Enviro Monitoring	5/09/2018	Dunloe Sands	NS	NS	NS	NS
2018 Enviro Monitoring	5/10/2018	Dunloe Sands	0.1	0.4	0.3	0.7
2018 Enviro Monitoring	6/11/2018	Dunloe Sands	0.1	0.1	1.5	0.7
2018 Enviro Monitoring	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
2019 Enviro Monitoring	5/02/2019	Dunloe Sands	0.2	0.2	0.2	0.2
2019 Enviro Monitoring	8/03/2019	Dunloe Sands	1.1	1	1.2	0.9
2019 Enviro Monitoring	5/04/2019	Dunloe Sands	0.5	0.2	0.2	0.9
2019 Enviro Monitoring	7/05/2019	Dunloe Sands	0.1	0.4	0.2	1.2
2019 Enviro Monitoring	4/06/2019	Dunloe Sands	0.2	0.4	0.7	0.2
2019 Enviro Monitoring	4/07/2019	Dunloe Sands	0.3	0.3	0.2	1.1
2019 Enviro Monitoring	29/08/2019	Dunloe Sands	0.5	0.5	0.4	1.8
2019 Enviro Monitoring	26/09/2019	Dunloe Sands	0.7	0.6	0.5	1.5
2019 Enviro Monitoring	24/10/2019	Dunloe Sands	1.2	0.7	0.5	1.4
2019 Enviro Monitoring	22/11/2019	Dunloe Sands	0.8	0.5	0.8	0.5
2019 Enviro Monitoring	20/12/2019	Dunloe Sands	1.8	1.8	1.6	1
2020 Enviro Monitoring Portal	17/01/2020	Dunloe Sands	2.3	2.5	1.3	NS
2020 Enviro Monitoring Portal	14/02/2020	Dunloe Sands	0.3	NS	NS	NS
2020 Enviro Monitoring Portal	18/03/2020	Dunloe Sands	0.4	6.1*	0.5*	5.4*
2020 Enviro Monitoring Portal	16/04/2020	Dunloe Sands	1	0.6	0.5	0.6
2020 Enviro Monitoring Portal	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*
2020 Enviro Monitoring Portal	9/07/2020	Dunloe Sands	0.1	2.1	0.2	4
2020 Enviro Monitoring Portal	10/08/2020	Dunloe Sands	1.4	0.7	0.2	3
2020 Enviro Monitoring Portal	10/09/2020	Dunloe Sands	0.5	0.6	0.7	0.8
2020 Enviro Monitoring Portal	8/10/2020	Dunloe Sands	0.5	0.4	1	7.7
2020 Enviro Monitoring Portal	9/11/2020	Dunloe Sands	1.1	1.6	0.4	3
2020 Enviro Monitoring Portal	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
2021 Enviro Monitoring Portal	11/02/2021	Dunloe Sands	0.5	0.3	2.5	1.1
2021 Enviro Monitoring Portal	15/03/2021	Dunloe Sands	0.2	0.6	0.7	12
2021 Enviro Monitoring Portal	13/04/2021	Dunloe Sands	0.4	0.6	1.3	1.5
2021 Enviro Monitoring Portal	12/05/2021	Dunloe Sands	0.3	0.5	1.9	14
2021 Enviro Monitoring Portal	10/06/2021	Dunloe Sands	0.2	0.2	0.2	7
2021 Enviro Monitoring Portal	8/07/2021	Dunloe Sands	0.2	0.1	0.3	NS
2021 Enviro Monitoring Portal	9/08/2021	Dunloe Sands	0.3	0.4	0.3	18
2021 Enviro Monitoring Portal	9/09/2021	Dunloe Sands	0.8	0.4	0.5	8.2
2021 Enviro Monitoring Portal	11/10/2021	Dunloe Sands	1.1	0.7	1.2	1.2
2021 Enviro Monitoring Portal	13/12/2021	Dunloe Sands	0.5	0.9	1.3	3.7
2022 Enviro Monitoring	12/01/2022	Dunloe Sands	0.4	3.7	0.9	3.6
2022 Enviro Monitoring	10/02/2022	Dunloe Sands	0.7	0.5	0.9	0.4
2022 Enviro Monitoring	14/03/2022	Dunloe Sands	0.2	NS	2.2	1.0
2022 Enviro Monitoring	13/04/2022	Dunloe Sands	0.4	0.5	0.3	0.4
2022 Enviro Monitoring	11/05/2022	Dunloe Sands	0.4	1.2	0.5	3.2
2022 Enviro Monitoring	9/06/2022	Dunloe Sands	0.4	0.4	0.4	1.8
2022 Enviro Monitoring	11/07/2022	Dunloe Sands	0.3	0.3	0.3	2.8
2022 Enviro Monitoring	11/08/2022	Dunloe Sands	0.2	0.2	0.3	1.6
2022 Enviro Monitoring	12/09/2022	Dunloe Sands	0.2	0.2	0.1	0.7
2022 Enviro Monitoring	13/10/2022	Dunloe Sands	0.1	0.1	0.1	0.1
2022 Enviro Monitoring	14/11/2022	Dunloe Sands	0.1	0.2	0.6	0.2
2022 Enviro Monitoring	14/12/2022	Dunloe Sands	0.1	0.3	0.1	0.1
		Minimum	**0.1**	**0.1**	**0.1**	**0.1**
		Maximum	**2.7**	**4.7**	**2.5**	**18**
		Average	**0.50**	**0.84**	**0.77**	**1.75**

Longterm Pond Water Quality Monitoring at Dunloe Sands Quarry

Data located	Date	Location	pH	EC	DO (membrane electrode)	*Redox Potential	Alkalinity as CaCO3	Bicarbonate as CaCO3	Chloride	Turbidity	TDS	TSS	Chlorophyll 'a'	Oil and Grease	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	NTU	mg/L	m	µg/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	30/05/2012	Lake	5.8	133	8.9					190		84		<2	0.09	0.66										
2011/2012 AEMR	27/06/2012	Lake	6	143	9.4		3	2	8	34		23		4	0.04	0.38		13	1.5	6.3	<5	41	1.21	<0.005	1.01	0.03
2011/2012 AEMR	26/07/2012	Lake	7	164	9.4					18		15		<2	0.02	33										
2011/2012 AEMR	27/08/2012	Lake	5.7	188	9.3	168				100		70		2	0.04	0.44										
2011/2012 AEMR	27/09/2012	Lake 1	4.6	214	8.2		<1	<1	10	7.8		11		<2	0.02			22	1.9	9	<5	65	0.47	<0.005	0.41	0.05
2011/2012 AEMR	29/10/2012	Lake	4.2	246	8.5					2.9		4		<2	<0.02	0.09										
2012/2013 AEMR	25/11/2013	Lake	5.9	478	7					18		26		<2	0.04	0.33										
2013/2014 AEMR	12/12/2013	Lake	4.7	568	7.7	160	2	1	22	33		54		<2	0.06	0.48		75	8.6	15	5	244	8.92	<0.005	3.49	0.64
2013/2014 AEMR	30/01/2014	Lake	4.4	650	7.9					31		41		<2	0.03	0.37										
2013/2014 AEMR	24/02/2014	Lake	4.4	780	7.7					40		45		<2	0.04	0.25										
2013/2014 AEMR	31/03/2014	Lake	4.9	800	7.5					70		63		<2	0.04	0.55										
2013/2014 AEMR	28/04/2014	Lake	4.4	874						33		30		<2	0.03	0.17										
2013/2014 AEMR	28/05/2014	Lake	4.1	895	9.2					42		30		<2	<0.02	0.27										
2013/2014 AEMR	25/06/2014	Lake	3.8	916	9.4		<1	<1	35	72		53		<2	0.08	0.37		109	16	23	6	413	26	<0.005	12	1.05
2013/2014 AEMR	30/07/2014	Lake	4.3	917						79		44		<2	0.02	0.44										
2013/2014 AEMR	29/08/2014	Lake	4.5	960						138		187		5	0.05	0.81										
2013/2014 AEMR	29/09/2014	Lake	3.8	971	8		<1	<1		68		58			0.03	0.58										
Appendix of 2015 AEMR	28/11/2014	Lake	4	998	8.3					70		101		<2	0.07	0.5										
Appendix of 2015 AEMR	15/12/2014	Lake	4.4	1005	8		NP	<1	40	119		167		<2	0.14	0.31		159	18	29	7	394	33	0.008	11	1.23
Appendix of 2015 AEMR	22/01/2015	Lake 1	4.4	1029	7.4	204				78		96		<2	0.05	0.32										
Appendix of 2015 AEMR	25/02/2015	Lake 1	4.2	960	7					85		89		<2	0.08	0.6										
Appendix of 2015 AEMR	26/03/2015	Lake 1	4.1	853	7.5		NP	NP	38	34		55		<2	0.25	0.42		92	12	22	6	369	24.2	0.003	5.61	1.03
Appendix of 2015 AEMR	24/04/2015	Lake	4.3	963	8.5					59		95		<2	0.1	0.73										
Appendix of 2015 AEMR	28/05/2015	Lake	4.4	927	9					52		85		<2	0.22	0.44										
Appendix of 2015 AEMR	17/09/2015	Lake	4.5	928	8.9		NP		35	56		61	6	<2	0.1	0.43	0.08	117	13	25	8	361	19.3	0.003	6.7	0.953
Appendix of 2015 AEMR	21/10/2015	Lake	4.4	955	7.8					56		100		<2	0.08	0.28										
Appendix of 2015 AEMR	25/11/2015	Lake	3.7	996	7.7					5.1		4		<2	0.03	0.16										
Appendix of 2015 AEMR	11/12/2015	Lake 1	4.2	956	6.8		<1	<1	45	20		39		<2	0.39	0.57		111	13	29	9	429	14.3	0.004	2.54	0.896
Appendix of 2016 AEMR	25/01/2016	Pond	3.9	1002	7.3					7.9				6												
Appendix of 2016 AEMR	24/02/2016	Pond	4	1021	7.4					6.1				2												
Appendix of 2016 AEMR	24/03/2016	Pond	3.9	1060	7.9					7.2				2	0.07	0.12		112.71	14.14	43.28	9.32	382.38	10.93	0.002	1.24	0.88
Appendix of 2016 AEMR	29/04/2016	Pond	4.4	1037	8.6					7.7				2												
Appendix of 2016 AEMR	24/05/2016	Pond	4.9	1029	8.4									4												
Appendix of 2016 AEMR	30/06/2016	Pond	4.7	518.9	9.8					4		16		2	0.02	0.31	<0.02	57.45	7.218	24.38	5.39	185.14	4.51	0.002	0.41	0.56
Appendix of 2016 AEMR	21/07/2016	Pond	4.5	546.4	9.3					1.2				0												
Appendix of 2016 AEMR	31/08/2016	Pond	4	618	9.1					2				2												
Appendix of 2016 AEMR	29/09/2016	Pond	4.1	651	8.7					2.6		10		2			<0.02		7.9	27	6	220	2.83	0.002	0.41	0.39
Appendix of 2016 AEMR	27/10/2016	Pond	4	684	8.4					7.2				2												
Appendix of 2016 AEMR	29/11/2016	Pond	3.8	714	8					1.7				2												
Appendix of 2016 AEMR	20/12/2016	Pond	3.5	742	7.3					2.8		2		2	<0.02	0.19	0.03		9.3	29	7	251	4.01	0.001	0.71	0.48
2017 Q1 Env Mon report	30/01/2017	Pond	3.6	758	7.2					2.6				<2												
2017 Q1 Env Mon report	27/02/2017	Pond	3.5	858	7.7					2.4				<2												
2017 Env Monitoring	22/03/2017	Pond	3.4	979	8.2		<5		67	2.2				<5.0	<0.05	0.01	0.013		10	46	7	260	5.6	<0.001	1.7	0.57
2017 Env Monitoring	19/04/2017	Pond	6.5	84	7.6					400				<5.0												
2017 Env Monitoring	17/05/2017	Pond	5.9	101	8.1					230				<5.0												
2017 Env Monitoring	14/06/2017	Pond	4.8	115	9.5		<5		8	100				<5.0	0.07	0.07	0.03		2	7	2	25	0.17	<0.001	0.04	0.12
2017 Env Monitoring	12/07/2017	Pond	4.3	153	9.2					5.5				<5.0												
2017 Env Monitoring	9/08/2017	Pond	4.2	171	9.9					3.4				<5.0												
2017 Env Monitoring	6/09/2017	Pond	4.2	183	6.6		<5		11	3.2				<5.0	<0.05	0.3	<0.005		2	8	2	47	0.35	<0.001	0.085	0.18
2017 Env Monitoring	4/10/2017	Pond	4.3	229	8.6					1.6				<5.0												
2017 Env Monitoring	1/11/2017	Pond	4.1	271	8					2.9				<5.0												
2017 Env Monitoring	29/11/2017	Pond	4.3	303	7.6					4				<5.0												
2017 Env Monitoring	28/12/2017	Pond	4.1	339	7.8		<5		16	1				<5.0	<0.05	<0.1	<0.005		3.7	11	3	84	0.6	<0.001	0.12	0.23
2018 Env Monitoring	24/01/2018	Dam 1	4.02	361	8.3					2.1		<1		<5												
2018 Env Monitoring	21/02/2018	Dam 1	3.96	367	8.74					2.1		<1		<5												
2018 Env Monitoring	21/03/2018	Dam 1	4.05	395	8.61		<5		21	2.42		<1		<5	<0.05	<0.1	<0.005		5	14	3.6	99	0.88	<0.001	0.088	0.25
2018 Env Monitoring	18/04/2018	Dam 1	4.6	373	8.18					4.64		1		<5												
2018 Env Monitoring	16/05/2018	Dam 1	4.12	346	8.38					2.27		<1		<5												
2018 Env Monitoring	13/06/2018	Dam 1	4.21	366	9.18		<5		21	2.87		<1		<5	<0.05	<0.1	<0.005		4.9	14	3.6	110	0.62	<0.001	0.1	0.25
2018 Env Monitoring	11/07/2018	Dam 1	4.13	324	9.69					4.17		<1		<5												
2018 Env Monitoring	8/08/2018	Dam 1	4.08	384	9.38					5.3		<1		<5												
2018 Env Monitoring	5/09/2018	Dam 1	6.73	382	99.2	138				21		<1			0.02		0.04									

2018 Env Monitoring	5/10/2018	Dam 1																						
2018 Env Monitoring	6/11/2018	Dam 1	4.25	560	104	3520				0.2		<5												
2018 Env Monitoring	7/12/2018	Dam 1	4.42	540	99.8	350	1		86	1.4		<1	<5	0.18		0.01		9	45	4	135	0.72	<0.002	0.07	0.243
2019 Env Monitoring	8/01/2019	Dredge Pond Dam 1	4.45	613	103					0.7			NR												
2019 Env Monitoring	5/02/2019	Dredge Pond Dam 1	4.41	680	7.44					0			5												
2019 Env Monitoring	8/03/2019	Dredge Pond Dam 1	4.12	625	5.63			1	81	0		2	5					10	47	5	164	0.84	0.001	0.23	0.278
2019 Env Monitoring	5/04/2019	Dredge Pond Dam 1	4.24	603	8.1					3.4			5												
2019 Env Monitoring	7/05/2019	Dredge Pond Dam 1	4.18	127	1.2					50.8			5												
2019 Env Monitoring	4/06/2019	Dredge Pond Dam 1	4.06	547	9.3			1	74	1.8		1	5					10	44	5	170	0.76	0.001	0.21	0.235
2019 Env Monitoring	4/07/2019	Dredge Pond Dam 1	4.15	436	12.8					1.8			5												
2019 Env Monitoring	29/08/2019	Dredge Pond Dam 1	4.35	120	11.4			1	66	1.9		1	NR					9	37	4	174	0.68	0.001	0.2	0.259
2019 Env Monitoring	26/09/2019	Dredge Pond Dam 1	5.54	620	8					8			5												
2019 Env Monitoring	24/10/2019	Dredge Pond Dam 1	4.42	663	60.3					NR			5												
2019 Env Monitoring	22/11/2019	Dredge Pond Dam 1	3.95	722	116			1	95	1.1		1	5					11	53	5	171	0.92	0.003	0.55	0.26
2019 Env Monitoring	20/12/2019	Dredge Pond Dam 1	5.13	783	85.4					12.7			5												
2020 Annual Review	18/03/2020	Dredge Pond	6.52	621	5.85					0.5	397000 c		10												
2020 Annual Review	16/04/2020	Dredge Pond	4.72	635	3.79					1.2	407000 c		10												
2020 Annual Review	14/05/2020	Dredge Pond	3.87	620	8.57					6.9	397		10												
2020 Annual Review	11/06/2020	Dredge Pond	3.69	611	8.38					0	391														
2020 Annual Review	9/07/2020	Dredge Pond	3.87	676	6.89					1.6	433														
2020 Annual Review	10/08/2020	Dredge Pond	4.06	291	7.43					61.5	189		5												
2020 Annual Review	8/09/2020	Dredge Pond	3.88	661	3.88					4	423000 c		5												
2020 Annual Review	8/10/2020	Dredge Pond	3.88	661	3.88					4	423000 c														
2020 Annual Review	9/11/2020	Dredge Pond	3.86	710	6.48				88	0	454000 c	5	5					10	44	5	146	1.8	0.001	0.54	0.29
2020 Annual Review	24/11/2020	Dredge Pond																							
2020 Annual Review	10/12/2020	Dredge Pond	3.83	245	8.63					40.9	155		5												
2021 Annual Review	11/02/2021	Dredge Pond	4.7	744	7.12				100	1.2	476000	5	5.2					23	57	4.6	240	0.95	0.001	0.14	0.3
2021 Annual Review	12/05/2021	Dredge Pond	5.9	676	7.4				100	0	433000	5	5					10	44	3.7	190	0.12	0.001	0.05	0.21
2021 Annual Review	9/08/2021	Dredge Pond	6.3	747	5.9				86	0	478000	5	10					27	51	6	200	0.12	0.001	0.05	0.21
2021 Annual Review	10/11/2021	Dredge Pond	7.9	440	8				83	29.5	286000	8.9	5						51	3.7	210	0.05	0.001	0.05	0.2
2022 Env Monitoring	9/02/2022	Dredge Pond	6.6	559	7				78	11.6	358000	5.0	5					9.6	48	4.5	200	0.05	0.001		
2022 Env Monitoring	11/05/2022	Dredge Pond	6.4	47	8				7	81.4	31000	5.0	5					1.3	5	1.4	13	0.11	0.001		
2022 Env Monitoring	10/08/2022	Dredge Pond	3.9	76	8				8	16.9	49000	5.0	5					1.5	5.8	1.5	32	0.50	0.001		
2022 Env Monitoring	14/11/2022	Dredge Pond	5.8	103	6				16	11.6	67000	5.0	5					1.6	7	1.3	34	0.11	0.001		
2019 Env Monitoring	8/01/2019	Silt Pond Dam 2	8.21	578	111.28					2.76			NR												
2019 Env Monitoring	5/02/2019	Silt Pond Dam 2	6.76	653	7.74					0			5												
2019 Env Monitoring	8/03/2019	Silt Pond Dam 2	9.85	612	5.97			8	71	0		3	5					10	43	4	158	0.03	0.001	0.05	0.076
2019 Env Monitoring	5/04/2019	Silt Pond Dam 2	6.8	587	8.2					15			5												
2019 Env Monitoring	7/05/2019	Silt Pond Dam 2	3.94	592	0.5					0.6			5												
2019 Env Monitoring	4/06/2019	Silt Pond Dam 2	6.08	501	9.6			5	72	8.8		1	5					10	42	4	164	0.01	0.001	0.05	0.164
2019 Env Monitoring	4/07/2019	Silt Pond Dam 2	6.7	420	9.5					7.6			8												
2019 Env Monitoring	29/08/2019	Silt Pond Dam 2	6.91	148	10			11	65	14.1		2	NR					9	36	4	164	0.02	0.001	0.05	0.203
2019 Env Monitoring	26/09/2019	Silt Pond Dam 2	6.81	130	9.3					15.5			5												
2019 Env Monitoring	24/10/2019	Silt Pond Dam 2	7.3	652	84.5					NR			5												
2019 Env Monitoring	22/11/2019	Silt Pond Dam 2	NRR	NRR	NRR			22	80	NRR		8	5					11	46	5	164	0.58	0.003	0.05	0.126
2019 Env Monitoring	20/12/2019	Silt Pond Dam 2	6.99	719	110					57.3			5												
2020 Annual Review	14/02/2020	Silt Pond	6.56	633	8.9					4		7	5	0.01				10	44	5	146	0.03	0.001	0.05	0.172
2020 Annual Review	18/03/2020	Silt Pond	5.84	592	5.27					48.2	379000 c		10												
2020 Annual Review	16/04/2020	Silt Pond	5.55	606	5.5					1.3	388000 c		10												
2020 Annual Review	14/05/2020	Silt Pond	4.54	606	7.63					12.3	388		10												
2020 Annual Review	11/06/2020	Silt Pond	5.17	565	9.09					0	362														
2020 Annual Review	9/07/2020	Silt Pond	5.91	643	7.79					17.6	412														
2020 Annual Review	10/08/2020	Silt Pond	4.79	641	7.46					79.6	410		5												
2020 Annual Review	8/09/2020	Silt Pond	4.56	676	6.18					9.4	433000 c		5												
2020 Annual Review	8/10/2020	Silt Pond	4.56	676	6.18					9.4	433000 c														
2020 Annual Review	9/11/2020	Silt Pond	4.34	707	4.94					0	452	5	5					10	45	4.4	210	0.79	0.001	0.08	0.33
2020 Annual Review	24/11/2020	Silt Pond																							
2020 Annual Review	10/12/2020	Silt Pond	5.76	753	4.42					739	482		5												
2021 Annual Review	11/02/2021	Silt Pond	5.8	772	6.8				130	4.9	476000	5	5					12	62	4.7	230	0.05	0.001	0.08	0.25
2021 Annual Review	12/05/2021	Silt Pond	6.4	667	7.3				83	6.8	433000	5	5					9.9	43	3.7	200	0.05	0.001	0.05	0.14
2021 Annual Review	9/08/2021	Silt Pond	6.6	715	6				81	0.7	478000	5	42					12	47	3.9	210	0.05	0.001	0.05	0.1
2021 Annual Review	10/11/2021	Silt Pond	8.4	444	6.7				81	21.9	286000	8.1	5						51	3.8	210	0.96	0.001	0.61	0.17
2022 Env Monitoring	9/02/2022	Silt Pond	6.6	558	6				76	27.9	357000	5.0	5					10	49	4.5	210	0.05	0.003	0.09	0.1
2022 Env Monitoring	11/05/2022	Silt Pond	4.6	98	7				8	47.4	64000	5.0	5					1.5	5	1.6	35	0.35	0.001	0.09	0.2
2022 Env Monitoring	10/08/2022	Silt Pond	4.3	114	7				11	22.2	74000	5.0	5					1.8	7	1.7	52	0.86	0.002	0.19	0.2
2022 Env Monitoring	14/11/2022	Silt Pond	7.1	131	5				33	200.0	85000	5.0	5					2	8	1.6	58	0.05	0.001	0.05	0.1
		Minimum	**3.4**	**47**	**0.5**	**138**	**1**	**1**	**7**	**0**	**155**	**4** 1	**0**	**0.01**	**0.01**	**0.01**	**13**	**1.3**	**5.0**	**1**	**13**	**0.01**	**0.001**	**0.05**	**0.00**
		Maximum	**9.85**	**1060**	**116**	**3520**	**3**	**22**	**130**	**739**	**478000**	**187** 16	**42**	**0.39**	**33**	**0.08**	**159**	**27**	**62**	**9.32**	**429**	**33**	**0.008**	**0.19**	**0.20**
		Average	**4.88**	**596.53**	**15.68**	**756.67**	**2.00**	**5.30**	**59.34**	**33.44**	**176319.53**	**61.79** 4.92	**5.68**	**0.08**	**1.36**	**0.03**	**86.82**	**10.08**	**34.58**	**4.96**	**200.93**	**4.41**	**0.00**	**1.17**	**0.35**

Longterm Pond Water Quality Monitoring at Dunloe Sands Quarry

Data located	Date	Location	pH	EC	DO (membrane electrode)	*Redox Potential	Alkalinity as CaCO3	Bicarbonate as CaCO3	Chloride	Turbidity	TDS	TSS	Chlorophyll 'a'	Oil and Grease	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	NTU	mg/L	mg/L	µg/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	30/05/2012	Lake	5.8	133	8.9					190		84		<2	0.09	0.66										
2011/2012 AEMR	27/06/2012	Lake	6	143	9.4		3	2	8	34		23		4	0.04	0.38		13	1.5	6.3	<5	41	1.21	<0.005	1.01	0.03
2011/2012 AEMR	26/07/2012	Lake	7	164	9.4					18		15		<2	0.02	33										
2011/2012 AEMR	27/08/2012	Lake	5.7	188	9.3	168				100		70		2	0.04	0.44										
2011/2012 AEMR	27/09/2012	Lake 1	4.6	214	8.2		<1	<1	10	7.8		11		<2	0.02			22	1.9	9	<5	65	0.47	<0.005	0.41	0.05
2011/2012 AEMR	29/10/2012	Lake	4.2	246	8.5					2.9		4		<2	<0.02	0.09										
2012/2013 AEMR	25/11/2013	Lake	5.9	478	7					18		26		<2	0.04	0.33										
2013/2014 AEMR	12/12/2013	Lake	4.7	568	7.7	160	2	1	22	33		54		<2	0.06	0.48		75	8.6	15	5	244	8.92	<0.005	3.49	0.64
2013/2014 AEMR	30/01/2014	Lake	4.4	650	7.9					31		41		<2	0.03	0.37										
2013/2014 AEMR	24/02/2014	Lake	4.4	780	7.7					40		45		<2	0.04	0.25										
2013/2014 AEMR	31/03/2014	Lake	4.9	800	7.5					70		63		<2	0.04	0.55										
2013/2014 AEMR	28/04/2014	Lake	4.4	874						33		30		<2	0.03	0.17										
2013/2014 AEMR	28/05/2014	Lake	4.1	895	9.2					42		30		<2	<0.02	0.27										
2013/2014 AEMR	25/06/2014	Lake	3.8	916	9.4		<1	<1	35	72		53		<2	0.08	0.37		109	16	23	6	413	26	<0.005	12	1.05
2013/2014 AEMR	30/07/2014	Lake	4.3	917						79		44		<2	0.02	0.44										
2013/2014 AEMR	29/08/2014	Lake	4.5	960						138		187		5	0.05	0.81										
2013/2014 AEMR	29/09/2014	Lake	3.8	971	8		<1	<1		68		58			0.03	0.58										
Appendix of 2015 AEMR	28/11/2014	Lake	4	998	8.3					70		101		<2	0.07	0.5										
Appendix of 2015 AEMR	15/12/2014	Lake	4.4	1005	8		NP	<1	40	119		167		<2	0.14	0.31		159	18	29	7	394	33	0.008	11	1.23
Appendix of 2015 AEMR	22/01/2015	Lake 1	4.4	1029	7.4	204				78		96		<2	0.05	0.32										
Appendix of 2015 AEMR	25/02/2015	Lake 1	4.2	960	7					85		89		<2	0.08	0.6										
Appendix of 2015 AEMR	26/03/2015	Lake 1	4.1	853	7.5		NP	NP	38	34		55		<2	0.25	0.42		92	12	22	6	369	24.2	0.003	5.61	1.03
Appendix of 2015 AEMR	24/04/2015	Lake	4.3	963	8.5					59		95		<2	0.1	0.73										
Appendix of 2015 AEMR	28/05/2015	Lake	4.4	927	9					52		85		<2	0.22	0.44										
Appendix of 2015 AEMR	17/09/2015	Lake	4.5	928	8.9		NP		35	56		61	6	<2	0.1	0.43	0.08	117	13	25	8	361	19.3	0.003	6.7	0.953
Appendix of 2015 AEMR	21/10/2015	Lake	4.4	955	7.8					56		100		<2	0.08	0.28										
Appendix of 2015 AEMR	25/11/2015	Lake	3.7	996	7.7					5.1		4		<2	0.03	0.16										
Appendix of 2015 AEMR	11/12/2015	Lake 1	4.2	956	6.8		<1	<1	45	20		39		<2	0.39	0.57		111	13	29	9	429	14.3	0.004	2.54	0.896
Appendix of 2016 AEMR	25/01/2016	Pond	3.9	1002	7.3					7.9				6												
Appendix of 2016 AEMR	24/02/2016	Pond	4	1021	7.4					6.1				2												
Appendix of 2016 AEMR	24/03/2016	Pond	3.9	1060	7.9					7.2				2	0.07	0.12		112.71	14.14	43.28	9.32	382.38	10.93	0.002	1.24	0.88
Appendix of 2016 AEMR	29/04/2016	Pond	4.4	1037	8.6					7.7				2												
Appendix of 2016 AEMR	24/05/2016	Pond	4.9	1029	8.4									4												
Appendix of 2016 AEMR	30/06/2016	Pond	4.7	518.9	9.8					4		16		2	0.02	0.31	<0.02	57.45	7.218	24.38	5.39	185.14	4.51	0.002	0.41	0.56
Appendix of 2016 AEMR	21/07/2016	Pond	4.5	546.4	9.3					1.2				0												
Appendix of 2016 AEMR	31/08/2016	Pond	4	618	9.1					2				2												
Appendix of 2016 AEMR	29/09/2016	Pond	4.1	651	8.7					2.6		10		2			<0.02		7.9	27	6	220	2.83	0.002	0.41	0.39
Appendix of 2016 AEMR	27/10/2016	Pond	4	684	8.4					7.2				2												
Appendix of 2016 AEMR	29/11/2016	Pond	3.8	714	8					1.7				2												
Appendix of 2016 AEMR	20/12/2016	Pond	3.5	742	7.3					2.8		2		2	<0.02	0.19	0.03		9.3	29	7	251	4.01	0.001	0.71	0.48
2017 Q1 Env Mon report	30/01/2017	Pond	3.6	758	7.2					2.6				<2												
2017 Q1 Env Mon report	27/02/2017	Pond	3.5	858	7.7					2.4				<2												
2017 Env Monitoring	22/03/2017	Pond	3.4	979	8.2		<5		67	2.2				<5.0	<0.05	0.01	0.013		10	46	7	260	5.6	<0.001	1.7	0.57
2017 Env Monitoring	19/04/2017	Pond	6.5	84	7.6					400				<5.0												
2017 Env Monitoring	17/05/2017	Pond	5.9	101	8.1					230				<5.0												
2017 Env Monitoring	14/06/2017	Pond	4.8	115	9.5		<5		8	100				<5.0	0.07	0.07	0.03		2	7	2	25	0.17	<0.001	0.04	0.12
2017 Env Monitoring	12/07/2017	Pond	4.3	153	9.2					5.5				<5.0												
2017 Env Monitoring	9/08/2017	Pond	4.2	171	9.9					3.4				<5.0												
2017 Env Monitoring	6/09/2017	Pond	4.2	183	6.6		<5		11	3.2				<5.0	<0.05	0.3	<0.005		2	8	2	47	0.35	<0.001	0.085	0.18
2017 Env Monitoring	4/10/2017	Pond	4.3	229	8.6					1.6				<5.0												
2017 Env Monitoring	1/11/2017	Pond	4.1	271	8					2.9				<5.0												
2017 Env Monitoring	29/11/2017	Pond	4.3	303	7.6					4				<5.0												
2017 Env Monitoring	28/12/2017	Pond	4.1	339	7.8		<5		16	1				<5.0	<0.05	<0.1	<0.005		3.7	11	3	84	0.6	<0.001	0.12	0.23
2018 Env Monitoring	24/01/2018	Dam 1	4.02	361	8.3					2.1		<1		<5												
2018 Env Monitoring	21/02/2018	Dam 1	3.96	367	8.74					2.1		<1		<5												
2018 Env Monitoring	21/03/2018	Dam 1	4.05	395	8.61		<5		21	2.42		<1		<5	<0.05	<0.1	<0.005		5	14	3.6	99	0.88	<0.001	0.880	0.25
2018 Env Monitoring	18/04/2018	Dam 1	4.6	373	8.18					4.64		1		<5												
2018 Env Monitoring	16/05/2018	Dam 1	4.12	346	8.38					2.27		<1		<5												
2018 Env Monitoring	13/06/2018	Dam 1	4.21	366	9.18		<5		21	2.87		<1		<5	<0.05	<0.1	<0.005		4.9	14	3.6	110	0.62	<0.001	0.1	0.25
2018 Env Monitoring	11/07/2018	Dam 1	4.13	324	9.69					4.17		<1		<5												
2018 Env Monitoring	8/08/2018	Dam 1	4.08	384	9.38					5.3		<1		<5												
2018 Env Monitoring	5/09/2018	Dam 1	6.73	382	99.2	138				21		<1			0.02		0.04									
2018 Env Monitoring	5/10/2018	Dam 1																								

2018 Env Monitoring	6/11/2018	Dam 1	4.25	560	104	3520				0.2		<5													
2018 Env Monitoring	7/12/2018	Dam 1	4.42	540	99.8	350	1		86	1.4		<1	<5	0.18		0.01		9	45	4	135	0.72	<0.002	0.07	0.243
2019 Env Monitoring	8/01/2019	Dredge Pond Dam 1	4.45	613	103					0.7			NR												
2019 Env Monitoring	5/02/2019	Dredge Pond Dam 1	4.41	680	7.44					0			5												
2019 Env Monitoring	8/03/2019	Dredge Pond Dam 1	4.12	625	5.63			1	81	0		2	5					10	47	5	164	0.84	0.001	0.23	0.278
2019 Env Monitoring	5/04/2019	Dredge Pond Dam 1	4.24	603	8.1					3.4			5												
2019 Env Monitoring	7/05/2019	Dredge Pond Dam 1	4.18	127	1.2					50.8			5												
2019 Env Monitoring	4/06/2019	Dredge Pond Dam 1	4.06	547	9.3			1	74	1.8		1	5					10	44	5	170	0.76	0.001	0.21	0.235
2019 Env Monitoring	4/07/2019	Dredge Pond Dam 1	4.15	436	12.8					1.8			5												
2019 Env Monitoring	29/08/2019	Dredge Pond Dam 1	4.35	120	11.4			1	66	1.9		1	NR					9	37	4	174	0.68	0.001	0.2	0.259
2019 Env Monitoring	26/09/2019	Dredge Pond Dam 1	5.54	620	8					8			5												
2019 Env Monitoring	24/10/2019	Dredge Pond Dam 1	4.42	663	60.3					NR			5												
2019 Env Monitoring	22/11/2019	Dredge Pond Dam 1	3.95	722	116			1	95	1.1		1	5					11	53	5	171	0.92	0.003	0.55	0.26
2019 Env Monitoring	20/12/2019	Dredge Pond Dam 1	5.13	783	85.4					12.7			5												
2020 Annual Review	18/03/2020	Dredge Pond	6.52	621	5.85					0.5	397000 c		10												
2020 Annual Review	16/04/2020	Dredge Pond	4.72	635	3.79					1.2	407000 c		10												
2020 Annual Review	14/05/2020	Dredge Pond	3.87	620	8.57					6.9	397		10												
2020 Annual Review	11/06/2020	Dredge Pond	3.69	611	8.38					0	391														
2020 Annual Review	9/07/2020	Dredge Pond	3.87	676	6.89					1.6	433														
2020 Annual Review	10/08/2020	Dredge Pond	4.06	291	7.43					61.5	189		5												
2020 Annual Review	8/09/2020	Dredge Pond	3.88	661	3.88					4	423000 c		5												
2020 Annual Review	8/10/2020	Dredge Pond	3.88	661	3.88					4	423000 c														
2020 Annual Review	9/11/2020	Dredge Pond	3.86	710	6.48				88	0	454000 c	5	5					10	44	5	146	1.8	0.001	0.54	0.29
2020 Annual Review	24/11/2020	Dredge Pond																							
2020 Annual Review	10/12/2020	Dredge Pond	3.83	245	8.63					40.9	155		5												
2021 Annual Review	11/02/2021	Dredge Pond	4.7	744	7.12				100	1.2	476000	5	5.2					23	57	4.6	240	0.95	0.001	0.14	0.3
2021 Annual Review	12/05/2021	Dredge Pond	5.9	676	7.4				100	0	433000	5	5					10	44	3.7	190	0.12	0.001	0.05	0.21
2021 Annual Review	9/08/2021	Dredge Pond	6.3	747	5.9				86	0	478000	5	10					27	51	6	200	0.12	0.001	0.05	0.21
2021 Annual Review	10/11/2021	Dredge Pond	7.9	440	8				83	29.5	286000	8.9	5						51	3.7	210	0.05	0.001	0.05	0.2
2022 Env Monitoring	9/02/2022	Dredge Pond	6.6	559	7				78	11.6	358000	5.0	5					9.6	48	4.5	200	0.05	0.001	0.05	0.1
2022 Env Monitoring	11/05/2022	Dredge Pond	6.4	47	8				7	81.4	31000	5.0	5					1.3	5	1.4	13	0.11	0.001	0.14	0.0
2022 Env Monitoring	10/08/2022	Dredge Pond	3.9	76	8				8	16.9	49000	5.0	5					1.5	6 5.8	1.5	32	0.50	0.001	0.13	0.2
2022 Env Monitoring	14/11/2022	Dredge Pond	5.8	103	6				16	11.6	67000	5.0	5					1.6	7	1.3	34	0.11	0.001	0.11	0.2
		Minimum	**3.4**	**84**	**1.2**	**138**	**1**	**1**	**8**	**0**	**155**	**4 1**	**0**	**0.02**	**0.01**	**0.01**	**13**	**1.5**	**6.3**	**2**	**25**	**0.05**	**0.001**	**0.04**	**0.03**
		Maximum	**7.9**	**1060**	**116**	**3520**	**3**	**2**	**100**	**400**	**478000**	**187 16**	**10**	**0.39**	**33**	**0.08**	**159**	**27**	**57**	**9.32**	**429**	**33**	**0.008**	**12**	**1.23**
		Average	**4.50**	**581.85**	**15.00**	**756.67**	**2.00**	**1.17**	**51.50**	**30.70**	**186062.78**	**61.79 4.92**	**4.56**	**0.08**	**1.36**	**0.03**	**86.82**	**9.97**	**30.53**	**5.23**	**206.41**	**5.89**	**0.00**	**1.88**	**0.42**
2019 Env Monitoring	8/01/2019	Silt Pond Dam 2	8.21	578	111.28					2.76			NR												
2019 Env Monitoring	5/02/2019	Silt Pond Dam 2	6.76	653	7.74					0			5												
2019 Env Monitoring	8/03/2019	Silt Pond Dam 2	9.85	612	5.97			8	71	0		3	5					10	43	4	158	0.03	0.001	0.05	0.076
2019 Env Monitoring	5/04/2019	Silt Pond Dam 2	6.8	587	8.2					15			5												
2019 Env Monitoring	7/05/2019	Silt Pond Dam 2	3.94	592	0.5					0.6			5												
2019 Env Monitoring	4/06/2019	Silt Pond Dam 2	6.08	501	9.6			5	72	8.8		1	5					10	42	4	164	0.01	0.001	0.05	0.164
2019 Env Monitoring	4/07/2019	Silt Pond Dam 2	6.7	420	9.5					7.6			8												
2019 Env Monitoring	29/08/2019	Silt Pond Dam 2	6.91	148	10			11	65	14.1		2	NR					9	36	4	164	0.02	0.001	0.05	0.203
2019 Env Monitoring	26/09/2019	Silt Pond Dam 2	6.81	130	9.3					15.5			5												
2019 Env Monitoring	24/10/2019	Silt Pond Dam 2	7.3	652	84.5					NR			5												
2019 Env Monitoring	22/11/2019	Silt Pond Dam 2	NRR	NRR	NRR			22	80	NRR		8	5					11	46	5	164	0.58	0.003	0.05	0.126
2019 Env Monitoring	20/12/2019	Silt Pond Dam 2	6.99	719	110					57.3			5												
2020 Annual Review	14/02/2020	Silt Pond	6.56	633	8.9					4		7	5	0.01				10	44	5	146	0.03	0.001	0.05	0.172
2020 Annual Review	18/03/2020	Silt Pond	5.84	592	5.27					48.2	379000 c		10												
2020 Annual Review	16/04/2020	Silt Pond	5.55	606	5.5					1.3	388000 c		10												
2020 Annual Review	14/05/2020	Silt Pond	4.54	606	7.63					12.3	388		10												
2020 Annual Review	11/06/2020	Silt Pond	5.17	565	9.09					0	362														
2020 Annual Review	9/07/2020	Silt Pond	5.91	643	7.79					17.6	412														
2020 Annual Review	10/08/2020	Silt Pond	4.79	641	7.46					79.6	410		5												
2020 Annual Review	8/09/2020	Silt Pond	4.56	676	6.18					9.4	433000 c		5												
2020 Annual Review	8/10/2020	Silt Pond	4.56	676	6.18					9.4	433000 c														
2020 Annual Review	9/11/2020	Silt Pond	4.34	707	4.94					0	452	5	5					10	45	4.4	210	0.79	0.001	0.08	0.33
2020 Annual Review	24/11/2020	Silt Pond																							
2020 Annual Review	10/12/2020	Silt Pond	5.76	753	4.42					739	482		5												
2021 Annual Review	11/02/2021	Silt Pond	5.8	772	6.8				130	4.9	476000	5	5					12	62	4.7	230	0.05	0.001	0.08	0.25
2021 Annual Review	12/05/2021	Silt Pond	6.4	667	7.3				83	6.8	433000	5	5					9.9	43	3.7	200	0.05	0.001	0.05	0.14
2021 Annual Review	9/08/2021	Silt Pond	6.6	715	6				81	0.7	478000	5	42					12	47	3.9	210	0.05	0.001	0.05	0.1
2021 Annual Review	10/11/2021	Silt Pond	8.4	444	6.7				81	21.9	286000	8.1	5						51	3.8	210	0.96	0.001	0.61	0.17
2022 Env Monitoring	9/02/2022	Silt Pond	6.6	558	6				76	27.9	357000	5.0	5					10	49	4.5	210	0.05	0.003	0.09	0.1
2022 Env Monitoring	11/05/2022	Silt Pond	4.6	98	7				8	47.4	64000	5.0	5					1.5	5	1.6	35	0.35	0.001	0.09	0.2
2022 Env Monitoring	10/08/2022	Silt Pond	4.3	114	7				11	22.2	74000	5.0	5					1.8	7	1.7	52	0.86	0.002	0.19	0.2
2022 Env Monitoring	14/11/2022	Silt Pond	7.1	131	5				33	200.0	85000	5.0	5					2	8	1.6	58	0.05	0.001	0.05	0.1
		Minimum	**3.94**	**114**	**0.5**	**0**	**0**	**5**	**8**	**0**	**362**	**0 1**	**5**	**0.01**	**0**	**0**	**0**	**2**	**5**	**1.6**	**35**	**0.01**	**0.001**	**0.05**	**0.076**
		Maximum	**9.85**	**772**	**111.28**	**0**	**0**	**22**	**130**	**739**	**478000**	**0 8.1**	**42**	**0.01**	**0**	**0**	**0**	**12**	**62**	**5**	**230**	**0.96**	**0.003**	**0.61**	**0.20**
		Average	**6.12**	**539.63**	**16.39**	**#DIV/0!**	**#DIV/0!**	**11.50**	**65.93**	**47.39**	**161107.57**	**#DIV/ 4.94**	**7.12**	**0.01**	**#DIV/0!**	**#DIV/0!**	**#DIV/0!**	**8.40**	**37.70**	**3.70**	**157.93**	**0.32**	**0.00**	**0.14**	**0.17**

Longterm 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						
2011/2012 AEMR	22/12/2012	Extraction Pond	800						
2011/2012 AEMR	2/02/2012	Extraction Pond	<100						
2011/2012 AEMR	20/02/2012	Extraction Pond	700						
2011/2012 AEMR	28/02/2012	Extraction Pond	14375						
2011/2012 AEMR	27/03/2012	Extraction Pond	1200						
2011/2012 AEMR	30/05/2012	Extraction Pond	<100						
2011/2012 AEMR	27/06/2012	Extraction Pond	130	0.01					
2011/2012 AEMR	26/07/2012	Extraction Pond	16360	2520					
2011/2012 AEMR	27/08/2012	Extraction Pond	24640	3720					
2011/2012 AEMR	27/09/2012	Extraction Pond	68000	35000					
2011/2012 AEMR	29/10/2012	Extraction Pond	<100	7900					
2012/2013 AEMR	28/11/2012	Extraction Pond	<100	80670					
2012/2013 AEMR	24/12/2012	Extraction Pond	<100						
2012/2013 AEMR	17/01/2013	Extraction Pond	<100						
2012/2013 AEMR	1/02/2013	Extraction Pond	<100						
2012/2013 AEMR	15/02/2013	Extraction Pond	<100						
2012/2013 AEMR	8/03/2013	Extraction Pond	<100	215					
2012/2013 AEMR	30/05/2013	Extraction Pond	<100	880					
2012/2013 AEMR	30/06/2013	Extraction Pond	<100						
2012/2013 AEMR	30/07/2013	Extraction Pond	<100	34000					
2012/2013 AEMR	28/08/2013	Extraction Pond	<100	205					
2012/2013 AEMR	30/09/2013	Extraction Pond	<100						
2012/2013 AEMR	25/10/2013	Extraction Pond	<100	17430					
2013/2014 AEMR	25/11/2013	Extraction Pond				480			
2013/2014 AEMR	12/12/2013	Extraction Pond	1150	39500					
2013/2014 AEMR	19/12/2013	Extraction Pond		22000					
2013/2014 AEMR	9/01/2014	Extraction Pond		123000					
2013/2014 AEMR	29/01/2014	Extraction Pond		34000					
2013/2014 AEMR	31/03/2014	Extraction Pond			295				
2013/2014 AEMR	28/04/2014	Extraction Pond		7700	45				
2013/2014 AEMR	29/05/2014	Extraction Pond	ND	7600					
2013/2014 AEMR	26/06/2014	Extraction Pond	ND	52000					
2013/2014 AEMR	31/07/2014	Extraction Pond	ND	28000					
2013/2014 AEMR	28/10/2014	Extraction Pond	ND	168000					
Appendix of 2015 AEMR	28/11/2014	Extraction Pond	ND	123000	260	60			
Appendix of 2015 AEMR	16/12/2014	Extraction Pond	ND	106500	220	35			
Appendix of 2015 AEMR	22/01/2015	Extraction Pond	ND	37000					
Appendix of 2015 AEMR	26/02/2015	Extraction Pond	ND						
Appendix of 2015 AEMR	26/03/2015	Extraction Pond	ND	8750					
Appendix of 2015 AEMR	24/04/2015	Extraction Pond	ND	8000					
Appendix of 2015 AEMR	29/05/2015	Extraction Pond	ND	76000	4200				
Appendix of 2015 AEMR	29/06/2015	Extraction Pond	ND	211000	6300				
Appendix of 2015 AEMR	21/10/2015	Extraction Pond	ND	18330	65	35	155		
Appendix of 2015 AEMR	26/11/2015	Extraction Pond	ND	4850		5			
Appendix of 2015 AEMR	11/12/2015	Extraction Pond	ND	11900	30	10			
2016 AEMR	25/01/2016	Extraction Pond	ND	34000					
2016 AEMR	8/02/2016	Extraction Pond	ND	0					
2016 AEMR	24/02/2016	Extraction Pond	ND	3700					
2016 AEMR	10/03/2016	Extraction Pond	ND	1575					
2016 AEMR	24/03/2016	Extraction Pond	ND	7600					
2016 AEMR	7/04/2016	Extraction Pond	ND	9700					
2016 AEMR	29/04/2016	Extraction Pond	ND	11800					
2016 AEMR	24/05/2016	Extraction Pond	ND	5700					
2016 AEMR	30/06/2016	Extraction Pond	ND	28930					
2016 AEMR	31/08/2016	Extraction Pond	840	61500					
2016 AEMR	30/09/2016	Extraction Pond	ND	920					
2016 AEMR	4/10/2016	Extraction Pond	ND	920					
2016 AEMR	28/10/2016	Extraction Pond	ND	29000					
2016 AEMR	21/12/2016	Extraction Pond	ND	10830					
2017 Q1 Env Mon report	30/01/2017	Extraction Pond	ND	1480					
2017 Q1 Env Mon report	27/02/2017	Extraction Pond	ND	640					
2017 Env Monitoring	22/03/2017	Extraction Pond	ND	175					
2017 Env Monitoring	19/04/2017	Extraction Pond	ND	600					
2017 Env Monitoring	17/05/2017	Extraction Pond	ND	2820					
2017 Env Monitoring	14/06/2017	Extraction Pond	ND	1830					
2017 Env Monitoring	12/07/2017	Extraction Pond	ND	5260					
2017 Env Monitoring	9/08/2017	Extraction Pond	ND	41500					
2017 Env Monitoring	6/09/2017	Extraction Pond	ND	99800					
2017 Env Monitoring	4/10/2017	Extraction Pond	ND	128000					
2017 Env Monitoring	1/11/2017	Extraction Pond	ND	38600					
2017 Env Monitoring	29/11/2017	Extraction Pond	ND	8150					
2017 Env Monitoring	28/12/2017	Extraction Pond	ND	1890					
2018 Env Monitoring	24/01/2018	Extraction Pond	<5	350					
2018 Env Monitoring	21/02/2018	Extraction Pond	<5	100					
2018 Env Monitoring	21/03/2018	Extraction Pond	<5	3,960					
2018 Env Monitoring	18/04/2018	Extraction Pond	<5	4,580					
2018 Env Monitoring	16/05/2018	Extraction Pond	<5	250					
2018 Env Monitoring	13/06/2018	Extraction Pond	<5	5,820					
2018 Env Monitoring	11/07/2018	Extraction Pond	<5	16,100					
2018 Env Monitoring	8/08/2018	Extraction Pond	<5	13,800					
2018 Env Monitoring	5/09/2018	Extraction Pond	ND	ND					
2018 Env Monitoring	5/10/2018	Extraction Pond	<5	ND					
2018 Env Monitoring	6/11/2018	Extraction Pond	ND	ND					
2018 Env Monitoring	7/12/2018	Extraction Pond	ND	ND					
2019 Env Monitoring	8/03/2019	Point 1 Silt Pond (Dam 2)	<0.001	<5					

2019 Env Monitoring	4/06/2019	Point 1 Silt Pond (Dam 2)	<0.001	500					
2019 Env Monitoring	29/08/2019	Point 1 Silt Pond (Dam 2)	<0.001	525					
2019 Env Monitoring	22/11/2019	Point 1 Silt Pond (Dam 2)	2.13	10800					
2019 Env Monitoring	8/03/2019	Point 2 Dredge Pond (Dam 1)	<0.001	<5					
2019 Env Monitoring	4/06/2019	Point 2 Dredge Pond (Dam 1)	<0.001	550					
2019 Env Monitoring	29/08/2019	Point 2 Dredge Pond (Dam 1)	0.002	30900					
2019 Env Monitoring	22/11/2019	Point 2 Dredge Pond (Dam 1)	0.002	900					
2020 Annual Review	14/02/2020	Silt Pond (Dam 2)						5	0.001
2020 Annual Review	18/03/2020	Dredge Pond (Dam 1)						735	1.0199
2020 Annual Review	18/03/2020	Silt Pond (Dam 2)						727	1.032
2020 Annual Review	16/04/2020	Dredge Pond (Dam 1)						430	0.0166
2020 Annual Review	16/04/2020	Silt Pond (Dam 2)						0	0
2020 Annual Review	14/05/2020	Dredge Pond (Dam 1)						90	0.0043
2020 Annual Review	14/05/2020	Silt Pond (Dam 2)						270	0.115
2020 Annual Review	11/06/2020	Dredge Pond (Dam 1)						0	0
2020 Annual Review	11/06/2020	Silt Pond (Dam 2)						0	0
2020 Annual Review	9/07/2020	Dredge Pond (Dam 1)						0	0
2020 Annual Review	9/07/2020	Silt Pond (Dam 2)						110	0.0011
2020 Annual Review	10/08/2020	Dredge Pond (Dam 1)						210	0.0153
2020 Annual Review	10/08/2020	Silt Pond (Dam 2)						170	0.0151
2020 Annual Review	8/09/2020	Dredge Pond (Dam 1)						326	0.00171
2020 Annual Review	8/09/2020	Silt Pond (Dam 2)						2252	0.0089
2020 Annual Review	8/10/2020	Dredge Pond (Dam 1)						0	0
2020 Annual Review	8/10/2020	Silt Pond (Dam 2)						148	0.00186
2020 Annual Review	9/11/2020	Dredge Pond (Dam 1)						1	0.01
2020 Annual Review	9/11/2020	Silt Pond (Dam 2)						1	0.01
2020 Annual Review	24/11/2020	Dredge Pond (Dam 1)						1	0.01
2020 Annual Review	24/11/2020	Silt Pond (Dam 2)						1	0.01
2020 Annual Review	10/12/2020	Dredge Pond (Dam 1)						1	0.01
2020 Annual Review	10/12/2020	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	1/01/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	22/01/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	11/02/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	3/03/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	16/03/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	22/03/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	3/04/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	12/05/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	10/06/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	8/07/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	9/08/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	9/09/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	11/10/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	22/10/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	10/11/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	10/12/2021	Dredge Pond (Dam 1)						1	0.01
2021 Annual Review	1/01/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	22/01/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	11/02/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	3/03/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	16/03/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	22/03/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	3/04/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	12/05/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	10/06/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	8/07/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	9/08/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	9/09/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	11/10/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	22/10/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	10/11/2021	Silt Pond (Dam 2)						1	0.01
2021 Annual Review	10/12/2021	Silt Pond (Dam 2)						1	0.01
2022 Env Monitoring	12/01/2022	Dredge Pond (Dam 1)							0.01
2022 Env Monitoring	9/02/2022	Dredge Pond (Dam 1)							0.01
2022 Env Monitoring	14/03/2022	Dredge Pond (Dam 1)							0.01
2022 Env Monitoring	13/04/2022	Dredge Pond (Dam 1)							0.01
2022 Env Monitoring	11/05/2022	Dredge Pond (Dam 1)							0.01
2022 Env Monitoring	8/06/2022	Dredge Pond (Dam 1)							0.01
2022 Env Monitoring	11/07/2022	Dredge Pond (Dam 1)							0.01
2022 Env Monitoring	10/08/2022	Dredge Pond (Dam 1)							0.01
2022 Env Monitoring	12/09/2022	Dredge Pond (Dam 1)							0.01
2022 Env Monitoring	14/11/2022	Dredge Pond (Dam 1)							0.01
2022 Env Monitoring	14/12/2022	Dredge Pond (Dam 1)							0.01
2021 Env Monitoring	12/01/2022	Silt Pond (Dam 2)							0.01
2022 Env Monitoring	9/02/2022	Silt Pond (Dam 2)							0.01
2021 Env Monitoring	14/03/2022	Silt Pond (Dam 2)							0.02
2022 Env Monitoring	13/04/2022	Silt Pond (Dam 2)							0.01
2021 Env Monitoring	11/05/2022	Silt Pond (Dam 2)							0.01
2022 Env Monitoring	8/06/2022	Silt Pond (Dam 2)							0.01
2021 Env Monitoring	11/07/2022	Silt Pond (Dam 2)							0.01
2022 Env Monitoring	10/08/2022	Silt Pond (Dam 2)							0.01
2021 Env Monitoring	12/09/2022	Silt Pond (Dam 2)							0.01
2020 Env Monitoring	12/10/2022	Silt Pond (Dam 2)							0.01
2021 Env Monitoring	14/11/2022	Silt Pond (Dam 2)							0.01
2022 Env Monitoring	14/12/2022	Silt Pond (Dam 2)							0.01
		Minimum	**0.002**	**0**	**30**	**5**	**155**	**0**	**0**
		Maximum	**68000**	**211000**	**6300**	**480**	**155**	**2252**	**1.032**
		Average	**9174.1**	**26700.4**	**1426.9**	**104.2**	**155.0**	**100.2**	**0.0**

Longterm 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
2011/2012 AEMR	Mar-12	DPL1							17				0.2	0.4	5.4	<5	4.8		<0.005	1.32	<0.01
2011/2012 AEMR	30/05/2012	DPL1	4.2	98	3.3	435															
2011/2012 AEMR	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
2011/2012 AEMR	26/07/2012	DPL1	4.3	87	5.1	374															
2011/2012 AEMR	27/08/2012	DPL1	4.2	98	2.1	365															
2011/2012 AEMR	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
2011/2012 AEMR	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
2012/2013 AEMR	Mar-13	DPL1							12				0.2	0.1	9.2	<5	7.3		<0.005	1.68	<0.01
2012/2013 AEMR	Jun-13	DPL1							19				0.1	<0.1	0.1	<5	5.9		<0.005	1.5	<0.01
2012/2013 AEMR	Sep-13	DPL1							16				0.4	0.2	7.5	<5			<0.005	5.82	<0.01
2013/2014 AEMR	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
2013/2014 AEMR	29/01/2014	DPL1	4	279	5.7	264															
2013/2014 AEMR	24/02/2014	DPL1	4.6	76	3.8	242															
2013/2014 AEMR	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
2013/2014 AEMR	24/04/2014	DPL1	4	75		204															
2013/2014 AEMR	28/05/2014	DPL1	4.2	95		307															
2013/2014 AEMR	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
2013/2014 AEMR	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
2013/2014 AEMR	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
2013/2014 AEMR	29/09/2014	DPL1	4	108	3.5	177															
Appendix of 2015 AEMR	28/11/2014	DPL1	4.7	81	3.3	110															
Appendix of 2015 AEMR	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
Appendix of 2015 AEMR	22/01/2015	DPL1	4.8	80	3.8	110															
Appendix of 2015 AEMR	25/02/2015	DPL1	4.2	110	1.1	160															
Appendix of 2015 AEMR	26/03/2015	DPL1	4	109	4	245	NP	NP													
Appendix of 2015 AEMR	24/04/2015	DPL1	4.1	131	2.7	253															
Appendix of 2015 AEMR	28/05/2015	DPL1	3.8	164	2	256															
Appendix of 2015 AEMR	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
Appendix of 2015 AEMR	21/10/2015	DPL1	4.3	116	2.9	217															
Appendix of 2015 AEMR	25/11/2015	DPL1	4.2	102	6.1	170															
Appendix of 2015 AEMR	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															
Appendix of 2016 AEMR	24/02/2016	DPL1	4.8	98	5.7	138															
Appendix of 2016 AEMR	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
Appendix of 2016 AEMR	29/04/2016	DPL1	4.3	96	6.4	388															
Appendix of 2016 AEMR	24/05/2016	DPL1	4.2	106	2.7	255															
Appendix of 2016 AEMR	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
Appendix of 2016 AEMR	21/07/2016	DPL1	3.9	142.2	6.8	384															
Appendix of 2016 AEMR	31/08/2016	DPL1	4	140	6.5	321															
Appendix of 2016 AEMR	29/09/2016	DPL1	3.9	151	2.5	366															
Appendix of 2016 AEMR	27/10/2016	DPL1	4	151	2.5	366															
Appendix of 2016 AEMR	29/11/2016	DPL1	4.7	116	1.9	108															
Appendix of 2016 AEMR	20/12/2016	DPL1	4.7	131	5.2	307.1															
Q1 2017 Env mon report	30/01/2017	DPL1	4.2	121																	
Q1 2017 Env mon report	27/02/2017	DPL1	4.6	103																	
2017 Env Monitoring	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
2017 Env Monitoring	19/04/2017	DPL1	4.2	180																	
2017 Env Monitoring	17/05/2017	DPL1	4.4	135																	
2017 Env Monitoring	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
2017 Env Monitoring	12/07/2017	DPL1	4.1	137																	
2017 Env Monitoring	9/08/2017	DPL1	4.3	123																	
2017 Env Monitoring	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
2017 Env Monitoring	4/10/2017	DPL1	4.3	123																	
2017 Env Monitoring	1/11/2017	DPL1	4.4	121																	
2017 Env Monitoring	29/11/2017	DPL1	4.5	129																	
2017 Env Monitoring	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																	
2018 Env Monitoring	21/02/2018	DPL1	4.46	120.5																	
2018 Env Monitoring	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
2018 Env Monitoring	18/04/2018	DPL1	4.49	153																	
2018 Env Monitoring	16/05/2018	DPL1	4.4	146.3																	
2018 Env Monitoring	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
2018 Env Monitoring	11/07/2018	DPL1	4.31	146.3																	
2018 Env Monitoring	8/08/2018	DPL1	3.91	204																	
2018 Env Monitoring	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
2018 Env Monitoring	5/10/2018	DPL1	4.53	143	7																
2018 Env Monitoring	6/11/2018	DPL1	4.51	142	4.8																
2018 Env Monitoring	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															
2019 Env Monitoring	5/02/2019	DPL1	4.48	142.5	0.26	-64.1															
2019 Env Monitoring	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
2019 Env Monitoring	5/04/2019	DPL1	4.14	122	0.2	NR		<1						1					<0.001		0.038
2019 Env Monitoring	7/05/2019	DPL1	6.6	3570	0.3	0.1		<1											<0.001		0.033
2019 Env Monitoring	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
2019 Env Monitoring	4/07/2019	DPL1	6.6	3570	0.3	0.1															
2019 Env Monitoring	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
2019 Env Monitoring	26/09/2019	DPL1	5.01	38	9.6	-29.4		<1													0.034
2019 Env Monitoring	24/10/2019	DPL1	5.01	138	1.8	<0.1		<1													

2019 Env Monitoring	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
2019 Env Monitoring	20/12/2019	DPL1	4.86	84	15.5	110															
2020 Env Monitoring	17/01/2020	DPL1	4.57	132	2.5																
2020 Env Monitoring	14/02/2020	DPL1																			
2020 Env Monitoring	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
2020 Env Monitoring	16/04/2020	DPL1	4.43	196	0.11	162															
2020 Env Monitoring	14/05/2020	DPL1	5.77	198	0	-13															
2020 Env Monitoring	11/06/2020	DPL1	5.59	191	0.62	83		25	27				10	3.9	20	3	44	0.05	0.017		0.11
2020 Env Monitoring	9/07/2020	DPL1	5.84	204	4.7	187															
2020 Env Monitoring	10/08/2020	DPL1	4.91	187	2.74	283															
2020 Env Monitoring	24/09/2020	DPL1	5.3	190	0			20	28			0.26	9.5	5	16	5	42	0.05	0.005		
2020 Env Monitoring	8/10/2020	DPL1	5.96	213	0	98															
2020 Env Monitoring	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
2020 Env Monitoring	10/12/2020	DPL1	6.63	451	0.09	-14															
2021 Env Monitoring	11/01/2021	DPL1	4.85	185	0	214															
2021 Env Monitoring	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
2021 Env Monitoring	15/03/2021	DPL1	4.3	124	0.2	323															
2021 Env Monitoring	13/04/2021	DPL1	4.7	105	0.1	205															
2021 Env Monitoring	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
2021 Env Monitoring	10/06/2021	DPL1	7.1	676	0																
2021 Env Monitoring	8/07/2021	DPL1	5.1	95	0	228															
2021 Env Monitoring	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
2021 Env Monitoring	9/09/2021	DPL1	7.2	709	0.1	28															
2021 Env Monitoring	11/10/2021	DPL1	7.3	1300	0.6	-104															
2021 Env Monitoring	11/11/2021	DPL1	7.4	489		-36		480	220			2	84	38	250	13	180	0.05		4	0.31
2021 Env Monitoring	13/12/2021	DPL1	5.7	116	2.3	183															
2022 Env Monitoring	12/01/2022	DPL1	5.2	96	1.7	165.0															
2022 Env Monitoring	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
2022 Env Monitoring	14/03/2022	DPL1	6.4	353	0.3	79.0															
2022 Env Monitoring	13/04/2022	DPL1	7.2	1590	0.0	-90.0															
2022 Env Monitoring	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
2022 Env Monitoring	9/06/2022	DPL1	7.4	1830	0.0	-167.0															
2022 Env Monitoring	11/07/2022	DPL1	7.8	1790	0.0																
2022 Env Monitoring	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
2022 Env Monitoring	13/09/2022	DPL1	7.6	1570	0.1	-146.0															
2022 Env Monitoring	13/10/2022	DPL1	7.3	1680	1.0	-148.0															
2022 Env Monitoring	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
2022 Env Monitoring	14/12/2022	DPL1	7.4		0.3																
No of Samples			**111**	**110**	**87**	**81**	**4**	**31**	**37**	**2**	**7**	**20**	**31**	**42**	**41**	**41**	**39**	**30**	**7**	**37**	**43**
Minimum			**3.8**	**38**	**0**	**-104**	**1**	**1**	**10**	**0.06**	**0.19**	**0.031**	**0.1**	**0.1**	**0.1**	**1**	**3.5**	**0.049**	**0.001**	**0.05**	**0.001**
Maximum			**7.78**	**3570**	**15.6**	**435**	**3**	**480**	**220**	**0.09**	**1.2**	**3**	**84**	**39**	**280**	**14**	**190**	**2.58**	**0.025**	**19.5**	**0.33**
Average			**5.00**	**333.17**	**2.73**	**150.05**	**2.25**	**189.37**	**51.20**	**0.08**	**0.57**	**0.70**	**13.10**	**5.58**	**37.49**	**4.29**	**40.15**	**0.56**	**0.01**	**4.22**	**0.08**
2011/2012 AEMR	Dec-11	DPL3							2300				72	119	842	72	136		<0.005	0.74	0.53
2011/2012 AEMR	Mar-12	DPL3							2400				66	109	1081	<5	126		<0.005	1.25	0.51
2011/2012 AEMR	30/05/2012	DPL3	6.6	7074	2.3	317															
2011/2012 AEMR	Jun-12	DPL3	6.7	7057	6.6	315	150	94	2220				70	112	1119	48	143		<0.005	1.94	0.53
2011/2012 AEMR	26/07/2012	DPL3	6.6	7093	3.6	284															
2011/2012 AEMR	27/08/2012	DPL3	6.7	7343	1.8	193															
2011/2012 AEMR	27/09/2012	DPL3	6.4	7130	2.4	249	120	75	2280				63	100	1060	50	147		<0.005	2.11	0.51
2011/2012 AEMR	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
2012/2013 AEMR	Mar-13	DPL3							2280				74	115	1296	48	149		<0.005	1.78	0.58
2012/2013 AEMR	Jun-13	DPL3							2310				66	105	66	44	169		<0.005	1.63	0.52
2012/2013 AEMR	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
2013/2014 AEMR	29/01/2014	DPL3	6.3	6964	4.4	201															
2013/2014 AEMR	24/02/2014	DPL3	6.3	6677	3.6	245															
2013/2014 AEMR	31/03/2014	DPL3	6.4	7234	4.2	118	120	74	120				63	109	109	43	175		<0.005	2.86	0.56
2013/2014 AEMR	24/04/2014	DPL3	6.5	7448		136															
2013/2014 AEMR	28/05/2014	DPL3	6.6	7484		318															
2013/2014 AEMR	25/06/2014	DPL3	6.6	7370	5.9	260	110	70	2290				82	125	1320	44	180		<0.005	6.47	0.93
2013/2014 AEMR	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
2013/2014 AEMR	29/08/2014	DPL3	6.5	7643	3.9	184	110	68	2370				71	110	1140	43	168		<0.005	4.22	0.56
2013/2014 AEMR	29/09/2014	DPL3	6.1	7558	3	188															
Appendix of 2015 AEMR	28/11/2014	DPL3	6.1	7491	4.2	100															
Appendix of 2015 AEMR	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
Appendix of 2015 AEMR	22/01/2015	DPL3	6.1	7473	2.2	136															
Appendix of 2015 AEMR	25/02/2015	DPL3	6.4	7478	3.2	150															
Appendix of 2015 AEMR	26/03/2015	DPL3	6.1	7542	2.9	195	130	128													
Appendix of 2015 AEMR	24/04/2015	DPL3	6.6	7540	4.8	246															
Appendix of 2015 AEMR	28/05/2015	DPL3	6.5	7483	5.2	182															
Appendix of 2015 AEMR	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
Appendix of 2015 AEMR	21/10/2015	DPL3	6.2	7310	2.4	157															
Appendix of 2015 AEMR	25/11/2015	DPL3	6.2	7562	6.9	205															
Appendix of 2015 AEMR	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															
Appendix of 2016 AEMR	24/02/2016	DPL3	6.2	7372	5.7	58															
Appendix of 2016 AEMR	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
Appendix of 2016 AEMR	29/04/2016	DPL3	6.4	7417	6.4	196															
Appendix of 2016 AEMR	24/05/2016	DPL3	6.5	7394	5.4	180															

Appendix of 2016 AEMR	30/06/2016	DPL3	6.6	7250.2	6.4	180															
Appendix of 2016 AEMR	21/07/2016	DPL3	6.5	6868.2	6.6	262															
Appendix of 2016 AEMR	31/08/2016	DPL3	6.5	7281	5.8	170	121		2650				78	121	1350	46	170		0.001	3.33	0.541
Appendix of 2016 AEMR	29/09/2016	DPL3	6.1	7313	2.5	221															
Appendix of 2016 AEMR	27/10/2016	DPL3	6.1	7313	399	1738															
Appendix of 2016 AEMR	29/11/2016	DPL3	6.1	7376	1.8	67															
Appendix of 2016 AEMR	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 mon report	30/01/2017	DPL3	6.1	7119																	
Q1 2017 Env mon report	27/02/2017	DPL3	6.1	7013																	
2017 Env Monitoring	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
2017 Env Monitoring	19/04/2017	DPL3	5.9	7660																	
2017 Env Monitoring	17/05/2017	DPL3	5.9	7410																	
2017 Env Monitoring	14/06/2017	DPL3																			
2017 Env Monitoring	12/07/2017	DPL3	6.2	7060																	
2017 Env Monitoring	9/08/2017	DPL3	6.2	7490																	
2017 Env Monitoring	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
2017 Env Monitoring	4/10/2017	DPL3	6	7530																	
2017 Env Monitoring	1/11/2017	DPL3	5.9	7970																	
2017 Env Monitoring	29/11/2017	DPL3	5.9	7680																	
2017 Env Monitoring	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																	
2018 Env Monitoring	21/02/2018	DPL3	5.94	7240																	
2018 Env Monitoring	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
2018 Env Monitoring	18/04/2018	DPL3	5.94	7580																	
2018 Env Monitoring	16/05/2018	DPL3	5.97	7670																	
2018 Env Monitoring	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
2018 Env Monitoring	11/07/2018	DPL3	6.18	7280																	
2018 Env Monitoring	8/08/2018	DPL3	6.1	7880																	
2018 Env Monitoring	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
2018 Env Monitoring	5/10/2018	DPL3	5.87	7540	7.8																
2018 Env Monitoring	6/11/2018	DPL3	5.81	7580																	
2018 Env Monitoring	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															
2019 Env Monitoring	5/02/2019	DPL3	5.76	8597.1	0.38	-88.9															
2019 Env Monitoring	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
2019 Env Monitoring	5/04/2019	DPL3	5.83	8790	0.3	NR															
2019 Env Monitoring	7/05/2019	DPL3	4.08	568	8.5	278															
2019 Env Monitoring	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
2019 Env Monitoring	4/07/2019	DPL3	4.08	568	8.5	278															
2019 Env Monitoring	1/08/2019	DPL3	5.99	7560	7.6	2.9		138	2610				84	130	1240	41		0.46	<0.001	14	0.797
2019 Env Monitoring	26/09/2019	DPL3	6.4	8790	4.3	106															
2019 Env Monitoring	24/10/2019	DPL3	6.16	8580	16	48															
2019 Env Monitoring	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
2019 Env Monitoring	20/12/2019	DPL3	6.26	10400	40.4	<0.1															
2020 Env Monitoring	17/01/2020	DPL3	6.47	8880	6.8																
2020 Env Monitoring	14/02/2020	DPL3																			
2020 Env Monitoring	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
2020 Env Monitoring	16/04/2020	DPL3	6.08	7170	0.89	-38															
2020 Env Monitoring	14/05/2020	DPL3	5.79	6800	0.23	-67															
2020 Env Monitoring	11/06/2020	DPL3	5.9	6800	1.02	-62		220	2400				85	120	1300	43	210	0.09	0.001	12	0.68
2020 Env Monitoring	9/07/2020	DPL3	5.73	7590	1.46	-38															
2020 Env Monitoring	10/08/2020	DPL3	6.33	7620	0.97	13															
2020 Env Monitoring	10/09/2020	DPL3	6.26	7550	1.62	-109		150	2300			2.2	79	120	1200	42	180	0.08	0.001	10	
2020 Env Monitoring	10/09/2020	DPL3	6.26	7550	1.62			150	2300			2.2	79	120	1200	42	180	0.08	0.001	10	
2020 Env Monitoring	8/10/2020	DPL3	7.64	7200	1.74	-70															
2020 Env Monitoring	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
2020 Env Monitoring	10/12/2020	DPL3	5.64	8920	6.09	-130															
2021 Env Monitoring	11/01/2021	DPL3	5.92	8110	1.42	-125															
2021 Env Monitoring	11/02/2021	DPL3	5.6	8500	0	-91		170	2500			2.9	93	130	1400	50	210	0.08		12	0.66
2021 Env Monitoring	15/03/2021	DPL3	7	7850	4.6	-93															
2021 Env Monitoring	13/04/2021	DPL3	5.8	8390	7	-14															
2021 Env Monitoring	11/05/2021	DPL3	6	8250	0.7	-41		210	2500			2.7	78	110	1100	38	180	0.07		12	0.64
2021 Env Monitoring	10/06/2021	DPL3	5.8	12800	0																
2021 Env Monitoring	8/07/2021	DPL3	5.9	11500	0	-151															
2021 Env Monitoring	9/08/2021	DPL3	5.8	1120	0	-26		170	2600			3.1	90	130	1400	48	190	0.1		13	0.71
2021 Env Monitoring	9/09/2021	DPL3	5.7	6990	0	-35															
2021 Env Monitoring	11/10/2021	DPL3	6.1	6950	6.6	-29															
2021 Env Monitoring	11/11/2021	DPL3	6.5	7800		-2		180	2900			2.8	110	150	1500	51	220	0.09		12	0.72
2021 Env Monitoring	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
2022 Env Monitoring	9/02/2022	DPL3	5.6	8660	0	14															
2022 Env Monitoring	14/03/2022	DPL3	5.9	8720	0	30															
2022 Env Monitoring	13/04/2022	DPL3	5.9	8550	0.2	-3		220	2000			3.1	81	120	1300	46	160	0.08		12	0.74
2022 Env Monitoring	11/05/2022	DPL3	6.1	7480	0.4	32															
2022 Env Monitoring	9/06/2022	DPL3	5.8	8380	0.4	-6															
2022 Env Monitoring	11/07/2022	DPL3	6.2	7930	0.28			190	2100			2.6	98	110	1100	40	140	0.1		14	0.7
2022 Env Monitoring	10/08/2022	DPL3	6.3	7510	1.9	11															
2022 Env Monitoring	13/09/2022	DPL3	6.1	7370	0.5	30															
2022 Env Monitoring	13/10/2022	DPL3	6	7170	0.8	58		180	2600			1.5	73	120	1300	40	180	0.05		4.1	0.53
2022 Env Monitoring	14/11/2022	DPL3	6.2	6810	0.1	100															
2022 Env Monitoring	14/12/2022	DPL3	6.2		0.2																
No of Samples			**111**	**110**	**87**	**82**	**21**	**28**	**42**	**2**	**5**	**20**	**34**	**42**	**42**	**42**	**37**	**29**	**10**	**42**	**40**
Minimum			**3.88**	**568**	**0**	**-151**	**110**	**66**	**120**	**0.05**	**3**	**0.04**	**60**	**93**	**1.28**	**38**	**126**	**0.03**	**0.0009**	**0.74**	**0.51**
Maximum			**7.64**	**12800**	**399**	**1738**	**151**	**220**	**10000**	**0.1**	**4.1**	**3.2**	**150**	**236**	**1910**	**72**	**230**	**0.66**	**0.002**	**24**	**6.23**
Average			**6.08**	**7436.01**	**9.10**	**113.15**	**126.67**	**136.57**	**2611.67**	**0.08**	**3.74**	**2.46**	**80.85**	**123.93**	**1172.39**	**47.10**	**175.68**	**0.13**	**0.00**	**8.23**	**0.79**
2011/2012 AEMR	Dec-11	DPL5																			

2011/2012 AEMR	Mar-12	DPL5							14				0.5	1	9.1	<5	5.9		<0.005	2.51	<0.01
2011/2012 AEMR	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
2011/2012 AEMR	26/07/2012	DPL5	4.7	92	3.7	313															
2011/2012 AEMR	27/08/2012	DPL5	4.6	103	3.4	292															
2011/2012 AEMR	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
2011/2012 AEMR	29/10/2012	DPL5	4.4	108	2.2	288															
2012/2013 AEMR	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
2012/2013 AEMR	Jun-13	DPL5							30				0.7	1.9	0.7	<5	8.2		<0.005	0.31	<0.01
2012/2013 AEMR	Sep-13	DPL5							640				13	40	243	9			<0.005	15	0.14
2013/2014 AEMR	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
2013/2014 AEMR	29/01/2014	DPL5	4.9	314	4.2	161															
2013/2014 AEMR	24/02/2014	DPL5	4.1	337	4.1	255															
2013/2014 AEMR	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															
2013/2014 AEMR	28/05/2014	DPL5	4	239		313															
2013/2014 AEMR	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
2013/2014 AEMR	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
2013/2014 AEMR	29/08/2014	DPL5	3.9	678	2.7	215	NP	NP	170				4.9	12	75	<5	16		<0.005	11	0.03
2013/2014 AEMR	29/09/2014	DPL5	3.8	942	1.8	247															
Appendix of 2015 AEMR	28/11/2014	DPL5	4.9	706	2.7	105															
Appendix of 2015 AEMR	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
Appendix of 2015 AEMR	22/01/2015	DPL5	5	811	3.8	160															
Appendix of 2015 AEMR	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													
Appendix of 2015 AEMR	24/04/2015	DPL5	3.7	963	4.8	257															
Appendix of 2015 AEMR	28/05/2015	DPL5	3.8	611	2.5	325															
Appendix of 2015 AEMR	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
Appendix of 2015 AEMR	21/10/2015	DPL5	4.3	676	5.4	189															
Appendix of 2015 AEMR	25/11/2015	DPL5	5.2	390	6	135															
Appendix of 2015 AEMR	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
Appendix of 2016 AEMR	25/01/2016	DPL5	5.6	376	3.1	113															
Appendix of 2016 AEMR	24/02/2016	DPL5	5.6	335	2.9	76															
Appendix of 2016 AEMR	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
Appendix of 2016 AEMR	29/04/2016	DPL5	4.6	285	6.2	259															
Appendix of 2016 AEMR	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															
Appendix of 2016 AEMR	21/07/2016	DPL5	4.4	321.5	5.2	297															
Appendix of 2016 AEMR	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
Appendix of 2016 AEMR	29/09/2016	DPL5	4.4	399	2.5	285															
Appendix of 2016 AEMR	27/10/2016	DPL5	4.4	399	2.5	285															
Appendix of 2016 AEMR	29/11/2016	DPL5	5.4	5.4	1.6	74															
Appendix of 2016 AEMR	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
Q1 2017 Env mon report	30/01/2017	DPL5	5.2	260																	
Q1 2017 Env mon report	27/02/2017	DPL5	5.5	244																	
2017 Env Monitoring	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
2017 Env Monitoring	19/04/2017	DPL5	5.1	203																	
2017 Env Monitoring	17/05/2017	DPL5	5.1	226																	
2017 Env Monitoring	14/06/2017	DPL5																			
2017 Env Monitoring	12/07/2017	DPL5	5.2	189																	
2017 Env Monitoring	9/08/2017	DPL5	5.1	200																	
2017 Env Monitoring	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
2017 Env Monitoring	4/10/2017	DPL5	5.3	188																	
2017 Env Monitoring	1/11/2017	DPL5	5.3	197																	
2017 Env Monitoring	29/11/2017	DPL5	5	480																	
2017 Env Monitoring	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
2018 Env Monitoring	24/01/2018	DPL5	4.42	2470																	
2018 Env Monitoring	21/02/2018	DPL5	4.53	1392																	
2018 Env Monitoring	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
2018 Env Monitoring	18/04/2018	DPL5	4.88	266																	
2018 Env Monitoring	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
2018 Env Monitoring	11/07/2018	DPL5	4.73	623																	
2018 Env Monitoring	8/08/2018	DPL5	4.61	252																	
2018 Env Monitoring	5/09/2018	DPL5	4.67	1880			4		112			0.12		7	58	2	14	0.36	<0.001	3.11	0.0029
2018 Env Monitoring	5/10/2018	DPL5	4.96	201																	
2018 Env Monitoring	6/11/2018	DPL5	4.99	296																	
2018 Env Monitoring	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
2019 Env Monitoring	8/01/2019	DPL5	5.13	259.66	12.15	-36.9															
2019 Env Monitoring	5/02/2019	DPL5	4.62	1140.4	0.43	-40.9															
2019 Env Monitoring	8/03/2019	DPL5	9.89	3168	48	-82.4		4	100				2	5	16	2		0.23	<0.001		0.02
2019 Env Monitoring	5/04/2019	DPL5	4.63	1280	0.3	NR															
2019 Env Monitoring	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
2019 Env Monitoring	4/07/2019	DPL5	6.41	563	9.5	121															
2019 Env Monitoring	1/08/2019	DPL5	4.5	1780	10	46		<1	940				15	56	462	10		2.23	<0.001		0.212
2019 Env Monitoring	26/09/2019	DPL5	4.35	657	5.3	-14.4															
2019 Env Monitoring	24/10/2019	DPL5	4.63	2380	10.8	61															
2019 Env Monitoring	22/11/2019	DPL5	4.63	2200	11.6	66.1		<1	888				14	55	54	10		1.74	<0.01		0.16
2019 Env Monitoring	20/12/2019	DPL5	5.71	22	43.1	59.7															
2020 Env Monitoring	17/01/2020	DPL5	4.5	2040	8.4																
2020 Env Monitoring	14/02/2020	DPL5																			
2020 Env Monitoring	18/03/2020	DPL5	4.65	4140	0.84	-89			1500			0.37		96	830	26	180	3.8	0.0009		0.54
2020 Env Monitoring	16/04/2020	DPL5	7.92	1770	1.03	63															
2020 Env Monitoring	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

2020 Env Monitoring	9/07/2020	DPL5	4.3	642	0	380															
2020 Env Monitoring	24/09/2020	DPL5	5.68	149	0				25			0.03	5	5	19	5	5	0.17	0.001		
2020 Env Monitoring	8/10/2020	DPL5	6.54	123	0.31	184															
2020 Env Monitoring	9/11/2020	DPL5	6.24	285	0				110			1.79	21	9	46	1.8	20	0.18	0.001		0.011
2020 Env Monitoring	10/12/2020	DPL5	6.62	4.83	0	-216															
2021 Env Monitoring	11/01/2021	DPL5	5.67	256	4.99	-94															
2021 Env Monitoring	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
2021 Env Monitoring	15/03/2021	DPL5	5.3	266	0.2	15															
2021 Env Monitoring	13/04/2021	DPL5	5.6	349	1.5	220															
2021 Env Monitoring	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
2021 Env Monitoring	10/06/2021	DPL5	5	364	0																
2021 Env Monitoring	8/07/2021	DPL5	5.2	317	0																
2021 Env Monitoring	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
2021 Env Monitoring	9/09/2021	DPL5	4.6	207	0	234															
2021 Env Monitoring	11/10/2021	DPL5	4.6	247	0	161															
2021 Env Monitoring	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
2021 Env Monitoring	13/12/2021	DPL5	5.3	384	0.3	17															
2022 Env Monitoring	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
2022 Env Monitoring	9/02/2022	DPL5	5	405	0	51															
2022 Env Monitoring	14/03/2022	DPL5	5	1930	0	95															
2022 Env Monitoring	13/04/2022	DPL5	4.4	2660	0	25		20	1200			0.86	22	77	600	17	110	2.3		14	0.54
2022 Env Monitoring	11/05/2022	DPL5	4.7	2570	0.3	108															
2022 Env Monitoring	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
2022 Env Monitoring	10/08/2022	DPL5	3.7	2460	0.6	270															
2022 Env Monitoring	13/09/2022	DPL5	3.7	2580	0.2	393															
2022 Env Monitoring	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
2022 Env Monitoring	14/11/2022	DPL5	4.9	1700	0.4	81															
2022 Env Monitoring	14/12/2022	DPL5	4.5		0.3																
No of Samples			**109**	**108**	**82**	**79**	**12**	**23**	**41**	**1**	**5**	**19**	**33**	**41**	**41**	**41**	**110**	**28**	**6**	**33**	**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**	**5623**	**48**	**386**	**11**	**580**	**1500**	**0.1**	**1.3**	**1.79**	**25**	**96**	**830**	**26**	**180**	**3.96**	**0.001**	**15**	**0.54**
Average			**4.91**	**850.58**	**3.87**	**155.26**	**4.75**	**46.63**	**272.66**	**0.10**	**0.74**	**0.31**	**6.13**	**17.00**	**131.36**	**6.05**	**30.49**	**0.99**	**0.00**	**4.79**	**0.10**
2011/2012 AEMR	Dec-11	DPL6							14				2.7	3.6	4.9	<5	37		<0.005	9.48	0.02
2011/2012 AEMR	Mar-12	DPL6							14				3.3	4.5	8.4	<5	42		<0.005	17	0.02
2011/2012 AEMR	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
2011/2012 AEMR	26/07/2012	DPL6	4.6	331	3.3	14															
2011/2012 AEMR	27/08/2012	DPL6	4.4	419	2	84															
2011/2012 AEMR	27/09/2012	DPL6	4.3	363	2.2	279	<1	<1	15				11	14	12	<5	130		<0.005	24	0.16
2011/2012 AEMR	29/10/2012	DPL6	4.4	425	4.9	127															
2012/2013 AEMR	Dec-12	DPL6							15				4.7	4.7	13	<5	63		<0.005	15	0.07
2012/2013 AEMR	Mar-13	DPL6							14				3.6	2.5	11	<5	34		<0.005	20	0.07
2012/2013 AEMR	Jun-13	DPL6							18				3.1	2.1	3.1	<5	40		<0.005	15	0.04
2012/2013 AEMR	Sep-13	DPL6							16				2.4	1.6	11	<5			<0.005	10	0.04
2013/2014 AEMR	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
2013/2014 AEMR	29/01/2014	DPL6	4.2	210	5.3	269															
2013/2014 AEMR	24/02/2014	DPL6	4.2	228	4.5	268															
2013/2014 AEMR	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
2013/2014 AEMR	24/04/2014	DPL6	5	156		162															
2013/2014 AEMR	28/05/2014	DPL6	3.8	198		343															
2013/2014 AEMR	25/06/2014	DPL6	3.2	497	6.1	440	<1	<1	17				7	4.5	16	<5	119		<0.005	13	0.2
2013/2014 AEMR	29/08/2014	DPL6	4.1	1764	4.9	191	NP	NP	40				45	23	16	9	958		<0.005	388	2.01
2013/2014 AEMR	29/09/2014	DPL6	3.5	1699	<1	302															
Appendix of 2015 AEMR	28/11/2014	DPL6	4.5	1622	2.6	90															
Appendix of 2015 AEMR	15/12/2014	DPL6	3.5	1700	<0.1	290	NP	<1	<3				134	26	24	10	768	10	<0.005	322	1.91
Appendix of 2015 AEMR	22/01/2015	DPL6	4.1	1216	3.4	230															
Appendix of 2015 AEMR	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													
Appendix of 2015 AEMR	24/04/2015	DPL6	4.0	1558	2.5	226															
Appendix of 2015 AEMR	28/05/2015	DPL6	3.9	2153	5.3	279															
Appendix of 2015 AEMR	17/09/2015	DPL6	3.8	2219	2	220	NP		100			1.13	22	24	16	9	1490	147	<0.001	580	3.65
Appendix of 2015 AEMR	21/10/2015	DPL6	3.6	2189	2	284															
Appendix of 2015 AEMR	25/11/2015	DPL6	3.3	2264	1.7	226															
Appendix of 2015 AEMR	11/12/2015	DPL6	3.4	2164	0.9	342	<1	<1	40				50	23	18	10	1520	104	0.011	291	3
Appendix of 2016 AEMR	25/01/2016	DPL6	4.5	2056	1.1	52															
Appendix of 2016 AEMR	24/02/2016	DPL6	4.4	2056	2.3	78															
Appendix of 2016 AEMR	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
Appendix of 2016 AEMR	29/04/2016	DPL6	3.9	1997	1.9	183															
Appendix of 2016 AEMR	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															
Appendix of 2016 AEMR	21/07/2016	DPL6	3.5	1731.9	1.3	338															
Appendix of 2016 AEMR	31/08/2016	DPL6	3.7	1783	3.8	262	<1		790				24	22	14	<5	1100		0.001	241	1.96
Appendix of 2016 AEMR	29/09/2016	DPL6	3.8	1738	1.9	189															
Appendix of 2016 AEMR	27/10/2016	DPL6	3.8	1738	1.9	189															
Appendix of 2016 AEMR	29/11/2016	DPL6	3.8	3.8	2.3	182															
Appendix of 2016 AEMR	20/12/2016	DPL6	3.7	1752	2.1	274.7	<1		<1				21	33	16	9	1080		0.001	259	1.96
Q1 2017 Env mon report	30/01/2017	DPL6	3.6	1745																	
Q1 2017 Env mon report	27/02/2017	DPL6	3.8	1653																	
2017 Env Monitoring	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
2017 Env Monitoring	19/04/2017	DPL6	3.9	1540																	
2017 Env Monitoring	17/05/2017	DPL6	3.8	1580																	
2017 Env Monitoring	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
2017 Env Monitoring	12/07/2017	DPL6	3.9	1100																	
2017 Env Monitoring	9/08/2017	DPL6	3.9	1050																	
2017 Env Monitoring	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

2017 Env Monitoring	4/10/2017	DPL6	3.9	1030																	
2017 Env Monitoring	1/11/2017	DPL6	3.9	1000																	
2017 Env Monitoring	29/11/2017	DPL6	3.9	919																	
2017 Env Monitoring	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
2018 Env Monitoring	24/01/2018	DPL6	3.88	866																	
2018 Env Monitoring	21/02/2018	DPL6	3.84	822																	
2018 Env Monitoring	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
2018 Env Monitoring	18/04/2018	DPL6	4.03	472																	
2018 Env Monitoring	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
2018 Env Monitoring	11/07/2018	DPL6	3.92	463																	
2018 Env Monitoring	8/08/2018	DPL6	3.93	517																	
2018 Env Monitoring	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
2018 Env Monitoring	5/10/2018	DPL6	3.99	641	8.8																
2018 Env Monitoring	6/11/2018	DPL6	4.02	634	14.1																
2018 Env Monitoring	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
2019 Env Monitoring	8/01/2019	DPL6	4.07	607.54	10.04	39.9															
2019 Env Monitoring	5/02/2019	DPL6	4.07	653.15	0.25	-45.9															
2019 Env Monitoring	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
2019 Env Monitoring	5/04/2019	DPL6	3.98	655	0.3	NR															
2019 Env Monitoring	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
2019 Env Monitoring	4/07/2019	DPL6	5.69	8160	0.6	0.1															
2019 Env Monitoring	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
2019 Env Monitoring	26/09/2019	DPL6	3.93	109	0.8	-19.9															
2019 Env Monitoring	24/10/2019	DPL6	4.94	393	24.3	<0.1															
2019 Env Monitoring	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
2019 Env Monitoring	20/12/2019	DPL6	4.84	262	35.9	80.6															
2020 Env Monitoring	17/01/2020	DPL6	4.7	249	7.7																
2020 Env Monitoring	14/02/2020	DPL6	4.09										4	4	9	5	127	4.35	0.001	54.8	0.275
2020 Env Monitoring	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
2020 Env Monitoring	16/04/2020	DPL6	5.11	2250	1.52	-26															
2020 Env Monitoring	14/05/2020	DPL6	4.74	207	0.34	-21															
2020 Env Monitoring	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
2020 Env Monitoring	9/07/2020	DPL6	4.46	302	0	54															
2020 Env Monitoring	10/08/2020	DPL6	4.31	520	0	-13															
2020 Env Monitoring	24/09/2020	DPL6	7.14	504	0.46			20				2.4	5	5	28	7.2	160	0.56	0.001	73	
2020 Env Monitoring	8/10/2020	DPL6	4.37	507	0	27															
2020 Env Monitoring	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
2020 Env Monitoring	10/12/2020	DPL6	6.18	498	1.34	-41															
2021 Env Monitoring	11/01/2021	DPL6	4.3	444	0	-58															
2021 Env Monitoring	11/02/2021	DPL6	4.3	334	0	-71		20	47			0.96	16	5	13	5	110	1.7		24	0.11
2021 Env Monitoring	15/03/2021	DPL6	4.6	214	1.5	89															
2021 Env Monitoring	13/04/2021	DPL6	4.8	234	0.1	3															
2021 Env Monitoring	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
2021 Env Monitoring	10/06/2021	DPL6	3.8	265	0																
2021 Env Monitoring	8/07/2021	DPL6	4.22	292	1.93	-12															
2021 Env Monitoring	9/08/2021	DPL6	4.1	286	0	71		20	18			0.97	24	21	74	3.9	83	1.5		19	0.11
2021 Env Monitoring	9/09/2021	DPL6	5.5	288	0	28															
2021 Env Monitoring	11/10/2021	DPL6	3.9	196	0	103															
2021 Env Monitoring	11/11/2021	DPL6	4.9	171		110		20	27			1	8.3	2.4	6.6	4	67	1.3		26	0.14
2021 Env Monitoring	13/12/2021	DPL6	4.9	163	0.3	1															
2022 Env Monitoring	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
2022 Env Monitoring	9/02/2022	DPL6	4.8	109	0	35															
2022 Env Monitoring	14/03/2022	DPL6	6.1	109	0	-24															
2022 Env Monitoring	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
2022 Env Monitoring	11/05/2022	DPL6	5.5	162	0	4															
2022 Env Monitoring	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
2022 Env Monitoring	10/08/2022	DPL6	4.4	133	0	131															
2022 Env Monitoring	13/09/2022	DPL6	4	113	0	184															
2022 Env Monitoring	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
2022 Env Monitoring	14/11/2022	DPL6	5.7	116	0.1	-62															
2022 Env Monitoring	14/12/2022	DPL6	5.5		0.1																
No of Samples			**111**	**109**	**86**	**80**	**2**	**26**	**37**	**7**	**6**	**20**	**33**	**42**	**42**	**42**	**41**	**29**	**17**	**41**	**41**
Minimum			**3.2**	**3.8**	**0**	**-97**	**3**	**2**	**14**	**0.1**	**1.3**	**0.71**	**2.1**	**1.0**	**1.5**	**2.2**	**26**	**0.12**	**0.0009**	**2.60**	**0.02**
Maximum			**7.14**	**10190**	**35.9**	**464**	**10**	**20**	**790**	**11**	**2.5**	**1.0**	**134**	**33**	**74**	**11**	**1520**	**147**	**0.026**	**580**	**3.75**
Average			**4.33**	**1034.00**	**2.71**	**122.40**	**6.50**	**17.71**	**45.40**	**6.37**	**1.67**	**0.81**	**15.88**	**9.36**	**13.55**	**6.28**	**372.93**	**19.65**	**0.00**	**115.18**	**0.73**
2011/2012 AEMR	Dec-11	DPL7							680				**16**	**24**	451	36	207		<0.005	0.34	0.04
2011/2012 AEMR	Mar-12	DPL7							710				**16**	**24**	649	28	210		<0.005	0.28	0.03
2011/2012 AEMR	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
2011/2012 AEMR	26/07/2012	DPL7	7.4	3434	3.4	-15															
2011/2012 AEMR	27/08/2012	DPL7	7.6	3492	2.5	24															
2011/2012 AEMR	27/09/2012	DPL7	7.4	3385	2.1	154	430	256	730				15	32	530	28	226		<0.005	1.11	0.02
2011/2012 AEMR	29/10/2012	DPL7	7.2	3416	1.7	52															
2012/2013 AEMR	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
2012/2013 AEMR	Jun-13	DPL7							740				16	36	16	25	274		<0.005	1.56	0.03
2012/2013 AEMR	Sep-13	DPL7							750				16	34	543	23			<0.005	1.2	0.05
2013/2014 AEMR	12/12/2013	DPL7	7.2	3341	4.1	52	390	238	750				18	38	38	26	249		<0.005	1.33	0.08
2013/2014 AEMR	29/01/2014	DPL7	7.3	3243	3.9	154															
2013/2014 AEMR	24/02/2014	DPL7	7.2	3151	2.4	231															
2013/2014 AEMR	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														
2013/2014 AEMR	28/05/2014	DPL7	7.3	3468		297														
2013/2014 AEMR	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
2013/2014 AEMR	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
2013/2014 AEMR	29/08/2014	DPL7	7.5	3477	2.8	128	400	245	740				17	37	611	25	236		<0.005	1.88	0.01
2013/2014 AEMR	29/09/2014	DPL7	7.2	3436	4.9	173															
Appendix of 2015 AEMR	28/11/2014	DPL7	7.1	3416	4.9	75															
Appendix of 2015 AEMR	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
Appendix of 2015 AEMR	22/01/2015	DPL7	7.1	3404	2.6	77															
Appendix of 2015 AEMR	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
Appendix of 2015 AEMR	24/04/2015	DPL7	7.5	3438	5.5	53															
Appendix of 2015 AEMR	28/05/2015	DPL7	7.5	3417	6	161															
Appendix of 2015 AEMR	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
Appendix of 2015 AEMR	21/10/2015	DPL7	7.2	3330	3.5	144															
Appendix of 2015 AEMR	25/11/2015	DPL7	7.2	3500	5.8	100															
Appendix of 2015 AEMR	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
Appendix of 2016 AEMR	25/01/2016	DPL7	7.1	3344	1.8	-36.00															
Appendix of 2016 AEMR	24/02/2016	DPL7	7.2	3444	5.5	-60.00															
Appendix of 2016 AEMR	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
Appendix of 2016 AEMR	29/04/2016	DPL7	7.4	3374	6.4	26.00															
Appendix of 2016 AEMR	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															
Appendix of 2016 AEMR	21/07/2016	DPL7	7.5	3159	6.5	-31.00															
Appendix of 2016 AEMR	31/08/2016	DPL7	7.3	3364	3.7	-22.00	369		760				24	35	604	24	217		0.001	2.07	0.082
Appendix of 2016 AEMR	29/09/2016	DPL7	7.2	3558	2.4	44.00															
Appendix of 2016 AEMR	27/10/2016	DPL7	7.2	3558	2.4	44.00															
Appendix of 2016 AEMR	29/11/2016	DPL7	7.1	7.1	2.4	20.00															
Appendix of 2016 AEMR	20/12/2016	DPL7	6.9	3527	4.5	229.3	372		372				18	38	648	25	263		0.001	1.85	0.082
Q1 2017 Env mon report	30/01/2017	DPL7	6.9	3471																	
Q1 2017 Env mon report	27/02/2017	DPL7	7.1	3174																	
2017 Env Monitoring	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
2017 Env Monitoring	19/04/2017	DPL7																			
2017 Env Monitoring	17/05/2017	DPL7	6.9	3440																	
2017 Env Monitoring	14/06/2017	DPL7																			
2017 Env Monitoring	12/07/2017	DPL7	7	3360																	
2017 Env Monitoring	9/08/2017	DPL7	7	3480																	
2017 Env Monitoring	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
2017 Env Monitoring	4/10/2017	DPL7	7	3450																	
2017 Env Monitoring	1/11/2017	DPL7	6.9	3440																	
2017 Env Monitoring	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
2018 Env Monitoring	24/01/2018	DPL7	6.84	3450																	
2018 Env Monitoring	21/02/2018	DPL7	6.83	3310																	
2018 Env Monitoring	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
2018 Env Monitoring	18/04/2018	DPL7	6.88	3500																	
2018 Env Monitoring	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
2018 Env Monitoring	11/07/2018	DPL7	7.08	3220																	
2018 Env Monitoring	8/08/2018	DPL7	7.01	3510																	
2018 Env Monitoring	5/09/2018	DPL7	3.9	2680	57.6	391	393		783			2.06		40	651	26	232	0.49	<0.001		0.074
2018 Env Monitoring	5/10/2018	DPL7	6.88	3340	7.5																
2018 Env Monitoring	6/11/2018	DPL7	6.73	3530	4																
2018 Env Monitoring	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
2019 Env Monitoring	8/01/2019	DPL7	6.75	3329.4	14.2	-90.7															
2019 Env Monitoring	5/02/2019	DPL7	6.74	3571.4	0.18	-1620															
2019 Env Monitoring	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
2019 Env Monitoring	5/04/2019	DPL7	6.74	3460	0.6	NR															
2019 Env Monitoring	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
2019 Env Monitoring	4/07/2019	DPL7	4.4	2320	0.7	0.1															
2019 Env Monitoring	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
2019 Env Monitoring	26/09/2019	DPL7	7.35	3420	2.2	195															
2019 Env Monitoring	24/10/2019	DPL7	7.51	3590	1.3	0.1															
2019 Env Monitoring	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
2019 Env Monitoring	20/12/2019	DPL7	6.82	3820	3.1	<0.1															
2020 Env Monitoring	17/01/2020	DPL7	7.25	3500	4.1																
2020 Env Monitoring	16/01/2020	DPL7																			
2020 Env Monitoring	14/02/2020	DPL7																			
2020 Env Monitoring	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
2020 Env Monitoring	16/04/2020	DPL7	6.36	3070	1.58	8															
2020 Env Monitoring	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
2020 Env Monitoring	9/07/2020	DPL7	7.2	3190	0.5	-69															
2020 Env Monitoring	10/08/2020	DPL7	4.75	276	0	113															
2020 Env Monitoring	10/08/2020	DPL7	7.12	3290	0.59	-182100															
2020 Env Monitoring	24/09/2020	DPL7	6.99	3220	0			6100	650			2.1	16	33	550	23	290	0.29	0.001	1.4	
2020 Env Monitoring	8/10/2020	DPL7	7.27	3250	0	-94															
2020 Env Monitoring	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
2020 Env Monitoring	10/12/2020	DPL7	6.79	3150	0	-228															
2021 Env Monitoring	11/01/2021	DPL7	6.82	3440	0	-249															
2021 Env Monitoring	11/02/2021	DPL7	7.43	3600	0.47	-152		440	670			1.6	18	34	590	24	320	1		1.2	0.069
2021 Env Monitoring	15/03/2021	DPL7	6.9	3290	0.1	-133															
2021 Env Monitoring	13/04/2021	DPL7	6.8	3490	0.1	-80															
2021 Env Monitoring	11/05/2021	DPL7	6.9	3460	0.4	-65		580	710			2.3	18	33	570	23	270	0.5		1	0.065
2021 Env Monitoring	10/06/2021	DPL7	6.8	4770	0																

2021 Env Monitoring	8/07/2021	DPL7	6.9	4600	0	-126														
2021 Env Monitoring	9/08/2021	DPL7	6.8	4420	0	-179		490	740			2.6	20	41	640	26	270	0.51		1.3	0.075
2021 Env Monitoring	9/09/2021	DPL7	6.8	2750	0	-60															
2021 Env Monitoring	11/10/2021	DPL7	6.9	2740	0	-99															
2021 Env Monitoring	11/11/2021	DPL7	7.6	2890	0	-62		380	780			2.4	14	32	590	24	270	0.5		1.3	0.068
2021 Env Monitoring	13/12/2021	DPL7	7	3170	0.3	-52															
2022 Env Monitoring	12/01/2022	DPL7	6.9	3180	0.2	-85															
2022 Env Monitoring	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
2022 Env Monitoring	14/03/2022	DPL7	7	3250	0	-67															
2022 Env Monitoring	13/04/2022	DPL7	6.9	3370	0	-76															
2022 Env Monitoring	11/05/2022	DPL7	7	3080	0.2	-60		580	680			2.6	17	35	620	25	240	0.5		1.6	0.065
2022 Env Monitoring	9/06/2022	DPL7	6.8	3060	0	-113															
2022 Env Monitoring	11/07/2022	DPL7	7.1	2990	0.3																
2022 Env Monitoring	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
2022 Env Monitoring	13/09/2022	DPL7	7.1	2890	0	-57															
2022 Env Monitoring	13/10/2022	DPL7	6.8	2890	0.1	-71															
2022 Env Monitoring	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
2022 Env Monitoring	14/12/2022	DPL7	7.3		0.1																
No of Samples			**110**	**109**	**89**	**83**	**21**	**27**	**38**	**5**	**5**	**19**	**34**	**42**	**42**	**42**	**41**	**29**	**7**	**41**	**41**
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**	**2.6**	**803**	**44**	**940**	**36**	**710**	**1**	**0.002**	**2.62**	**0.659**
Average			**6.93**	**3203.65**	**2.90**	**-2332.88**	**378.24**	**627.31**	**688.64**	**0.12**	**3.24**	**1.75**	**96.84**	**35.33**	**586.77**	**26.07**	**260.61**	**0.42**	**0.00**	**1.39**	**0.07**

Longterm 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
Minimum	**0.3**	**0.57**	**0.2**	**0.59**	**0.61**
Maximum	**2.45**	**2.74**	**2.77**	**2.3**	**2.75**
Average	**1.63**	**1.50**	**1.46**	**1.52**	**1.55**

APPENDIX C

DUNLOE SAND QUARRY INDEPENDENT ENVIRONMENTAL AUDIT REPORT 2022

INDEPENDENT ENVIRONMENTAL AUDIT

Dunloe Sand Quarry

February 2022

06_0030

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DOCUMENT VERIFICATION

Project Title:	Dunloe Sand Quarry
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Project File Name:	Dunloe Sand Quarry Audit Report 2021 Final

Revision	Date	Prepared by	Reviewed by	Approved by
Draft Rev 1	19/11/2021	Michial Sutherland	Will Weir	Erwin Budde
Final Rev 1	14/02/2022	Michial Sutherland	Will Weir	Erwin Budde

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1. INTRODUCTION

1.1. BACKGROUND

Ramtech Pty Ltd (Ramtech) received Project Approval (PA06_0030) on 24 November 2008 for Dunloe Sand Quarry (the Quarry) at Pottsville, NSW. Two subsequent modifications were approved on 28 August 2009 (Mod 1) and 6 November 2018 (Mod 2). Pottsville is about 53 km North of Ballina and 25 km south of the Queensland - NSW border at Tweed Heads, NSW. The Quarry is about 4.5km south of Pottsville and 1km west of the Pacific Ocean. The Quarry is situated on flat land associated with the floodplain of Moonball Creek to the east and south, and Sheens Creek to the north and west. The surrounding land use is agricultural including cattle grazing and some sugar cane.

Holcim Australia has managed operations on site from the 1 August 2016 to today. Prior to this the Quarry was managed by Ramtech, who also managed the project approval, commissioning and operation of the Quarry between 2007 and 2016.

The key features of the Dunloe Sand Quarry include:

- A 2.7km sealed access road from the Moonball – Pottsville Road to the quarry office
- A raised office, lunchroom and amenities building, along with diesel fuel and equipment storage
- Sand processing, storage and handling areas of approximately 3.2ha
- Windrowed overburden material for windbreaks approximately 750m long and 3m high
- Windrowed overburden material around the perimeter of the site ranging between 0.75-1.5m high
- A fine material return Pond (Pond 1) of 2.7ha
- A quarry dredging pond (Pond 2) of about 10ha (at the time of the audit)
- A sand grading, washing and treatment plant with fines return to Pond 1.

This is the second independent environmental audit of the project. The first audit was conducted in June 2016. This audit builds upon the compliance status of the first audit and addresses the operation of the project between 2017 and 2021.

1.2. AUDIT TEAM

The audit was completed by:

> **Lead Auditor** - Michial Sutherland. Michial has over 26 years of experience in the environmental industry.

Holcim Australia requested approval from the NSW Department of Planning, Industry and Environment (DPIE) for NGH to be the approved auditors for the 2021 Independent Environmental Audit. DPIE wrote to Holcim Australia on the 28th June 2021 approving Mr Michial Sutherland of NGH as the Auditor (Appendix B).

1.3. OBJECTIVES

The objectives of the audit were to conduct an independent review of compliance with the Conditions of Approval PA06_0030, issued by the Minister for Planning in November 2008 (as modified), and in accordance with the requirements of the Independent Audit Post Approval Requirements, May 2020 (DPE 2020).

1.4. AUDIT SCOPE

The scope of the audit was generally in accordance with Section 3.3 of the Independent Audit Post Approval Requirements (May 2020). The scope in general included:

- Conditions of consent applicable to the operation of the project
- All post approval documents required by the conditions of consent (eg. EMPs)
- All environmental licences and approvals applicable to the development (excluding EPL)
- An assessment of the environmental performance of the development
- A high-level review of the project's EMS
- A high-level assessment of whether Environmental Management Plans and Sub-plans are adequate.

1.5. AUDIT PERIOD

The audit period for this audit was from the July 2017 to July 2021.

2. AUDIT METHODOLOGY

2.1. SCOPE DEVELOPMENT

The audit scope as developed during the preparation of the Audit program. This involved:

1. Reviewing the PA06_0030 Conditions as modified by Mod 2
2. Reviewing the DPIE Independent Audit – Post Approval requirements (May 2020)
3. Consultation with DPIE NSW DPI Fisheries, Tweed Shire and EPA
4. Site Inspection
5. Document Review
6. Preparing the Audit Table

2.2. AUDIT PROCESS

A document review was undertaken prior to and following the site inspection for the audit. The document review included a review of the Conditions of Approval.

The Audit program was submitted to the Auditee indicating the dates of the site audit, scope, criteria, audit details and required project representatives.

The audit site inspection was conducted on 20 July 2021.

An opening meeting was held at 8.30am on 20 July 2021. Present at the opening meetings were:

- Matt Kelly, Quarries Manager Teven and Dunloe Sand Quarries, Holcim
- Daniel Dwyer, Production Supervisor, Holcim
- Michial Sutherland, NGH Lead Auditor

A closing meeting was held at 1pm on 20 July 2021. Present at the closing meeting were:

- Matt Kelly, Quarries Manager Teven and Dunloe Sand Quarries, Holcim
- Daniel Dwyer, Production Supervisor, Holcim
- Michial Sutherland, NGH Lead Auditor

2.3. AUDIT INTERVIEWS

Interviews were held with a number of staff including:

- Matt Kelly, Quarries Manager Teven and Dunloe Sand Quarries, Holcim
- Daniel Dwyer, Production Supervisor, Holcim
- Shilpa Shashi, Planning and Environment Coordinator NSW / ACT, Holcim

All interview requests were granted.

2.4. SITE INSPECTION

The site inspection was attended by Michial Sutherland, Matt Kelly and Daniel Dwyer. The purpose of site inspection was to become familiar with the quarry operations and works. In particularly to view the:

- Access roads and intersection treatment/arrangement, signage and security
- Site accommodation, office, storage, ablutions and on-site sewage, fuel storage
- Weather monitoring facilities, piezometers
- Ponds 1 and 2, stockpile wind breaks, stockpiled product
- Entry, loading and heavy vehicle movement area

- Perimeter bunding, vegetation screening and revegetation areas
- Ground water and surface water, and dust monitoring locations
- Adjacent dwellings and landowners
- Adjacent surface water drainage scheme
- Dredge, transfer pump, wash plant and screen, fines return line
- New dredge repairs and commissioning

No restrictions to site access occurred during the site visit. Most of the site could be easily accessed from internal access roads. Some walking was required to skirt regenerating vegetation on the southeast boundary.

At the time of the site inspection the wind speed at the Ballina Airport AWS (# 058198) was recorded as 15km/h from the WNW at 9am and 19km/h from the west at 3pm. No rain exceeding 0.2mm was recorded at Ballina AWTS during the site visit or for seven days prior to the site inspection. Between the 1 – 4 July 2021 76.3mm of rain was recorded and between the 9 – 12 July 2021 22mm of rain was recorded at Ballina AWTS. The conditions on the day of the audit were clear and sunny but cool ranging from a low of 14.8 °C at 9am to 18 °C at 3pm.

Sunrise at Ballina was at 6:36am and sunset was at 5:08pm. The first high tide was at 4:26am and the next high tide at 5:26pm. The low tide of the day was at 10:28am.

Pasture/cane drainage structures on private land adjacent to the site had some seepage flows with observed iron staining. The creeks adjacent to the site were not observed to be flowing with noticeable velocity in either direction. The water level within the ponds was well below the lip of the ponds.

2.5. CONSULTATION

A written request (Appendix C) for consultation was emailed on the 13 July 2021 to:

- NSW Environment Protection Authority (EPA)
- NSW Department of Planning, Industry and Environment (DPIE)
- NSW Department of Primary Industries – Fisheries (Fisheries)
- Tweed Shire Council TSC

Responses were received from:

- NSW EPA, 21 July 2021
- DPIE, 20 July 2021
- Fisheries, 20 July 2021

No response has been received from Tweed Shire Council.

A summary of the response is provided below (Table 2-1).

The complete response is attached (Appendix C).

Table 2-1 Summary of the agency response

Agency	Agency Comment
NSW EPA	*Thankyou for your letter dated 13 July 2021 in relation to the independent environmental audit of Dunloe Park Sand Quarry, Pottsville-Mooball Road, Mooball, NSW. The Environment Protection Authority (EPA) does not have any specific issues regarding the environmental performance of this site.*
DPIE	*In previous Annual Reviews, water quality exceedance has been identified as (a) common matter of non-compliance, most notably turbidity and pH. Concerns have also been raised in previous Annual Reviews regarding frequency of monitoring sampling. The Department would like an in-depth review into the continuing water quality exceedances. The Department is interested to identify if the water quality objectives identified in Schedule 3, Condition 9 are achievable, what impacts the water quality exceedances could have on the site and receiving environment and if any reasonable measures that could be employed by the project to meet the objectives. The Department would also like a review on the frequency of monitoring to confirm consistency with the Environmental Monitoring Program which forms part of the Soil and Water Management Plan.*
Fisheries	*As the quarry is located directly adjacent to Coastal Wetlands and is within the Mooball Creek catchment, the audit should include a review of the impacts of quarry operations, including those activities that impact and/or occur outside of the quarry footprint such as run-off, surface/ground water pumping and hauling activities, on adjacent key fish habitat (i.e. third order and greater waterways and Coastal Wetlands).* *Where impacts are identified by the audit (e.g. sedimentation and other water quality impacts such as changes in pH and thermal pollution, increased/decreased flow regimes etc.), then the report should provide appropriate measures to avoid and/or mitigate these impacts from future quarry operations.*

2.6. COMPLIANCE STATUS DESCRIPTORS USED IN THIS REPORT

The compliance descriptors used in this report are:

Compliant Sufficient verifiable evidence demonstrates that all elements of the requirement have been complied with

Non-Compliant Identified non-compliance with one or more elements of the requirement

Not Triggered The activation or timing trigger has not been met at this phase of the development

3. AUDIT FINDINGS

3.1. DOCUMENT LIST

- Dunloe Sand Quarry Water Quality Review Ramboll 2021
- Spread sheets Dunloe Sands daily material sales, April to December 2017
- Spread sheets Dunloe Sands daily material sales, January to December 2021
- Community Consultative Committee Agenda, 2018 to 2020 (x5)
- Community Complaints Register 2017-2021, (www.holcim.com.au/community-complaint-register)
- Dunloe Sands EIS Planit Consulting, September 2007
- Dunloe Sands EIA, Modification 1 Proposed Machinery Shed, Planit (2009)
- Dunloe Sands EIA, Modification 2 Proposed increase in heavy vehicle movements GHD (July 2017)
- Dunloe Sands Submissions Report Mod 2, GHD (November 2017)
- MAC Operational Noise Monitoring Report Q1 2020 to Q1 2021
- Pollution Monitoring Data - Dunloe Sand Quarry (EPL 13077) 2021
- Pollution Monitoring Data - Dunloe Sand Quarry (EPL 13077) 2020
- Pollution Monitoring Data - Dunloe Sand Quarry (EPL 13077) 2019
- Pollution Monitoring Data - Dunloe Sand Quarry (EPL 13077) 2018
- Independent Environmental Audit, MRA 2016
- 2017 Dunloe Sand On-Site Sewage Management System Approval - expiry 12/7/2023
- 190620 DPIE Approval of Dunloe Sand Traffic Management Plan
- 190924 Quarry - Submission of Landscape Management Plan for Review
- 191218 DPIE Endorsement of Dunloe Sand EMS + Comments
- 200116 DPIE Endorsement - Dunloe Sand EMS, EMP and ACHMP
- 200219 DPIE Endorsement - Dunloe Sand AQMP
- 200724 DPIE Approval of Dunloe Sand Waste Management Plan
- 201022 DPIE Approval of Dunloe Sand Soil and Water Management Plan
- 210616 DPIE advice & partial approval of Dunloe Sand Quarry LMP and review of RRMP
- 210618 DPIE Approval of Dunloe Sand Quarry LMP
- DPIE Approval of NGH as Auditor 28/6/2021
- Propeller Bathometric Survey Dunloe Sands Nov 2020
- Holcim Calculation of Dunloe 2021 Rehabilitation Bond, Rev May 2021
- Dunloe Sands Aboriginal Cultural Heritage Management Dec 2019
- Dunloe Sands Annual Review, Holcim, 2017
- Dunloe Sands Annual Review, Holcim, 2018
- Dunloe Sands Annual Review, Holcim, 2019
- Dunloe Sands Annual Review, Holcim, 2020
- Dunloe Sands Air Quality Management Plan February 2020
- Dunloe Sands Environmental Management Strategy January 2020
- Dunloe Sands Environmental Monitoring Program December 2019
- Dunloe Sands Landscape Management Plan June 2021
- Dunloe Sands Modification to Project Approval 06-0030, Subs Report Nov 2017
- Dunloe Sands Noise Management Plan July 2020
- Dunloe Sand Consolidated Approval Mod 2, 6 Nov 2018
- Dunloe Sand Quarry Water Quality Review 14 September 2021
- Dunloe Sands Incidents and Events Report 2017 – 2021
- Dunloe Sand Soil and Water Management Plan October 2020
- Dunloe Sand Traffic Management Plan May 2019
- Dunloe Sand Waste Management Plan Jul 2020
- Holcim Environmental Policy June 2019
- NSW EPA EPL #13077
- Brett Sekac Plumbing Inspection record for the Screen and treatment Plant, 17/07/2020
- Payments to Tweed Shire for Road Contributions 30K June 2019, 2020, 2021
- DPIE receipt of Rehabilitation Bond Calculations Aug 2020

- Daily Truck Movement Record sheets, 5/7/21 - 9/7/21, 14/7/21, 28/1/20,30/5/19
- Raw material delivery dockets, 16/7/21, Jan 2020, May 2019, Feb 2019, Nov 17
- Dunloe Sands Daily Loader Production Report 1/2020, 5/2019, Jan 2017, 11/2017
- Plant Maintenance white board Current
- Dredge Maintenance white board Current
- Employee and visitor induction Rev July 2018
- Historic Aerial photography, Google Earth

3.2. COMPLIANCE PERFORMANCE

A total of 350 conditions and sub-clauses of Approval were extracted from the consent. Of those conditions and sub-clauses 308 were triggered and thus found to be relevant to the current stage of the project. The project was found to be compliant with 292 of these (Table 3-1).

For the purposes of Table 3-1, if a Condition contained a part which is relevant, the whole Condition is counted as being relevant. Similarly, where a non-compliance was found with part of a Condition, the entire condition is considered non-compliant.

Table 3-1 Summary of Compliance

Number of Conditions and subclauses of Approval	350
Triggered Conditions and subclauses of Approval	308
Number of Compliances	292
Number of Non-compliances	16
Not Triggered	42

3.3. NOTICES, ORDERS OR PROSECUTIONS

No notices, orders, infringement notices or prosecutions had been issued during the audit period.

3.4. NON-COMPLIANCES

A total of 16 non-compliances were identified during the audit period. These related to eight (8) conditions of approval (CoA) and six (5) statements of commitment (Table 3-2).

Table 3-2 Non-compliances

ID	Condition of Approval	Requirement	Details of Non-compliance	Recommended Action
06-0030 Mod2 2021/A	Schedule 2 CoA 4(b & c)	The Proponent must comply with any reasonable requirement/s of the Secretary arising from the Department's assessment of: (b) any reviews, reports or audits undertaken or commissioned by the Department regarding compliance with the conditions of this approval; and (c) the implementation of any actions or measures contained in these documents.	Several actions from the previous audit are still open (Table 3-2).	Address and close actions from the previous audit.
06-0030 Mod2 2021/B	Schedule 3 CoA 5	Within three months of the approval of Modification 2, the Proponent must prepare a Noise Management Plan for the project to the satisfaction of the Secretary.	Mod 2 approved Nov 2018, consultation with EPA in Aug 2019, DPIE approval of NMP July 2020. As such the plan was not prepared within three months of Mod 2 approval.	Nil. Plan now developed and approved.
06-0030 Mod2 2021/C	Schedule 3 CoA 7(a)	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.	Mod 2 approved Nov 2018, consultation with EPA in Aug 2019, DPIE approval of plan Feb 2020. As such the plan was not prepared within three months of Mod 2 approval.	Nil. Plan now developed and approved.
06-0030 Mod2 2021/D	Schedule 3 CoA 9	The Proponent must aim to meet the water quality objectives (WQO) in Table 4 for water in the dredge ponds and in groundwater adjacent the dredge ponds, unless otherwise approved by the Secretary.	Pond turbidity levels exceeded the WQO for Turbidity in 2017 and 2018, likely due to 90% rainfall/flooding. Pond pH levels are consistently below (more acid) the WQO, however they are within the range for upgradient groundwater.	Stockpiling of screened material should be managed to reduce the transmission to ground water of stormwater that infiltrates the stockpile. Investigate forming stockpile areas so they drain to the

ID	Condition of Approval	Requirement	Details of Non-compliance	Recommended Action
			In bore hole six ground water levels of pH, sulphate, aluminium and Iron are outside the nominated levels and the levels measured in other bores. The exceedances were major in 2015-2018 but have improved in recent years.	ponds, lining the stockpile areas with a barrier to prevent seepage to groundwater and lining drains to the ponds with limestone or similar.
06-0030 Mod2 2021/E	Schedule 3 CoA 17	The Proponent must ensure that the flood storage capacity of the site is no less than the pre-existing flood storage capacity at all stages of the project. Details of the available flood storage capacity must be reported in the Annual Review.	Flood storage capacity not reported in the Annual Review for 2018 to 2020.	Report on flood storage capacity in the Annual Review.
06-0030 Mod2 2021/F	Schedule 3 CoA 18(b)	The Acid Sulphate Soil Management Plan (ASSMP) specifies the use of lime in the wash plant to adjust pH.	The site is using granular sodium bicarbonate in the wash plant to adjust pH. This is not documented in the plan.	Document the use of a range of alkalis in the wash plant to allow flexible pH management.
06-0030 Mod2 2021/G	Schedule 3 CoA 18(c)	The Proponent must implement the plan as approved by the Secretary.	Some historic actions were not completed for monitoring (accidental) and changes have occurred without being documented or approved.	Update the management plan to include current and planned actions that deviate from the SWMP.
06-0030 Mod2 2021/H	Schedule 3 CoA 35(b)	Traffic Management Plan (TMP) and driver code of conduct to include; complaint resolution procedures and consultation measures for peak haulage periods	Code of conduct does not include complaint resolution procedures or consultation measures for peak haulage periods.	Insert cross reference to EMS for complaint resolution. Insert cross reference to TMP for community consultation.

ID	Condition of Approval	Requirement	Details of Non-compliance	Recommended Action
06-0030 Mod2 2021/I	Schedule 5 CoA 1(b)	…prepare an Environmental Management Strategy (EMS) for the project.. (b)… in consultation with the relevant agencies	The EMS 2020 notes agency consultation but it is not appended to the plan on the web site.	Add agency consultation to EMS.
06-0030 Mod2 2021/J	Schedule 5 CoA 1(f)	…prepare an EMS for the project.. (f) describe the procedures that would be implemented to: manage cumulative impacts;	Cumulative impacts are not specifically addressed.	Include a statement addressing cumulative impact for multiple issues or singular repeat issues.
06-0030 Mod2 2021/K	Appendix 3 SoC	Surface water quality monitoring shall be … as outlined in the draft EMP App. G	Some water quality monitoring was not completed due to subcontractor errors. This has subsequently been rectified.	Ensure subcontractors complete monitoring as required.
06-0030 Mod2 2021/L	Appendix 3 SoC	Provision of in situ monitoring equipment at all times for use by Quarry Staff. This Equipment will be calibrated at least monthly	All monitoring completed by contractors at the required frequency. For ad hoc issues pH strips are available on site.	Redundant statements of commitment need to be removed from Schedule 3
06-0030 Mod2 2021/m	Appendix 3 SoC	Groundwater monitoring bores are to be licensed with DIPNR (Water NSW)	License details could not be located on Water NSW Website.	Register monitoring bores with Water NSW.
06-0030 Mod2 2021/N	Appendix 3 SoC	Contour profiling of groundwater head data will be undertaken as part of site monitoring and reporting procedure.	Head data assessed based on AHD. Contouring not available in the reporting period, Rambolt Report dated September 2021.	Ground water head data assessed in Ramboll Report September 2021. Issue Closed
06-0030 Mod2 2021/O	Appendix 3 SoC	All operations to be limited to 7am to 6pm Monday to Friday and 7am to 12am Saturday.	Truck loaded 15 minutes early.	Issue closed out, no further action required.

SoC = Statement of Commitments

3.5. PREVIOUS AUDITS

Table 3-3 Non-compliance Status from Previous Audit

Condition of Approval	Requirement	Details of Non-compliance	Recommended Action	Compliance Status
Schedule 2 CoA 4	4. The Proponent shall comply with any reasonable requirement/s of the Director-General arising from the Department's assessment of: a) any reports, plans, programs or correspondence that are submitted in accordance with this approval; and b) the implementation of any actions or measures contained in these reports, plans, programs or correspondence.	Following a NSW Department of Planning and Environment Sand Quarry Audit a in 2015, an Action Plan was developed to address non-compliances identified during the audit. An Action Plan was prepared in response to this audit report and submitted to the Department on 15 February 2016. Following further discussion, the Department accepted an updated Action Plan on 19 February 2016. Ramtech are currently working through completion of these items.	Continue implementation of the Action Plan to transition nominated conditions to compliance, Including: • Calibration records for monitoring equipment. • AEMRs 2018-2020 need comment on flood storage. • BG Algae monitoring not at required frequency.	Action being progressed and previous audit issues still open (see below). **Issue Open.**
Schedule 3 CoA 6	The Proponent shall ensure that dust generated by the project does not cause additional exceedances of the criteria listed in Tables 3 to 5 at any privately owned land.	No dust monitoring results were identified within the AEMR observed for the previous 12 months. Ramtech advised that dust monitoring did not commence until 2015. Results provided relate to analysis reports dated 1/10/2015, 9/12/2015, 10/5/2016 and 31/5/2016 and address deposited dust only and not particulate matter. It is noted that a request to amend monitoring within the approved EMP is currently in progress. An extract of the scope of	Implement dust monitoring in accordance with current approved EMP until such time as an amendment is approved by DoP.	Confusion on air monitoring requirements and the Air Quality Management Plan led to missed PM10 monitoring in 2016 and 2017. PM10 monitoring is now conducted when production exceeds 200,000t/a. Monitoring

Condition of Approval	Requirement	Details of Non-compliance	Recommended Action	Compliance Status
		amendments under discussion between the Department and ASK was observed. Ramtech advised the proposed amendment will request a reduction in the PM10 monitoring until such time a production increases to over 200,000T. TSP monitoring proposed to continue whilst production is less than 200,000T.		for PM10 during 2017 and 2018 indicated general compliance. **Issue Closed.**
Schedule 3 CoA 7	7. The Proponent shall prepare and implement a Dust Monitoring Program for the project to the satisfaction of the Director-General. This program must: a) be submitted to the Director-General prior to carrying out any development on the site; b) be prepared in consultation with DECCW; and c) include details of how the air quality performance of the project would be monitored, and include a protocol for evaluating compliance with the relevant air quality criteria in this approval.	a) DMP submitted prior to operation as part of EMP. Department approved 19th June 2009. Operations commenced October 2010. Dust monitoring not commence until 2015. Request to amend monitoring within the approved EMP is currently (2016) being prepared. Results provided relate to analysis reports dated 1/10/2015, 9/12/2015, 10/5/2016 and 31/5/2016 and address deposited dust only and not particulate matter. b) EMP approval letter (19/6/2009) notes sufficient opportunity for consultation. c) In Section 7.3 of EMP (July 2012). Ramtech advised they have review the DMP and a that request to amend monitoring within the approved EMP is currently (2012) being prepared.	Implement dust monitoring in accordance with current approved EMP until such time as an amendment is approved by DoP.	Altered conditions for dust and air quality issued for Mod 2 in 2018. **Issue Closed.**
Schedule 3 CoA 9	The Proponent shall aim to meet the water quality objectives in Table 6 for	Water quality equipment and calibration not available on site.	Suitable water quality monitoring equipment	Water quality equipment and

Condition of Approval	Requirement	Details of Non-compliance	Recommended Action	Compliance Status
	water in the dredge ponds and in groundwater adjacent the dredge ponds, unless otherwise approved by the Director-General.	AEMR format for water quality results requires improvement. Exceedances noted but no recommended actions described.	should be available to staff to allow for in-situ monitoring as per the EMP at all times of operation. Develop a process for calibration of in-situ monitoring equipment and maintain records of calibration occurring. **Or, remove consent condition as monitoring now outsourced.** Review the AEMR format to ensure relevant Interim Targets are reflected and all required information is presented in the reports.	calibration records not available on site. **Remove consent requirement.** AEMR data format altered and acceptable. **Issue Open.**
Schedule 3 CoA 10	The Proponent shall ensure that all excavated potential acid sulfate soil fines material is returned back to below the watertable as soon as possible to prevent oxidation. No potential acid sulfate soil shall be removed from the site, unless adequately neutralised in accordance with methods	Observation at the time of the audit was that fines from the wash-plant are discharged to an initial fore-bay pond prior to discharging via a pipe into the re-internment pond. Quarry staff move pipe location based on visual monitoring. Fines material is incorporated into products when needed and subject to lime treatment to reduce the potential risk of acid sulfate leaching. No evidence of verification sampling	Implement a process to demonstrate that the fines are not 'potential acid sulfate soil fines' or are adequately neutralised in accordance with the approved Soil and Water Management Plan.	Fines materials returned to Pond 1 directly from the wash screen. Alkali is used at the wash screen to neutralise acid sulfate materials. **Issue Closed.**

Condition of Approval	Requirement	Details of Non-compliance	Recommended Action	Compliance Status
	approved under the Soil and Water Management Plan.	having occurred was provided at the time of the audit.		
Schedule 3 CoA 11	The Proponent shall ensure that all potential acid sulfate 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.	Observation at the time of the audit was that fines are discharged via a pipe into the re-internment pond at a point less than 3 metres from the water surface as evidenced by the vegetation growth immediately adjacent the discharge location. The depth of pipe is fixed from the starting point based on the water level at that time. Quarry staff move pipe location based on visual monitoring. No record of depth of fines re-internment is taken.	1. Recommend a review of Fines Management including the method in which potential ASS fines are placed at depths in accordance with Schedule 3 Condition 11. 2. Undertake refresher training with Quarry staff on the requirements of PA06_0030.	Bathymetric survey demonstrated that ample pond 1 depth was available. Site observations indicated that fines were being returned to a deep area of the pond. **Issue Closed.**
Schedule 3 CoA 17	The Proponent shall ensure that the flood storage capacity of the site is no less than the pre-existing flood storage capacity at all stages of the project. Details of the available flood storage capacity shall be reported in the AEMR.	The most recent Annual Environmental Monitoring Report (AEMR) available covered the period December 2014 to December 2015 was reviewed and did not contain information on the available flood storage capacity of the site.	Incorporate flood storage capacity information into the AEMR.	2017 AEMR included comment on flood storage at Ch 7.6. Subsequent AEMRs 2018-2020 do not include comment on flood storage. **Issue Open.**
Schedule 3 CoA 22	22. The Blue-Green Algae Management Plan shall: a) be prepared by a suitably qualified blue-green algae expert, whose	Monitoring plan not fully completed or approved and as such not being implemented as required by the plan.	Implement monitoring requirements as outlined in current approved Blue Green Algae Management Plan until such time as an	Monitor at the required frequency described in the plan was not occurring 2017-2019.

Condition of Approval	Requirement	Details of Non-compliance	Recommended Action	Compliance Status
	appointment has been approved by the Director-General; b) be consistent with extant guidelines for blue-green algae management including the NHMRC's Guidelines for Managing Risks in Recreational Water; c) describe the measures that would be implemented to prevent and control the sources of algal blooms over the short, medium and long term; and d) define procedures for the management and notification of identified algal blooms.		amendment to this condition is approved.	**Issue Open.**
Schedule 3 CoA 24	24. The Ground Water Monitoring Program shall include: a) detailed baseline data on groundwater levels and quality, based on statistical analysis; b) groundwater impact assessment criteria; c) a program to monitor ground water levels and quality; d) a program to monitor ground water level effects on vegetation, and on ground water supply to adjoining properties; and e) a protocol for the investigation, notification and mitigation of identified	Item d) is not specifically addressed within the Groundwater Monitoring Program. It is noted that in 2012, Ramtech engaged Hydrosphere to undertake a review of the water quality monitoring program for the Dunloe Sands operation. Correspondence dated 26/4/12 from the Department approved some of the requested changes and requested Ramtech seek formal approval of the revised monitoring schedule.	Implement monitoring requirements as outlined in current approved Ground Water Management Plan until such time as an amendment to this condition is approved.	A review of the ground water monitoring results from the AEMR 2017-2020 indicate that in general ground water monitoring is being completed as per the plan all be it with some exceptions. **Issue Closed.**

Condition of Approval	Requirement	Details of Non-compliance	Recommended Action	Compliance Status
	exceedances of the groundwater impact assessment criteria.			
Schedule 3 CoA 26	26. The Proponent shall: a) rehabilitate and revegetate the 15 ha of land identified in the EA (see the revegetation plan in Appendix 2); and b) within 12 months of the commencement of quarrying operations, make suitable arrangements to provide appropriate long term security for the revegetation area to ensure it is managed for conservation purposes to the satisfaction of the Director-General.	Long term arrangements for the security of the revegetation land have not been finalized. It is noted however that development of a master planned long term strategy for the site including security of the revegetation land is in progress.	Continue development of long-term arrangements for security of the revegetation land to progress finalisation as soon as possible.	Long term strategy (App C of the LMP) makes provision for monitoring and maintaining the site and revegetation areas. Land tenure, covenanting, etc not considered. **Issue Closed.**
Schedule 3 CoA 45	The Proponent shall: a) provide annual production date to the DII using the standard form for that purpose; and b) include a copy of this data in the AEMR.	A review of the AEMR for Dec 2014- Dec 2015 indicated that the annual production data was not included. Ramtech have stated that a copy of this production data with be included in future AEMRs.	Include the annual production data in the AEMR.	AEMR Section 4 reports production figures and compares it to the limit and past year. **Issue Closed.**
Schedule 5 CoA 5	Within 12 months of the date of this approval, and annually thereafter, the Proponent shall submit an AEMR to the Director-General and relevant agencies. This report must: a) identify the standards and performance measures that apply to the project;	Review of AEMR Jan 2015 to Dec 2015 titled "Six Monthly Monitoring for July 2015 – Dec 2015". This AEMR contained data for the Dec 2014 to Dec 2015 period. Correspondence identified the AEMR was submitted to DoP 5 May 2016 and was	Ensure all required items are adequately addressed within the AEMR. Ensure the AEMR is submitted within the DoP nominated timeframe and	AEMR 2017-2020 now includes the details required. **Issue Closed.**

Condition of Approval	Requirement	Details of Non-compliance	Recommended Action	Compliance Status
	b) describe the works carried out in the last 12 months; c) describe the works that will be carried out in the next 12 months; d) include a summary of the complaints received during the past year & compare to complaints received in previous years; e) include a summary of the monitoring results for the project during the past year; f) include an analysis of these monitoring results against the relevant: • impact assessment criteria/limits; • monitoring results from previous years • predictions in the EA; g) identify any trends in the monitoring results over the life of the project; h) identify any non-compliance during the previous year; and i) describe what actions were, or are being, taken to ensure compliance.	generally in accordance with MP06_0030. However, DoP requires future AEMR's are to be submitted no later than 31 March immediately after the reporting period. Items a), d), e), g), h) and i) are addressed within the AEMR reviewed. Items b), c) and f) did not appear to be addressed within the AEMR. Ramtech have stated that they are currently reviewing and revising the AEMR at the request of the Department and have committed to submitting an updated version on or before the 14/8/2016. Ramtech consultant PlanIt have stated that they posted AEMR's to relevant agencies, however no additional physical evidence was provided to confirm this at the time of the audit.	evidence of it being provided to relevant agencies is maintained.	
Schedule 5 CoA 6	Within 2 years of the start of quarrying operations on site, and every 5 years thereafter, unless the Director-General directs otherwise, the Proponent shall commission and pay the full cost of an	This audit undertaken by Mark Rigby & Associates (MRA) represents the first Independent Environmental Audit conducted on the Dunloe Sands quarry operations and was not conducted within 2 years from the start of quarrying operations in October 2010.	Ensure that future IEA's are undertaken in timeframes nominated by the Director-General.	MRA completed their Audit in 2016, NGH are undertaking this Audit in 2017.

Condition of Approval	Requirement	Details of Non-compliance	Recommended Action	Compliance Status
	Independent Environmental Audit of the project.			Unavoidable delays have occurred due to Covid-19. **Issue Closed.**
Schedule 5 CoA 10	Within 1 month of the approval of any plan/strategy/program required under this approval (or any subsequent revision of these plans/strategies/programs), or the completion of any independent environmental audit or AEMR, the Proponent shall: a) provide a copy of the relevant document/s to Tweed Shire Council and relevant agencies; and b) ensure that a copy of the relevant document/s is made publicly available on site and/or at the Proponent's regional office, to the satisfaction of the Director-General	No record/evidence was provided to confirm the EMP and AEMRs was submitted to any other relevant agencies.	Ensure that copies of any plan/strategy/program or subsequent revision required under the approval, each AEMR and IEA's are provided to the Tweed Shire Council and relevant agencies within the Department's nominated timeframes.	All plans are available on the Project Website. Agencies were consulted in plan preparation. **Issue Closed.**

3.6. ENVIRONMENTAL MANAGEMENT

Noise Management

The hours of operation are generally restricted to those indicated in CoA 3. One instance of early truck loading was identified. This issue was investigated and closed out. A Noise Management Plan (NMP) has been prepared for the project. The management plan was approved by DPIE July 2020. The NMP is appropriate for the nature of the operation. The use of spoil mounds as windbreaks and on-site plant access also serve to reduce noise transmission. The spoil mounds are positioned between the screen, loader and truck movement areas and the nearest sensitive receivers. The dredge is low in the landscape as it floats on the surface of the pond (Figure 1). The level of the water surface and diesel engine allows the perimeter bund to provide some noise dampening.

Figure 1 Dredge, pond 2

Noise monitoring was conducted quarterly in 2017-2021. The monitoring was conducted in accordance with the plan and Condition 4 (Ch.3). The noise monitoring found that the quarry operations were inaudible at each of the four nearest sensitive receivers (R1-R4). For three of the receivers the noise from the adjacent (~1km) Pacific Highway traffic (15,000+ vehicles/day) was the dominant noise source.

The CoA 5 (Schedule 3) required the Noise Management Plan for the project to be prepared to the satisfaction of the Secretary within 3 months of the approved modification, the time frame was not met. **This issue is raised as a non-compliance ID. 2021/B (Mod 2, Sch 3, CoA 5).** The Noise Management Plan has subsequently been prepared and approved by DPIE, as such this issue is closed.

Air Quality

An Air Quality Management Plan was developed and most recently approved by DPIE in February 2020. The plan adequately addresses the management of dust on site. At the time of the audit no dust was observed on the haul roads or being generated on site. Dust generation and management was discussed with staff. A water cart is available for dry windy conditions. Covered loads were observed for trucks leaving the site. Speed limit signs were in place and the site induction and driver code of conduct address dust. Mounded spoil is used to breakup easterly winds and reduce wind speeds at ground level. The reduced wind speeds at ground level decreases the movement of product and surface sands.

Dust monitoring using depositional gauges and PM10 static air quality monitoring (2017 and 2018) has occurred. Results from the monitoring indicate that dust levels are within acceptable limits. Some exceedances in PM10 levels were observed in 2018 but were not routine. Depositional dust gauges are now the primary source of fixed monitoring.

The CoA 7A (Schedule 3) required the Air Quality Management Plan for the project to be prepared to the satisfaction of the Secretary within 3 months of the approved modification, the time frame was not met. **This issue is raised as a non-compliance ID. 2021/C (Mod 2, Sch 3, CoA 7A),** The Noise Management Plan has subsequently been prepared and approved by DPIE, as such this issue is closed.

Soil and water management

A Soil and Water Management Plan was prepared for the works and most recently approved by DPIE in October 2020. The plan adequately addresses the conditions of consent. Most of the monitoring has been completed as per the plan. Exceptions include flooding, site access issue and some subcontractor management issues. However, in general an extensive data set now exists to facilitate discussion of past practice and inform future management.

The extensive surface water monitoring for the site is of little value for managing surface water quality impacts. Observation of the site and reference to the sites geomorphological setting indicate that water in adjacent creeks and constructed paddock drains are not impacted by the facility. Rather drainage from local paddocks and water courses are the predominant source of water. Water within the facility percolates through the sands underlying the facility hardstands or the walls and floors of the facility ponds. Surface water discharge from the site is likely only in periods of very high rainfall or flooding. In either case the dilution from rainfall and run-on water are likely to negate any impacts from the facility.

Further confounding surface water quality monitoring are the effects of tides, paddock runoff and discharges from the Pacific highway. The daily fluctuation of the tides influences both brackish flows in Moonball Creek and movement of Ground water to the east. Paddock drainage introduces both nutrient rich water and acidic tail water from cane drains. The Pacific Highway provides run off from even the smallest rainfall events. These competing factors make the interpretation of results from monthly monitoring difficult. Drawing meaningful management action from the surface water quality monitoring results is very difficult.

The ground water under and adjacent to the site has and is being directly impacted by the works. The historic management of fines and acid sulfate forming materials appears to have affected the water quality of ground water associated with Piezometer 6 (DLP6). The pH of the ground water and the levels iron, Aluminium and sulphate were consistently outside the desired range between May 2015 and April 2019.

The 2016 Independent Audit identified that fines from the screen were discharged to an adjacent shallow unlined lagoon. The lagoon then discharged to the now Pond 1 area. This method exposed the fines to oxygen promoting the generation of acid and the release of iron, aluminium and sulphate. The pulsing of local recharge driven by rainfall and evaporative losses from the extraction ponds would inject acidic water with iron, aluminium and sulphate into the groundwater around Piezometer 6.

As observed at the time of the audit fines are being returned from the wash screen directly to pond 1. This reduces the time of exposure for acid forming fines by interning them at depth in Pond 1. From 2017 the levels of pH, iron, aluminium and sulphate begin to return to normal. In 2020 the levels are similar to those observed in 2012-14.

The CoA 9 (Schedule 3) required that the Proponent must aim to meet the water quality objectives (in Table 4 of the Consent) for water in the dredge ponds and in groundwater adjacent the dredge ponds, unless otherwise approved by the Secretary. Water quality parameters in the ponds and DLP6were not met. **This issue is raised as a non-compliance ID. 2021/D (Mod 2, Sch 3, CoA, 9).** Groundwater quality in DLP6has recovered in recent years. However, some potential still exists for curing stockpiles to leach acid forming by-products to the shallow ground water. Consideration should be given to forming stockpile areas so they always drain to the ponds, lining the stockpile areas with a barrier to prevent seepage to groundwater and lining drains to the ponds with limestone or similar to neutralise acidic seepage from the stockpiles.

Figure 2 Fines return lagoon 2016 (left) and Pond 1 2021 (right)

The CoA 17 (Schedule 3) required that the Proponent to report the details of the available flood storage capacity in the Annual Review, flood storage was reported in 2017 Annual Environmental Review but not in subsequent annual reviews. **This issue is raised as a non-compliance ID. 2021/E (Mod 2, Sch 3, CoA, 17).** Flood storage should be reported in each annual review.

The CoA 18 (b) requires the preparation of a Soil and Water Management Plan including an Acid Sulfate Management Plan to the satisfaction of DPIE. The existing Acid Sulfate Management Plan states that lime will be used to manage acidity at the screen and in the curing stockpiles. At the time of the audit it was observed that sodium bicarbonate was being used to manage acidity. **This issue is raised as a non-compliance ID. 2021/F (Mod 2, Sch 3, CoA, 18 b).** Update the Acid Sulfate Management Plan to include the use of sodium bicarbonate to manage acidity.

The CoA 18 (Schedule 3) requires the preparation of a Soil and Water Management Plan and that the Proponent must implement the plan as approved by the Secretary. Programmed monitoring was not being completed (accidental/flooding) and changes to the plan occurred without being documented or approved. **This issue is raised as a non-compliance ID. 2021/G (Mod 2, Sch 3, CoA, 18 c).** Ensure monitoring is completed where safe to do so and that changes in management or processes are documented and approved prior to implementation.

The management and monitoring of erosion and sediment control and blue-green algae appeared at the time of the audit to be fit for the current purpose.

Rehabilitation and landscaping

A Landscape Management Plan was prepared for the works and most recently approved by DPIE in July 2021. The plan adequately addresses the conditions of consent. The plan includes a Rehabilitation and Revegetation Management Plan, a Long Term Management Strategy, a Kola Management Plan and various procedures and forms.

Approximately 14-15ha of the site has been revegetated since the commencement of operations. Most revegetation has occurred in the north and east of the site about 700m from Pond 2. At the time of the audit about 10ha of native revegetation was mature and well established. About 4ha of planted vegetation was developing and appeared to be between 3-5 years old. In general, the revegetation was being completed according to the plan. In addition, planting along the western side of the site was observed to be established and forming a visual screen. Some natural regeneration was observed along the southern boundary of the ponds.

A rehabilitation bond is required for the project (CoA 30, Schedule 3). The previous audit cited evidence of the bond, and additional evidence was cited for both payment of the bond and a review of the bond in line with the CPI. Remediation of the site has yet to commence as the project is still actively extracting sand. Stockpiled spoil material has been revegetated but this is a temporary measure to control wind and water erosion.

Aboriginal cultural heritage

An Aboriginal Cultural Heritage Management Plan (December 2019) was prepared for the works and most recently approved by DPIE in January 2021. The plan adequately addresses the conditions of consent. Areas of potential cultural sensitivity were identified in the EIS to the east of Pond 2. These areas were to be further investigated prior to disturbance. The plan states that test excavations did not uncover aboriginal objects or human remains. Consultation reproduced in Appendix A of the plan indicates that the Registered Aboriginal Parties were supportive with the plan.

Traffic and Transportation

A Traffic Management Plan (May 2019) was prepared for the works and most recently approved by DPIE in June 2019.

Traffic enters and exits the site via an upgraded intersection with the Pottsville-Moonball Rd. The intersection is signed on Moonball Road and also on the access road. The intersection of the access road was sealed and line marked. The access road is sealed from Moonball road to the site access. A parking area was available adjacent to the intersection on the access road. There is a turnaround bay prior to the site office and an additional heavy vehicle parking area at the site office. Light vehicle parking exists at the site office. Room exists within the site for the turning and movement of heavy vehicles and loaders.

A review of the site induction and records indicates that heavy vehicle operators are inducted prior to accessing the site as are site staff. This includes the driver code of conduct and access rules to and from the site. Entry to the site is sign posted and speed limited. Attendance is by appointment and sales to the general public as passing trade is not permitted. Movement paths, stockpiles and hold points for heavy vehicles were sign posted on site. At the time of the audit driver radio calls could be heard, advising that they were entering and exiting the site. Drivers were observed tarping vehicles prior to leaving the site.

The CoA 35B (Schedule 3) requires the driver code of conduct to include a complaint resolution procedure and community consultation measures for peak haulage periods. The code of conduct does not include a complaint resolution procedure or consultation measures for peak haulage periods. **This issue is raised as a non-compliance ID. 2021/H (Mod 2, Sch 3, CoA, 35 b).** Insert cross reference to EMS for complaint resolution in the driver code of conduct. Insert cross reference to TMP for community consultation in the driver code of conduct.

Visual impact

The approved Landscape Management Plan makes provision for screen plantings along the western edge of the quarry. The area immediately surrounding the site office and entry is landscaped and grassed. Access areas are delineated with logs and stone. Signage is legible without being gaudy. Advertising signage was not observed.

Lighting at the site is minimal and flood lighting was not observed.

Vegetative growth along the quarry boundaries, access roads and public roads screen views of the quarry. At the time of the audit is was difficult to directly observe the development from public roads. Dwellings to the south and southwest may be afforded direct view because of the elevated position of those dwellings in the landscape.

Waste management

A Waste Management Plan (July 2020) was prepared for the works and most recently approved by DPIE in July 2020.

Overburden stripped from the site is variously used for mounding around the site. Those mounds are both shallow perimeter bunds, but also tall wind breaks in the vicinity of the stockpile areas. In general, those spoil stockpiles were revegetated with grass, except for the western mound where wood vegetation (Shea Oaks) have also been planted.

Office waste is removed on a weekly basis. Black and grey water is treated onsite with an aerated waste water treatment system approved by Tweed Shire and serviced by a local plumber. Approval and service records were cited at the time of the audit.

Process waste in terms of the fines from the screening process have been returned to the centre of Pond 1 from at least May 2018 (Figure 3). For a period of time in 2017 the fines were delivered directly to the edge of Pond 1. Prior to 2017 it appears that fines passed through a shallow lagoon(s) system before the supernate was returned to Pond 1 (Figure 4). It's the auditor's opinion that the management of fines prior to 2017 generated acid from the aeration of acid sulfate fines held in the lagoons.

Figure 3: Management and placement of screen fines 2017 to now

May 2018

July 2017

The width of the lagoon prior to 2017 are at best 15m. With an angle of repose of 3:1 (conservative) the maximum depth would be 2.5m. As the depth was shallow the water will have been constantly aerated facilitating the generation of acid releasing, iron, aluminium and sulphur. This is reflected in the elevated levels for pH, aluminium and sulphur in Pond 1 between 2013 and 2017, and the elevated ground water levels for pH, iron aluminium and sulphur discussed above.

Figure 4 Management and placement of screen fines before 2017

October 2016

April 2014

3.7. ENVIRONMENTAL MANAGEMENT STRATEGY

An Environmental Management Strategy (January 2020) has been prepared for the Dunloe Sand Quarry by GHD and most recently approved by DPIE in January 2020. The management has been prepared in accordance with the requirements of CoA 1 Schedule 5 of the consent.

The Environmental Management Strategy (January 2020) provided by Holcim contains the consultation with agencies during preparation of the strategy. However, when viewed on the website the consultation for the strategy presentation is not available. **This issue is raised as a non-compliance ID. 2021/I (Mod 2, Sch 5, CoA, 1 b).** Agency consultation for Environmental Management Strategy 2020 preparation to be included in the Environmental Management Strategy 2020 made available on the company website.

The Environmental Management Strategy is required to identify strategies that addressed cumulative impacts. The Environmental Management Strategy does not identify and address cumulative impacts. **This issue is raised as a non-compliance ID. 2021/J (Mod 2, Sch 5, CoA, 1 f). A**ddress cumulative impacts in the Environmental Management Strategy.

3.8. STATEMENTS OF COMMITMENTS

A total of 66 Statements of Commitment (SoC) are contained in Appendix 3 of the consent for Mod 2. Of the 66 SoC, six (6) were found to be non-compliant while 10 were found to be not triggered. In general, broad adherence with the SoC were observed at the time of the audit. The main areas of non-compliance related to ground water and surface water quality not meeting the required levels. One non-compliance with the hours of operation was also recorded.

The auditor has arbitrarily numbered each statement of commitment in the audit protocol for ease of reporting.

Some water quality monitoring was not completed as required due to subcontractor errors and flooding. **This issue is raised as a non-compliance ID. 2021/K (Mod 2, App. 3, SoC, 19).** Ensure water quality monitoring is completed as specified in the EMP. Include a provision in the EMP that water quality monitoring will only be completed where safe to do so.

In relation to surface water and ground water, there is a requirement for in situ monitoring equipment to be provided (onsite) for use by Quarry staff, and that the equipment will be calibrated at least monthly. All monitoring is now completed by subcontractors and the site has reduced its equipment to a stock of litmus paper to assess pH as required. **This issue is raised as a non-compliance ID. 2021/L (Mod 2, App. 3, SoC, 21/25).** It is recommended that this SoC be removed at the time of the next modification.

All groundwater monitoring bores for the site are required to be licensed. A review of the Water NSW website could not locate any licensed bores at the site. **This issue is raised as a non-compliance ID. 2021/M (Mod 2, App. 3, SoC, 26).** Register the bores with Water NSW.

Contour profiling of ground water head data was required to be part of routine monitoring and reporting. Ramboll reviewed the water quality monitoring data for July 2020-July 2021 report. No other contouring of ground water head data was available at the time of the audit. **This issue is raised as a non-compliance ID. 2021/N (Mod 2, App. 3, SoC, 28).** Contour profiling of ground water head data should be completed on an annual basis and reported in the Annual Review.

Operations on the site are restricted to 7am to 6pm Monday to Friday and 7am to 12 noon Saturdays. On one occasion it was reported that a truck was loaded at 6.45am. **This issue is raised as a non-compliance ID. 2021/O (Mod 2, App. 3, SoC, 46).** This issue has been investigated and closed out.

3.9. OTHER MATTERS

The EPA varied the EPL (#13077) via notice 1552463 dated 20 February 2018. The notice introduced a new description of the activity and extractive limits, and it updated the points of discharge and set new limits for water quality and established monitoring frequency for surface and ground water.

The EPA completed a desktop audit in July 2020 of the water quality monitoring data for the site published on the Holcim Web site.

In addition, the EPA varied the EPL (#13077) via notice 1599399 dated 20 October 2020. The notice made minor changes to the licence to ensure consistency across extractive industries for NSW.

3.10. COMPLAINTS

Two complaints were received in 2017; one related to faded stop sign and stop line. The line was re-painted and stop sign subsequently replaced. The second complaint was in relation to noise from truck operations. This was investigated and closed out.

No complaints were received in 2018, 2019 or 2020.

3.11. INCIDENTS

Flooding of the site from significant rainfall in adjacent catchments occurred in Feb 2020 and April 2017. In both cases the monitoring program was interrupted. Water quality in the ponds took some time to recover following sediment inflows to the facility.

In addition, there have been exceedances in pond and groundwater quality limits over the last five years. However, as discussed above the impacts to DLP6appear to have dissipated over time with the correction of fines management on site.

3.12. KEY STRENGTHS

The auditor notes the following key strengths of the environmental performance as observed during the audit:

1. Mounding of spoil material has reduced the impact of winds on dust generation.
2. The project's Community Consultative Committee continues to function on a regular basis apart from 2020 due to Covid 19. Complaints from the community are infrequent.
3. The project appears to have adequate human resources to deliver environmental management, with management support from Holcim.
4. Revegetation and rehabilitation are progressing well despite the impacts of the February 2020 floods.
5. Deep fines return to Pond 1 from 2018 onwards has reduced impacts on groundwater quality.
6. A new dredge is due to be commissioned in Q3 2021.
7. Surface water in adjacent creeks is unlikely to be impacted by the facility due to its position in the landscape and the nature of the hydrogeology of the site and surrounds.

4. RECOMMENDATIONS

4.1. RECOMMENDED ACTIONS

Non-compliances raised during the current audit and recommendations are tabulated below (Table 4-1).

Table 4-1 Recommended Actions

ID	CoA	Details of Non-compliance	Recommended Action
06-0030 Mod2 2021/A	Schedule 2 CoA 4(b&c)	Several actions from the previous audit are still open (Table 3-2).	Address and close actions from the previous audit.
06-0030 Mod2 2021/B	Schedule 3 CoA 5	Mod 2 approved Nov 2018, consultation with EPA in Aug 2019, DPIE approval of NMP July 2020. As such the plan was not prepared within three months of Mod 2 approval.	Nil. Plan now developed and approved.
06-0030 Mod2 2021/C	Schedule 3 CoA 7(a)	Mod 2 approved Nov 2018, consultation with EPA in Aug 2019, DPIE approval of plan Feb 2020. As such the plan was not prepared within three months of Mod 2 approval.	Nil. Plan now developed and approved.
06-0030 Mod2 2021/D	Schedule 3 CoA 9	Pond turbidity levels exceeded the WQO for Turbidity in 2017 and 2018, likely due to 90% rainfall/flooding. Pond pH levels are consistently below (more acid) the WQO, however they are within the range for upgradient groundwater. In bore hole six ground water levels of pH, sulphate, aluminium and Iron are outside the nominated levels and the levels measured in other bores. The exceedances were major in 2015-2018 but have improved in recent years.	Stockpiling of screened material should be managed to reduce the transmission to ground water of stormwater that infiltrates the stockpile. Consideration should be given to forming stockpile areas so they drain to the ponds, lining the stockpile areas with a barrier to prevent seepage to groundwater and lining drains to the ponds with limestone or similar to neutralise leachate.
06-0030 Mod2 2021/E	Schedule 3 CoA 17	Flood storage capacity not reported in the Annual Review for 2018 to 2020.	Report on flood storage capacity in the Annual Review.
06-0030 Mod2 2021/F	Schedule 3 CoA 18(b)	The site is using granular sodium bicarbonate in the wash plant to adjust pH. This is not documented in the plan.	Document the use of a range of alkalis in the wash plant to allow flexible pH management.
06-0030 Mod2 2021/G	Schedule 3 CoA 18(c)	Some historic actions were not completed for monitoring (accidental) and changes have occurred without being documented or approved.	Update the management plan to include current and planned actions that deviate from the SWMP.

ID	CoA	Details of Non-compliance	Recommended Action
06-0030 Mod2 2021/H	Schedule 3 CoA 35(b)	Code of conduct does not include; complaint resolution procedures and consultation measures for peak haulage periods.	Insert cross reference to EMS for complaint resolution. Insert cross reference to TMP for community consultation.
06-0030 Mod2 2021/I	Schedule 5 CoA 1(b)	The EMS 2020 notes agency consultation but it is not appended to the plan on the web site.	Add agency consultation to EMS.
06-0030 Mod2 2021/J	Schedule 5 CoA 1(f)	Cumulative impacts are not specifically addressed.	Include statement addressing cumulative impact for multiple issues or singular repeat issues.
06-0030 Mod2 2021/K	Appendix 3 SoC	Some water quality monitoring was not completed due to subcontractor errors. This has subsequently been rectified.	Ensure subcontractors complete monitoring as required.
06-0030 Mod2 2021/L	Appendix 3 SoC	All monitoring completed by contractors at the required frequency. For ad hoc issues pH strips available on site.	Redundant statements of commitment need to be removed from Schedule 3
06-0030 Mod2 2021/m	Appendix 3 SoC	License details could not be located on Water NSW Website.	Register monitoring bores with Water NSW.
06-0030 Mod2 2021/N	Appendix 3 SoC	Head data assessed based on AHD. Contouring not available in the reporting period, Rambolt Report dated September 2021.	Ground water head data assessed in Ramboll Report Sept 2021. Issue Closed
06-0030 Mod2 2021/O	Appendix 3 SoC	Truck loaded 15 minutes early.	Issue closed out, no further action required.

APPENDIX A AUDIT TABLE AND PROTOCOL

The compliance status for each requirement or commitment has been assessed in accordance with the criteria in (DPIE 2020).

Compliance status descriptors

Status	Description
Compliant	The auditor has collected sufficient verifiable evidence to demonstrate that all elements of the requirement have been complied with within the scope of the audit.
Non-compliant	The auditor has determined that one or more specific elements of the conditions or requirements have not been complied with within the scope of the audit.
Not triggered	A requirement has an activation or timing trigger that has not been met at the time when the audit is undertaken, therefore an assessment of compliance is not relevant.

Dunloe Park Sand Project Audit Protocol 2021

Reference	Required Audit Action, and Terms of Approval	Evidence collected July 2021	Comments	Finding	Proposed Action
	Licence No. 06_0030 • Licensee: Ramtech Pty Ltd • Approval Authority: Minister for Planning • Project: Dunloe Park Sand Project				
	Lot 1 DP208249; Lot 182 DP755721; Lot 183 DP755721; Lot 44 DP755721; Lot 81 DP755721; Lot 162 DP755721; Lot 2 DP 780199; Lot 1 DP780199; Lot 1 DP780200; Lot 2 DP785895				
ADMINISTRATIVE CONDITIONS					
Obligation to minimise harm to the environment					
1	In addition to meeting the specific performance measures and criteria established under this approval, the Proponent must implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise any material harm to the environment that may result from the construction and operation of the project, and any rehabilitation required under this approval.	The result of this audit. Site observations and Aerial photography.	In general the actions of the Management Plans and other documents have been implemented. While some issues require further actions Holcim management of the site has corrected past failures and reduced the level of impact of the development.	Compliant	
Terms of approval					
2	The Proponent must carry out the project generally in accordance with the:				
	(a) EA, EA (MOD 1) and EA (MOD 2); and	The result of this audit. Site observations and Aerial photography.	The project is being carried out generally in accordance with the original EIS and subsequent modifications. The machinery storage shed for Mod 1 was not constructed. Some non-compliances have been identified below.	Compliant	
	(b) Statement of Commitments.	The result of this audit. Site observations and Aerial photography.	The statements of commitments are generally being adhered too.	Compliant	
	Notes: * The general layout of the project is shown in Appendix 1; and * The Statement of Commitments is reproduced in Appendix 3.	The result of this audit. Site observations and Aerial photography.	The site layout is generally in accordance with the project site lay out. Stage two has not commenced.	Compliant	
2A	The Proponent must carry out the project in accordance with the conditions of this approval.				
3	If there is any inconsistency between the documents referred to above, the conditions of this approval shall prevail to the extent of any inconsistency.	Noted			
4	The Proponent must comply with any reasonable requirement/s of the Secretary arising from the Department's assessment of:	Noted			
	(a) any reports, strategies, plans, programs, reviews, audits or correspondence that are submitted in accordance with the conditions of this approval;	The result of this audit. Site observations and Aerial photography.	Reports, strategies and plans have been prepared as required.	Compliant	
	(b) any reviews, reports or audits undertaken or commissioned by the Department regarding compliance with the conditions of this approval; and	The result of this audit. Site observations and Aerial photography.	The findings of the previous audit have been mostly implemented and corrections to various aspects of the monitoring program have been effected.	Non-compliant	Close items form previous audit.
	(c) the implementation of any actions or measures contained in these documents.	The result of this audit. Site observations and Aerial photography.	In general the actions of the Management Plans and other documents have been implemented. However, several actions from the previous audit are still open.	Non-compliant	Close items form previous audit.
Limits on approval					
5	Sand extraction operations may take place until 1 January 2035. Note: Under this Approval, the Proponent is required to rehabilitate and revegetate the site to the satisfaction of the Secretary. Consequently this approval will continue to apply in all other respects other than the right to conduct quarrying operations until the site has been rehabilitated and revegetated to a satisfactory standard.	Aerial Photography and site inspection during Audit	No rehabilitation occurring at this stage. Macrophyte species normalising areas of pond banks not subject to disturbance.	Not triggered	

6	The Proponent must not extract to a depth of more than 12 m below the natural ground surface. Note: The Department acknowledges that this limit may have a variance of +/- 1m.	DSQ Bathymetric Survey November 2020	Extraction below 12m not indicated by survey.	Compliant	
7	The Proponent must not transport more than 300,000 tonnes of quarry products in any financial year from the site.	DSQ Annual Review (AR) 2017- 2020	Annual production figures indicate less than 300,000t/y. 2016 - 65730t, 2017 - 150339t, 2018 - 174,583t, 2019 - 186,280t and 2020 - 156,918t.	Compliant	
8	The Proponent must ensure that heavy vehicle movements (in and out) associated with the project do not exceed 24 per hour.	Annual production tonnages from AR 2017-2020. Load out and truck number spreadsheets, 2017-2021. Daily truck movement record sheets, 30/5/19, 20/1/20, 8/7/21, 9/7/21.	The number of loads are limited by the capacity of loading equipment (1 Loader), on-site production and sales. Load out sheets were reviewed and indicate that daily truck movements are on average about 20 to 30 movements per day. Maximum vehicle movements/hour observed were 10.	Compliant	
Staging, combining and updating strategies, plans or programs					
9	With the approval of the Secretary, the Proponent may:				
	(a) prepare and submit any strategy, plan or program required by this approval on a staged basis (if a clear description is provided as to the specific stage and scope of the project to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan or program);	Management plans	The management plans acknowledge stage 1 and stage 2 of the Dunloe Sands Quarry (DSQ). At this point the DSQ is still at stage 1	Not triggered	
	(b) combine any strategy, plan or program required by this approval (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined); and	Site observations.	At this point the DSQ is still at stage 1.	Not triggered	
	(c) update any strategy, plan or program required by this approval (to ensure the strategies, plans and programs required under this approval are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the project).	Site observations.	At this point the DSQ is still at stage 1.	Not triggered	
9A	If the Secretary agrees, a strategy, plan or program may be staged or updated without consultation being undertaken with all parties required to be consulted in the relevant condition in this approval.		Noted	Not triggered	
Application of existing strategies, plans or programs					
9B	The Proponent must continue to apply existing management strategies, plans or monitoring programs approved prior to the approval of Modification 2, until the approval of a similar plan, strategy or program following the approval of Modification 2.	EMS, EMP and ACHMP Approval letter from DPIE to Holcim dated 6 Jan 2020.	Updated plans Approved	Compliant	
Structural adequacy					
10	The Proponent must ensure that any new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA. Notes: · Under Part 4A of the EP&A Act, the Proponent is required to obtain construction and occupation certificates for the proposed building works. · Part 8 of the EP&A Regulation sets out the requirements for the certification of the project.	Site observations. Aerial Images	Buildings erected prior to the audit period	Not triggered	
Demolition					
11	The Proponent must ensure that all demolition work is carried out in accordance with AS 2601-2001: The Demolition of Structures, or its latest version.	Site observations. Aerial Images	No demolition has occurred in the audit period	Not triggered	
Operation of plant and equipment					
12	The Proponent must ensure that all plant and equipment used at the site is:				
	(a) maintained in a proper and efficient condition; and	Plant maintenance plan (white board). Site observations.	Equipment appeared to be serviceable with no visible leaks or defects.	Compliant	
	(b) operated in a proper and efficient manner.	Site observations.	Plant movement and operation on site is planned, signed and recorded. Existing dredge being replaced with new unit, loader recently replaced, diesel storage double bunded, loader parking/fuelling area concreted and drained to pit. Excessive smoke and noise was not observed from loader or dredges. Screen/wash plant was not operating at the time of the audit.	Compliant	
Road maintenance contributions					
13	Prior to increasing heavy vehicle movements (in and out) above eight per hour, the Proponent must pay Council $182,280 in accordance with Council's Tweed Road Contribution Plan, unless a deferred payment agreement is executed under Council's Business Investment Policy, in which case contributions are to be paid in accordance with that agreement.	Payment Receipt Tweed Shire June 2019, June 2020, June 2021.	Part payment of $30,000/year	Compliant	

<table>
<tr><td colspan="2">Compliance</td><td></td><td></td><td></td><td></td></tr>
<tr><td>14</td><td>The Proponent must ensure that all employees, contractors and sub-contractors are made aware of, and instructed to comply with, the conditions of this approval relevant to their respective activities.</td><td>Dunloe Quarry Employee, visitor & Contractor Site Rules (SAWA SHE 013</td><td>Induction describes vehicle movement requirements, incident reporting, Emergency Response and Environmental Responsibilities. Consequences of non compliance</td><td>Compliant</td><td></td></tr>
<tr><td colspan="2">Evidence of consultation</td><td></td><td></td><td></td><td></td></tr>
<tr><td>15</td><td>Where consultation with any public authority is required by the conditions of this approval, the Proponent must:</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>(a) consult with the relevant public authority prior to submitting the required document to the Secretary for approval;</td><td>Management Plans October to November 2020</td><td>Appended to management plans</td><td>Compliant</td><td></td></tr>
<tr><td></td><td>(b) submit evidence of this consultation as part of the relevant document; and</td><td>Management Plans October to November 2020</td><td>Appended to management plans</td><td>Compliant</td><td></td></tr>
<tr><td></td><td>(c) describe how matters raised by the authority have been addressed and any matters not resolved.</td><td>Management Plans October to November 2020</td><td>Limited response to consultation from agencies.</td><td>Compliant</td><td></td></tr>
<tr><td colspan="6">GENERAL EXTRACTION AND PROCESSING PROVISIONS</td></tr>
<tr><td colspan="2">Identification of boundaries</td><td></td><td></td><td></td><td></td></tr>
<tr><td>1</td><td>Within 1 month of the date of approval of the Landscape Management Plan (see condition 27 below), the Proponent must:</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>(a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction;</td><td>Beyond the time period for the audit</td><td></td><td>Not triggered</td><td></td></tr>
<tr><td></td><td>(b) submit a survey plan of these boundaries to the Secretary; and</td><td>Beyond the time period for the audit</td><td></td><td>Not triggered</td><td></td></tr>
<tr><td></td><td>(c) ensure that these boundaries are clearly marked at all times in a permanent manner that allows operating staff and inspecting officers to clearly identify those limits.</td><td>Site observations.</td><td>The boundary of stage 1 is marked by a five strand barb wire fence and signage.</td><td>Compliant</td><td></td></tr>
<tr><td></td><td>Note: The limit of extraction includes the area described in the EA and shown conceptually on the plan in Appendix 1.</td><td></td><td>Noted</td><td></td><td></td></tr>
<tr><td colspan="6">NOISE</td></tr>
<tr><td colspan="2">Impact assessment criteria</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2</td><td>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
<table><tr><th>Receiver Location</th><th>Day $L_{Aeq\ (15\ min)}$ dB(A)</th></tr><tr><td>R6 and R7</td><td>42</td></tr><tr><td>R8</td><td>48</td></tr><tr><td>All other residences</td><td>41</td></tr></table></td><td>Muller Acoustic Consulting (MAC):
Jan 2020, May 2020, Sept 2020, Nov 2020.
Site observation.</td><td>Closest receivers over 1km away.</td><td>Compliant</td><td></td></tr>
<tr><td></td><td>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.</td><td>MAC Noise reports Q1-4 2019
MAC Noise reports Q1-4 2020
Site observations.</td><td>Monitoring indicates that quarry operations inaudible at adjoining properties.
Evening and night operations not occurring.
Loading operations make little noise.
Reports found activities not audible over other noise sources, including the Pacific Highway.</td><td>Compliant</td><td></td></tr>
<tr><td colspan="2">Hours of operation</td><td></td><td></td><td></td><td></td></tr>
<tr><td>3</td><td>The Proponent must comply with the operating hours in Table 2.</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td><table><tr><th>Activity</th><th>Day</th><th>Time</th></tr><tr><td rowspan="3">Sand extraction and processing, delivery and distribution, and other quarry related activities</td><td>Monday – Friday</td><td>7:00am to 5:00pm</td></tr><tr><td>Saturday</td><td>7:00am to 12:00pm</td></tr><tr><td>Sunday and Public Holidays</td><td>Nil</td></tr><tr><td>Maintenance (if inaudible at neighbouring residences)</td><td>Any day</td><td>Any time</td></tr></table>Table 2: Operating Hours</td><td>Annual production tonnages from AR 2017-2020.
Load out and truck number spreadsheets, 2017-2021.
Daily truck movement record sheets, 30/5/19, 20/1/20, 8/7/21, 9/7/21.
Site signage and induction.</td><td>Works within approved hours</td><td>Compliant</td><td></td></tr>
<tr><td colspan="2">Noise operating conditions</td><td></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>The Proponent must:</td><td></td><td></td><td></td><td></td></tr>
</table>

	(a) implement best practice management to minimise the construction, operational and road transportation noise of the development;	Sight observations.	Stockpiles and screen plantings provide attenuation for site noise. Plant switched off when not in use. Washing plant located between stockpiled materials of similar height.	Compliant	
	(b) minimise the noise impacts of the project during meteorological conditions when the noise criteria in this approval do not apply;	MAC Noise reports Q1-4 2019 MAC Noise reports Q1-4 2020 Site observations.		Compliant	
	(c) carry out attended noise monitoring (at least every 3 months or as otherwise agreed by the Secretary) to determine whether the project is complying with the relevant conditions of this approval; and	MAC Noise reports Q1-4 2019 MAC Noise reports Q1-4 2020 Site observations.	Quarterly monitoring occurring	Compliant	
	(d) regularly assess noise monitoring data and modify and/or stop operations on site to ensure compliance with the relevant conditions of this approval	AR 2017-2020	Noise data reviewed on and annual basis by Holcim and reported in AR.	Compliant	
	to the satisfaction of the Secretary. Note: Monitoring under this approval is not required at all residences and the use of representative monitoring locations can be used to demonstrate compliance with criteria, if agreed to by the Secretary.				
Noise management plan					
5	Within three months of the approval of Modification 2, the Proponent must prepare a Noise Management Plan for the project to the satisfaction of the Secretary. This plan must:	Dunloe Quarry NMP 2020, document control and Appendix A. DPIE Approval (letter) of NMP July 2020	Mod 2 approved in Nov 2018, consultation with EPA in Aug 2019 DPIE approval of plan in July 2020. As such the plan was not prepared within three months of the approval of Mod 2.	Non-compliant	Nil
	(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Secretary;	Dunloe Quarry NMP 2020. DPIE Approval (letter) of NMP July 2020	Plan Approved by DPIE in July 2020.	Compliant	
	(b) be prepared in consultation with the EPA;	Dunloe Quarry NMP 2020, document control and Appendix A.	EPA were consulted but declined request for review.	Compliant	
	(c) describe the measures to be implemented to ensure:	Dunloe Quarry NMP 2020. DPIE Approval (letter) of NMP July 2020	Plan Approved by DPIE in July 2020.	Compliant	
	(i) compliance with the noise criteria and operating conditions in this approval;	Dunloe Quarry NMP 2020. DPIE Approval (letter) of NMP July 2020	Plan Approved by DPIE in July 2020.	Compliant	
	(ii) best practice management is being employed;	Dunloe Quarry NMP 2020. DPIE Approval (letter) of NMP July 2020	Plan Approved by DPIE in July 2020.	Compliant	
	(iii) noise impacts of the project are minimised during noise-enhancing meteorological conditions;	Dunloe Quarry NMP 2020. DPIE Approval (letter) of NMP July 2020	Plan Approved by DPIE in July 2020.	Compliant	
	(d) describe the noise management system; and	Dunloe Quarry NMP 2020. DPIE Approval (letter) of NMP July 2020	Plan Approved by DPIE in July 2020.	Compliant	
	(e) include a monitoring program to be implemented to measure noise from the project against the noise criteria in Table 1, and which evaluates and reports on the effectiveness of the noise management system on site.	Dunloe Quarry NMP 2020. DPIE Approval (letter) of NMP July 2020	Plan Approved by DPIE in July 2020.	Compliant	
	The Proponent must implement the Noise Management Plan as approved by the Secretary.	MAC Noise reports Q1-4 2019 MAC Noise reports Q1-4 2020 Site observations.	Noise levels at the time of the audit were modest but restricted to load out operations only. Noise reports indicate that the Quarry operations are inaudible at monitoring locations. Stockpiles and tree plantings restrict noise transmission.	Compliant	
AIR QUALITY					
Impact assessment criteria					
6	The Proponent must ensure that particulate matter emissions generated by the project do not cause exceedances of the criteria in Table 3 at any residence on privately-owned land.				

	Table 3: Air quality criteria **Pollutant** / **Averaging Period** / **Criterion** Particulate matter < 10 µm (PM_{10}) — Annual — [a,c] 30 µg/m³ Particulate matter < 10 µm (PM_{10}) — 24 hour — [b] 50 µg/m³ Total suspended particulates (TSP) — Annual — [a,c] 90 µg/m³ [d] Deposited dust — Annual — [b] 2 g/m²/month — [a] 4 g/m²/month	Dunloe AEMR 2017 to 2020	Some confusion about air monitoring requirements and the Air Quality Management Plan led to errors for PM10 monitoring in 2016 and 2017. PM10 monitoring is now conducted when production exceeds 200,000t/a. Monitoring for PM10 during 2017 and 2018 indicated broad compliance.	Compliant	
	Notes: a Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources). b Incremental impact (i.e. incremental increase in concentrations due to the project on its own). c Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents or any other activity agreed by the Secretary. d Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.	Noted		Not triggered	
Air quality operating conditions					
7	The Proponent must:				
	(a) implement best management practice to minimise the dust emissions of the project, including routinely watering haul roads being used by heavy vehicles and equipment;	Dunloe Quarry AQMP Feb 2020. Dunloe AEMR Ch.6.3 2017, 2019, 2020. Site observations.	Site access road sealed, Loads covered, Shaker grid in place, quarry plant movement areas moist. Sand is kept wet as part of the processing. Staff induction requires dust monitoring and management.	Compliant	
	(b) regularly assess meteorological and air quality monitoring data to guide the day-to-day planning of operations and implementation of air quality mitigation measures to ensure compliance with the relevant conditions of this approval;	Dunloe Quarry Enviro. Monitoring Program 2019, Table 2.1. Met Station On site. Site observations.	Staff able to access weather reports. Staff able to interpret weather reports for various centres and gauge local issues.	Compliant	
	(c) minimise the air quality impacts of the project during adverse meteorological conditions and extraordinary events (see Note c to Table 3 above);	Dunloe Quarry Enviro. Monitoring Program 2019, Table 2.1. Met Station On site. Site observations.	Internal and perimeter vegetated soil bunds and vegetation buffer strips used to minimise wind speeds and blown dusts from stockpiles.	Compliant	
	(d) monitor and report on compliance with the relevant air quality conditions in this approval; and	Dunloe Quarry AQMP Feb 2020. Dunloe Quarry Enviro. Monitoring Program 2019. Dunloe AEMR Ch.6.3 2017, 2019, 2020. Site observations.	Air quality monitoring completed as per management plans. Results of monitoring reported in the AEMR 2017-2020 Ch. 6.3	Compliant	
	(e) minimise surface disturbance of the site, other than as permitted under this approval,	Site observations. Aerial Images	At the time of the audit only those areas required for dredging and the processing and storage of materials were disturbed .	Compliant	
	to the satisfaction of the Secretary.				
Air quality management plan					
7A	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:	Dunloe Quarry AQMP Feb 2020. DPIE Approval letter 19 Feb 2020.	Mod 2 was approved by DPIE in November 2018. Consultation with EPA in occurred in August 2019, then DPIE approval of plan was granted in February 2020. As such the plan was not prepared within three months of the approval of Mod 2.	Non-compliant	Nil
	(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Secretary;	Dunloe Quarry AQMP Feb 2020. DPIE Approval letter 19 Feb 2020.	Plan Approved by DPIE in July 2020.	Compliant	
	(b) be prepared in consultation with the EPA;	Plan Approved by DPIE in July 2020.	Plan Approved by DPIE in July 2020.	Compliant	
	(c) describe the measures to be implemented to ensure:	Plan Approved by DPIE in July 2020.	Plan Approved by DPIE in July 2020.	Compliant	
	(i) compliance with the air quality criteria and operating conditions in this approval;	Plan Approved by DPIE in July 2020.	Plan Approved by DPIE in July 2020.	Compliant	
	(ii) best practice management is being employed; and	Plan Approved by DPIE in July 2020.	Plan Approved by DPIE in July 2020.	Compliant	

	(iii) air quality impacts of the project are minimised during adverse meteorological conditions and extraordinary events;	Plan Approved by DPIE in July 2020.	Plan Approved by DPIE in July 2020.	Compliant	
	(d) describe the air quality management system; and	Plan Approved by DPIE in July 2020.	Plan Approved by DPIE in July 2020.	Compliant	
	(e) include an air quality monitoring program that:	Plan Approved by DPIE in July 2020.	Plan Approved by DPIE in July 2020.	Compliant	
	(i) is capable of evaluating the performance of the project against the air quality criteria;	Plan Approved by DPIE in July 2020.	Plan Approved by DPIE in July 2020.	Compliant	
	(ii) adequately supports the air quality management system; and	Plan Approved by DPIE in July 2020.	Plan Approved by DPIE in July 2020.	Compliant	
	(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.	Plan Approved by DPIE in July 2020.	Plan Approved by DPIE in July 2020.	Compliant	
	The Project must implement the Air Quality Management Plan as approved by the Secretary.	Dunloe Quarry AQMP Feb 2020. Dunloe AEMR Ch.6.3 2017, 2019, 2020. Site observations.	Site access road is sealed. Loads are covered prior leaving site, Sand a shaker grid in place, while quarry plant movement areas are moist. Sand is kept wet as part of the processing. Staff induction covers dust monitoring and management.	Compliant	
SOIL AND WATER					
Discharges					
8	Except as may be expressly provided for by an EPL, the Proponent must not discharge any water from the project or ancillary operational areas. The Proponent must ensure that the extraction pit subject to dredging is maintained and operated to prevent discharges of any surface water from these ponds.	Site Observations	No evidence of discharge of waters from the site, with exception of flood events. Drains from the process area leading back to the dredged ponds observed.	Compliant	
Water quality objectives					
9	The Proponent must aim to meet the water quality objectives in Table 4 for water in the dredge ponds and in groundwater adjacent the dredge ponds, unless otherwise approved by the Secretary.				
	Pollutant / ***Unit of Measure*** / ***Water Quality Objectives*** Turbidity — NTU — 5 - 20 pH — pH — 6.5 – 8.5 Oil and Grease — mg/L — 10 Salinity — µS/cm — <3,000 Dissolved oxygen — mg/L — >6 Chorophyll-a — µg/L — 2-10	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. AEMR Ch 7, 2017, 2018, 2019, 2020. Aerial Images.	Pond turbidity levels exceeded the Water Quality Objectives (WQO) for Turbidity in 2017 and 2018, likely due to 90% rainfall. Levels for pond pH are consistently below the WQO (more acidic), however they are within the range for upgradient groundwater. It is likely that the results and variations in pH are driven by rainfall and ground water flux conditions. Pond oil and grease levels are below the WQO and acceptable. Dissolved Oxygen levels in the ponds were consistently above the WQO and acceptable. Chlorophyll-A levels were found to be generally within the WQO or less than the method detection limit.	Non-compliant	The proponent should seek to alter the limits for pH in the ponds to be more inline with groundwater levels and a range of 5.5 to 7.5.

	<table><tr><td>Faecal coliforms</td><td>Median No./100mL</td><td><1000</td></tr><tr><td>Enterococci</td><td>Median No./100mL</td><td><230</td></tr><tr><td rowspan="2">Algae and blue-green algae</td><td>No.cells/mL (M.aeruginosa)</td><td><50,000</td></tr><tr><td>mm^3/L (total biovolume)</td><td><4</td></tr><tr><td>Sodium</td><td>mg/L</td><td>500</td></tr><tr><td>Potassium ion</td><td>mg/L</td><td>40</td></tr><tr><td>Magnesium ion</td><td>mg/L</td><td>100</td></tr><tr><td>Chloride ion</td><td>mg/L</td><td>1000</td></tr><tr><td>Sulphate ion</td><td>mg/L</td><td>800</td></tr><tr><td>Bicarbonate ion</td><td>mg/L</td><td>400</td></tr><tr><td>Soluble Iron ion</td><td>mg/L</td><td>20</td></tr><tr><td>Soluable aluminium ion</td><td>mg/L</td><td>0.5</td></tr><tr><td>Ammonium ion</td><td>mg/L</td><td>20</td></tr></table> *Table 4: Water Quality Objectives*	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. AEMR Ch 7, 2017, 2018, 2019, 2020. Aerial Images.	Faecal coliforms were measured in 2020 and met the WQO. Enterococci were measured in 2020 and met the WQO. Algae and blue green Algae were measure in accordance with the criteria in 2020 and met the WQO. Most non metal concentrations meet the WQO. In bore hole six ground water levels of pH, sulphate, aluminium and Iron are outside the nominated levels and the levels measured in other bores. The exceedances were major in 2015-2018 but have improved in recent years.	Non-compliant	Significant improvements have been made regarding fines management and reducing the impacts on ground water by ensuring that fines are piped directly to Pond 1. Stockpiling of screened material should be managed to reduce the transmission to ground water of stormwater that infiltrates the stockpile. To this end consideration should be given to forming stockpile areas so they drain to the ponds, lining the stockpile areas with a barrier to prevent seepage to groundwater and lining drains to the ponds with limestone or similar.
	Notes: ⍰ The objectives for dissolved oxygen, turbidity and algae are relevant to surface water only. ⍰ The Department acknowledges that short term exceedances of these objectives may occur during natural events such as flooding. ⍰ The Department acknowledges that pre-existing water quality may not meet the objectives for some analytes, including salinity. The proponent must 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.	Site observations	Operation of the dredge and sand washing has improved over time to ensure that acid forming materials are returned directly to the deeper areas of pond 1. The pyrite material extracted and retuned is kept wet and receives minimal exposure to air reducing opportunities for acid formation. The dominant factor in pond water quality is the hydrogeology of the area. Groundwater moving from the top of the catchment to the ocean will flux through the site at various rates and qualities.	Compliant	
Fines management					
10	The Proponent must 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 must be removed from the site, unless adequately neutralised in accordance with methods approved under the Soil and Water Management Plan.	Dunloe Quarry Soil and Water Management Plan 2020. Site Observations	The SWMP calls for the correct management of both dry and wet material from the quarrying process. Site observations revealed that fines were effectively treated and reinterned. Sands were stockpiled to cure, tested and released on report. Stockpiled materials were stored such that water from stockpiles could be returned to the ponds.	Compliant	
11	The Proponent must 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 DoI and the Secretary.	Bathometric Survey of Pond 1. Site Observations	The Bathymetric survey demonstrated that ample pond depth was available. Site observations indicated that fines were being returned to a deep area of the pond.	Compliant	
Wastewater treatment					
12	The Proponent must manage on-site sewage to the satisfaction of Council and EPA. The facility must comply with the requirements of the Environment and Health Protection Guidelines – On-site Sewage Management for Single Households (1998).	Tweed Shire Approval for On-Site Sewage system July 2017. Site Observations	Tweed shire issued approval for System in 2017. System tanks proud of surface with no leakage. Disposal area showed no signs of effluent on the surface and vegetation was maintained.	Compliant	
Flood management					
13	The Proponent must ensure that flood bunding around the Stage 1 and Stage 2 works does not exceed 300 mm in height above natural surface level, to a maximum height of 2.0 m AHD, unless otherwise approved by the Secretary.	Site Observation.	Bunding includes flood-way on western, southern and northern boundary. Bunding observed between 200mm and 500mm above ground level, and less than two metres in height. The bathymetric survey indicates that areas surounding the ponds are generally between 0 and 2.5m.	Compliant	

14	The Proponent must ensure that perimeter drainage must be installed and operational prior to the construction of bunding or the placement of fill on site.	Beyond the time frame of the audit.		Not triggered	
15	All earthworks, including flood and acoustic bunding works, must be contained wholly within the site.	Site Observation.	All works were observed to be contained within the boundary of the site at the time of the audit.	Compliant	
16	The Proponent must cease dredging and processing activities not less than 24 hours prior to the commencement of overflow from any dredge pond. No dredging or processing must occur when the dredge ponds are overflowing.	Contour information and site observations	Overflow from the ponds can only be as part of a flood event. During a flood event the site can not be accessed.	Compliant	
17	The Proponent must ensure that the flood storage capacity of the site is no less than the pre-existing flood storage capacity at all stages of the project. Details of the available flood storage capacity must be reported in the Annual Review.	Site observations. AEMR 2017-2020.	Flood storage capacity does not appear to be constrained the work. Given the water table is likely to be largely unchanged or slightly lowered due to pond evaporation as opposed to transpiration and that sand materials have been removed from the site it is probable that flood storage is similar or greater. Flood storage capacity not reported in the Annual Review for 2018 to 2020.	Non-compliant	Report on flood storage capacity in the Annual Review.
Management and monitoring					
18	The Proponent must prepare a Soil and Water Management Plan (SWMP) for the project to the satisfaction of the Secretary. This plan must:				
	(a) be prepared in consultation with DoI and EPA;	SWMP 2020 include attempt to consult with DoI and EPA	EPA declined opportunity to review the plan, DoI did not respond to invitation to review plan.	Compliant	
	(b) include a:				
	• Water Balance;	SWMP 2020 Chapter 4	Water balance included, shows net surplus of water onsite. Excess absorbed by sands of the immediate area	Compliant	
	• Erosion and Sediment Control Plan;	SWMP 2020 Appendix B	All dirty on site water directed to the extraction pit via bunding and drains.	Compliant	
	• Acid Sulphate Soil Management Plan;	SWMP 2020 Appendix C	Granular Sodium bicarbonate 99.3% is being used instead of lime at the sand washing process. SWMP does not include sue of NA CO3.	Non-compliant	Update plan to include the use of Sodium Bicarbonate for the wash plant.
	• Blue-Green Algae Management Plan;	SWMP 2020	The SWMP includes aspects of blue green algae management.	Compliant	
	• Surface Water Monitoring Program; and	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	The SWMP has been approved by DPIE. Surface water monitoring is described in Ch 6 of the SWMP. Surface water monitoring is described in Ch2 of the environmental Monitoring Program	Compliant	
	• Groundwater Monitoring Program; and	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	The SWMP has been approved by DPIE. Groundwater monitoring is described in Ch 6 of the SWMP. Groundwater monitoring is described in Ch2 of the environmental Monitoring Program	Compliant	
	(c) be submitted to the Secretary prior to starting quarrying operations, and prior to carrying out any development on the site in the case of the Erosion and Sediment Control Plan.	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan submitted and approved by DPIE	Compliant	
	The Proponent must implement the plan as approved by the Secretary.	Site observations AEMR 2017, 2018, 2019, 2020.	Generally the soil and water management plan is being implemented and improvements are being made on a regular basis. However, some historic actions are not being completed in terms of monitoring (accidental) and some changes are occurring without the changes being documented or approved.	Non-compliant	Update the management plan to include current and planned actions that deviate from the SWMP.
19	The Water Balance must include:				
	(a) details of all water extracted, transferred, used and/or discharged by the quarry;	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	The Water balance and SWMP was reviewed and approved by DPIE. It includes conservative estimates of extraction.	Compliant	

	(b) the source of all water collected or stored on the site, including rainfall, stormwater and groundwater; and	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	The balance notes that rainfall on the site will be held on site.	Compliant	
	(c) measures to minimise water use by the project.	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	Four points are nominated that will reduce water use. However, in an environment with an over supply of water this seams unwarranted.	Compliant	
20	The Erosion and Sediment Control Plan must:				
	(a) be consistent with the requirements of Managing Urban Stormwater: Soils and Construction, Volume 1, 4th Edition, 2004 (Landcom), and Council's codes including its Code of Practice for Soil and Water Management on Construction Sites, Development Design Specification D7 – Stormwater Quality and Tweed Urban Stormwater Quality Management Plan;	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020. Site observations.	The plan is consistent with the blue book. Clean water diversion, dirty water containment and secondary controls are nominated.	Compliant	
	(b) identify activities that could cause soil erosion and generate sediment;	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	The plan nominates the sand extraction and vehicle movement as opportunities for erosion.	Compliant	
	(c) describe measures to minimise soil erosion and the potential for the transport of sediment to downstream waters;	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	Plan nominates bunding, sit fencing and vehicle shake down.	Compliant	
	(d) describe the location, function, and capacity of erosion and sediment control structures; and	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	Describes the location and function but not the capacity.	Compliant	
	(e) describe what measures would be implemented to maintain these structures over time.	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	Plan nominates basic procedures to maintain the controls	Compliant	
21	The Acid Sulfate Soil Management Plan must:				
	(a) be consistent with the NSW Acid Sulphate Soil Advisory Committee's Acid Sulfate Soil Manual; and	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	Plan approved in 2020 by DPIE.	Compliant	
	(b) define procedures for managing the potential acid sulfate soils on the site, including sample testing and procedures.	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	Plan approved in 2020 by DPIE.	Compliant	
22	The Blue-Green Algae Management Plan (BGAMP) must:				
	(a) be prepared by a suitably qualified blue-green algae expert, whose appointment has been approved by the Secretary;	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020. Independent Audit 2016	Blue-Green Algae Management Plan originally prepared Dr Paul Write as section within SWMP. BGAMP addressed at various locations within the SWMP, as approved by DPIE.	Compliant	
	(b) be consistent with extant guidelines for blue-green algae management including the NHMRC's Guidelines for Managing Risks in Recreational Water;	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	SWMP acknowledges NHMRC's Guidelines for Managing Risks in Recreational Water.	Compliant	
	(c) describe the measures that would be implemented to prevent and control the sources of algal blooms over the short, medium and long term; and	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	Table 5.1 of the SWMP discusses reducing nutrient inflow and increasing the diversity of vegetation to lower nutrient levels. Also includes measures to reduce the risk of human exposure to blooms.	Compliant	
	(d) define procedures for the management and notification of identified algal blooms.	DPIE approval to SWMP Oct 2020. Dunloe Quarry Soil and Water Management Plan 2020.	Signage to be kept on hand and installed in the event of a bloom.	Compliant	
23	The Surface Water Monitoring Program must include:				
	(a) detailed baseline data on surface water quality;	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan approved in 2020 by DPIE.	Compliant	
	(b) surface water impact assessment criteria;	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan approved in 2020 by DPIE.	Compliant	

	(c) a program to monitor surface water flows and quality;	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan approved in 2020 by DPIE.	Compliant	
	(d) a program to manage water releases from the site;	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan approved in 2020 by DPIE.	Compliant	
	(e) a program to monitor bank and bed stability; and	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan approved in 2020 by DPIE.	Compliant	
	(f) a protocol for the investigation, notification and mitigation of identified exceedances of the surface water impact assessment criteria.	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan approved in 2020 by DPIE.	Compliant	
24	The Ground Water Monitoring Program must include:				
	(a) detailed baseline data on groundwater levels and quality, based on statistical analysis;	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan approved in 2020 by DPIE.	Compliant	
	(b) groundwater impact assessment criteria;	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan approved in 2020 by DPIE.	Compliant	
	(c) a program to monitor ground water levels and quality;	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan approved in 2020 by DPIE.	Compliant	
	(d) a program to monitor ground water level effects on vegetation, and on ground water supply to adjoining properties; and	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan approved in 2020 by DPIE.	Compliant	
	(e) a protocol for the investigation, notification and mitigation of identified exceedances of the groundwater impact assessment criteria.	Dunloe Quarry Environmental Monitoring Program 2019. Dunloe Quarry Soil and Water Management Plan 2020. DPIE approval to SWMP Oct 2020.	Plan approved in 2020 by DPIE.	Compliant	
REHABILITATION AND LANDSCAPING					
Rehabilitation and revegetation					
25	The Proponent must rehabilitate the site to the satisfaction of the Secretary. This rehabilitation must be generally consistent with the proposed rehabilitation activities described in the documents listed in condition 2 of Schedule 2 and comply with the objectives in Table 5.			Not triggered	

	Table 5: Rehabilitation Objectives **Feature** / **Objective** All areas of the site affected by the project: • Safe • Hydraulically and geotechnically stable • Non-polluting • Fit for the intended post-quarrying land use/s • Final landform integrated with surrounding natural landforms as far as is reasonable and feasible, and minimising visual impacts when viewed from surrounding land Surface infrastructure: • Decommissioned and removed, unless otherwise agreed by the Planning Secretary Void lake: • Water retained on the site maintains long-term water quality objectives fit for the intended post-mining purpose • Water discharged from the site is suitable for receiving waters, aquatic ecology and riparian vegetation			Not triggered	
26	The Proponent must:				
	(a) rehabilitate and revegetate the 15 ha hectares of land identified in the EA (see the revegetation plan in Appendix 2); and	Site observations and aerial photography.	Stage 1 still being developed and not available for rehabilitation. Some pond bank areas are revegetating with macrophytes from the area. 15 ha of revegetation observed.	Compliant	
	(b) within 12 months of the commencement of quarrying operations, make suitable arrangements to provide appropriate long term security for the revegetation area to ensure it is managed for conservation purposes,	Site observations and aerial photography.	Revegetation has occurred and is substantial.	Not triggered	
	to the satisfaction of the Secretary.				
Landscape management plan					
27	The Proponent must prepare a Landscape Management Plan for the project to the satisfaction of the Secretary. This plan must:	Dunloe Quarry Landscape Management Plan (2021) DPIE letter approving LMP June 2021.	Plan updated and approved 2021	Compliant	
	(a) be prepared:				
	· by suitably qualified consultants, including a specialist hydrologist, coastal engineer, wetlands ecologist and landscape architect;	Dunloe Quarry Landscape Management Plan (2021), Ch. 1 DPIE letter approving LMP June 2021.	Original Plan preparation by suitably qualified specialists. Updated plan largely the same. Approved by DPIE	Compliant	
	· in consultation with Council, DoI, OEH, DPI Fisheries and the CCC; and	Dunloe Quarry Landscape Management Plan (2021), Ch 1 and Appendix B. DPIE letter approving LMP June 2021.	Consultation completed with Council and agencies. Plan approved by DPIE June 2021.	Compliant	
	· in accordance with extant guidelines including the DoI's Constructed Wetlands Manual, Volumes 1 and 2 and the DPI's Policy and Guidelines: Aquatic Habitat Management, 1999;	Dunloe Quarry Landscape Management Plan (2021), Ch. 2 DPIE letter approving LMP June 2021.	Plan prepared in accordance with guidelines and approved by DPIE.	Compliant	
	(b) be submitted to the Secretary prior to starting quarrying operations on the site; and	Dunloe Quarry Landscape Management Plan (2021), Ch. 2 DPIE letter approving LMP June 2021.	Updated plan prepared prior to the Mod activation.	Compliant	
	(c) include a:				
	· Rehabilitation and Revegetation Management Plan; and	Dunloe Quarry Landscape Management Plan (2021), App A DPIE letter approving LMP June 2021.	Plan updated and approved 2021	Compliant	
	· Long Term Management Strategy.	Dunloe Quarry Landscape Management Plan (2021), App C DPIE letter approving LMP June 2021.	Plan updated and approved 2021	Compliant	
	The Proponent must implement the plan as approved by the Secretary.	Aerial photograph and Site observations	Zones 1, 2 and three implemented for stage 1.	Compliant	
	Note: The Department accepts that the initial Landscape Management Plan may not include the detailed Long Term Management Strategy. However, a conceptual strategy must be included in the initial plan, along with a timetable for augmentation of the strategy with each subsequent review of the plan.	Noted			
28	The Rehabilitation and Revegetation Management Plan must include:				

	(a) the rehabilitation objectives for the site and revegetation areas;	Dunloe Quarry Landscape Management Plan (2021), App A DPIE letter approving LMP June 2021.	Objectives included in ch1.	Compliant	
	(b) a description of the short, medium, and long term measures that would be implemented to:	Dunloe Quarry Landscape Management Plan (2021), App A DPIE letter approving LMP June 2021.	Measures described in Ch 4.6 and in Attachment 4 Veg Man Plan.	Compliant	
	· rehabilitate and stabilise the site;	As above		Compliant	
	· implement the revegetation strategy; and	As above		Compliant	
	· manage the remnant vegetation and habitat on the site and in the revegetation areas;	Dunloe Quarry Landscape Management Plan (2021), App A DPIE letter approving LMP June 2021.	Appendix A describes the retention of remnant vegetation and the enhancement through plantings of the same vegetation community.	Compliant	
	(c) detailed performance and completion criteria for the rehabilitation and stabilisation of the site and implementation of the revegetation strategy;	Dunloe Quarry Landscape Management Plan (2021), App A DPIE letter approving LMP June 2021.	App A section 4.5 describes the criteria for the rehab.	Compliant	
	(d) a detailed description of how the performance of the rehabilitation of the quarry and the revegetation areas would be monitored over time to achieve the stated objectives;	Dunloe Quarry Landscape Management Plan (2021), App A DPIE letter approving LMP June 2021.	App A section 4.4 describes the monitoring for the rehab.	Compliant	
	(e) a detailed description of what measures would be implemented over the next 5 years to rehabilitate and manage the landscape of the site and revegetation areas including the procedures to be implemented for:	Dunloe Quarry Landscape Management Plan (2021), App A DPIE letter approving LMP June 2021	Section 3 describes the process, strategy, species etc	Compliant	
	· progressively rehabilitating and stabilising areas disturbed by quarrying;	As above	As above	Compliant	
	· implementing revegetation and regeneration within the disturbance areas and revegetation areas;	As above	As above	Compliant	
	· protecting areas outside the disturbance areas, including SEPP 14 wetlands and SEPP 26 littoral rainforests;	As above	App section 4 describes the EPZ incl. SEPP areas	Compliant	
	· vegetation clearing protocols;	As above	App A section 5 describes clearing protocols	Compliant	
	· managing impacts on fauna;	As above	App A section 5 describes clearing protocols	Compliant	
	· controlling terrestrial and aquatic weeds and pests;	As above	App A section 4 describes weed management	Compliant	
	· controlling access;	As above	App A section 3, 4 describes access management	Compliant	
	· bushfire management; and	As above	App section 4 describes APZ, Form A monitors fire trails	Compliant	
	· reducing the visual impacts of the project;	As above	Visual buffering addressed in App A sect 1, 2 and 4	Compliant	
	(f) a description of the potential risks to successful rehabilitation and/or revegetation, and a description of the contingency measures that would be implemented to mitigate these risks;	As above	Appendix A and E	Compliant	
	(g) details of who is responsible for monitoring, reviewing, and implementing the plan; and	As above	Section 4 allocates responsibilities	Compliant	
	(h) a monitoring and reporting program of the project's impacts on Koalas, including road strike, to the satisfaction of the Secretary; and	As above	Section 4 allocates responsibilities Appendix A, D and E	Compliant	
	(i) adaptive management options for managing Impacts on Koalas, including specific impact triggers, developed in consultation with Council.	As above	Section 4 allocates responsibilities Appendix A, D and E	Compliant	
29	The Long Term Management Strategy must:				
	(a) define the objectives and criteria for quarry closure and post-extraction management;	Dunloe Quarry Landscape Management Plan (2021), App A/C DPIE letter approving LMP June 2021.	Section C3 describes the objectives Post closure management described in rehab plan App A.	Compliant	
	(b) investigate options for the future use of the site;	As above	Future use explored in Appendix A and described briefly in App C	Compliant	
	(c) describe the measures that would be implemented to minimise or manage the ongoing environmental effects of the project; and	As above	Describes performance criteria, implementation and monitoring.	Compliant	
	(d) describe how the performance of these measures would be monitored over time.	As above	Describes performance criteria, implementation and monitoring.	Compliant	
Rehabilitation bond					
30	Prior to starting quarrying operations on the site, the Proponent must lodge a rehabilitation bond for the project with the Secretary. The sum of the bond must be calculated at:	Previous Audit	Evidence supplied of Bank guarantee and DPIE correspondence and acceptance of bond calculations.	Compliant	
	(a) $2.50/m2 for the total area to be disturbed and/or revegetated in each 5 year review period (see condition 31 below); and	Previous Audit	Evidence supplied of Bank guarantee and DPIE correspondence and acceptance of bond calculations.	Compliant	
	(b) $1.50/m2 for the total area of land previously disturbed and/or rehabilitated by the project,	Previous Audit	Evidence supplied of Bank guarantee and DPIE correspondence and acceptance of bond calculations.	Compliant	

	to the satisfaction of the Secretary.	Previous Audit	Evidence supplied of Bank guarantee and DPIE correspondence and acceptance of bond calculations.	Compliant	
	Notes: · If the rehabilitation and revegetation works are completed to the satisfaction of the Secretary, the Secretary will release the rehabilitation bond.	Noted			
	· If the rehabilitation and revegetation works are not completed to the satisfaction of the Secretary, the Secretary will call in all or part of the rehabilitation bond, and arrange for the satisfactory completion of the relevant works.	Noted			
31	Within 6 months of each Independent Environmental Audit (see condition 6 of schedule 5) excluding the inaugural audit, unless the Secretary directs otherwise, the Proponent must review, and if necessary revise, the sum of the rehabilitation bond to the satisfaction of the Secretary. This review must consider:	Submission Advice from DPIE noting DPIE assessment of submitted Bond information 20/08/2021	Submission made for reassessment of bond.	Compliant	
	(c) the effects of inflation;	Dunloe Bond Revision May 2021	Bond rate adjusted from $2.50 to $3.08/m based on CPI at 2020	Compliant	
	(d) any changes to the total area of disturbance; and	Dunloe Bond Review Areas May 2021	Additional areas included	Compliant	
	(e) the performance of the rehabilitation and revegetation to date.	Submission Advice from DPIE noting DPIE assessment of submitted Bond information 20/08/2021	Revegetation areas acknowledged	Compliant	
ABORIGINAL CULTURAL HERITAGE					
Aboriginal cultural heritage management plan					
32	The Proponent must prepare an Aboriginal Cultural Heritage Management Plan to the satisfaction of the Secretary. This plan must:				
	(a) be prepared in consultation with OEH and all relevant Aboriginal communities;	Dunloe Quarry Cultural Heritage Management Plan (2021), App A DPIE letter approving CHMP Jan 2020.	Plan approved following consultation with DPIE and TWEED Byron LALC.	Compliant	
	(b) be submitted to the Secretary for approval prior to commencement of construction; and	Dunloe Quarry Cultural Heritage Management Plan (2021), App A DPIE letter approving CHMP Jan 2020.	Plan submitted and approved by DPIE, Mod works yet to commence.	Compliant	
	(c) include a:				
	· program for additional archaeological survey/s of the disturbance area;	As above	Chapter 4 examines control measures	Compliant	
	· description of the measures that would be implemented to salvage any identified Aboriginal sites within the disturbance area;	As above	Chapter 4 examines control measures	Compliant	
	· description of the measures that would be implemented to protect any Aboriginal sites outside the disturbance area; and	As above	Chapter 4 examines control measures	Compliant	
	· description of the measures that would be implemented if any new Aboriginal objects or skeletal remains are discovered during the project.	As above	Chapter 4 examines control measures	Compliant	
	The Proponent must implement the plan as approved by the Secretary.	Site Observations	Objects yet to be uncovered.	Compliant	
TRAFFIC AND TRANSPORTATION					
Road haulage					
33	Prior to commencement of operations the Proponent must:				
	(a) design and construct the haul road and its intersection with Pottsville-Mooball Road; and	Site Observations Historic images	Road constructed in 2009	Compliant	
	(b) install advanced truck turning warning signage along Pottsville-Mooball Road, to the satisfaction of Council.	Site Observations Historic images	Grade and Koala warning sign on crest	Compliant	
34	The Proponent must ensure that all loaded vehicles entering or leaving the site have their loads covered.	Site instruction, Induction, Site Observations	Loads observed to be covered at the time of the audit. Induction requires same.	Compliant	
35	The Proponent must ensure all loaded vehicles leaving the site are cleaned of materials that may fall on the road before they are allowed to leave the site.	Site instruction, Induction, Site Observations	Vehicles are cleaned. No debris observed on the road verge along the access.	Compliant	
Road maintenance					

35A	Within 12 months of approval of Modification 2, unless otherwise agreed by the Secretary, the Proponent must implement and pay the full cost of implementing the recommended treatments listed in Table 3 of the Independent Road Safety Audit prepared by Bitzios Consulting and dated 16 October 2017, and outlined in the Proponent's Response to Road Safety Audit dated March 2018, to the satisfaction of Council, including any additional line marking and signage requested by Council. Note: The Proponent must obtain all necessary approvals under section 138 of the Roads Act 1993 from Council before implementing the recommended treatments.	Dunloe Quarry Traffic Management Plan, May 2019 (TMP) DPIE letter approving TMP Jan June 2019.	Council consulted and agreed scope included in Appendix A of TMP.	Compliant	
Traffic management plan					
35B	The Proponent must prepare a Traffic Management Plan for the project to the satisfaction of the Secretary. This plan must:	Dunloe Quarry Traffic Management Plan (May 2019) DPIE letter approving TMP Jan June 2019.	Plan prepared and approved	Compliant	
	(a) be prepared in consultation with RMS and Council;	As above Ch1 and App A	Plan adjusted after consultation	Compliant	
	(b) be submitted to the Secretary for approval prior to the commencement of operations under Modification 2, unless otherwise agreed by the Secretary;	Dunloe Quarry Traffic Management Plan (May 2019) DPIE letter approving TMP Jan June 2019.	Mod 2 has not commenced	Not triggered	
	(c) describe the processes in place for the management of trucks entering and exiting the site;	As above	Ch 5 addresses controls, App B driver code of conduct	Compliant	
	(d) include a Drivers' Code of Conduct that details:	As above	App B driver code of conduct	Compliant	
	· safe and quiet driving practices that must be used by drivers travelling to and from the quarry;	TMP App B driver code of conduct	Section 1, 2 and 4 address safety and impacts (like noise) on the public.	Compliant	
	· a map of the primary haulage routes highlighting critical locations for application of safe and quiet driving practices, including residential areas and school bus routes;	TMP App B driver code of conduct	Figure 1	Compliant	
	· an induction process for drivers and regular toolbox meetings;	TMP App B driver code of conduct	Section 2 requires induction, toolbox talks listed in TMP, drivers required to contact quarry on entry via UHF.	Compliant	
	· complaint resolution procedures;	TMP App B driver code of conduct	Code of conduct does not detail dispute resolution process.	Non-compliant	Insert cross reference to EMS for complaint resolution.
	· any community consultation measures in respect of peak haulage periods; and	TMP App B driver code of conduct	Code of conduct does not detail community consultation for peak haulage periods.	Non-compliant	Insert cross reference to TMP for community consultation.
	· consideration of seasonal traffic and events;	TMP App B driver code of conduct	Section 5 addresses seasonal traffic and events.	Compliant	
	(e) describe the measures to be put in place to ensure compliance with the Drivers' Code of Conduct; and	TMP section 6 and App B driver code of conduct	Section 6 and DCC sect. 2 lists consequence for failure to comply with the DCC.	Compliant	
	(f) propose measures to minimise the transmission of dust and tracking of material onto public roads from vehicles leaving the site.	TMP table 5.1	Control measures include cleaning and tarping vehicles to ensure material spills and dust is reduced.	Compliant	
	The Proponent must implement the plan as approved by the Secretary.	Site observations	Vehicles cleaned and tarped. Induction records cited. Material on road or dust from HVs not observed.	Compliant	
Parking					
36	The Proponent must provide sufficient parking on-site for all project-related traffic and visitors, in accordance with Council's parking codes and to the satisfaction of the Secretary. No on street parking must be undertaken.	Site observations	Parking on site for Light vehicles and visitors up to 10 vehicles. Heavy vehicle parking ample on site.	Compliant	
VISUAL IMPACT					
Visual amenity					
37	The Proponent must minimise the visual impacts of the project to the satisfaction of the Secretary.	Dunloe Quarry Landscape Management Plan (2021), Ch. 1 DPIE letter approving LMP June 2021.	Buffer plantings for stage 1 established and maintained. Rehab plantings to the north and east implemented and maintained	Compliant	
38	The Proponent must establish and subsequently maintain the vegetated buffer around the extraction area within 12 months of the date of this approval. Note: The vegetation buffer must be detailed in the Landscape Management Plan.	Dunloe Quarry Landscape Management Plan (2021), Ch. 1 DPIE letter approving LMP June 2021. Site observations and Aerial photos.	Buffer plantings to the west and south for stage 1 established and maintained.	Compliant	
Lighting emissions					
39	The Proponent must:				
	(a) take all practicable measures to mitigate off-site lighting impacts from the project; and	Site observations	Minimal exterior lighting. No flood lighting on site.	Compliant	
	(b) ensure that all external lighting associated with the project complies with Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting,	Site observations	Small fluorescent lights under office veranda.	Compliant	

	to the satisfaction of the Secretary.				
Advertising					
40	The Proponent must not erect or display any advertising structure(s) or signs on the site without the written approval of the Secretary. Note: This does not include business identification, traffic management and safety or environmental signs.	Site observations	No advertising signs observed.	Compliant	
WASTE MANAGEMENT					
41	The Proponent must minimise the amount of waste generated by the project to the satisfaction of the Secretary.	Dunloe Quarry Waste Management Plan (July 2020) DPIE Approval Letter for WMP, July 2020. Site observations and Aerial photos.	Plan identifies waste streams and the management of same. Waste used on site for mounds, or transported to licenced facility. Septic system approved by Council. Waste from off site is not acceped at the facility.	Compliant	
EMERGENCY AND HAZARDS MANAGEMENT					
Dangerous goods					
42	The Proponent must ensure that the storage, handling, and transport of dangerous goods are conducted in accordance with the relevant Australian Standards, particularly AS1940 and AS1596, and the Dangerous Goods Code.	Site observations	Diesel storage in bunded container. Other chemicals held in lockable shipping container. Spill kits available where required, sign-posted and observed to be well stocked.	Compliant	
Safety					
43	The Proponent must secure the project to ensure public safety to the satisfaction of the Secretary.	Site observations	Lockable gates provided at multiple points. Warning and directional signage provided.	Compliant	
Bushfire management					
44	The Proponent must:				
	(a) ensure that the project is suitably equipped to respond to any fires on-site; and	Site observations	Fire extinguishers available on site.	Compliant	
	(b) assist the rural fire service and emergency services as much as possible if there is a fire onsite.	Site observations	Loader, sand, UHF and water available. Induction includes incident and emergency information.	Compliant	
PRODUCTION DATA					
45	The Proponent must:				
	(a) provide annual production data to the DRG using the standard form for that purpose; and	AEMR 2017-2020	Production Data on Page 15, below limit.	Compliant	
	(b) include a copy of this data in the Annual Review.	AEMR 2017-2020	Production Data on Page 15, below limit.	Compliant	
NOTIFICATION OF LANDOWNERS					
1	If the results of monitoring required in schedule 3 identify that impacts generated by the project are greater than the relevant impact assessment criteria, then the Proponent must notify the Secretary, affected landowners, and/or existing or future tenants accordingly, and provide quarterly monitoring results to each of these parties until the results show that the project is complying with the relevant criteria.	AEMR 2017-2020	This condition relates primarily to Dust and Noise for adjacent landowners. No incidents reported.	Compliant	
INDEPENDENT REVIEW					
2	If a landowner considers that the project is exceeding the impact assessment criteria in schedule 3, then he/she may ask the Secretary in writing for an independent review of the impacts of the project on his/her land. If the Secretary is satisfied that an independent review is warranted, the Proponent must within 3 months of the Secretary advising that an independent review is warranted:			Not triggered	
	(a) consult with the landowner to determine his/her concerns;			Not triggered	
	(b) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Secretary, to conduct monitoring on the land, to determine whether the project is complying with the relevant criteria in schedule 3, and identify the source(s) and scale of any impact on the land, and the project's contribution to this impact; and			Not triggered	
	(c) give the Secretary and landowner a copy of the independent review.			Not triggered	
3	If the independent review determines that the project is complying with the relevant criteria in schedule 3, then the Proponent may discontinue the independent review with the approval of the Secretary.			Not triggered	
4	If the independent review determines that the project is not complying with the relevant criteria in schedule 3, and that the project is primarily responsible for this non-compliance, then the Proponent must:			Not triggered	
	(a) implement all reasonable and feasible measures, in consultation with the landowner, to ensure that the project complies with the relevant criteria; and			Not triggered	
	(b) conduct further monitoring to determine whether these measures ensure compliance; or			Not triggered	
	(b) conduct further monitoring to determine whether these measures ensure compliance; or (c) secure a written agreement with the landowner to allow exceedances of the relevant criteria in schedule 3,			Not triggered	

	to the satisfaction of the Secretary.			Not triggered	
	If the additional monitoring referred to above subsequently determines that the project is complying with the relevant criteria in schedule 3, or the Proponent and landowner enter into a negotiated agreement to allow these exceedances, then the Proponent may discontinue the independent review with the approval of the Secretary.			Not triggered	
5	If the landowner disputes the results of the independent review, either the Proponent or the landowner may refer the matter to the Secretary for resolution.			Not triggered	
ENVIRONMENTAL MANAGEMENT					
Environmental management strategy					
1	The Proponent must prepare an Environmental Management Strategy for the project to the satisfaction of the Secretary. This strategy must:	Dunloe Quarry Environmental Management Strategy (Jan 2020) DPIE Approval Letter for EMS, Jan 2020.	Strategy approved by DPIE Jan 2020.	Compliant	
	(a) be submitted to the Secretary prior to starting quarrying operations on the site;	Dunloe Quarry Environmental Management Strategy (Jan 2020) DPIE Approval Letter for EMS, Jan 2020.	Strategy approved by DPIE Jan 2020.	Compliant	
	(b) be prepared in consultation with the relevant agencies;	Dunloe Quarry Environmental Management Strategy (Jan 2020) DPIE Approval Letter for EMS, Jan 2020.	The EMS 2020 notes agency consultation but it is not appended to the plan on the web site.	Non-compliant	
	(c) provide the strategic context for environmental management of the project;	Dunloe Quarry Environmental Management Strategy (Jan 2020) DPIE Approval Letter for EMS, Jan 2020.	EMS Section 1 and 4 provides the strategic context.	Compliant	
	(d) identify the statutory requirements that apply to the project;	Dunloe Quarry Environmental Management Strategy (Jan 2020) DPIE Approval Letter for EMS, Jan 2020.	EMS Section 3 provides a legislative frame work.	Compliant	
	(e) describe in general how the environmental performance of the project would be monitored and managed;	Dunloe Quarry Environmental Management Strategy (Jan 2020) DPIE Approval Letter for EMS, Jan 2020.	EMS Sections 4, to 9 describe the various processes and procedures for monitoring and management.	Compliant	
	(f) describe the procedures that would be implemented to:	Dunloe Quarry Environmental Management Strategy (Jan 2020) DPIE Approval Letter for EMS, Jan 2020.	EMS table 1.1 identifies objectives and targets including references to procedures. EMS section 4 nominates and allocates responsibilities for procedures. EMS section 6 and Appendix K provides emergency procedures. EMS section 8 and Appendix L provides for monitoring, inspection and audit procedures.	Compliant	
	· keep the local community and relevant agencies informed about the construction, operation and environmental performance of the project;	Dunloe Quarry Environmental Management Strategy (Jan 2020) DPIE Approval Letter for EMS, Jan 2020.	EMS section 7 describes agency and community consultation including the DQCCC.	Compliant	
	· receive, handle, respond to, and record complaints;	Dunloe Quarry Environmental Management Strategy (Jan 2020) DPIE Approval Letter for EMS, Jan 2020.	EMS section 7 describes complaint management.	Compliant	
	· resolve any disputes that may arise during the life of the project;	Dunloe Quarry Environmental Management Strategy (Jan 2020) DPIE Approval Letter for EMS, Jan 2020.	Section 7.6 describes dispute resolution.	Compliant	
	· respond to any non-compliance;	As above	Section 8.3 describes resolution of non-compliances for various aspects.	Compliant	
	· manage cumulative impacts; and	As above	Cumulative impacts are not specifically addressed.	Non-compliant	Include statement addressing cumulative impact for multiple issues or singular repeat issues.
	· respond to emergencies;	As above	EMS section 6 and Appendix K provides emergency procedures.	Compliant	
	(g) describe the role, responsibility, authority, and accountability of the key personnel involved in the environmental management of the project; and	As above	EMS section 4 nominates and allocates responsibilities for procedures.	Compliant	
	(h) include:				
	· reference to any strategies, plans and programs approved under the conditions of this approval; and	As above	EMS section 4.1 describes plans/sub plans required.	Compliant	
	· a clear plan depicting all the monitoring to be carried out under the conditions of this approval.	As above	EMS section 8 and Appendix L provides for monitoring, required by the consent.	Compliant	
	The Proponent must implement the strategy as approved by the Secretary.	Noted			
Management plan requirements					

1A	The Proponent must ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:	Sub plans required include for the quarry: Soil and Water Management Plan Landscape Management Plan Noise Management Plan Air Quality Management Plan Traffic Management Plan Aboriginal Cultural Heritage Management Plan Waste Management Plan	Seven Sub-plans have been developed as required by the consent. The plans have been reviewed, updated and subsequently reviewed and approved by DPIE.	Compliant	
	(a) a summary relevant background or baseline data;	As above.	Information has been provided for the EIS and specialist reports to inform the plan.	Compliant	
	(b) a description of:				
	· the relevant statutory requirements (including any relevant approval, licence or lease conditions);	As above.	Each sub plan has a section of legislative requirements.	Compliant	
	· any relevant limits or performance measures/criteria; and	As above.			
	· the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;	As above.	Each subplan has performance indicators.	Compliant	
	(c) a description of the measures that to be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	As above.	Measures are contained in the subplans as discrete chapters or as matrixes.	Compliant	
	(d) a program to monitor and report on the:				
	· impacts and environmental performance of the project; and	As above.	Section 6 or seven of each report is dedicated monitoring and reporting.	Compliant	
	· effectiveness of any management measures (see (c) above);	As above.	Each subplan includes requirement to review the effectiveness on the plan generally in section 7.	Compliant	
	(e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	As above.	Each subplan includes a table to address the contingency plan as part of monitoring and reporting, generally section six.	Compliant	
	(f) a program to investigate and implement ways to improve the environmental performance of the project over time;	As above.	Each subplan includes requirement to review and improve performance, generally in section 7.	Compliant	
	(g) a protocol for managing and reporting any:				
	· incidents;	As above and the EMS	Where required the subplans defer incident management to the EMS.	Compliant	
	· complaints;	As above and the EMS	Complaint management is deferred where required to the EMS	Compliant	
	· non-compliances with statutory requirements; and	As above and the EMS	Dealt with in the contingency plan are specifically in chapters.	Compliant	
	· exceedances of the impact assessment criteria and/or performance criteria; and	As above and the EMS	Dealt with in the contingency plan are specifically in chapters.	Compliant	
	(h) a protocol for periodic review of the plan.	As above	Each subplan includes requirement to review and improve performance, generally in section 7.	Compliant	
	Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.	Noted			
Revision of strategies, plans and programs					
1B	Within 3 months of the submission of:				
	(a) an incident report under condition 4 below;			Not triggered	
	(b) an Annual Review under condition 5 below;	AEMR 2017-2020	Annual Review prepared and provided to agencies.	Compliant	
	(c) an audit report under condition 6 below; and			Not triggered	
	(d) any modifications to this approval,	Mod 2 and the plans listed above	All plans reviewed subsequent to the Mod 2 approval.	Compliant	
	the Proponent must review the strategies, plans and programs required under this approval, to the satisfaction of the Secretary. The Proponent must notify the Department in writing of any such review being undertaken. Where this review leads to revisions in any such document, then within 6 weeks of the review the revised document must be submitted for the approval of the Secretary. Note: The purpose of this condition is to ensure that strategies, plans and programs are regularly updated to incorporate any measures recommended to improve environmental performance of the project.	Noted			
ENVIRONMENTAL MONITORING PROGRAM					

2	The Proponent must prepare an Environmental Monitoring Program for the project to the satisfaction of the Secretary. This program must be submitted to the Secretary prior to starting quarrying operations on the site, and consolidate the various monitoring requirements in schedule 3 of this approval into a single document.	Dunloe Monitoring Program Dec. 2019. DPIE approval Letter for EMP Jan 2020	Plan submitted and approved	Compliant	
INCIDENT REPORTING					
3	Within 24 hours of detecting an exceedance of the limits/performance criteria in this approval or the occurrence of an incident that causes (or may cause) material harm to the environment, the Proponent must notify the Department and other relevant agencies of the exceedance/incident.	Quarry management comments	Some exceedances of water quality monitoring have occurred in the past. These exceedances were repored in the annual monitoring report. Nil incidents	Compliant	
4	Within 6 days of notifying the Department and other relevant agencies of an exceedance/incident, the Proponent must provide the Department and these agencies with a written report that:	Quarry management comments	Nil incidents	Compliant	
	(a) describes the date, time, and nature of the exceedance/incident;	Quarry management comments	Nil incidents	Compliant	
	(b) identifies the cause (or likely cause) of the exceedance/incident;	Quarry management comments	Nil incidents	Compliant	
	(c) describes what action has been taken to date; and	Quarry management comments	Nil incidents	Compliant	
	(d) describes the proposed measures to address the exceedance/incident.	Quarry management comments	Nil incidents	Compliant	
REGULAR REPORTING					
4A	The Proponent must provide regular reporting on the environmental performance of the project on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this approval.	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Web site has AEMR and other monitoring reports of relevance.	Compliant	
ANNUAL REVIEW					
5	Within 12 months of the date of this approval, and annually thereafter, the Proponent must submit an Annual Review to the Secretary and relevant agencies. This report must:	AEMR 2017-2020			
	(a) identify the standards and performance measures that apply to the project;	AEMR 2017-2020	Section six of the AEMR	Compliant	
	(b) describe the works carried out in the last 12 months;	AEMR 2017-2020	Section four of the AEMR	Compliant	
	(c) describe the works that will be carried out in the next 12 months;	AEMR 2017-2020	Section four of the AEMR	Compliant	
	(d) include a summary of the complaints received during the past year, and compare this to the complaints received in previous years;	AEMR 2017-2020	Section nine of the AEMR	Compliant	
	(e) include a summary of the monitoring results for the project during the past year;	AEMR 2017-2020	Section six of the AEMR	Compliant	
	(f) include an analysis of these monitoring results against the relevant:	AEMR 2017-2020	Section six of the AEMR	Compliant	
	· impact assessment criteria/limits;	AEMR 2017-2020	Section six of the AEMR	Compliant	
	· monitoring results from previous years; and	AEMR 2017-2020	Section six of the AEMR	Compliant	
	· predictions in the documents listed in condition 2 of Schedule 2;	AEMR 2017-2020	Section six of the AEMR	Compliant	
	(g) identify any trends in the monitoring results over the life of the project;	AEMR 2017-2020	Section six and seven	Compliant	
	(h) identify any non-compliance during the previous year; and	AEMR 2017-2020	Section five, six and seven	Compliant	
	(i) describe what actions were, or are being, taken to ensure compliance.	AEMR 2017-2020	Section five	Compliant	
INDEPENDENT ENVIRONMENTAL AUDIT					
6	Within 2 years of the start of quarrying operations on site, and every 5 years thereafter, unless the Secretary directs otherwise, the Proponent must commission, commence and pay the full cost of an Independent Environmental Audit of the project. This audit must:	2016 Independent Audit MRA. This NGH report 2021.			
	(a) be conducted by a suitably qualified, experienced, and independent person(s) whose appointment has been approved by the Secretary;	2016 Independent Audit MRA. This NGH report 2021.	Auditors approved by the Department.	Compliant	
	(b) include consultation with the relevant agencies;	2016 Independent Audit MRA. This NGH report 2021.	Consultation provided with agencies.	Compliant	
	(c) assess the environmental performance of the project, and its effects on the surrounding environment;	2016 Independent Audit MRA. This NGH report 2021.	Reports reviewed and reported on provided information to provide an evidence based assessment of the impacts of the development.	Compliant	
	(d) assess whether the project is complying with the relevant standards, performance measures and statutory requirements;	2016 Independent Audit MRA. This NGH report 2021.	Each report provides an object review of performance.	Compliant	
	(e) review the adequacy of any strategy/plan/program required under this approval;	2016 Independent Audit MRA. This NGH report 2021.	Each report provides an object review of performance.	Compliant	
	(f) recommend measures or actions to improve the environmental performance of the project, and/or any strategy/plan/program required under this approval; and	2016 Independent Audit MRA. This NGH report 2021.	Measure recommended.	Compliant	
	(g) be conducted and reported to the satisfaction of the Secretary.	2016 Independent Audit MRA. This NGH report 2021.	Reports adopted.	Compliant	

7	Within three months of commencing an Independent Environmental Audit, or within another timeframe agreed by the Secretary, the Proponent must submit a copy of the audit report to the Secretary, and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations. The recommendations must be implemented to the satisfaction of the Secretary.	2016 Independent Audit MRA. This NGH report 2021.	Reports adopted.	Compliant	
Monitoring and environmental audits					
8	Any condition of this approval that requires the carrying out of monitoring or an environmental audit, whether directly or by way of a plan, strategy or program, is taken to be a condition requiring monitoring or an environmental audit under Division 9.4 of Part 9 of the EP&A Act. This includes conditions in respect of incident notification, reporting and response, non-compliance notification, compliance report and independent audit. Note: For the purposes of this condition, as set out in the EP&A Act, "monitoring" is monitoring of the project to provide data on compliance with the approval or on the environmental impact of the project, and an "environmental audit" is a periodic or particular documented evaluation of the project to provide information on compliance with the approval or the environmental management or impact of the project.	Noted		Not triggered	
COMMUNITY CONSULTATIVE COMMITTEE					
9	Prior to starting quarrying operations on the site, the Proponent must establish a CCC for the project. This CCC must be established and operated in accordance with the Department's Community Consultative Committee Guidelines: State Significant Projects (2016), and to the satisfaction of the Secretary.	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Committee established and operational apart from some perturbation due to Covid 19 Pandemic.	Compliant	
	Notes:				
	· The CCC is an advisory committee only.	Noted			
	· In accordance with the guidelines, the committee should comprise an independent chair and appropriate representation from the Proponent, Council and the local community.	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Refer to website	Compliant	
ACCESS TO INFORMATION					
10	Within 1 month of the approval of any plan/strategy/program required under this approval (or any subsequent revision of these plans/strategies/programs), or the completion of any independent environmental audit or Annual Review, the Proponent must:				
	(a) provide a copy of the relevant document/s to Tweed Shire Council and relevant agencies; and	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Documents on the web site including appendices. Some searching required to find the Environmental Policy.	Compliant	
	(b) ensure that a copy of the relevant document/s is made publicly available on site and/or at the Proponent's regional office,	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Documents on the web site including appendices. Some searching required to find the Environmental Policy.	Compliant	
	to the satisfaction of the Secretary.	DPIE approval letters for each plan.	Each plan has been approved by DPIE and added to the web site.	Compliant	
11	For the life of the project, the Proponent must:				
	(a) make the following information publicly available on its website:				
	• the documents listed in condition 2(a) of Schedule 2;	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Original assessment and Mod 1 and Mod 2 assessments are available on the website.	Compliant	
	• current statutory approvals for the development;	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Current consolidated mod 2 approval available.	Compliant	
	• all approved strategies, plans and programs required under the conditions of this consent;	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Plans and strategy's availably	Compliant	
	• a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Monitoring results available for 2017 to 2021.	Compliant	
	• a complaints register, updated monthly;	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Complaints register available, very few complaints recorded across the years.	Compliant	
	• the Annual Reviews of the project;	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Annual reviews form 2012 to 2020 available.	Compliant	
	• any independent environmental audit as described in condition 6 above, and the Proponent's response to the recommendations in any audit; and	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	July 2016 audit available.	Compliant	

	(b) any other matter required by the Secretary; and	Noted			
	(c) keep this information up-to-date,	Web site: https://www.holcim.com.au/dunloe-sand-quarry-pottsville-nsw	Information Current	Compliant	
	to the satisfaction of the Secretary.	Noted			
APPENDIX 3 - STATEMENT OF COMMITMENTS					
	The following sections summarises the commitments by Ramtech Pty Ltd regarding mitigations and control measures to be implemented for the proposal:				
Sand extraction					
1	Additional resource assessment works are to be undertaken in respect of two (2) key elements, being the extent of resource available for brickies loam and the extent of resource available with respect of mineral sands. Such assessments are to be undertaken in accord with the matters raised by the Department of Primary Industries in correspondence dated 21st December 2007.	MRA Audit 2016	Found broad compliance with commitments and did not raise a non-compliance	Not triggered	
2	Annual production data will be made available in accord with DPI requirements.	AEMR 2017-2020	Production data made available	Compliant	
3	Extraction of marine clay will not be undertaken.	DSQ Bathymetric Survey November 2020	Survey indicates extraction below 10m has not occurred,. Marine clays occur below 12m.	Compliant	
4	Sand extraction below the watertable will be by suction dredge only. No dry extraction of sand will occur on site, with the exception of the initial overburden and brickies loam.	Site observations. Dunloe Soil and Water Management Plan 2020.	Dredge only able to extent 6m below water level which is largely constant (within 0.5m).	Compliant	
5	Prior to commencement of extraction, the extent of the approved extraction areas shall be clearly and permanently marked by a licensed surveyor with survey posts.	Beyond the scope of the audit.	One survey peg was identified in the field adjacent the office at the time of the audit.	Not triggered	
6	Fines will be reinterred approximately below the water table at approximately 10m below NSL.	Site observations. Dunloe Soil and Water Management Plan 2020.	Return of materials below 10m in depth is not practical. The SWMP ensures fines are returned at a minimum depth of 3m. Based on observations and the bathymetric survey fines appeared to be placed in water with a depth of about 4m.	Compliant	
Sediment and erosion control					
7	A perimeter bund and catch drain shall be constructed around each dredge pond and processing areas. The bund is to be vegetated.	Site observations and DSQ Bathymetric Survey November 2020. Aerial photography.	Bund composed of overburden and enclosed all of the site and the ponds also. Revegetation in place for older bunds and advancing as time/conditions permit.	Compliant	
8	Installation of sediment control fences at the downslope perimeter of cleared or disturbed land. These are to be functional before clearing commences.	Site observations. Dunloe Soil and Water Management Plan 2020.	Area enclosed by bund.	Compliant	
9	A negative grade will be maintained around the dredge ponds within the bunded perimeter.	Site observations. Dunloe Soil and Water Management Plan 2020.	Site drains to the ponds, drainage observed.	Compliant	
10	Additional Erosion and sediment control devices shall be installed on an 'as required' basis. Such measures will be installed in accordance with the "Soils and Construction Guidelines – Managing Urban Stormwater".	Noted		Compliant	
11	Where practical, surface waters from undisturbed areas shall be diverted away from extraction/works areas.	Site observations. Aerial photography.	Surface water drainage for previous farming drains paddocks to adjacent Sheens creek north and unnamed creek south of the site.	Compliant	
12	All processing areas will drain towards the onsite water bodies. No discharge of processing waters from the site shall occur under normal conditions (ie. Not flooded).	Site observations. Aerial photography.	Processing areas observed to drain to on-site water bodies.	Compliant	
13	Topsoil stripping will be undertaken in sub-stages of 1 hectare or less	Site observations. Aerial photography.	New extraction areas and resultant topsoil stripping measured as less than 1ha.	Compliant	
14	All existing ground cover around the site is to remain and be maintained to limit sediment and erosion.	Site observations. Aerial photography.	Areas not used for extraction or roads have grass or woody vegetation cover.	Compliant	

15	Any on-site stockpiles of commercial sand shall remain damp and will have appropriate sediment and erosion control devices installed at all times.	Site observations. Dunloe Soil and Water Management Plan 2020.	Stockpiled product is within bunded areas, shielded from wind erosion by grassed stockpiles and drainage directed to ponds.	Compliant	
16	Stockpiled topsoil shall be seeded so as to achieve adequate vegetation cover and sediment and erosion devices will be installed around all stockpiles at all times.	Site observations. Dunloe Soil and Water Management Plan 2020.	Good vegetation cover established. Stockpile run off directed to the ponds.	Compliant	
17	No discharge of processing water from the site shall occur under normal conditions (ie. not flooded)	Site observations. Aerial photography.	Process water returned to the ponds.	Compliant	
Surface water quality control					
18	Installation of surface and ground water monitoring devices as located on figure GJ0400.9.2 (Appendix Q)	Site observations. Dunloe Soil and Water Management Plan 2020.	Monitoring device located as required	Compliant	
19	Surface water monitoring shall be undertaken in accordance with requirements as outlined with the draft EMP under Appendix G.	Site observations. Dunloe Soil and Water Management Plan 2020. DSQ Water Quality Monitoring Review.	Some water quality monitoring was not completed due to subcontractor errors. This has subsequently been rectified.	Non-compliant	Ensure subcontractors complete monitoring as required.
20	All processing areas will drain towards the onsite water bodies. No discharge of processing waters from the site shall occur under normal conditions (ie. not flooded).	Site observations. Aerial photography.	Process water returned to the ponds.	Compliant	
21	Provision of reliable *in situ* monitoring equipment at all times for use by Quarry staff. This equipment will be calibrated at least monthly.	Site Advice SWMP, EMP and Monitoring Worksheet.	All monitoring completed by contractors at the required frequency. For ad hoc issues pH strips available on site.	Non-compliant	Redundant Commitment, remove with next modification.
22	All effluent generated will be pumped off site for treatment at Council facility.	Site observations. Council approval for on site sewage treatment and disposal.	Domestic effluent is treated and disposed of through a licenced on site disposal system. This commitment is contrary to the consent and so is superseded	Compliant	Remove statement of commitment from consent.
Ground water movement and control					
23	Installation of ground water monitoring devices as located on figure GJ0400.8.1 (Appendix Q)	Site observations. Dunloe Soil and Water Management Plan 2020.	Monitoring device located as required	Compliant	
24	Ground water monitoring shall be undertaken in accordance with the requirements as outlined within the draft EMP under Appendix G.	Site observations. Dunloe Soil and Water Management Plan 2020	Ground water monitored as required except for periods of flooding.	Compliant	
25	Provision of reliable *in situ* monitoring equipment at all times for use by Quarry staff. This equipment will be calibrated at least monthly.	Site Advice SWMP, EMP and Monitoring Worksheet.	All monitoring completed by contractors at the required frequency. For ad hoc issues pH strips available on site.	Non-compliant	Redundant Commitment, remove with next modification.
26	All groundwater bores will be licensed by DIPNR.	https://realtimedata.waternsw.com.au/	Groundwater bores not discoverable on the Water NSW web site at the time of the audit.	Non-compliant	Register bores with Water NSW.
27	Dewatering from on site water bodies will not be undertaken	Site observations. Dunloe Soil and Water Management Plan 2020.	Dewatering note required or occurring.	Compliant	
28	Contour profiling of groundwater head data will be undertaken as part of site monitoring and reporting procedures.	Site observations. Dunloe Soil and Water Management Plan 2020. DSQ Water Quality Data Review September	Head data assessed based on AHD. Contouring not available in the reporting period, Rambolt Report dated September 2021.	Non-compliant	Ground water head data assessed in Ramboll Report Sept 2021. Issue Closed
Fuel Management and Land Contamination		**However contouring not occurring.**			
29	Fuel storage is to be contained within a bund area, and protected form the elements. Bunding will be sufficient to contain 110% of the volume of fuel storage.	Site observations	Fuel storage bunded.	Compliant	
30	Operating procedures for containing and cleaning up oil spills on water to be established and implemented on site, with all staff to be trained in these procedures. Such measures are to form part of the site EMP.	Site observations. Dunloe Soil and Water Management Plan 2020.	Addressed in plan and spill kits available on site.	Compliant	
31	Products designed to contain and absorb oil spills on water will be available on site. Quantity and type of product will be monitored and will be available in sufficient quantities to deal with any potential spill on site.	Site observations. Dunloe Soil and Water Management Plan 2020.	Several spill kits available and located at key risk areas.	Compliant	

32	Materials stored on site will be limited to - One (1) month supply of diesel - Machine and equipment oils and grease - limited quantities of petrol	Site observations. Dunloe Soil and Water Management Plan 2020.	Small quantities of fuel and oil held on site. 1000L diesel held in bunded pod.	Compliant	
Air Quality					
33	The full length of internal haulage roadways will be sealed.	Site observations. Aerial photography.	Haul road sealed	Compliant	
34	A vegetation barrier for dust control along the southern boundary adjoining Warwick Park Road will be established (species and planting in accordance with rehabilitation plan, Appendix H).	Site observations. Aerial photography.	Vegetation established	Compliant	
35	Topsoil stripping will be undertaken in sub-stages of 1 hectare of less. Topsoil stripping will not be undertaken on day with excess winds.	Site observations. Aerial photography.	New extraction areas and resultant topsoil stripping measured as less than 1ha.	Compliant	
36	All trucks entering/leaving the site shall be covered.	Site obs. TMP	Loads were observed to be covered at the time of the audit.	Compliant	
37	Stockpiled topsoil shall be seeded so as to achieve adequate vegetation cover and sediment and erosion devices will be installed around all stockpiles.	Site observations. Aerial photography.	Stockpiles revegetated.	Compliant	
38	Any disturbed or unsealed movement areas will be watered by an onsite cart to ensure that such areas remain damp. Watering rates shall not be less than 2.5l/m²/hour.	Site observations.	Water cart available. Surface wet.	Compliant	
Noise					
39	Construction of a 4m high earth mound shielding the operational areas. This mound shall form part of the stockpile and be lightly top soiled, seeded and maintained with native grasses.	Site observations. DSQ Water Quality Monitoring Review.	Significant stockpiles od striped materials around the processing area.	Compliant	
40	The earth mound is to be constructed between 7.30am and 5pm. The occupants of the nearest dwellings to the site be notified as to the hours of operation for the mound construction, and be provided with a contact telephone number should they have concerns regarding noise from this stage of the operation;	Beyond the scope of the audit.		Not triggered	
41	The bulldozer used to construct the earth barriers should be well maintained, and fitted with residential mufflers;	Site observations.	No Bull dozers observed on site.	Not triggered	
42	Upon plant dredge pump selection, noise levels should be less than or equal to 88dB(A) at 1m from the plant. If this level is not achievable, further acoustic treatment in the form of a semi enclosure will be required to reduce source noise levels to within the acceptable range;	Beyond the scope of the audit.		Not triggered	
43	Haulage trucks and the wheeled loader should be well maintained, and fitted with residential mufflers;	Site observations.	Plant observed were using compliant muffler systems.	Compliant	
44	Internal haulage route and the crossover to Pottsville Road be as smooth as possible, and well maintained;	Site observations.	The majority of the haul road was in good condition. Some pothole repairs were observed. Additional repairs planned.	Compliant	
45	Prior to commencement of operations, an acoustic test be conducted to ensure compliance with the noise limit criteria;	Beyond the scope of the audit.			
46	All operations to be limited to 7am to 6pm, Monday to Friday, and 7am to midday, Saturdays.	Site observations. Recordable events register.	One incident of a truck being loaded at 6.45am.	Non-compliant	Issue investigated and closed out.
Flora and fauna					
47	A detailed regeneration and rehabilitation plan is to be prepared and approved by the DECCC prior to the issue of a construction certificate.	Dunloe LMP 2020	Plan prepared, reviewed and approved by DPIE.	Compliant	
48	Removal of existing weed species (particularly infestations of Bitou Bush and Lantana).	Beyond the scope of the audit.		Not triggered	
49	Revegetation of disturbed areas within existing native vegetation communities with plants endemic to the locality. Revegetation areas will total approximately 15ha in area. No clearing of vegetation is required with the exception of approximately 20 Casuarina trees lining minor drainage channels in the extraction areas.	Site observations. Aerial photography.	Up to 10 ha of revegetation observed plus buffer strips all of native vegetation.	Compliant	

50	Revegetation of nominated areas within the rehabilitation plan as attached under Appendix H to strengthen potential habitat corridors, extend the distribution of Swamp Sclerophyll and Littoral Rainforest environments and to extend the perimeter of the narrowest portions of the eastern forest to provide long-term mitigation against potential edge effects.	Site observations. Aerial photography.	Vegetation used for regeneration endemic to the local PCT.	Compliant	
51	A monitoring program will be implemented in respect of the rehabilitation areas external to the extraction areas. Such program will be subject to final approval by the DECCC and will contain consideration of additional rehabilitation / regeneration areas at the expense of implementation of the nest boxes. Consideration will also be given to strengthening corridor linkages where possible.	Beyond the scope of the audit.		Not triggered	
52	Incorporation of potential foraging resources for threatened fauna species within landscaping/revegetation areas including: - *Allocasuarina littoralis, A. torulosa* for Glossy Black Cockatoos - Flowering species (Eucalypts, Corymbians, Melaleuca, Banksia) for flying fox/bat species - Littoral Rainforest fruiting species for Fruit-doves/Rainforest Pigeons - Favoured Eucalypts for Koalas	Beyond the scope of the audit.		Not triggered	
53	Installation of nest boxes within the existing vegetation communities.	Beyond the scope of the audit.		Not triggered	
Waste					
54	All soil waste will be disposed of by licensed contractor in accordance with the *Protection of Environmental Operations Act 1997* (POEO Act 1997) & *Waste Minimisation Act 1995*.	DSWMP	Waste removed by contractors.	Compliant	
55	All solid wastes are to be managed in accord with the attached HMC Solid Waste Management Plan.	DSWMP	Waste removed by contractors.	Compliant	
56	Effluent will be treated on site in accord with the attached HMC report.	DSWMP. Council onsite sewage system approval letter.	Waste removed by contractors.	Compliant	
Flooding					
57	Adoption of a maximum 300mm bund height to all levels below 2m AHD.	Site observations.	Low lying areas available for flood expression.	Compliant	
Cultural Heritage					
58	The proponent will undertake additional archaeological surveys of the proposed extraction areas prior to works commencing to provide assurance that no aboriginal sites exist within the extraction areas	Beyond the scope of the audit.		Not triggered	
59	If aboriginal sites are found within the extraction areas the proponent must undertake surveys / assessment to determine the cultural heritage values of the site and report how those values might be impacted upon and provide appropriate avoidance, mitigation or compensatory measures. Such additional assessments must be in accord with guidelines and requirements of the DECCC.	Pers Com with Site staff.	No Aboriginal objects discovered.	Compliant	
Views and Landscapes					
60	5m to 10m vegetated buffers will be established around the extraction areas in accordance with the rehabilitation plan attached under Appendix H. The objectives of these areas are for visual protection primarily.	Site observations Aerial photos DSLMP 2020	Buffer established	Compliant	
61	A detailed rehabilitation plan will be prepared for those areas external to the extraction areas.	Site observations Aerial photos DSLMP 2020	Plan prepared and approved by DPIE.	Compliant	
Monitoring Reporting and Consultation					
62	Reporting and consultation measures will be implemented as outlined with the draft EMP under Appendix G.	Noted.			
Licensing					

63	The proponent will commit to gaining an Environmental Protection Licence from DECCC.	EPL for site.	EPL #13077 cited	Compliant	

APPENDIX B AUDITOR APPOINTMENT

Planning, Industry & Environment

Ms Shilpa Shashi
Planning and Environmental Coordinator
Holcim (Australia) Pty Ltd
Level 7 – 799 Pacific Highway
CHATSWOOD NSW 2067

28/06/2021

Dear Ms Shashi

Dunloe Quarry (MP06_0030)
Auditors Request for Approval Response

I refer to your request (MP06_0030-PA-10) for the Planning Secretary's approval of suitably qualified persons to prepare the Independent Auditor for Dunloe Quarry (MP06_0030).

The Department has reviewed the nominations and information you have provided and is satisfied that these experts are suitably qualified and experienced. Consequently, I can advise that the Planning Secretary approves the appointment of Michial Sutherland to prepare the Independent Audit for Dunloe Quarry.

If you wish to discuss the matter further, please contact Phillip Rose on (02) 6670 8657.

Yours sincerely

Heidi Watters
Team Leader Northern
Compliance

As nominee of the Planning Secretary

APPENDIX C CONSULTATION WITH AGENCIES

13 July 2021

Mr Phillip Rose
Northern Compliance
Department of Planning Industry and Environment
4 Parramatta Square
12 Darcy Street
PARRAMATTA NSW 2150

Dear Phillip

Re: Dunloe Sand Quarry Independent Environmental Audit 2021. 21-473

Holcim (Australia) Pty Ltd, in accordance with the Project Approval (06_0030) for its Dunloe Sand Quarry, has commenced the audit process. NGH has been approved as the Independent Environmental Auditor. The NSW Department of Planning and Environment Guideline *Independent Audit Post Approval Requirements* (June 2018) recommends consultation with various parties as part of the audit process.

NGH as part of the consultation process is writing to seek your input to the audit. The audit will address the requirements of the consent, and compliance with the Environment Protection Licence.

Where the Department has need to raise matters relevant to the audit please take this opportunity to express them.

NGH is also consulting with NSW EPA, Tweed Shire Council, and NSW Fisheries for the purpose of the audit.

Please provide input at your earliest convenience. I can be contacted at Michial.s@nghconsulting.com.au or 02 6923 1532.

Yours sincerely

Mike Sutherland
Manager Riverina and Western NSW
Ph 0427-953 053

NGH

13 July 2021

Mr Benjamin Lewin
NSW EPA

Email: benjamin.lewin@epa.nsw.gov.au

Dear Benjamin

Re: Dunloe Sand Quarry Independent Environmental Audit 2021. 21-473

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NGH is also consulting with NSW Fisheries, NSW DPIE and Tweed Shire Council for the purpose of the audit.

Please provide input at your earliest convenience. I can be contacted at Michial.s@nghconsulting.com.au or 02 6923 1532.

Yours sincerely

Mike Sutherland
Manager Riverina and Western NSW
Ph 0427-953 053

NGH

13 July 2021

Mr Jonathan Yantsch
Senior Fisheries Manager
Coastal Systems North Coast
NSW DPIE

Email: Jonathan.yantsch@dpi.nsw.gov.au

Dear Jonathan

Re: Dunloe Sand Quarry Independent Environmental Audit 2021. 21-473

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NGH is commencing the consultation process and I am writing to seek your input to the audit. The audit will address the requirements of the consent, and compliance with the Environment Protection Licence.

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Please provide input at your earliest convenience. I can be contacted at Michial.s@nghconsulting.com.au or 02 6923 1532.

Yours sincerely

Mike Sutherland
Manager Riverina and Western NSW
Ph 0427-953 053

NGH

13 July 2021

Mr Troy Green
General Manager
Tweed Shire Council
PO Box 816
MURWILLUMBAH NSW 2484

Email: tsc@tweed.nsw.gov.au

Dear Troy

Re: Dunloe Sand Quarry Independent Environmental Audit 2021. 21-473

Holcim (Australia) Pty Ltd, in accordance with the Project Approval for its Dunloe Sand Quarry 06_0030, has commenced the audit process. NGH has been approved as the Independent Environmental Auditor. The NSW Department of Planning and Environment Guideline *Independent Audit Post Approval Requirements* (June 2018) recommends consultation with various parties as part of the audit process.

NGH is commencing the consultation process and I am writing to seek your input to the audit. The audit will address the requirements of the consent, and compliance with the Environment Protection Licence.

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Please provide input at your earliest convenience. I can be contacted at Michial.s@nghconsulting.com.au or 02 6923 1532.

Yours sincerely

Mike Sutherland
Manager Riverina and Western NSW
Ph 0427-953 053

NGH

DOC21/587522-1

Mr Mike Sutherland
Manager Riverina and Western NSW
NGH Consulting
PO Box 5464
WAGGA WAGGA NSW 2650

Email: Michial.s@nghconsulting.com.au

21 July 2021

Dear Mr Sutherland,

Dunloe Park Sand Quarry Independent Environmental Audit EPL 13077

Thankyou for your letter dated 13 July 2021 in relation to the independent environmental audit of Dunloe Park Sand Quarry, Pottsville-Mooball Road, Mooball, NSW. The Environment Protection Authority (EPA) does not have any specific issues regarding the environmental performance of this site. The Environment Protection Licence and regulatory history for the site can be viewed on the EPA's public register.

The public register may be accessed at https://www.epa.nsw.gov.au/licensing-and-regulation/public-registers

If you have any questions or wish to discuss this matter further please contact Johanne Hunt on (02) 9860-1476 or by email Johanne.hunt@epa.nsw.gov.au

Yours sincerely

ROBERT DONOHOE
Acting Unit Head
Regulatory Operations Regional

Phone 131 555
Phone +61 2 9995 5555
(from outside NSW)

TTY 133 677
ABN 43 692 285 758

Locked Bag 5022
Parramatta
NSW 2124 Australia

4 Parramatta Square
12 Darcy St, Parramatta
NSW 2150 Australia

info@epa.nsw.gov.au
www.epa.nsw.gov.au

Fwd: Communication regarding IEA Scope Request MP06_0030-PA-12

Reply | Reply All | Forward | ...

SS Shilpa Shashi <shilpa.shashi@holcim.com>
To Michial Sutherland
Tue 20/07/2021 9:50 AM

Click here to download pictures. To help protect your privacy, Outlook prevented automatic download of some pictures in this message.

---------- Forwarded message ---------
From: **no-reply@majorprojects.planning.nsw.gov.au** <no-reply@majorprojects.planning.nsw.gov.au>
Date: Tue, Jul 20, 2021 at 8:38 AM
Subject: Communication regarding IEA Scope Request MP06_0030-PA-12
To: <shilpa.shashi@lafargeholcim.com>
Cc: <shilpa.shashi@lafargeholcim.com>

Dear Shilpa ,

Dear Mr Sutherland,

Thank you for contacting DPIE regarding input into the scope of the proposed Independent Audit.

In previous Annual Reviews, water quality exceedance has been identified as common matter of non-compliance, most notably turbidity and pH. Concerns have also been raised in previous Annual Reviews regarding frequency of monitoring sampling. The Department would like an in-depth review into the continuing water quality exceedances. The Department is interested to identify if the water quality objectives identified in Schedule 3, Condition 9 are achievable, what impacts the water quality exceedances could have on the site and receiving environment and if any reasonable measures that could be employed by the project to meet the objectives. The Department would also like a review on the frequency of monitoring to confirm consistency with the Environmental Monitoring Program which forms part of the Soil and Water Management Plan.

Please contact me to discuss if further clarification is required.

Kind Regards

Phillip Rose

To sign in to your account click here or visit the Major Projects Website.
Please do not reply to this email.

Kind regards

The Department of Planning, Industry and Environment

NSW GOVERNMENT | Planning, Industry & Environment

RE: 21-473 - Dunloe Park Sand Quarry Audit

JY

Jonathan Yantsch <jonathan.yantsch@dpi.nsw.gov.au>
To Michial Sutherland

Reply | Reply All | Forward | ...

Tue 20/07/2021 4:01 PM

Hi Michial

As the quarry is located directly adjacent to Coastal Wetlands and is within the Mooball Creek catchment, the audit should include a review of the impacts of quarry operations, including those activities that impact and/or occur outside of the quarry footprint such as run-off, surface/ground water pumping and hauling activities, on adjacent key fish habitat (i.e. third order and greater waterways and Coastal Wetlands).

Where impacts are identified by the audit (e.g. sedimentation and other water quality impacts such as changes in pH and thermal pollution, increased/decreased flow regimes etc.), then the report should provide appropriate measures to avoid and/or mitigate these impacts from future quarry operations.

Please contact me on the details below if you have any questions.

Regards

Jonathan

Jonathan Yantsch | Senior Fisheries Manager - Coastal Systems (North Coast)
Aboriginal Fishing & Marine and Coastal Environments
NSW Department of Primary Industries | Fisheries
1243 Bruxner Hwy | Wollongbar | NSW 2477
T: 02 6626 1375 | M: 0447 537 168 | E: jonathan.yantsch@dpi.nsw.gov.au

PERMIT APPLICATION FORMS & FISH HABITAT POLICIES:
www.dpi.nsw.gov.au/fishing/habitat/protecting-habitats/toolkit
Submit permit applications via email to ahp.central@dpi.nsw.gov.au
NB: From date of receipt of application, please allow:
- 21 days for s199 Consultations
- 28 days for Permits, Consultations and Land Owner's Consent responses
- 40 days for Integrated Development Applications

KNOWN & EXPECTED DISTRIBUTION OF THREATENED FISH SPECIES:
www.dpi.nsw.gov.au/fishing/threatened-species/threatened-species-distributions-in-nsw

APPENDIX D DECLARATION

Project Name	Dunloe Park Sand Project
Consent No.	06_0030 Mod 2
Description of Project	Sand Quarry
Project Address	Pottsville-Moonball Rd Potsville
Proponent	Ramtech Pty Ltd (Holcim Aust) Pty Ltd
Operator Address	Holcim (Australia), Locked Bag 5007, Baulkham Hills, 1755, NSW
Title of Audit	Independent Environmental Audit
Date	June 2021

I declare that I have undertaken the Independent Audit and prepared the contents of the attached Independent Audit Report and to the best of my knowledge:

- the audit has been undertaken in accordance with relevant condition(s) of consent and the *Compliance Reporting - Post Approval Requirements (DPIE May 2020)*;
- the findings of the audit are reported truthfully, accurately and completely;
- I have exercised due diligence and professional judgement in conducting the audit;
- I have acted professionally, objectively and in an unbiased manner;
- I am not related to any proponent, owner or operator of the project neither as an employer, business partner, employee, or by sharing a common employer, having a contractual arrangement outside the audit, or by relationship as spouse, partner, sibling, parent, or child;
- I do not have any pecuniary interest in the audited project, including where there is a reasonable likelihood or expectation of financial gain or loss to me or spouse, partner, sibling, parent, or child;
- neither I nor my employer have provided consultancy services for the audited project that were subject to this audit except as otherwise declared to the Department prior to the audit; and
- I have not accepted, nor intend to accept any inducement, commission, gift or any other benefit (apart from payment for auditing services) from any proponent, owner or operator of the project, their employees or any interested party. I have not knowingly allowed, nor intend to allow my colleagues to do so.

Notes:

a) Under section 10.6 of the *Environmental Planning and Assessment Act 1979* a person must not include false or misleading information (or provide information for inclusion in) in a report of monitoring data or an audit report produced to the Minister in connection with an audit if the person knows that the information is false or misleading in a material respect. The proponent of an approved project must not fail to include information in (or provide information for inclusion in) a report of monitoring data or an audit report produced to the Minister in connection with an audit if the person knows that the information is materially relevant to the monitoring or audit. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000; and

b) The *Crimes Act 1900* contains other offences relating to false and misleading information: section 307B (giving false or misleading information – maximum penalty 2 years imprisonment or 200 penalty units, or both)

Name of Auditor	Michial Sutherland
Signature	 24/11/2021
Qualification	Ba.Edu Sci., Environmental Audit, Centre for Professional Development Melb.1997, Environmental Auditing (24 years) including quarrying, waste, SSI / SSD.
Email Address	Michial.s@nghenvironmental.com.au
Company	NGH Environmental
Company Address	35 Kincaid Street, Wagga Wagga, NSW

APPENDIX E SITE INSPECTION PHOTOS

Figure 5 Dust Gauge east of access road and north of the site

Figure 6 Site office, carpark, met mast

Figure 7 Signage at entry/exit

Figure 8 Aerated waste water system, stormwater and signage landscaped areas

Figure 9 Bunded fuel storage and spill controls, solar power

Figure 10 Product stockpiles

Figure 11 Ground water monitoring site DLP1

Figure 12 Dredge line from Pond 2

Figure 13 Sand staining from acid sulfate seepage return to Pond 2,

Note: Grass growth tolerant of acidic conditions

Figure 14 Fines return line Pond 1 and additional fines return line

Figure 15 Opening between Ponds 1 and 2, new dredge being commissioned

Figure 16 Wash screen, liming tank and bicarbonate

Figure 17 Fringing vegetation on Pond 1

Figure 18 Soil bund along the southern edge of Pond 1

Figure 19 Revegetated mound along southern edge of Pond 2

Figure 20 Improved management and control of stockpile seepage requires investigation

Figure 21 Screen plantings along the western boundary

Figure 22 Revegetation established and mature east of the site

Figure 23 Revegetation established and mature north of the site

Figure 24 Revegetation established and maturing north of the site

Figure 25 Typical off site drain receiving ground and surface water from pastures

Note: Acid sulphate impacted water and iron staining observed.