ANNUAL REVIEW
1 April 2019 – 31 March 2020

Northern Dune Extension

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SITE DETAILS

Name of operation	Northern Dune Extension
Name of operator	Holcim (Australia) Pty Ltd
Development consent / project approval #	MP 09_0091
Name of holder of development consent / project approval	Holcim (Australia) Pty Ltd
Annual Review start date	April 1, 2019
Annual Review end date	March 31, 2020
I, Peter Radzievic certify that this audit report is a true and accurate record of the compliance status of Northern Dune Extension for the period of April 1, 2019- March 31, 2020 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	Peter Radzievic
Title of authorised reporting officer	Quarry Manager
Signature of authorised reporting officer	
Date	30 June 2020

1 STATEMENT OF COMPLIANCE

See **Table 1** for statement of commitments for the 2019/20 reporting period for Norther Dune Extension Quarry.

Table 1: Statement of Commitments

Were all conditions of the relevant approval(s) complied with?	
MP 09_0091	Yes
Hunter Water (Special Areas) Regulations 2010 – Approval under Clause 10(1)	Yes
EPL No. 11633	Yes

No incidents or non-compliances were recorded during this AR period.

2 INTRODUCTION

Holcim (Australia) Pty Ltd (Holcim) operates Norther Dune Extension (NDE), a sand quarry located in Tanilba Bay, within the Port Stephens Local Government Area. The site operates under Project Approval (MP-09-0091) approved by the then New South Wales (NSW) Department of Planning and Environment (DPE) (now Department of Planning, Industry and Environment (DPIE)) on 8 March 2013.

This Annual Review (AR) has been prepared for the Tanilba Northern Dune Extension Project to report on mining activities undertaken during the past 12 month reporting period from 1st April 2019 to 31st of March 2020. This report addresses the site's present compliance obligations and status, activities undertaken at the site during the reporting period and proposed activities for the following 12 month period.

This AR encompasses the annual reporting requirements required by Project Approval MP 09_0091 issued by the Department of Planning and Environment on 8 March 2013 for the Tanilba Northern Dune Extension Project (attached as Appendix 1).

This AR will be distributed to DPIE, Hunter Water Corporation (HWC) and Port Stephens Council (PSC) and will also be made publicly available on Holcim's website

The site also operates in accordance with Environment Protection License (EPL) No. 11633 issued by the Environmental Protection Authority (EPA). A location figure and aerial view of the site are outlined in Figure 1 below.

Project Application MP 09_0091 was approved under Section 75J of the *Environmental Planning and Assessment Act 1979* for Sibelco Australia to conduct mining activities on Lots 11, 12 and 13 on DP601306, Lot 408 on DP1041934, and Lots 1 and 2 on DP408240. Project Approval MP 09_0091 has been attached as Appendix 1.

The Annual Review required by approval MP 09_0091 is detailed in Schedule 5, Condition 3 of the approval whereby it is stated:

"Within 12 months of the commencement of quarrying operations, and annually thereafter, the Proponent shall review the environmental performance of the project to the satisfaction of the Director-General. This review must:

- *(a) describe the works (including rehabilitation) that were carried out in the previous year, and the works that are proposed to be carried out over current year;*
- *(b) include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against:*
  - *the relevant statutory requirements, limits or performance measures/criteria;*
  - *the monitoring results of previous years; and*
  - *the relevant predictions in the EA;*
- *(c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;*
- *(d) identify any trends in the monitoring data over the life of the project;*
- *(e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and*
- (f) *describe what measures will be implemented over the next year to improve the environmental performance of the project."*

Mining commenced within Lots 11 – 13 of the Extension area in 2016 and ceased on 18 December 2018. As such, **no clearing or extraction occurred during the reporting period**.

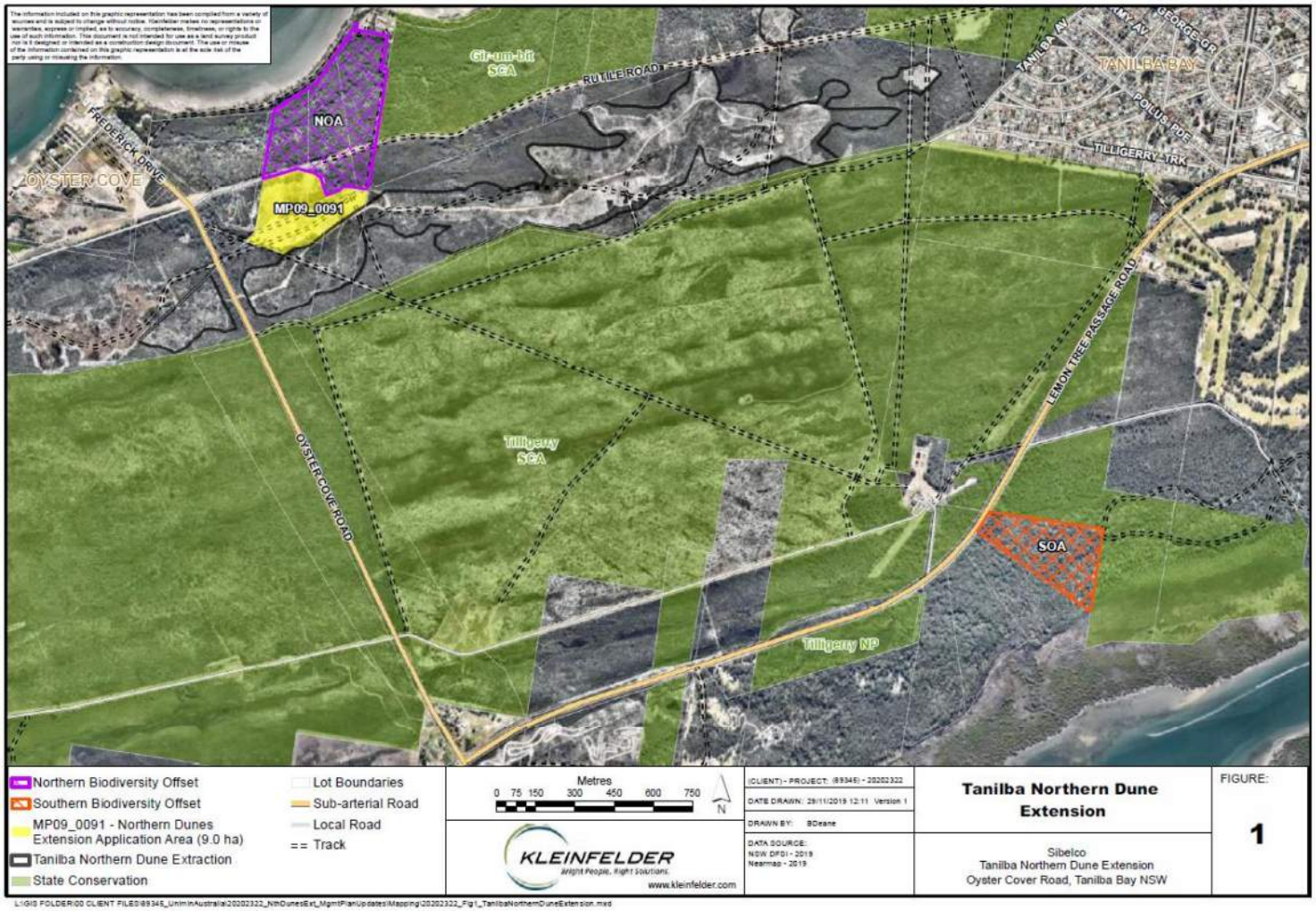

Figure 1: Northern Dune Extension Operations (Including Offset Area)

In accordance with Schedule 5, Condition 4 of the modified Development Consent the site is required to undertake an Annual Review of the site. This Annual Review has been prepared in accordance with Schedule 5 Condition 4 (Annual Performance Monitoring) of the Development Consent and in accordance with the *Annual Review Guideline: post approvals requirements for state significance mining developments* (October 2015). The Annual Review requirements and the section where they have been addressed in this document have been provided in **Table 2**.

Table 2: Annual Review Requirement

Condition	Section in Annual Review
4. Annual Review Annual Review by the end of March each year, the Applicant shall review the environmental performance of the development to the satisfaction of the Secretary. This review must: (a) describe the development (including rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;	Section 4 and 6
(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against: - the relevant statutory requirements, limits or performance measures/criteria;. - the monitoring results of previous years, and - the relevant predictions in the documents listed in condition 2 of Schedule 2;	Section 6 and 7
(c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;	Section 1 and 11
(d) identify any trends in the monitoring data over the life of the development;	Section 6 and 7
(e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and	Section 6
(f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the development	Section 12

2.1 Name and Contact Details

Quarry Manager

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2.2 Change of Ownership

Holcim Australia Pty Ltd (Holcim) recently acquired from Sibelco Australia Limited (Sibelco) its sand mining and processing business and associated assets at Glenshera in South Australia, Lang Lang in Victoria, and Salt Ash, Oyster Cove and Anna Bay in New South Wales. Part of this acquisition was the land comprising of Lots 11, 12 and 13 DP60130, now owned under freehold by Holcim, and furthermore Holcim are in discussion with Hunter Water Corporation on the assignment of leases for Lot 408 DP1041934 and Lots 1 and 2 DP408240. Accordingly, Holcim are now the ongoing responsible operator of the land under Project Approval MP09_0091 and accordingly, provide this AR as required under schedule 5, condition 3 of the Project Approval.

The Northern Dune Extension operations were purchased from Sibelco on the 31 March 2020, the final day of the 2019/20 Annual Report (AR) reporting period. As such, while Holcim are submitting this AR, much of the document refers to actions or correspondence regarding Sibelco.

2.3 Background Information and Mining History

The Tanilba Northern Dune is an elevated sand dune system located on the Tilligerry Peninsula adjacent to the township of Oyster Cove in the Port Stephens Shire, New South Wales.

White silica sand has been extracted from the Tanilba Northern Dune by several companies at different locations since 1991 - the approved extraction area in relation to the regional context can be seen in Figure 1.

Prior to 2003, the western parts of the northern dune were mined by ACI Operations Ltd. Sibelco commenced operations in 2004. Sand extraction works at the Tanilba Northern Dune were comprised of four approval areas separated jurisdictionally by Crown Lands, Hunter Water (x2) and Department of Planning and Environment approvals.

In 2013 approval was granted by the Minister for Planning and Infrastructure to extend the approval area for quarrying activities by 9 ha in an area to the north of the existing extraction operations. The extension project was a Major Project considered under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and is known as the Tanilba Northern Dune Extension Project (now declared a State significant development under an Order dated 22 November 2018). The project area comprises land owned by the Crown, the Hunter Water Corporation and Holcim (the site) and consists of the following:

- Lots 11, 12 ,13 DP601306 (Sibelco);
- Lot 408 DP1041934 (Crown Land); and
- Lots 1, 2 DP408240 (Hunter Water Corporation).

The above areas are depicted in Figure 3.

In terms of the mining process, clearance was undertaken progressively across the site to minimise the area exposed at any one time. Topsoil was then stripped before sand was extracted for processing at the nearby Salt Ash processing plant. Sand was extracted in a rolling south to north sequence where possible with previously mined areas no longer subject to extraction undergoing rehabilitation at the same time. Pre-clearance surveys for flora, fauna and the presence of culturally significant sites were undertaken prior to any clearing of vegetation.

Mined areas are required to be rehabilitated in accordance with an approved Landscape Management Plan and areas cleared of vegetation are required to be offset by implementation of a Biodiversity Offset Strategy including management and improvement of vegetation retained in the north of the approval area. Once rehabilitation is complete, the rehabilitated areas will be returned to their respective owners. Mining ceased in December 2018, with the project moving to a rehabilitation only phase.

A summary of operating parameters at the Tanilba Northern Dunes Extension during the reporting period (reportable per the January 2006 Annual Environmental Management Report guidelines) is provided below.

Table 3: Summary of operations

Parameter	Site detail
Operating hours	Daylight hours from 7:00am to 6:00pm (light permitting) Monday to Friday.
Infrastructure	No permanent infrastructure has been constructed on-site at the Northern Dune Extension as per approvals.
Construction activities	No construction took place at Northern Dune Extension during the reporting period.
Equipment management	No chemicals or mobile plant are stored overnight at Northern Dune Extension
Waste management	No bins or other waste management facilities are kept on site - any waste produced is removed at the end of each working day.
Lighting	Northern Dune Extension does not operate outside of daylight hours and therefore does not have a lighting system installed.
Exploration	No exploration took place at the Northern Dune Extension during the reporting period.
Blasting	Blasting does not occur at the Northern Dune Extension Project site.
Land clearing	No land clearing occurred during the reporting period.
Extraction	Extraction ceased at the site on December 18 2019. No extraction occurred during the reporting period.

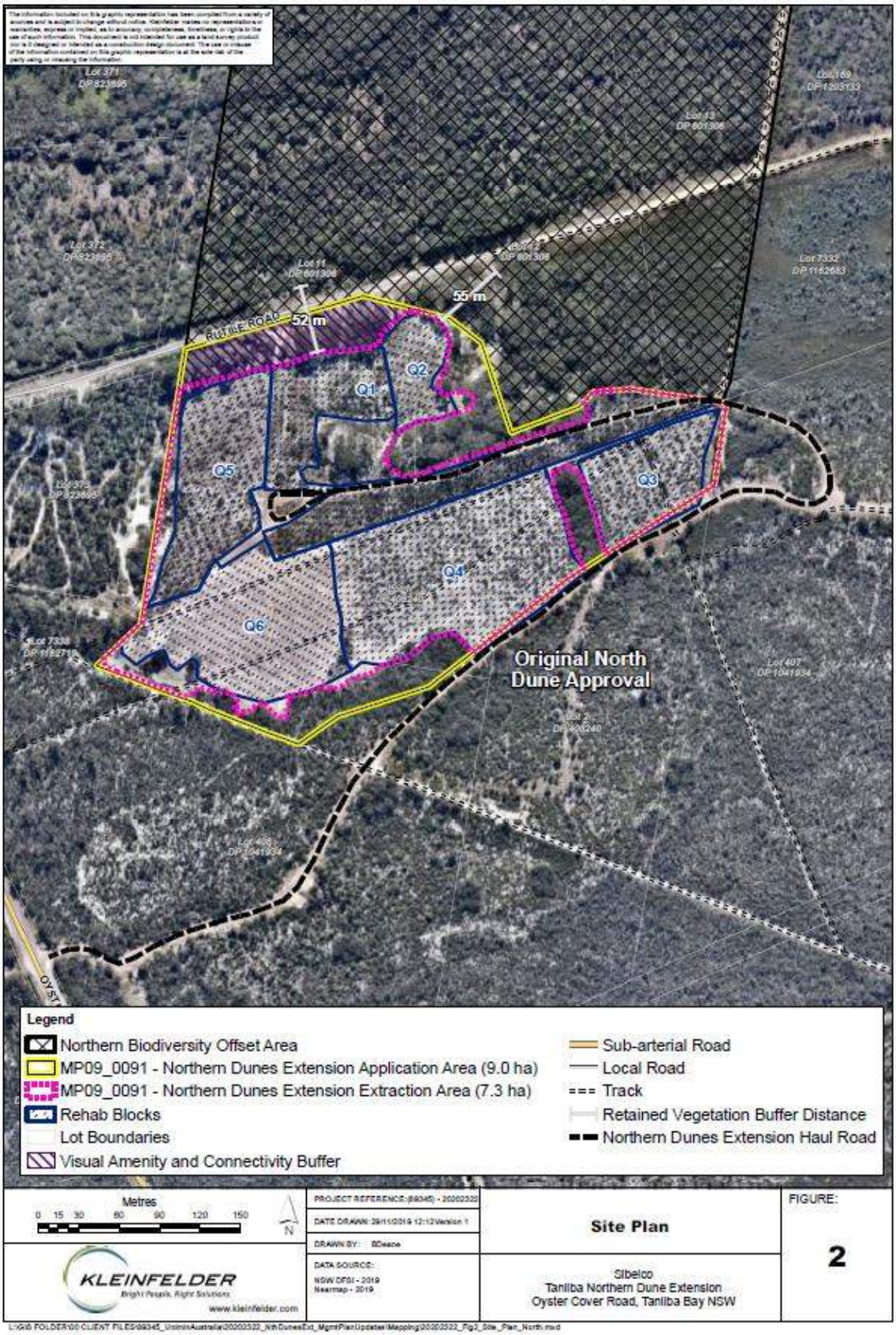


Figure 2: Northern Dune Extension Site Plan

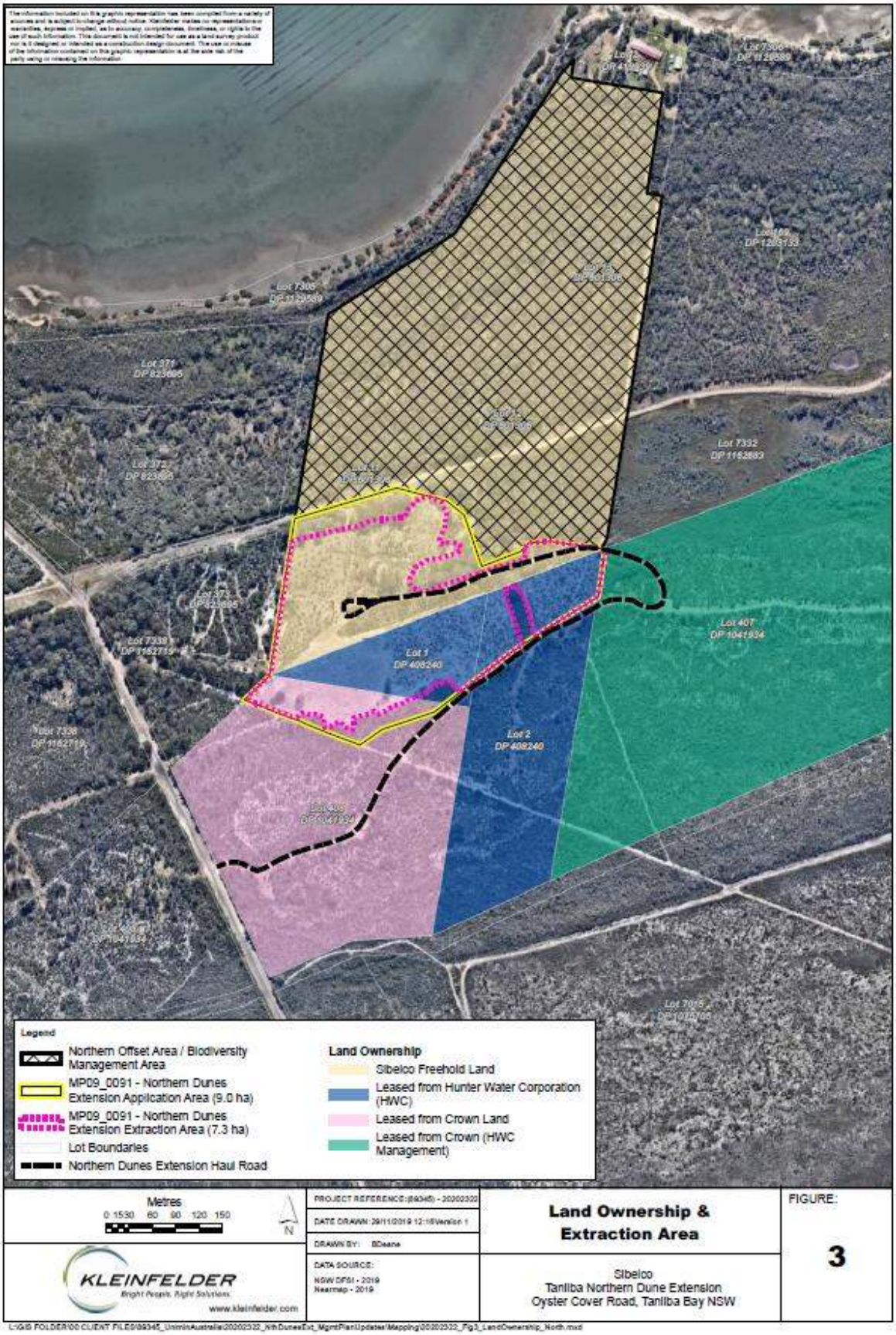


Figure 3: Northern Dune Extension Land Ownership and Extraction Area

3 APPROVALS

The site operates under the following approvals listed in **Table** 4, with the areas of land ownership displayed in **Figure 3**.

Table 4: Approvals for Northern Dune Extension

Approval	Regulatory Authority
MP 09_0091	NSW Department of Planning, Industry & Environment
EPL11633	NSW Environmental Protection Authority
Hunter Water (Special Areas) Regulations 2010 – Approval under Clause 10(1)	Hunter Water Corporation

Holcim holds EPL11633 which covers its activities at Northern Dunes Extension. **Table 5** outlines the EPL licensing limits.

Table 5: EPL Fee-Based Activity at Northern Dune Extension.

Scheduled Activity	Fee Based Activity	Scale
Extractive activities	Land-based extractive activity	>100,000 – 500,000 T extracted, processed or stored

Schedule 2 Condition 6 outlines that the proponent shall not transport more than 150, 000 tonnes of extractive materials from the site in any calendar year.

4 OPERATIONS SUMMARY

4.1 Exploration

No exploration activities were completed during the Annual Review period.

4.2 Land Preparation

No clearing took place during the Annual Review period. All areas of the site were undergoing rehabilitation and covered by vegetation

4.3 Construction Activities

There was no construction undertaken during the Annual Review period.

4.4 Quarry Operations

No extraction occurred during the reporting period. Only rehabilitation activities were performed and are discussed in Section 8. No extractive material was transported from site.

4.5 Next Reporting Period

Extraction at the Northern Dunes Extension site has ceased. Only rehabilitation activities are proposed during the next reporting period. These are discussed further in Section 8.6. Groundwater monitoring will also be performed as per the Groundwater Management Plan (GMP).

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

5.1 Actions from 2018/19 Annual Review

Correspondence between DPIE and Sibelco involved the events described in **Table 6** below.

Table 6: Summary of action item correspondence timeline following 2018/19 Annual Review

Date	Correspondence	Summary of Correspondence Received	Where addressed in 2019/20 Annual Review
27 August 2019	Site Visit	Northern Dune Extension site visit attended by DPIE and HWC.	Table 6
4 October 2019	Letter – DPIE to Sibelco	*Reference is made to the Annual Review for the period 1 April 2018 to 31 March 2019, submitted to the Department of Planning, Industry and Environment (the Department) on 1 July 2019 as required under Schedule 5, Condition 3, of Project Approval MP 09_0091 (the approval), for the Tanilba Northern Dune Extension Project (the site).* *Reference is also made to a final landform survey undertaken by Sibelco on 9 May 2019 and submitted to the Department on 14 June 2019.* *Further reference is made to an inspection of the site conducted by the Department on 27 August 2019 in relation to the Annual Review.* Accompanying email requested submission of revised Annual Review by 1 November 2019.	Table 6 and Table 7
1 November 2019	Email from Sibelco to DPIE	Submission of revised AEMR with actions performed as per Table 7.	Table 7
8 November	Letter from DPIE to Sibelco	Show Cause Notice Issued. The content of the Show Cause Notice consisted of the following five alleged breaches: 1. Failure to Implement the Biodiversity Management Plan 2. Failure to Implement the Environmental Management Strategy 3. Failure to Carry Out the Project in Accordance with Statement of Commitments 4. Failure to Implement the Groundwater Management Program 5. Failure to Notify	Section 5.2
29	Letter – Sibelco	*Reference is made to the DPIE Letter regarding the*	As per this

Date	Correspondence	Summary of Correspondence Received	Where addressed in 2019/20 Annual Review
November 2019	to DPIE	*review of the 2018-19 Annual Review, whereby under Schedule 2, Condition 4, the Secretary requested Sibelco implement the following actions by 29 November 2019. The requested actions have been completed and evidence attached.* ***a) Final Landform** – The final landform level has been rectified via physical works and another landform survey has been conducted to verify compliance with the final landform as stipulated in the GMP. The final landform survey is attached as Appendix I.* ***b) Asbestos** – The material has been removed and request has been complied with. Relevant commentary from Practical Environmental Solutions verifying compliance with the request and a Clearance Certificate is provided as Appendix II.* ***c) Edge Blending** – The uneven edge blending (logs) and topsoil from around the edges of the extraction area has been rectified via physical works, providing a smooth transition between previously disturbed and undisturbed areas. An image is attached showing the outcome of these works as Appendix III.* ***d) Waste** – Sibelco have removed all visible signs of illegally dumped material on our land and any residual rubbish. Further in our monthly inspections, we log and remove all visible waste found.*	line item.
7 December 2019	Letter – Sibelco to DPIE	Response to Show Cause Notice	Section 5.2
16 April 2019	Letter DPIE to Sibelco	Issue of three Penalty Infringement Notices and three Official Cautions.	Section 5.3
18 May 2020	Letter – DPIE to Sibelco	*Reference is made to documentation submitted by Sibelco Australia Limited (Sibelco) on 29 November 2019 in response to actions that were requested by the Department of Planning, Industry and Environment (the Department) in a letter sent on 4 October 2019, under the provisions of Schedule 2, Condition 4, of Project Approval MP 09_0091 (the approval), for the Tanilba Northern Dune Extension Project (the site).The Department has reviewed the information and considers that the Secretary's request has been adequately addressed. Please note that the Department's acceptance of this documentation is not endorsement of the compliance status of the project.*	As per this line item.

Table 7: Actions arising and closed from the 2018/19 Annual Review

Comment	Action Performed	Where Addressed in 2018/19 Annual Review
Table of Contents – include a list of appendices in the Table of Contents.	Updated formatting throughout document and captured additional appendices.	Page vi and throughout
Trends – include a discussion on trends for all monitoring results	Discussion on observed trends expanded throughout the document, in particular regarding Air Quality and Groundwater where more discussion has been provided regarding trends over the life of the project. More information has been provided on the progression of rehabilitation in the main body of the document.	Throughout, notably Sections 3.3 Air Quality, Section 4.3 Groundwater Levels, Section 4.4 Groundwater Quality and Section 5.2 Rehabilitation.
Operations – the discussion of site operations on page 46 should be corrected to reflect the correct completion date of December 2018 (rather than December 2019).	Corrected.	Page 74
Figures – please revise Figure 1 to clearly show the project approval boundary, extraction footprint as of the end of the reporting period, and a base aerial image that is recent (as close as possible to end of the reporting period).	Figure updated. Note this is now Figure 2.	Figure 2, Page 5.
Figures – two figures are labelled "Figure 1" (pages 3 and 10). Please rectify.	Reference error removed through figure updates.	N/A

Comment	Action Performed	Where Addressed in 2018/19 Annual Review
Figures – confirm whether the reference to Figure 4 on page 1 should actually refer to Figure 1 instead.	Reference error removed through figure updates.	N/A
Figures – include an inset figure on Figure 4 that more clearly shows the location/vicinity of the biodiversity offsets in relation to the site and other surrounding identifying features.	New Figure 1 provided to demonstrate biodiversity offset areas.	N/A
Air quality – please report the annual average dust deposition results for each monitoring location and compare against the annual average dust deposition criteria.	Annual averages presented in Table 6, Table 7, and compared against criteria in Figure 9.	Section 3.3 Air Quality
Air quality – please explain why dust deposition monitoring ceased at location TB2/D4 in February 2019 and commenced at location Lot 2-1 in October 2018.	Lot 2-1 data was provided in error. Monitoring did not cease at comparison site TB2/D4. It was tampered with in January 2019, and stolen in February 2019. It was replaced in March 2019 from when monitoring continued at TB2/D4. Compliance site datasets are presented and discussed, with reference to comparison sites made if required.	Section 3.3 Air Quality

Comment	Action Performed	Where Addressed in 2018/19 Annual Review
Air quality – the result from dust deposition gauge TB4 exceeded the limit of allowable monthly increase of 2 g/m2/month from April to May 2018 results, with an increase of 2.8 g/m2/month. Please report this in Table 6 and discuss in Section 2.5.	Discussion of results against the criteria has been expanded and is supported by tabulated and graphical data.	Section 3.3 Air Quality
Groundwater – the Department notes that the March 2019 monitoring was delayed to April 2019, resulting in only one monitoring event during the reporting period. The Department also notes the following monitoring was not undertaken in accordance with the Groundwater Monitoring Program (GWMP). Please include an explanation for the following missed monitoring: i. Monthly water level testing for all locations ii. TPHs for September 2018 monitoring event for all locations.	Monitoring occurred in early April 2019 due to logistical problems. It was delayed by approximately 3 weeks when compared to previous years monitoring programs. It is unfortunate that this fell outside of the reporting period however the results are still applicable to providing observations and trends throughout the reporting period, and contribute to the trends monitored over the life of the project. i. Monthly water testing was not missed. Results are now presented in tabulated form within the main body of the document rather than within the appendices. ii. TPH monitoring results for September 2018, and April 2019 are provided in Table 11.	Groundwater levels discussed throughout section 4.3 and presented in Table 8. TPH monitoring results presented in Table 11 and discussed in Section 4.4.2.5.

Comment	Action Performed	Where Addressed in 2018/19 Annual Review
Groundwater – the report shows an increase in EC and a decrease in pH in bore SAL4, where both trigger limits were exceeded. The trigger levels were also exceeded in nearby bore ACI-2 for iron and manganese. Please provide a discussion around potential causes and whether there is any influence from mining operations.	SAL4 and ACI-2 quality results are discussed in section 4.4.2 along with any other relevant observations at the bores monitored. SAL4 and ACI-2 are also discussed in the September 2018 bi-annual monitoring report provided and in Appendix 8.	Section 4.4 and specifically section 4.4.2.
Groundwater – Appendix 8 of the report recommends further investigation of the integrity of the casing/collar of groundwater bore SAL4, as there may be surface water interaction or influence from mining operations. Please discuss and include any follow up actions to investigate the matter.	This discussion is now provided in section 4.4.2.4.	Section 4.4.2.4
Groundwater – please include tabulated water results in addition to the hydrographs.	Tabulated results are now provided in Table 11 in addition to the hydrographs.	Table 11
Groundwater – please provide a comparison against trigger levels in the GWMP, and provide a discussion of trends in data against predictions in the EA.	Results are now presented alongside trigger levels in Table 11. Discussions of trends in data compared to their predictions of the EA are now provided in Section 4.4.4	Table 11 and Section 4.4.4

Comment	Action Performed	Where Addressed in 2018/19 Annual Review
Rehabilitation – please provide the January 2019 rehabilitation monitoring results.	Results are now provided in main body of document in section 5.2 along with Appendix 10.	Section 5.2
Rehabilitation – please insert a figure showing the locations of blocks Q1 through Q5.	Provided in Figure 19.	Figure 19, Page 54.
Rehabilitation – please provide specific actions to be undertaken in the next reporting period (2019-2020) to address or rectify deficiencies identified from the rehabilitation monitoring (Table 16) and compared to the performance indicators (Table 15).	Section 5.6 has been added to confirm actions to be undertaken, identified during the July 2018 and January 2019 monitoring events, which are provided in Appendix 10 and 11. These actions are also presented in Table 21, Page 62 of the main body of the document.	Table 21, Page 62 and Appendix 10 and 11.
Nest Boxes – the report notes that some nest boxes were destroyed or overcome by pests, and recommends latches be placed to prevent predator species (lace monitor) from inhabiting them. Please provide details of which nest boxes were replaced/ repaired and provide the total number of functional nest boxes. Please show the current nest boxes in Figure 1, Appendix 12.	Discussion added around the replaced and functional nestboxes, supported by graphical representation with the addition of Figure 20.	Section 6.2 and Figure 20, Page 65.

5.2 Show Cause Notice

Following DPIE feedback on the 2018/19 Annual Review and Sibelco's response to DPIE comments as detailed in Table 6 and Table 7, further actions were identified by DPIE in a Show Cause Notice issued to Sibelco on 8 November 2019. The actions contained within the Show Cause Notice related to items identified as occurring both within the 2018/19 reporting period and during preceding years.

The content of the Show Cause Notice consisted of the following five alleged breaches:

1. Failure to Implement the Biodiversity Management Plan
2. Failure to Implement the Environmental Management Strategy
3. Failure to Carry Out the Project in Accordance with Statement of Commitments
4. Failure to Implement the Groundwater Management Program
5. Failure to Notify of incidents

The actions were addressed within a response to the Show Cause Notice provided to DPIE on 7 December 2019, and through additional actions as detailed in Table 8. Following the response to the Show Cause Notice, three penalty notices and three official cautions were issued to Sibelco on 16 April 2020 (see Section 5.3).

5.3 Enforcement Actions

Alleged breaches are detailed below. Sibelco responded to the Show Cause Notice and addressed each of the alleged breaches (as per the letter summarised in Table 8). This resulted in DPIE issuing Sibelco with three Penalty Infringement Notices (PINs) and three official cautions on 20 April 2020.

The three PINs related to:

1. Failure to implement Biodiversity Monitoring Program – Koala, novel *Uperoleia*, and all other vegetation and fauna in the biodiversity offsets prior to and during extraction operations. The BMP is a requirement of Schedule 3, Condition 15 of the project approval MP 09_0091 (the approval), for the Tanilba Northern Dune Extension Project
2. Failure to implement the Biodiversity Management Plan (BMP) in the biodiversity offsets by failing to expand and enhance the Koala habitat, and rehabilitate and revegetate the Regenerating Grassland – Heath. The BMP is a requirement of Schedule 3, Condition 15 of the project approval MP 09_0091 (the approval), for the Tanilba Northern Dune Extension Project
3. Failure to implement the Environmental Management Strategy (EMS) by failing to undertake annual monitoring of the Wallum Froglet in the biodiversity offsets. The EMS is a requirement of Schedule 5, Condition 1 of the project approval MP 09_0091 (the approval), for the Tanilba Northern Dune Extension Project.

The three official cautions consisted of:

1. Failure to notify the Secretary of a number of incidents and breaches of performance measures, as noted below, in accordance with Schedule 5, Condition 5 of the project approval MP 09_0091.
    a. Failing to implement the Biodiversity Management Plan (Schedule 3, Condition 15) by failing to undertake monitoring, habitat enhancement, and weed and pest management in the biodiversity offsets;
    b. Failing to implement the Environmental Management Strategy (Schedule 5, Condition 1) by failing to undertake Wallum Froglet monitoring in the biodiversity offsets;
    c. Failing to implement the Groundwater Monitoring Program (Schedule 3, Condition 12) by reducing the monitoring program without prior approval from the Secretary, or consultation with relevant agencies;
    d. Failing to implement the Dust Monitoring Program (Schedule 3, Condition 8) by failing

to collect two months of dust deposition monitoring data (February and March 2019) at location TB2/D4 due to samples being tampered with; and

e. Exceedances of air quality criteria listed in Schedule 3, Condition 6 for dust deposition results for May and November 2018, and March 2019.

2. Failure to implement the Groundwater Monitoring Program (GWMP) by reducing the program from six monthly down to annually without prior approval from the Department. The GWMP is a requirement of Schedule 3, Condition 12 of the project approval MP 09_0091 (the approval), for the Tanilba Northern Dune Extension Project.

3. Failure to implement the Biodiversity Management Plan (BMP) by failing to undertake weed and pest management in the biodiversity offsets. The BMP is a requirement of Schedule 3, Condition 15 of the project approval MP 09_0091 (the approval), for the Tanilba Northern Dune Extension Project.

Table 8: Summary of Status Updates on Alleged Breaches and Associated Actions

Alleged Breach	Outcome	Action
1. Failure to Implement the Biodiversity Management Plan	Two PINs received and one official caution received.	Following receipt of the Show Cause Notice Sibelco commissioned targeted amphibian monitoring, koala monitoring and vegetation monitoring as per the requirements of the BMP and Schedule 3 Condition 15 of MP 09_0091. • Targeted Amphibian monitoring was performed over January and February 2020 as detailed in Appendix 4 and Section 6.5.2. • Koala monitoring was performed between 3 and 8 August 2019 as detailed in Appendix 5 and Section 6.5.3 • Vegetation monitoring and maintenance was performed in the Northern Offset area as described in Section 6.5.4
2. Failure to Implement the Environmental Management Strategy	One PIN received regarding failure to implement Wallum Froglet monitoring.	Sibelco scheduled Wallum Froglet monitoring to be performed in December 2019 following significant rainfall as per the BMP. Due to drought conditions, sufficient rainfall to perform the monitoring was not encountered until February 2020. Monitoring was performed on 11 February 2020 and both Wallum froglet and *Uperoleia* were recorded within the offset area. The Targeted Amphibian Monitoring Report is available in Appendix 4 and discussed in Section 6.5.2. The BMP was reviewed and updated to reflect DPIEs comments and ensure that monitoring is performed as required under the conditions of consent. The updated BMP was approved by DPIE in February 2020.
3. Failure to Carry Out the Project in Accordance with Statement of Commitments	Actions undertaken as per Action column of this table.	Actions undertaken as per Action column of this table.
4. Failure to Implement the Groundwater Management Program (GWMP)	Official Caution received for failing to implement the GWMP as per the approved GWMP.	Following receipt of the Show Cause Notice, Sibelco submitted a revised GWMP to both DPIE and HWC which was subsequently approved on 10 March 2020. The revised GWMP provides for a reduced program of monitoring and annual reporting via this Annual Report (see Section 7).

Alleged Breach	Outcome	Action
5. Failure to Notify	Official Caution received.	Sibelco reviewed environmental obligations by internally auditing the approvals of each site. Obligations were compiled to produce a better understanding, and more appropriate management in future to ensure that obligations are not missed and therefore future notifications of failure to implement monitoring are not required.

5.4 Management Plan Updates

Schedule 5 Clause 4 of the project approval requires that management plans are reviewed and, if necessary, revised within 3 months of the submission of an annual review. All management plans for the Northern Dune Extension were reviewed and where necessary revised following the submission of the 2018/19 AR. Revisions were made to reflect the requirements of the current operation now that it has transitioned into a rehabilitation phase. Following revision, they were submitted to DPIE for review to meet the satisfaction of the Director-General.

6 ENVIRONMENTAL PERFORMANCE

6.1 Summary of Environmental Performance

A summary of the conditions of the approval MP 09_0091 and sections within this AR where each condition is addressed is provided in **Table 9** below.

Table 9: Summary of Conditions

MP 09_0091 Reference	*Summary of Condition*	*Report Reference*	*Compliance*
ADMINISTRATIVE CONDITIONS			
S2, Cl6	*The Proponent shall not transport more than 150,000 tonnes of extractive materials from the site in any calendar year*	4.4	Y
S2, Cl7	*The Proponent shall ensure that no more than three hectares of the site would be exposed (ie cleared but not re-vegetated) at any one time*	4.2	Y
ENVIRONMENTAL PERFORMANCE CONDITIONS			
Identification of Boundaries			
S3, Cl1	*Prior to the commencement of quarrying operations, the Proponent shall:* *(a) Engage a registered surveyor to mark out the boundaries of the approved limits of extraction; and* *(b) 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*	4.4	Y
Noise			
S3, Cl2	*The Proponent shall ensure that the operational noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land*	4.4	Y
S3, C3	*The Proponent shall only conduct quarrying operations on the site … during stipulated hours*	4.4	Y
Noise Monitoring Program			
S3, Cl5	*The proponent shall prepare and implement a Noise Monitoring Program for the project to the satisfaction of the DG. This program must (amongst other items):* *Include quarterly noise monitoring during at least the first two years of operations*	6.2.2	Y
Air quality			
S3, Cl6	*The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not exceed the criteria listed in Tables 2 to 4 at any privately-owned land*	6.3.2	Y
S3, Cl7	*The Proponent shall regularly assess air quality monitoring data*	6.3.2	Y
S3, Cl8	*The Proponent shall prepare and implement a Dust Monitoring Program*	6.3.2	Y
Soil and Water - Management and monitoring			
S3, Cl10	*The Proponent shall not extract sand or other extractive materials or carry out any work in the extraction area below a level of 0.7 m above the predicted maximum groundwater elevation (see condition 14 of schedule 3), other than the construction of any bores approved by NOW*	4.4	Y
S3, Cl11	*The Proponent shall ensure that the final landform of the extraction area must be at least 1 metre above the predicted maximum groundwater elevation*	Table 6	Y
S3, C13	*Erosion and sediment control plan*	5.4	Y
S3, Cl14	*The Ground Water Monitoring Program shall include* *(a) Detailed baseline data on groundwater levels and quality* *(b) Groundwater impact assessment criteria'* *(c) A program to monitor groundwater levels and quality* *(d) A protocol for the investigation, notification and mitigation of any notified exceedance of the impact assessment criteria;* *(e) The outcome of groundwater modelling to establish the predicted maximum groundwater elevation for the site*	7.1	 Y Y Y Y Y

MP 09_0091 Reference	*Summary of Condition*	*Report Reference*	*Compliance*
	(f) a program to monitor any impacts on GDE *(g) a contingency plan to manage any acid sulfate soils and potentially acid sulfate soils encountered during quarrying operations*		N/A Y
MP 09_0091 Reference	*Summary of Condition*	*Report Reference*	*Compliance*
Biodiversity			
S3, Cl15	*The Biodiversity Management Plan must* *(c) Address project site and offset areas* *(d) provide for retention of hollow bearing trees* *(e) on-going monitoring (at least 6 years) of at least 2 nest boxes for each hollow tree removed during clearing* *(f) a program to undertake targeted survey for* Uperoleia sp *(g) implement a program for any areas within offset areas requiring rehabilitation and/or revegetation* *(i) include monitoring procedures and performance indicators with reference to* Uperoleia *sp., Koala and Wallum Froglet*	6.5	Y
S3, Cl16	*By 31 December 2013, or otherwise agreed by the Director-General, the Proponent shall:* *(a) enter into a Biobanking agreement in respect of the proposed offset areas (see Appendix 4) with the Minister for the Environment, in accordance with Part 7A of the Threatened Species Conservation Act 1995, to implement the Biodiversity Offset Strategy; or* *(b) enter into an agreement with OEH to transfer the offset areas into the national parks estate, to the satisfaction of the Director-General*	N/A	Y
Rehabilitation and landscaping			
S3, Cl18	*The Proponent shall prepare and implement a Landscape Management Plan to the satisfaction of the DG. This shall include a Rehabilitation Management Plan and a Long Term Management Strategy.*	8	Y
Aboriginal Cultural Heritage			
S3, Cl22	*The Proponent shall prepare and implement an Aboriginal Cultural Heritage Management Plan to the satisfaction of the DG*	6.6.2	Y
Visual amenity			
S3, Cl27	*The Proponent shall minimise the visual impacts of the project to the satisfaction of the DG*	8	Y
Waste Management			
S3, Cl28-31	*The Proponent shall comply with conditions of waste management as outlined in the approval]*	6.7.1	Y
Dangerous Goods			
S3, Cl32	*The Proponent shall ensure that chemicals and/or petroleum products are not stored on site*	6.7.1	Y
Production Data			
S3, Cl34	*The Proponent shall* *(a) provide annual quarry production data to DRE using the standard form for that purpose and* *(b) include a copy of this data in the Annual Review*	4.4	Y
ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING			
Annual Review			
S5, Cl3	*Within 12 months of the commencement of quarrying operations, and annually thereafter, the Proponent shall review the environmental performance of the project to the satisfaction of the Director-General.*	This Report and 5.4	Y
Reporting			
S5, Cl 5	*The Proponent shall notify the DG ... of any incident associated with the project*	11	Y
Auditing			
S5, Cl 7	*Within 1 month of completion of quarrying operations … the Proponent shall commission an Independent Environmental Audit to … assess the environmental performance of the project and whether it is complying with the relevant requirements in this approval and any relevant EPL.*	10	Y
Access to Information			

MP 09_0091 Reference	*Summary of Condition*	*Report Reference*	*Compliance*
S5, Cl 9	*From 1 July 2013, the Proponent shall make the following information publicly available on its website:* • *A copy of all approved strategies, plans and programs* • *A summary of all monitoring results of the project* • *A complaints register that is updated on a quarterly basis* • *Copies of any Annual Review* • *Copies of any Independent Environmental Audit and the Proponents response to the recommendation in any audit*	9.1	Y

6.2 Noise

6.2.1 Approved Criteria

A noise monitoring program has been established to meet the requirements of Schedule 3, Condition 5 (b) which states noise monitoring is to be undertaken at quarterly intervals at three receiver locations (identified in **Figure 4**) by suitably trained individuals.

Table 10: Noise Criteria

Receiver	$L_{Aeq\ (15\ min)}$ *dB(A)*
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

Figure 4: Noise Receiver Locations

6.2.2 Key Environmental Performance

Noise monitoring at Northern Dune Extension was undertaken by Global Acoustics on behalf of Sibelco to assess compliance with the approved Noise Management Plan. Copies of monitoring reports are provided in Appendix 2.

No exceedances were reported for this AR period, continuing the long term trend of previous reporting periods.

6.2.3 Proposed Improvements

The Noise Management Plan has been revised and is waiting acceptance following submission to DPIE.

6.3 Air Quality

6.3.1 Approved Criteria

Air Quality monitoring is required to be undertaken in accordance with the following development consent conditions:

"The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not exceed the criteria listed in Tables 2 to 4 at any privately-owned land."

Table 11: Long term criteria for particulate matter

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

Table 12: Short term criterion for particulate matter

Pollutant	Averaging Period	[d] Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	[a] 50 µg/m^3

Table 13: Long term criteria for deposited dust

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

Notes to Tables above:

- *[a] Total impact (i.e. incremental increase in concentrations due to the projects plus background concentrations due to all other sources);*
- *[b] Incremental impact (i.e. incremental increase in concentrations due to the projects on their own);*
- *[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.*
- *[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Director-General in consultation with DECCW.*

6.3.2 Management Measures

Air quality monitoring for the site is undertaken consistent with the Dust Management Plan, available as Appendix J of the Sibelco Northern Dune Environmental Management Plan.

Depositional dust monitoring is undertaken at four locations, known as D3 / TB4, D4 / TB2, D5 / TB3 and D6 / TB1 (see **Figure 5**). Monitoring locations D3 / TB4 and D5 / TB3 are located adjacent to the closest sensitive receiver to extraction activities undertaken by Sibelco within the Northern Dunes Extension area and represent compliance monitoring sites.

Monitoring locations D4 / TB2 and D6 / TB1 are located immediately adjacent to extraction activities where deposited dust is most likely to be related to Sibelco's activities. These sites enable evaluation of compliance stations D3 / TB4 and D5 / TB3 with data from comparison stations D4 / TB2 and D6 / TB1 to infer whether the high dust levels are likely related to the Northern Dune Extension activities or may have been associated with external land use activities.

Depositional dust was monitored monthly over the AR reporting period and analysis conducted by ALS Laboratory Services (NATA accredited) for insoluble solids in accordance with *AS 3580.10.1 - 2003*.

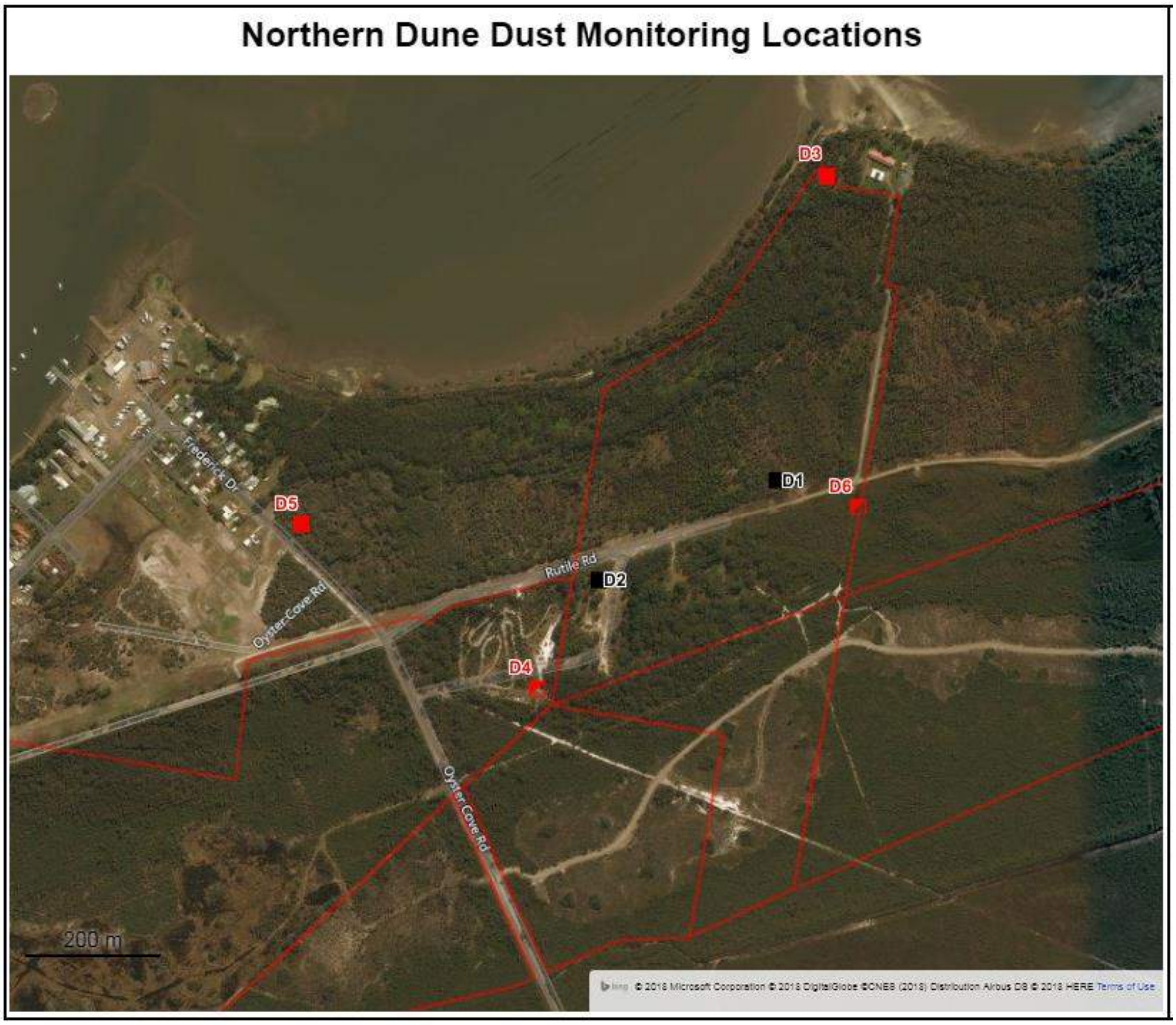


Figure 5: Dust Sampling Locations

6.3.3 Key Environmental Performance

6.3.3.1 Depositional Dust

Monitoring results for the 2019/20 reporting period are presented in Table 14 and Table 15. Results at compliance locations D3 / TB4 and D5 / TB3 have been compared against criteria in Schedule 3, Condition 6, Table 4, shown above. The criteria allows for an annual average of up to 4 g/m^2/month for insoluble solids (or Total Insoluble Matter (TIM) as reported by ALS), as a total (inclusive of the site and background dust). The criteria of 2 g/m^2/month relates to an incremental impact from the Project alone and is also assessed as a rolling annual average.

TIM is an indicator of the mineral constituent of dust as indicative of soil or rock particles and is the parameter of interest when measuring levels of deposited dust as per *Notes to Tables 2 to 4*, *Note C* referenced above. Highlighted results within the table indicate where dust trigger limits were exceeded during the reporting period.

The annual rolling average shown for D3 / TB4 and D5 / TB3 in Table 14 and Table 15 was calculated using data obtained over a rolling 12 month period in accordance with *Appendix J Dust Monitoring Program* of the approved Environmental Management Plan (EMP). The annual rolling average was then compared to the long term maximum total deposited dust level trigger level of 4 g/ m^2/month under Schedule 3, Clause 6 for analysis of ongoing compliance of Sibelco operations in relation to depositional dust levels. A standard background level of 1.5 g / m^2, drawn from the median of values from D3 / TB4, was utilised as the monthly average to generate the rolling average values for data where a 12 month back-date of data was not available.

As seen in Table 14 and Figure 6, there were two instances where measured deposited dust exceeded 4 g/m^2/month at monitoring station D5 / TB4

- November 2019 (4.1 g/m^2)
- March 2020 (5.6 g/m^2).

Review of depositional dust results at comparison sites D4 / TB2 and D6 / TB1 in the same time period found the following:

- In November 2019 comparison site D4 / TB2 had an insoluble matter level of 4.9 g/m^2 while D6 / TB1 had an insoluble matter level of 3.9g/m^2.
- In March 2020 comparison site D4 / TB2 had an insoluble matter level of 4.2 g/m^2 while D6 / TB1 had an insoluble matter level of 0.7g/m^2.

The above results for the comparison sites suggest consistent levels across the monitoring and comparison sites in November 2019. Given that no extraction was occurring during this time the source is highly unlikely to be related to activities on the Northern Dune Extension site. The only activities performed during the reporting period were rehabilitation activities (as discussed in Section 8.2) which do not have the potential to generate dust beyond the criteria. The same applies for the exceedance experienced at D5 / TB3 during March 2020.

Given that no extractive activity occurred through the reporting period it is possible that background dust levels are responsible for exceedances of the criteria. It is noted that significant bushfire events were

occurring from July 2019 through the remainder of the reporting period which may have contributed to elevated background dust levels where exceedances are shown. Indeed, the NSW Annual Air Quality Statement 2019 states '*Air quality in New South Wales (NSW) was greatly affected by the continuing intense drought conditions and unprecedented extensive bushfires during 2019'*. Further, regarding the exceedance in November 2019, the NSW 'DustWatch Report' based upon data supplied by DPIE Rural Air Quality network states '*November 2019 was the dustiest month since our records began in July 2005' (DustWatch Report, November 2019)*.

It is further worth noting that the monitoring events at D3 and D5 for months following the exceedences (December 2019 and April 2020) did not exceed the trigger limit of 4 g/m^2. No dust complaints have been received from nearby residents.

The annual rolling average throughout the reporting period for D3 / TB4 is impacted by the March 2019 result of 9.6 g/m^2. Due to it being the preceding month to the reporting period, this result leads to a monthly annual rolling average result of above 2 g/m^2 . The March 2019 exceedance was not recorded during this reporting period but is reflected as part of a rolling average calculation. The March 2019 result was reported in the 2018/19 Annual Review, with the comparison sites suggesting the result was not related to site activities. If this result is discounted due to this (and set to the threshold limit of 2 g/m^2) then the 2019/20 rolling average is below 2 g/m^2. No complaints related to air quality were received during the reporting period.

The annual rolling average for D5 / TB3 is below the trigger threshold under Schedule 3, Clause 6 of the conditions of approval for all months within the monitoring period with the exception of March 2020 where a result of 2.1 g/m^2 was recorded. This is attributed to the March 2020 result of 5.6 g/m^2 of depositional dust, discounted above as unlikely to be a result of site activities within the Northern Dunes Extension area.

Table 14: Insoluble Matter (g/m2) Monitoring results for the D3 / TB4 Monitoring Station (March 2018 – April 2019).

Sample Period		Dust Monitor		Purpose (Comparison / Compliance)	D3 - Insol. Matter (g/m^2)	Comment	D3 - Annual Rolling Average (g/m^2)	Criteria (g/m^2)
Month	Year	TB	D					
April	2019	TB4	D3	Compliance	2.2		2.4	4.0
May	2019	TB4	D3	Compliance	1.5		2.5	4.0
June	2019	TB4	D3	Compliance	0.8		2.2	4.0
July	2019	TB4	D3	Compliance	0.2		2.1	4.0
August	2019	TB4	D3	Compliance	0.8		2.2	4.0
September	2019	TB4	D3	Compliance	1.7		2.3	4.0
October	2019	TB4	D3	Compliance	1.5		2.3	4.0
November	2019	TB4	D3	Compliance	2.6		2.3	4.0
December	2019	TB4	D3	Compliance	1.9		2.1	4.0
January	2020	TB4	D3	Compliance	2.7		2.1	4.0
February	2020	TB4	D3	Compliance	2.8		2.2	4.0
March	2020	TB4	D3	Compliance	3.2		2.4	4.0

Table 15: Insoluble Matter (g/m2) Monitoring results for the D5 / TB3 Monitoring Station (September 2017 – April 2019).

Sample Period		Dust Monitor		Purpose (Comparison / Compliance)	D5 - Insol. Matter (g/m^2)	Comment	D5 - Annual Rolling Average (g/m^2)	Criteria (g/m^2)
Month	Year	TB	D					
April	2019	TB 3	D5	Compliance	0.5		0.9	4.0
May	2019	TB 3	D5	Compliance	3.4		1.1	4.0
June	2019	TB 3	D5	Compliance	1.2		1.2	4.0
July	2019	TB 3	D5	Compliance	1.3		1.2	4.0
August	2019	TB 3	D5	Compliance	0.7		1.3	4.0
September	2019	TB 3	D5	Compliance	0.2		1.3	4.0
October	2019	TB 3	D5	Compliance	1.1		1.3	4.0
November	2019	TB 3	D5	Compliance	4.1		1.6	4.0
December	2019	TB 3	D5	Compliance	1.6		1.6	4.0
January	2020	TB 3	D5	Compliance	2.4		1.6	4.0
February	2020	TB 3	D5	Compliance	4.0		1.8	4.0
March	2020	TB 3	D5	Compliance	5.6		2.1	4.0

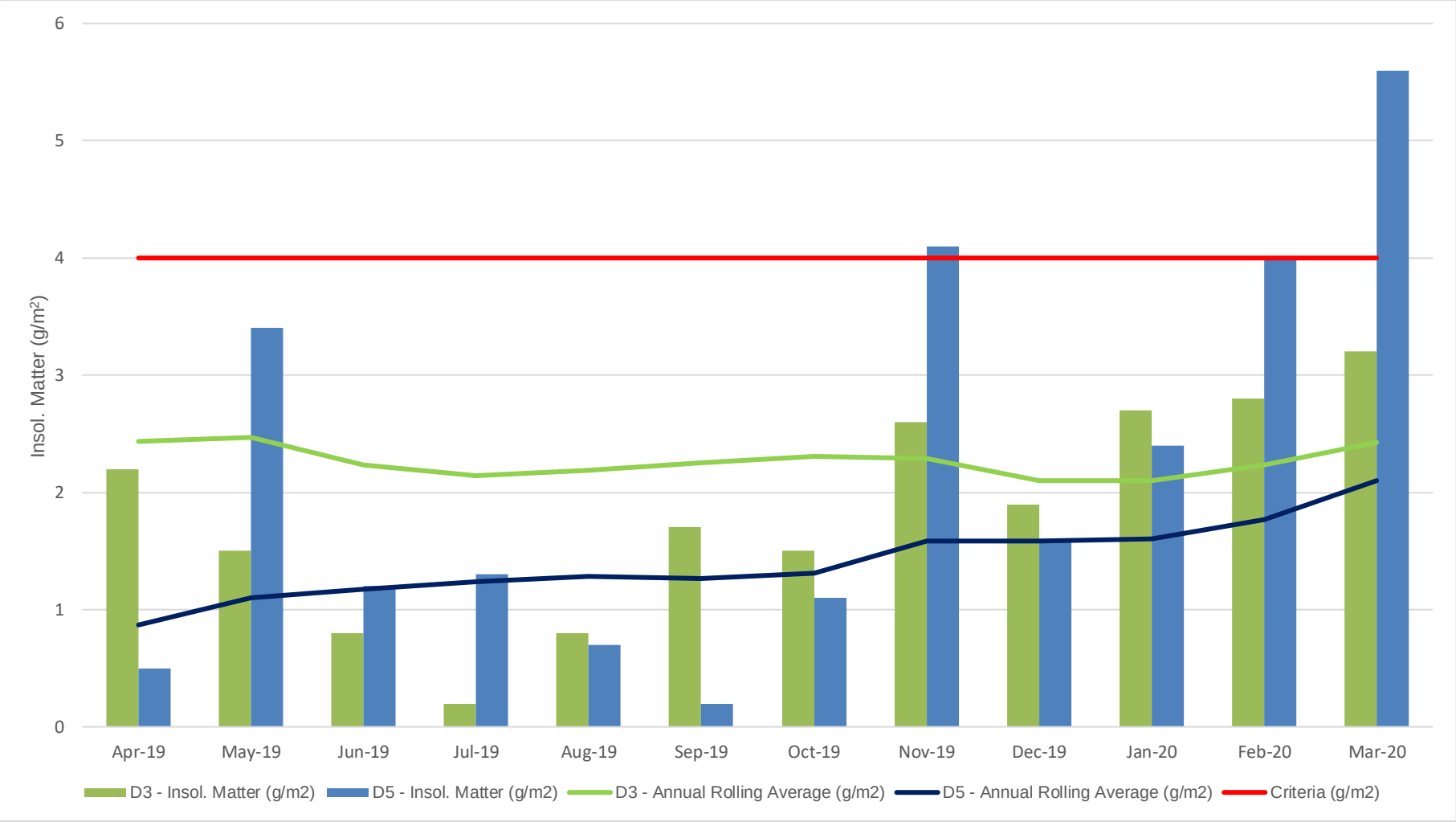


Figure 6: Insoluble Matter (g/m^2) Monitoring results for the D5 / TB3 Monitoring Station and D3 / TB4 Monitoring Station

6.3.4 Proposed Improvements

The Northern Dune Extension Dust Management Plan has been revised and is currently with DPIE under review. The plan will be reviewed again in the next Annual Reporting period and updated if necessary.

6.4 Traffic Management

6.4.1 Approved Criteria

The site is required to operate traffic and manage transport through compliance with the requirements of the conditions listed below:

TRAFFIC

Haulage Route

23. All extractive materials dispatched from the site must be delivered to Sibelco's Salt Ash Sand Processing Plant by the most direct route available.

Road Signage

24. Prior to commencing quarrying operations, the Proponent shall:
    (a) install "Trucks Crossing" and "Trucks Entering" warning signs on Nelson Bay Road on both the western and eastern approaches to the intersection of Lemon Tree Passage Road; and
    (b) pay the full cost of this installation,
    to the satisfaction of RMS.

On-Site Traffic Management

25. The Proponent shall ensure that:
    (a) all vehicles do not exceed a speed of 25 kph on the site;
    (b) all loaded vehicles entering or leaving the site have their loads covered; and
    (c) all loaded vehicles leaving the site are cleaned of sand and other materials that may fall on the road, before leaving the site.

Traffic Management Plan

26. The Proponent shall prepare and implement a Traffic Management Plan for the project, to the satisfaction of the Director-General. This plan must:
    (a) be submitted to the Director-General for approval prior to commencing quarrying operations;
    (b) include a drivers' code of conduct to minimise the impacts of project-related trucks on local residents and road users; and
    (c) describe the measures that would be put in place to ensure compliance with the drivers' code of conduct.

6.4.2 Key Environmental Performance

No extractive materials were dispatched form the site during the reporting period resulting in zero truck movements related to Northern Dune Extension. An approved Traffic Management Plan is in place, available as Appendix H of the Northern Dune EMP. No traffic related non-compliances were recorded during the reporting period.

6.5 Biodiversity

Schedule 3, Condition 15 of the Tanilba Northern Dune Extension Project Approval (MP 09_0091) required the preparation of a BMP. While the BMP requires similar management actions as the LMP, for operational and administrative simplicity, these plans apply to the site as follows:

- Management measures for the extraction area are addressed in the LMP (See Section 8).
- Management of the approved Biodiversity Offset Areas are addressed in the BMP.

Biodiversity offset areas for the project have been established in the north-east of the approved extraction area (northern biodiversity offset area) and to the south east of the extraction area off Lemon Tree Passage Road (southern biodiversity offset area).

The BMP requires the following actions to be undertaken within the offset areas:

- Implementation of a nest box installation and monitoring program within the northern offset area to replace hollow bearing tress removed from the extraction area;
- Utilisation of potential habitat features from the disturbance area (e.g. large organic debris and habitat hollows) either within the rehabilitation or northern offset area;
- Targeted fauna monitoring across all offset areas to monitor for Wallum Froglet, Koala and *Uperoleia* sp
- Establishment of a habitat restoration and rehabilitation program across all offset areas (including the visual amenity buffer along the northern boundary of the extraction area) consisting of:
    - Annual inspections to identify areas requiring weed and pest control;
    - A weed and pest management program;
    - Enhancement of the availability of habitat for the Koala through the use of *Eucalyptus robusta* (Swamp Mahogany) within the offset area;
    - Rehabilitation of the regenerating Grassland-Heath to the surrounding Swamp Mahogany – Paperbark Swamp Forest through seeding and planting of appropriate species;
- Establishment of a vegetation monitoring program (VMP) to ensure vegetation and fauna habitat qualities within the offset areas are being maintained and identify any issues requiring management.

Both the BMP and LMP were reviewed following submission of the 2018/19 AR. The plans were revised and are currently with DPIE under review.

6.5.1 Nest Box Installation and Monitoring Program

The approved BMP requires the establishment and on-going monitoring (at least 6 years) of at least two nest boxes for each tree hollow removed during clearing.

A nest box installation program was implemented on 21st December 2015 to offset the loss of 26 hollows across the whole of the approved extraction area. These were replaced at a 2:1 ratio resulting in the installation of 52 nest boxes in the Northern Offset Area within Coastal Sands Apple Blackbutt Forest and the northern section of the Swamp Mahogany – Paperbark Forest. Nest boxes were positioned in areas of vegetation that contained suitable food resources but lacked denning sites for arboreal fauna. As such, the central part of the offset area was the most appropriate site for installation. The installation of the nest boxes was supervised by suitably trained ecologists to ensure appropriate site selection.

Environmental contractor Kleinfelder was engaged by Sibelco to conduct annual monitoring of the nest boxes during the reporting period on 3 December 2019, and prepared a report on the monitoring program (refer Appendix 3).

This was the third annual monitoring event, and as such results can be compared to the previous

surveys undertaken in 2017 and 2018. The 2019 monitoring survey recorded a combined usage rate (incorporating animal's present, recent and old evidence of use) of 48%. This is a slight decrease of 4% from the 2018 survey of 52%. However, there were an extra six boxes available this year after the replacement of the nest boxes destroyed by fire. Raw numbers show that neither of the possum boxes had evidence of usage in 2019, while there were 25 glider boxes showing some evidence of use this year, an increase of one from the 2018 survey.

Last year's survey showed a rapid increase in uptake of the boxes, and several animals were observed in the boxes. This year, no animals were observed. This absence of animals may be explained by the timing of the survey. The 2019 survey was conducted later in the year (December 2019) as opposed to October for the 2018 survey. The animals may have moved out of the boxes with the increase in temperature, preferring to use better insulated natural hollows.

In the absence of actual fauna occupation of the nest boxes and the lack of obviously fresh nesting materials suggests that fauna were not actively using the boxes at the time of the survey. It is strongly recommended that the 2020 survey be conducted in September or October when temperatures are cooler, and fauna are actively raising young.

6.5.2 Amphibian Monitoring

Targeted fauna monitoring for the Wallum Froglet (*Crinia tinnula*) and Mahony's Toadlet (*Uperoleia mahonyi*) was conducted by Kleinfelder ecologists as part of the requirements outlined in section 5.1.4 of the BMP.

Monitoring was proposed to be conducted during December 2019, however, limited rainfall prevented surveys during this period. In the interests of conducting surveys during more suitable conditions, conducive to detecting amphibians, surveys were postponed until reasonable rainfall was received. As such, monitoring was conducted by two ecologists over four nights between late January and early February 2020, following periods of rainfall. Surveys were undertaken at night, after rainfall was received.

Both species targeted were recorded during the surveys. The full survey results are available in

APPENDIX4.

A prior diurnal assessment of the offset areas was conducted to determine habitat suitability. Surveys consisted of a meandering search in each of the designated offset areas for one hour per offset. Survey effort was focused around ephemeral and semi-permanent water bodies using both spotlighting and call-playback techniques.

Surveys revealed that no permanent water existed within either offset areas. Several areas were noted which had the potential to contain water after rainfall and later became the target of nocturnal surveys. The greatest potential to detected threatened amphibian species was identified within the northern offset with habitats including areas of Melaleuca/Swamp Mahogany forest and low-lying areas dominated by herbs, rushes and/or emergent vegetation. The southern offset contained the least suitable habitat with the only ephemeral water body dominated by saw-sedge (*Gahnia spp*.). Only one species of amphibian, *Limnodynastes peronii*, was recorded during the survey efforts at the southern offset.

Nocturnal surveys of amphibian species employed visual and audible detection techniques with the aid of spotlights. Both the Wallum Froglet (*Crinia tinnula*) and a species of Uperoleia (*Uperoleia mahonyi*) were detected on two of the four survey nights within or adjacent to the offset areas. Of the two species, *C. tinnula* was recorded within the northern offset area while *U. mahonyi* was identified calling from a semi-permanent waterbody approximately 300m to the east of the northern offset area. The adjacent waterbody was visited to confirm the presence of *U. mahonyi* after audibly detecting the species from within the offset area. While the species was found to be breeding in the adjacent waterbody, it is likely that the species utilises habitats within the northern offset site for foraging and over-wintering (refuge).

Table 16 represents amphibian records for the four nights of surveys in January and February of 2020. Opportunistic sightings of non-target amphibian species were also recorded. Addition opportunistic sightings of non-amphibian species within the offset areas include the Grey-headed

flying fox (*Pteropus poliocephalus*), Feathertail glider (*Acrobates pygmaeus*), Long-necked turtle (*Chelodina longicollis*) and a species of freshwater crayfish.

Table 16: Amphibian presence during targeted nocturnal monitoring

Species detected	Observation type	Comments	23/01/2020	29/01/2020	10/02/2020	11/02/2020
Crinia signifera	observed	northern offset			+	+
Crinia tinnula	heard	northern offset			+	+
Limnodynastes peronii	observed	southern and northern offsets	+		+	+
Litoria fallax	heard	calling outside northern offset			+	
Litoria freycineti	observed	northern offset	+	+	+	+
Litoria nasuta	heard	calling outside of northern offset			+	
Platyplectrum ornatum	observed / heard	northern offset	+	+	+	+
Uperoleia mahonyi	heard	calling outside of northern offset			+	+

6.5.3 Koala Monitoring

Koala monitoring was undertaken using the Spot Assessment Technique (SAT) within the Northern and Southern offset areas. Kleinfelder ecologists conducted SAT surveys between the 3rd and 8th August 2019. A total of 18 SAT tests were conducted over the two areas - 15 within the Northern Offsets and three within the Southern Offsets.

The SAT surveys found Koala activity in both the Northern and Southern offset areas. Within the Northern Offset area, the greater activities were found to be within the preferred Koala habitat to the north of the offset area where there are more mature trees for feeding, although evidence of use was found throughout the extent of the Northern offset area. The Southern Offset area was found to have high levels of activity within one SAT test result for the area. The full koala monitoring report is available in Appendix 5.

The Northern Offset area has good habitat suitability for the koala with plenty of mature *Eucalyptus robusta* (Swamp Mahogany), *Melaleuca quinquenervia* (Broad-leaved Paperbark) and *Casuarina glauca* (Swamp She-oak) to the north of the area, although parts of this area are hard to move through. There is thick *Lantana camara* (Lantana) which has the potential to hinder Koala movement through the site. Kleinfelder has been contracted to conduct weed mapping of the Northern Offsets, but this work had not been completed at the of writing this report. The remaining southern areas of the Northern Offset are still regenerating but have shown promising signs of koala use which will continue to improve as the trees mature. This will provide koalas with more habitat and a greater food source in the future.

Table 17: Spot Assessment Technique Results

Location	Low Activity	Medium Activity	High Activity
Northern Offset Area			
1	**+**		
2	**+**		
3	**+**		

4	**+**		
5	**+**		
6	**+**		
7		**+**	
8		**+**	
9	**+**		
10	**+**		
11	**+**		
12	**+**		
13	**+**		
14	**+**		
15	**+**		
Southern Offset Area			
1			**+**
2	**+**		
3	**+**		

6.5.4 Habitat Restoration

Sibelco commissioned Kleinfelder to undertake weed mapping and weed control works in the Northern Offset Area (Lots 11, 12 and 13). The weed mapping was conducted on the 24th and 25th of September 2019, with weed control works performed between the 9th and the 20th December 2019.

Table 18: Weed species identified in the Northern Offset Area

Scientific name	Common Name	Threat Level
Lantana camara	Lantana	Severe
Pinus elliottii	Slash Pine	Severe
Watsonia meriana	Bulge Lily	Severe
Phyllostachys aurea	Fishpole Bamboo	Severe -Declared Noxious Weed
Cortaderia selloana	Pampas Grass	Negligible - high potential
Senna pendula	Cassia	Negligible

Control of Slash Pines focused on the reduction of large canopy trees and trees that were mature enough to produce seed. By reducing the number of seeding trees the rate of re-infestation is reduced. The large pine trees were ring barked using a chainsaw or felled where appropriate and safe to do so. Medium to small trees were either ring barked or cut by hand. One area in the south west corner, where it was originally too dense with saplings to walk through, the slash pines where cut down using a brush cutter to allow access to a large slash pines in the centre of the infestation. The cut stumps were not treated with herbicide, as Pine trees do not re-sprout. Large trees along Rutile Road were left to be assessed by a qualified arborist due to their proximity to the power lines and public road.

Weed control of Lantana focused on the removal of the less dense infestations first, followed by treatment of denser clumps. The less dense areas were treated via hand pulling, foliar spraying and cutting and painting the main canes with herbicide. Time then allowed for the targeting of several isolated dense stands. Upon further inspection of the site, it was determined that the Lantana bush in

the North-west corner of the site was very dense (>90% cover), so work began in the east and moved west following best practice bush regeneration techniques where treatment moves from less dense to more dense infestations. Tracks where cut into the dense bushes to allow for access. Large stem bases that were found during the track cutting were cut and painted with 100% glyphosate. To prevent further growth up trees, Lantana canes were skirted by cutting at the highest possible point. The remaining patches were sprayed with a strong glyphosate mix (1L glyphosate: 9 L water). The strong mixture allowed the Lantana to be "Splatter gunned", meaning only 5-10% of the leaf coverage needed to be sprayed for the chemical to be effective. The use of this technique helps reduce the possibility of off-target damage and reduces the overall volume of chemical sprayed on the site. Photo monitoring points have been set up to track the effectiveness of this treatment and will continue through the 2020/21 reporting period.

An area south of Rutile Road was treated for Fishpole Bamboo. Large canes were cut at the base and painted with 100% glyphosate. Short clumps were treated by spraying a 2% glyphosate mixture. Due to the highly invasive nature of bamboo, the clumps were sprayed twice, once during each week. A photo monitoring point was established to monitor the regrowth and effectiveness of this treatment.

One population of Cassia was treated in order to reduce the risk of further invasion. Treatment included hand pulling and cutting and painting larger trunks with 100% glyphosate.

Treatment of Bulge Lily has not been completed at this time. Bulge Lily is a spring-time perennial, in which it undergoes an annual growth and die-back event. Treatment must coincide with its active growing season, spring. At the time of the works, most plants had already died off making any treatment impossible.

Kleinfelder was commissioned and undertook a survey of the Southern Offsets Area (Lots 21, 22, 23 and 24 Lemon Tree Passage Rd, Tanilba Bay) on the 8th January 2020 as part of the Biodiversity Stewardship Agreement ID Number 225 and submitted to the Biodiversity Conservation Trust.

No planting of native species was undertaken on the North Dunes Extension Offsets Areas during this reporting period.

6.6 Heritage

6.6.1 Approved Criteria

"The Proponent shall prepare and implement an Aboriginal Cultural Heritage Management Plan to the satisfaction of the Director-General. This plan must:

(a) be prepared in consultation with all relevant local Aboriginal communities;

(b) be submitted to the Director-General for approval prior to commencing quarrying operations; and

(c) include:

- *measures for the protection and management of site 38-4-0318 within Lot 13 DP601306;*
- *a program to complete prospective pre-clearance surveys of the extraction area in consultation with Aboriginal stakeholders;*
- *measures for ongoing consultation with local Aboriginal communities and the involvement of these communities in pre-clearance surveys and the ongoing management of any Aboriginal cultural heritage values identified within the site;*
- *an Aboriginal cultural education program for the induction of personnel and contractors involved in quarrying operations; and*
- *a description of the measures that would be implemented if any new Aboriginal objects or skeletal remains are discovered during the project."*

6.6.2 Cultural Heritage Management Plan

An Aboriginal Cultural Heritage Management Plan (CHMP) has been prepared in consultation with the

three Registered Aboriginal Parties (RAPs) within the local area:

- Worimi Local Aboriginal Land Council;
- Mur-Roo-Ma Incorporated, and;
- Nur-Run-Gee Pty Ltd

The CHMP contains plans of actions for pre-clearance surveys and unexpected finds such as new Aboriginal objects or skeletal remains during extraction as well as an ongoing plan to manage Aboriginal Cultural Heritage. With respect to actions under the CHMP during the reporting period:

- No clearing or extraction occurred as the project is in the rehabilitation phase;
- Site 38-4-0318 is located in the northern part of Lot 13 outside the extraction area. There was no disturbance of this area during the reporting period.

6.6.3 Key Environmental Performance

No clearing or extraction occurred during the reporting period. There were no issues relating to Aboriginal and Cultural Heritage in the reporting period.

6.6.4 Proposed Improvements

The CHMP will be reviewed and if necessary updated in the next reporting period.

6.7 Waste Minimisation

6.7.1 Management Measures

The following management measure are in place at Northern Dune Extension:

- No burning of waste;
- Any noxious plant species will be removed from the site, bagged and disposed of at a licensed landfill;
- Any waste will be removed daily and recycled or disposed of directly at a licensed landfill; and
- The site will be maintained and kept free of rubbish and cleaned up at the end of each working day.

6.7.2 Key Environmental Performance

No bins or other waste management facilities are kept on site - any waste produced is removed at the end of each working day.

A site inspection following submission of the 2018/19 AR resulted in the identification of suspected asbestos fragments in the west of the site. Samples were collected for lab analysis which confirmed the presence of asbestos. Asbestos clearing was organised with an asbestos clearance certificate provided to DPIE on 29 November 2019.

6.7.3 Proposed Improvements

There are no proposed improvements to waste management during the Annual Review period.

7 WATER MANAGEMENT

This section addresses compliance with the approved GMP required by Schedule 3, Clause 14 of Project Approval MP 09_0091, and EPL 11633. It should be noted that the GMP was revised and the updated version approved on 10 March 2020. Therefore, monitoring requirements changed throughout the reporting period. This is discussed further below in Section 7.1.

During the reporting period, visual inspections were carried out throughout the operational and rehabilitated areas with no surface water or ponding being noted. No environmental incidents or implementations of the Emergency Response Plan (ERP) in relation to groundwater occurred.

As described in the approved GMP there are no Groundwater Dependent Ecosystems (GDE) identified within the Northern Dune Extension area, therefore no impacts are able to be assessed. A study by SKM in 2012 for the NOW on NSW Coastal GDE's did not identify a GDE at the Northern Dune Extension area site, and a site is not listed in the National Atlas of GDE's.

7.1 Groundwater Management Measures

Groundwater Management issues are managed by the regulatory approved Groundwater Management Plan (GMP). The GMP has been developed to ensure compliance with the conditions of consent and licensing requirements stipulated by the relevant regulatory authorities, during development and operation at Northern Dune. The GMP provides a formal framework for ongoing monitoring of groundwater at the site to manage the potential impact of sand extraction on groundwater level and quality. The GMP stipulates that:

- No excavation is to be carried out to a depth greater than 0.7m above the maximum predicted elevation of the water table;
- The land surface is to be restored, following mining, to a level at least 1m above the maximum predicted elevation of the water table; and
- If concentrations of any analyte are found to exceed the provisional trigger levels given in the GMP, that monitoring point will be re-sampled within fourteen days, with investigatory monitoring implemented should re-sampling also be in exceedance of the trigger values.
- The relevant Regulatory Authorities will be contacted if any recorded water level exceeds the benchmark maximum predicted groundwater levels.

The GMP states that the GMP will be reviewed at the completion of sand extraction in a zone and/or prior to commencement of operations in each new zone (the Northern Dune Extension is effectively a single zone). If this review indicates a need to change programs or procedures, then a submission outlining the proposed changes and the need for them will be made to DPIE and HWC. Extraction ceased in 2018 and no extraction occurred during the reporting period.

A revised GMP was submitted and approved in March 2020 due to the cessation of extraction and progression of the project into a rehabilitation activity. The revised GMP includes monitoring at a reduced number of bores. It was also revised to lower the frequency of groundwater quality monitoring and reporting for bores that:

- Were not representative for the measurement of potential groundwater impacts from rehabilitation activities on the project area; and
- Were not part of the EPL monitoring network.

This resulted in the groundwater quality monitoring locations and frequencies listed in Table 19 remaining. The locations of these bores are shown in Figure 7.

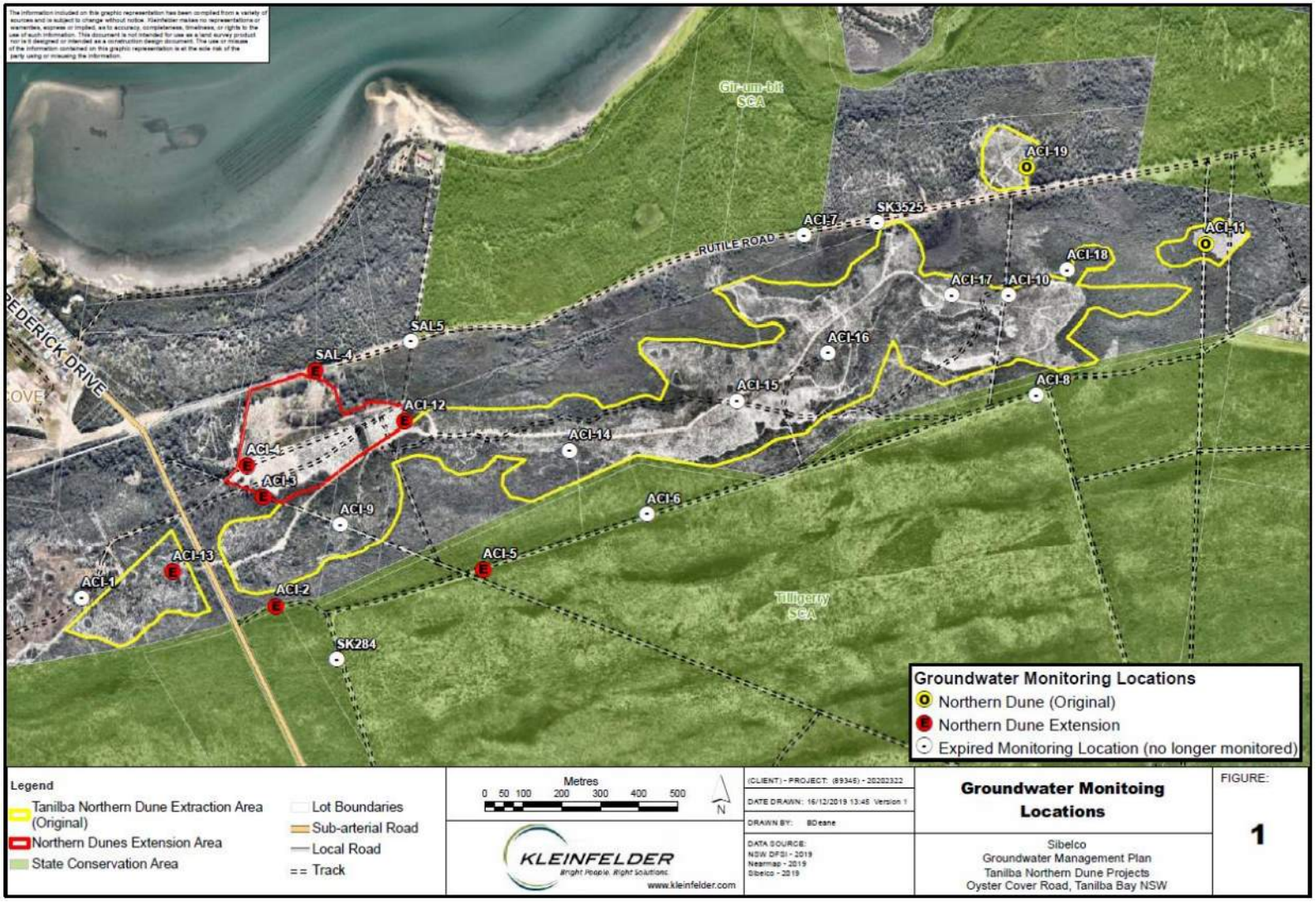


Figure 7: Location of the Tanilba Northern Dune Projects and Associated Current Monitoring Locations

Table 19 Current Groundwater Quality Monitoring Locations

Project	Agency / Approval Jurisdiction	Monitoring Location Name	Easting	Northing	End of Mining Activity	Groundwater quality Monitoring Frequency	Groundwater Level Monitoring Frequency
Northern Dune Extension	DPIE / HWC / EPA	ACI-2	402538	6376802	Ceased Jan 2006 (monitoring required until EPL surrendered / varied)	6 Monthly	Monthly
	DPIE / HWC / EPA	ACI-5	403076	6376897	Outside of extraction zone (monitoring required until EPL surrendered / varied)	6 Monthly	Monthly
	DPIE / HWC / EPA	ACI-13	402270	6376891	Ceased Jun 2005 (monitoring required until EPL surrendered / varied)	6 Monthly	Monthly
	DPIE / HWC / EPA	SAL-4	402641	6377413	Outside of extraction zone (monitoring required until EPL surrendered / varied)	6 Monthly	Monthly
	DPIE / HWC	ACI-3	402505	6377085	July 2018	Annually	Monthly
	DPIE / HWC	ACI-4	402463	6377166	July 2018	Annually	Monthly
	DPIE / HWC	ACI-12	402872	6377282	July 2018	Annually	Monthly

Prior to the updated GMP, the previous GMP described a groundwater monitoring network that consisted of 21 bores and two additional HWC bores. This network covered both the Northern Dune Extension Area and the wider Northern Dune area which is subject to separate approvals and reporting. Historically, due to a lack of updates to the GMP, the AR for the Northern Dune Extension Area has considered a wider network, which was not necessarily relevant to activities on the site.

The 2018/19 AR reported on the following monitoring locations:

- ACI-2;
- ACI-3;
- ACI-4;
- ACI-5;
- ACI-9;
- ACI-12;
- ACI-13;
- SAL-4;
- SAL-5.

This program was monitored until the reduced program was approved (i.e for the first biannual monitoring event). The results for this wider monitoring were provided in the final biannual groundwater monitoring report produced in October 2019 and submitted to DPIE and HWC. This report is available in Appendix 6.

The results of the reduced requirements of the current GMP, as per Table 19 are reported in this AR, as is now required by the updated GMP (note that separate biannual reporting is no longer required).

Groundwater quality is tested for the parameters required by EPL 11633, as presented in Table 20.

Table 20: EPL 11633 Groundwater Monitoring Requirements

POINT 2,5,13,14

Pollutant	Units of measure	Frequency	Sampling Method
Arsenic	milligrams per litre	Every 6 months	Grab sample
Conductivity	microsiemens per centimetre	Every 6 months	Grab sample
Iron	milligrams per litre	Every 6 months	Grab sample
Manganese	milligrams per litre	Every 6 months	Grab sample
pH	pH	Every 6 months	Grab sample
Standing Water Level	metres	Monthly	In situ
Total petroleum hydrocarbons	milligrams per litre	Every 6 months	Grab sample

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
2	Groundwater quality monitoring		Groundwater monitoring bore ACI-2 located to the South of Extraction Zone 1 near DLWC in "Northern Dune Water Bore Locations" figure accompanying additional information supplied to EPA on 6 May 2002.
5	Groundwater quality monitoring		Groundwater monitoring bore ACI-5 located at the South of Extraction Zone 2 & outside lease boundary in "Northern Dune Water Bore Locations" in additional information supplied to EPA on 6 May 2002.
13	Groundwater quality monitoring		Groundwater monitoring bore ACI-13 located within Extraction Zone 1 in "Northern Dune Water Bore Locations" figure in additional information supplied to EPA on 6 May 2002.
14	Groundwater quality monitoring		Groundwater monitoring bore SAL4 as identified on Figure 6.2 of report titled 'Tanilba Northern Dune Sand Extraction Extension - Environmental Assessment' dated August 2012.

7.1.1 Groundwater Levels

Wider groundwater monitoring was initiated at Northern Dune in 2002, prior to the commencement of sand extraction in 2003. Baseline groundwater level and quality monitoring is undertaken within a planned zone prior to commencing sand extraction. Baseline groundwater level monitoring is used to create a Predicted Maximum Groundwater Elevation (PMGE) which is then used for determining depth of extraction and final landform.

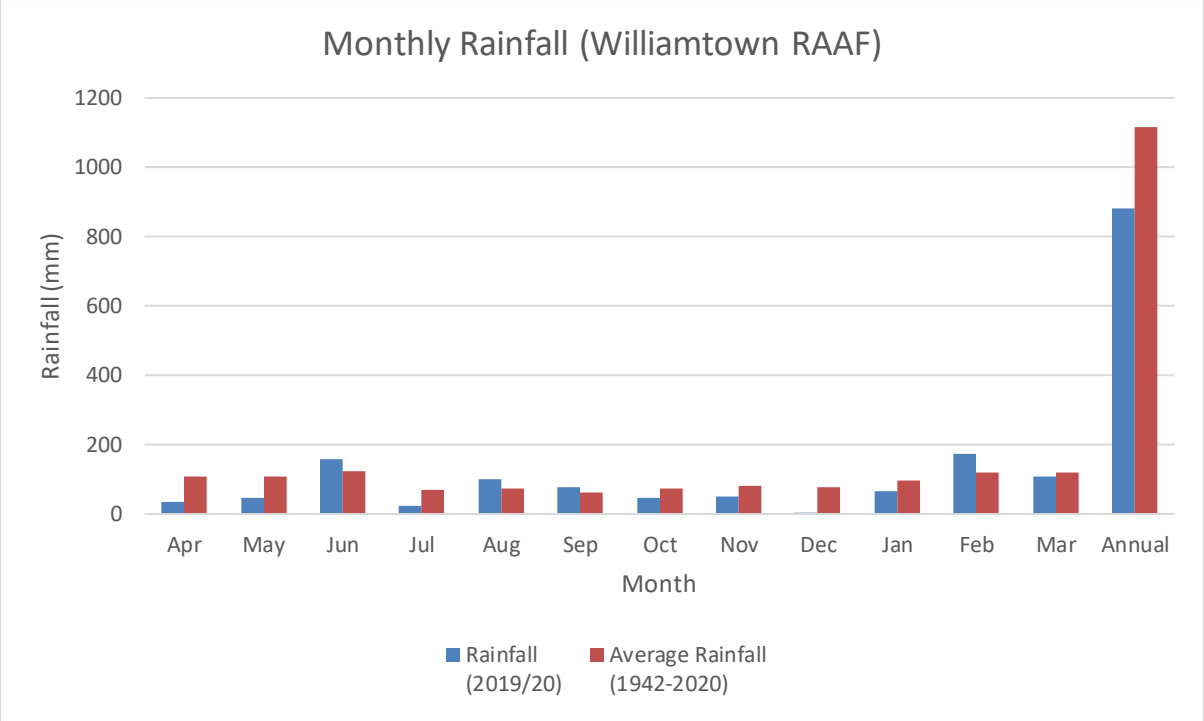


Figure 8: 2019/20 Monthly Rainfall at Williamtown RAAF

Historically, groundwater level data is collected monthly across the entire wider monitoring network with reporting against the piezometers used to analyse Predicted Maximum Groundwater Extent (PMGE) surfaces for the extraction zones.

For the Northern Dune Extension area, the required monitoring locations were reduced in March 2020 to those that are considered most relevant to groundwater level observation as detailed in Table 19. This was done via regulatory approval of a revised GMP as discussed above.

Other locations within the wider monitoring network are considered to be more applicable to the wider Northern Dune area, and of less significance to the specific Northern Dune Extension area (this report). The results for all locations are provided in tabulated form for this reporting period in Table 21, with those relevant to the Northern Dune Extension area shaded grey.

The hydrographs in Appendix 7 demonstrate the groundwater trends throughout the life of the project, and Table 8 presents the monthly results for the current reporting period which demonstrate that all locations were monitored monthly (or weekly) during the current reporting period as per the requirements.

Annual rain monitoring data recorded at Williamtown throughout the reporting has been included in Figure 8 for reference. During the reporting period, the highest recorded rainfall was in Feb 2020 with 171.6 mm being recorded. Dec 2019 was the lowest, with only 0.8 mm falling throughout the month. Figure 12 also presents the historical average monthly rainfall at Williamtown. The observations are that there is below average rainfall over the annual reporting period, and rainfall appears to show a trend of having less frequent but more significant rain events and longer drought periods when compared to the historical average. This is likely to influence the groundwater levels which respond to rainfall.

When rainfall levels exceeded more than 100 mm in a seven-day period, bores are monitored weekly for a total of four weeks. This occurred once during the reporting period in February 2020 and subsequent weekly monitoring was performed, the results of which are presented in Table 21.

Groundwater level monitoring results (Table 21) demonstrate that there have been no exceedances of the Predicted Maximum Groundwater Extent (PMGE) during the reporting period.

Table 21: Groundwater Levels at Northern Dune Extension Monitoring Locations

Date	ACI-1	ACI-2	ACI-3	ACI-4	ACI-5	ACI-6	ACI-7	ACI-8	ACI-9	ACI-10	ACI-11	ACI-12	ACI-13	ACI-14	ACI-15	ACI-16	ACI-17	ACI-18	ACI-19	SAL4	SAL5
8/04/2019	7.12	7.02	7.37	7.43	6.96	6.91	7.73	7.11	7.30	8.02	6.60	7.57	7.49	7.35	#N/A	6.84	7.19	6.39	8.18	7.20	6.73
1/05/2019	6.93	6.84	7.25	7.33	6.76	6.79	7.70	6.95	7.19	7.91	6.51	7.57	7.73	7.34	7.30	6.75	7.03	6.27	8.13	7.06	6.71
3/06/2019	6.91	6.82	7.21	7.09	6.71	6.78	7.83	6.94	7.12	7.88	6.47	7.57	7.73	7.34	7.29	6.72	6.61	6.25	8.12	7.10	6.93
3/07/2019	7.61	7.56	7.84	7.87	7.49	7.51	8.38	7.59	7.78	8.54	7.08	7.86	7.73	7.66	7.91	7.43	7.64	6.90	8.56	7.61	6.93
1/08/2019	7.45	7.33	7.68	7.73	7.28	7.29	8.36	7.40	7.65	8.80	6.95	7.72	7.33	7.46	7.75	7.21	7.45	6.21	8.63	7.49	7.02
29/08/2019	7.25	7.12	7.54	7.60	7.08	7.09	8.06	7.24	7.64	8.23	6.81	7.72	7.33	7.37	7.68	7.05	7.27	6.58	8.46	7.33	6.94
26/09/2019	7.72	7.56	7.91	7.93	7.41	7.49	8.34	7.56	7.86	8.53	7.12	7.72	7.76	7.67	8.02	7.37	7.57	6.93	8.71	7.62	7.07
30/10/2019	7.41	7.04	7.63	7.73	7.14	7.14	8.03	7.14	7.59	8.23	6.85	7.62	7.72	7.35	7.72	7.10	7.34	6.64	8.51	7.37	6.83
27/11/2019	7.30	6.92	7.48	7.63	6.86	7.02	7.74	8.01	7.31	9.03	6.67	7.61	7.71	7.29	7.39	6.99	7.07	6.47	8.14	7.11	6.58
30/12/2019	7.75	6.76	7.22	7.30	6.63	6.71	7.47	6.75	7.08	7.68	6.34	7.67	7.83	7.41	7.18	6.42	6.87	6.32	7.97	7.06	6.31
29/01/2020	7.75	6.44	7.09	7.14	6.53	6.53	7.51	6.76	6.93	7.88	6.44	7.62	7.73	7.41	6.98	6.52	6.87	5.82	7.94	6.95	6.61
10/02/2020	7.22	7.06	7.48	7.70	7.09	7.14	8.30	7.32	7.38	8.28	6.94	7.71	7.77	7.34	7.62	6.82	7.28	6.66	8.41	7.40	6.88
17/02/2020	7.22	7.02	7.57	7.75	7.11	6.99	8.01	7.28	7.45	8.21	6.99	7.62	7.72	7.41	7.52	7.02	7.00	6.64	8.52	7.46	6.96
27/02/2020	7.05	6.94	7.52	7.58	6.99	6.76	8.01	7.20	7.33	8.18	6.69	7.67	7.72	7.41	7.32	7.02	7.31	6.52	8.30	7.35	6.85
6/03/2020	7.05	6.72	7.24	7.26	5.98	6.69	8.00	7.16	7.42	8.27	6.61	7.67	7.78	7.41	7.41	7.02	7.29	6.55	8.24	7.30	6.90
26/03/2020	6.82	6.81	7.25	7.31	6.78	6.81	7.90	7.02	7.17	7.98	6.63	8.61	7.73	7.41	7.42	7.02	7.07	6.42	8.38	7.21	6.78
PMGE	**8.82**	**8.44**	**9.47**	**9.31**	**8.16**	**8.29**	**8.60**	**8.86**	**9.31**	**9.49**	**9.54**	**9.28**	**9.20**	**9.02**	**9.26**	**9.26**	**9.47**	**9.12**	**9.06**	**8.65**	**7.20**

In accordance with the GMP, the results of groundwater level monitoring are analysed to determine whether they are anomalous and whether further sampling is required. If further sampling confirms anomalous results, then notification to the regulators is required.

During the reporting period there were no groundwater level exceedances of the PMGE or anomalous results at any of the monitoring points, as demonstrated by Table 21.

7.1.1.1 Groundwater Level Results Discussion and Trend Summary

During previous reporting periods, it was noted that the trend observed in groundwater levels is that they fluctuate naturally in response to rainfall. During this reporting period Table 21 demonstrates the same trend is observed; groundwater levels rise as there is increased monthly rainfall and fall during periods of reduced rainfall. This trend is highlighted by the elevated levels following the significant rain events in June 2019 and February 2020. The January 2020 rain event resulted in weekly monitoring being undertaken as required by the GMP. The annual trend shows that following rain significant rain events, groundwater levels return to the expected fluctuating trend over time.

The ongoing fluctuating trend over the life of the project is shown in the hydrographs provided in Appendix 7. As the groundwater in the area is rain fed, and this reporting period has seen an overall reduced trend in the rainfall received annually, groundwater levels have shown a slight trend of falling across the monitoring network when compared to previous years.

No significant change to the trends demonstrated in groundwater levels over the life of the project have been observed within this reporting period.

7.1.2 Groundwater Quality

In addition to the requirements of EPL11633, Trigger Values were established for a number of initial monitoring bores. Baseline groundwater quality samples were collected prior to extraction to create trigger values for comparison against sample concentrations during extraction operations and post-extraction operations to assist in detecting any changes in groundwater quality at the site.

The trigger values are then tested against at predetermined increments. Groundwater quality testing is undertaken as per Table 19 and reported to the relevant regulators.

Groundwater quality is sampled and tested by an external third party with results sent to Holcim.

The groundwater quality monitoring results presented in Table 22 show that all results were within normal limits with the exception of ACI-2 which displayed an exceedance of the trigger value for Iron and Manganese in the October 2019 monitoring event. However, it should be noted that the results were back below reportable values in the March 2020 monitoring event.

The October 2019 biannual report submitted to DPIE and HWC reported the exceedance and stated that Iron results are on a rising trend and have exceeded the assigned triggers (3.058mg/L dissolved Fe and 3.62mg/L Total Fe) in the September/October monitoring events since September 2017 and that results have been below trigger values during the March/April monitoring events. The March 2020 result continues this trend.

Manganese results are also on a rising trend and have exceeded the assigned triggers in the September / October monitoring events since September 2017. Results have been below trigger values during the March/April monitoring events. As per the Iron result, the March 2020 monitoring event shows that Manganese levels return to below the reportable value.

Table 22: Comparison of Groundwater quality results against trigger values for the 2019/20 reporting period.

	Date	Bore	pH	EC µS/cm	Iron mg/L		Arsenic mg/L		Manganese mg/L		TPH mg/L			
					Dissolved	*Total*	*Dissolved*	*Total*	*Dissolved*	*Total*	*C6- C9*	*C10- C14*	*C15- C28*	*C29- C40*
Trigger Value	N/A	**ACI-2**	N/A	N/A	3.058	3.623	0.001	0.01	0.015	0.014	0.02 (LOR)	0.05 (LOR)	1 (LOR)	1 (LOR)
Results	10/10/2019		4.81	139	3.92	4.75	<0.001	<0.001	0.016	0.017	<LOR	<LOR	<LOR	<LOR
Results	*25/03/2020*		5.39	107	1.90	2.09	x	x	0.011	0.008	<LOR	<LOR	<LOR	<LOR
Trigger Value	(additional sample)	**ACI-3**	x	x	x	x	x	x	x	x	x	x	x	x
Results	10/10/2019		5.10	99	1.70	1.74	<0.001	<0.001	0.006	0.008	<LOR	<LOR	<LOR	<LOR
Results	*25/03/2020*		5.70	93	1.19	1.78	<0.001	<0.001	0.011	0.015	<LOR	<LOR	<LOR	<LOR
Trigger Value	N/A	**ACI-4**	x	x	x	x	x	x	x	x	x	x	x	x
Results	10/10/2019		4.74	128	0.28	0.30	<0.001	<0.001	0.004	0.005	<LOR	<LOR	<LOR	<LOR
Results	*25/03/2020*		4.96	135	0.20	0.30	<0.001	<0.001	0.002	0.002	<LOR	<LOR	<LOR	<LOR
Trigger Value		**ACI-5**	N/A	N/A	2.048	3.286	0.001	0.015	0.014	0.036	0.02	0.05	1	1
Results	10/10/2019		4.77	143	0.54	0.61	<0.001	<0.001	0.002	0.003	<LOR	<LOR	<LOR	<LOR
Results	*25/03/2020*		5.01	131	0.31	0.38	<0.001	<0.001	0.002	<0.001	<LOR	<LOR	<LOR	<LOR
Trigger Value		**ACI-12**	N/A	N/A	0.493	0.935	0.001	0.001	0.006	0.006	0.02	0.05	1	1
Results	10/10/2019		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Re-test	*25/03/2020*		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Trigger Value		**ACI-13**	N/A	N/A	1.547	6.428	0.001	0.012	0.061	0.056	0.02	0.05	1	1
Results	10/10/2019		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Results	*25/03/2020*		Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Trigger Value		**SAL-4**	4.44 - 6.6	213	3.21	3.64	0.001	0.002	0.093	0.116	0.02	0.05	1	1
Results	10/10/2019		4.74	x	0.42	0.76	<0.001	<0.001	0.022	0.005	<LOR	<LOR	<LOR	<LOR
Results	*25/03/2020*		4.61	153	0.17	0.22	<0.001	<0.001	0.007	0.005	<LOR	<LOR	<LOR	<LOR

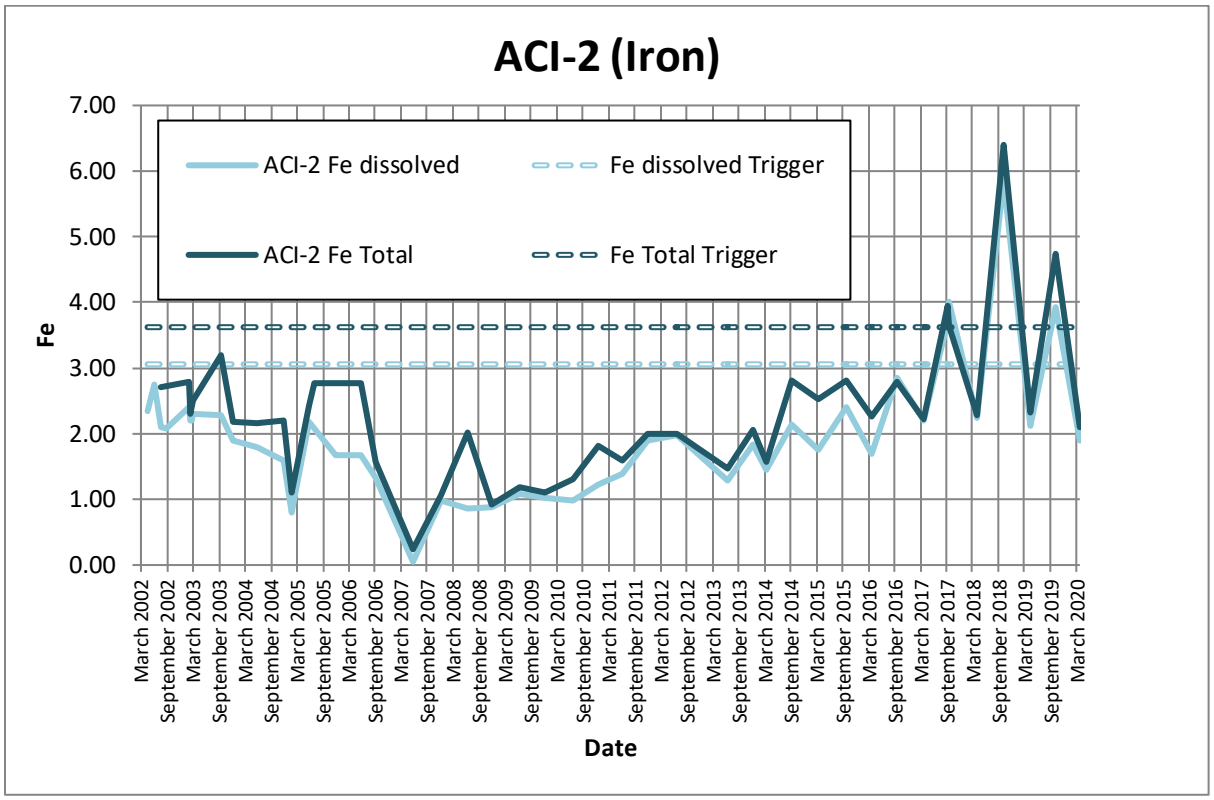


Figure 9: ACI-2 Iron Results Trend History

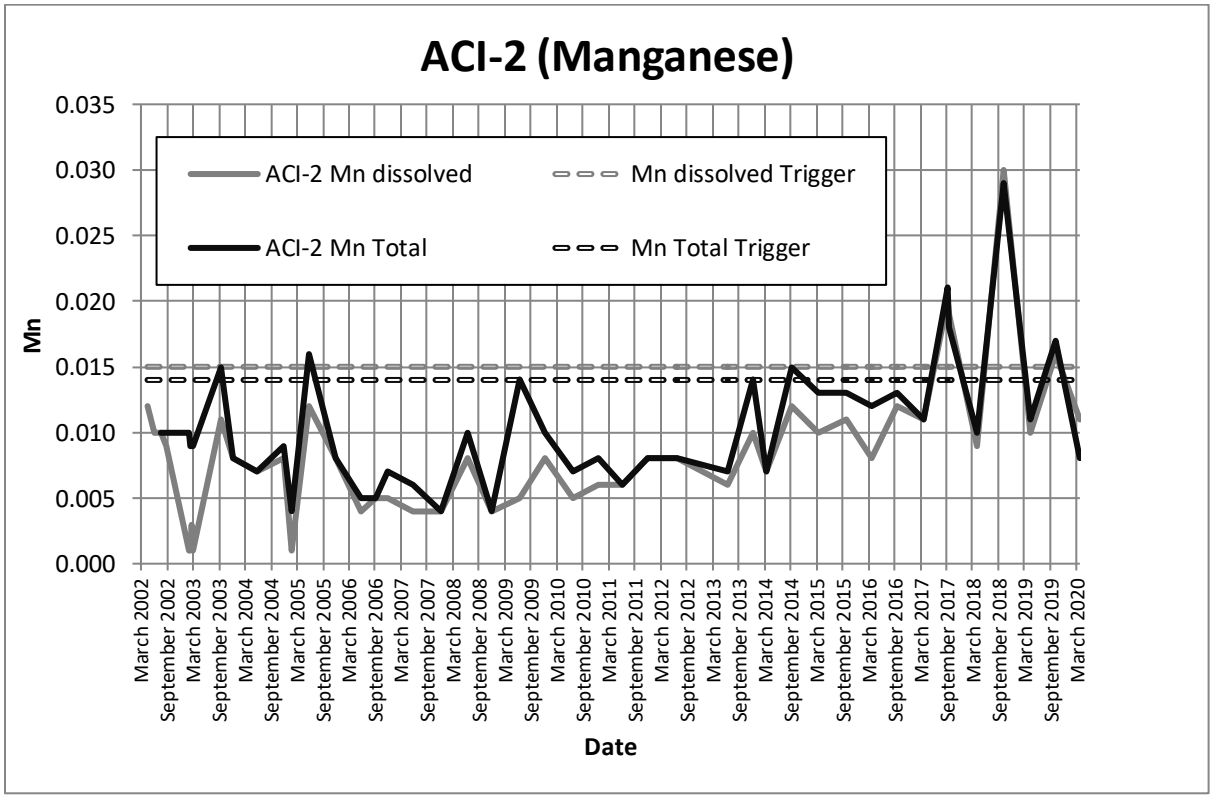


Figure 10: ACI-2 Manganese Results Trend History

Groundwater quality at Northern Dune is driven by the nature of rainfall and properties of the unsaturated zone. Rainfall entering the soil zone undergoes significant changes in chemical

composition and pH by processes such as root respiration and decomposition of organic matter via chemical reactions such as sorption and redox. The chemical constituency of infiltrating water in turn modifies groundwater chemistry by processes such as leaching, dilution but not concentration (which is protected against by licence conditions limiting depth to groundwater) as well as dissolution/precipitation. The effect of multiple processes on groundwater quality parameters and therefore setting Trigger Values is that water quality data is often multiple-modal (non-normal distribution) and so simple statistical analysis using mean and standard deviation may not adequately represent processes leading to water quality change. Water quality is dependent upon the nature of rainfall (ie. timing, intensity, duration...etc.) which determines whether infiltration provides a diluting effect and/or a leaching effect on ions and/or metals. Water quality can improve or deteriorate with rainfall and therefore timing of a small limited sample set strongly influences the calculated trigger value.

It is noted that extraction activities within proximity to ACI-2 ceased in 2005 and therefore the elevated iron levels observed are unlikely to be the result of extraction activities.

The ACI-2 monitoring location has exhibited similar seasonal exceedances for Iron in previous reporting periods as detailed in reports previously provided. ACI-2 has historically been used to monitor potential impacts from the Northern Dune project area, not the Northern Dune extension area. These exceedances are not related to the extension area and, consequently, have not been reported to the DPIE under Project Approval MP09_0091.

7.1.2.1 Groundwater Quality Results Discussion and Trend Summary

Observations of groundwater quality trends over time show concentrations have fluctuated throughout the life of the project. This trend has been demonstrated by the results provided in previous annual reports provided as per the approval requirements, along with bi-annual groundwater monitoring reports. This observation was also made based upon analysis of data collected during operations at the Northern Dune site and presented in the trend predictions of the Environmental Assessment (EA) for the Northern Dune Extension Area.

The fluctuating trend previously identified has been continued in the current reporting period as demonstrated by the data presented in the hydrographs (Quality vs. trigger values) which demonstrate this trend over the life of the project in Appendix 8, and in the tabulated results for the current reporting period provided in Table 22.

The EA for the Northern Dunes Extension project discussed possible causes and influences of the trends observed in metal concentrations (based upon observations of the wider Northern Dune area) and predicted that:

- Peak total iron concentration seems to be attributed to the re-establishment of topsoil and regeneration which occurs after mining has ceased.
- The fluctuation of the water table (in response to rainfall) may cause enhanced mobilisation of iron from the coffee rock horizon, giving rise to potentially increased concentrations of iron.
- Localised variability of metal concentrations has been seen throughout monitoring of the wider northern dune area and appears to be impacted from well construction through localised coffee rock deposits.

Groundwater quality trends have continued as expected during the reporting period. In line with earlier predictions of the EA, measured metal concentrations are consistent with data collected across the wider Tomago Sandbeds and have generally not exceeded the natural variation within metal concentrations recorded in the wider Tomago region. This is due to operations occurring above the deep grey sands and the groundwater table (by maintaining an exclusion zone from the PMGE), which are known to liberate metals in significant quantities if disturbed. The results presented in this report do not suggest any significant disturbance during the reporting period.

8 REHABILITATION AND LANDSCAPE MANAGEMENT

Rehabilitation objectives and targets for the Tanilba Northern Dune Extension Project are described in the LMP prepared to satisfy Schedule 3, Condition 17 of the Tanilba Northern Dune Extension Project Approval (MP 09_0091). The LMP describes management measures for the extraction (disturbed) area and, in accordance with the Project Approval, includes a Rehabilitation Management Plan (RMP) and Long-Term Management Strategy.

8.1 Rehabilitation Management

Rehabilitation at the Tanilba Northern Dunes Extension area is undertaken with works in areas mined as part of the approvals for the Tanilba Northern Dune. For rehabilitation purposes, works across both approval areas have been subdivided into several blocks: The extraction area within Tanilba Northern Dunes Extension is known as Block Q.

Inspection of revegetated areas forms part of monthly site inspections to identify issues requiring management. The outcomes and observations of inspection are incorporated into the future works program together with any items or recommendations resulting from the annual performance monitoring program (refer Table 33).

Works undertaken within the Tanilba Northern Dunes Extension during the reporting period include:

- Supplementary planting of assorted native species undertaken over several planting events
- Weed management inspections to identify areas requiring control by spraying.

Revegetation at the Extension site is ongoing and the final stage of planting is expected to be completed within the first quarter of the next reporting period. Sibelco has implemented a regime of weed control across the whole of the Tanilba Northern Dunes mining area which is ongoing and Holcim maintains a continued commitment to ongoing and progressive rehabilitation. Site wide weed spraying of the Extension will be undertaken following the completion of planting.

8.2 Rehabilitation Monitoring

Monitoring of the progress of rehabilitation at the Tanilba Northern Dune Extension Project area was undertaken by Kleinfelder in July 2019 and January 2020.

The objective of the LMP is to progressively re-establish original vegetation community types, after extraction and landform rehabilitation has been completed, to as close as possible to that of the original vegetation. This recognises that the final landform will be lower in elevation than the original topography, and Section 4.5 of the LMP therefore describes performance measures to assess the success of the rehabilitation This section addresses compliance to the following parts of the approved LMP:

- 4.5.1 Baseline Data – sets target figures for vegetation structure and content.
- 4.5.2 Performance Indicators – provides performance indicators for each stage of the rehabilitation program.

Section 4.5.3 of the LMP provides completion criteria to be applied to each rehabilitation block at the end of the monitoring program (8 years) to determine eligibility of operational areas for release from further rehabilitation or monitoring. Rehabilitation of the Northern Dunes Extension area commenced in 2016: Section 4.5.3 is therefore not discussed in the current report.

The Tanilba Northern Dunes Extension area has been subdivided into several blocks (known as Q1 to Q6 shown in **Figure 11**) for ease of data collection. Rehabilitation blocks are prepared and biannually surveyed after 6 months of growth for a period of 3 years. Details of each block surveyed for the 2019 annual report are provided below**.**

Table 23: Block preparation and survey details for the North Dunes Extension Rehabilitation Blocks

Block	Prepared	First Biannual Survey Conducted	Last Biannual Survey (Due)
Q1	December 2016 - July 2017	January 2018	July 2020
Q2	July 2018	January 2019	July 2021
Q3	July 2018	January 2019	July 2021
Q4	July 2018	January 2019	July 2021
Q5	July 2018	January 2019	July 2021
Q6	July 2019	January 2020	Jan 2022

The monitoring plan has been designed in accordance with principles of the EMP and will facilitate the stated aim of the EMP (Section 7.1) to re-establish stable and sustainable native vegetation cover in-line with the original vegetation community types pre-extraction, including similar structural components and species composition at similar elevations.

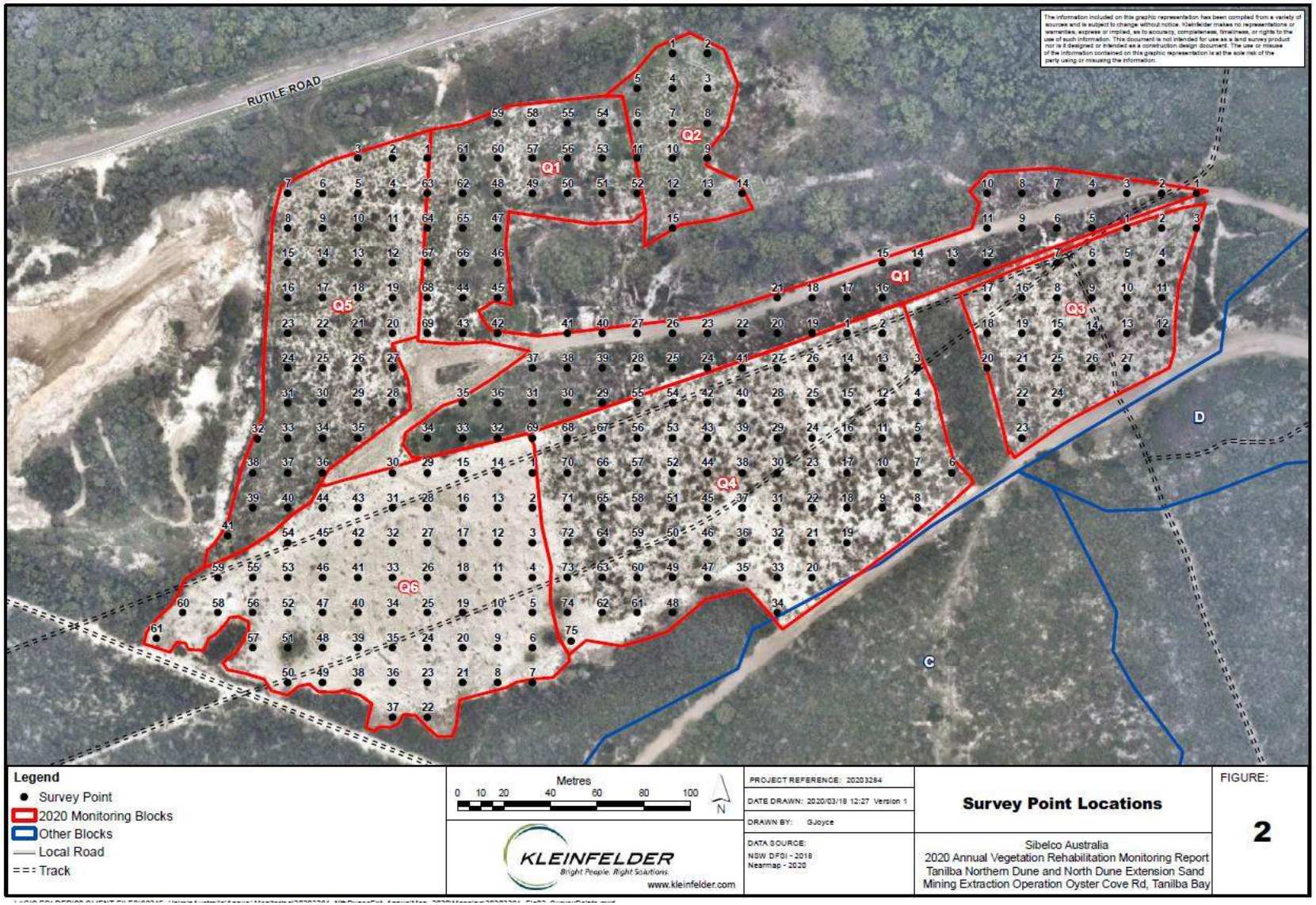


Figure 11: Locations of Blocks Q1 to Q6

A total of 227 plots were surveyed for the purpose of the current annual report consisting of:

- 69 plots on Block Q1,
- 15 plots on Block Q2,
- 27 plots of Block Q3,
- 75 plots on Block Q4,
- 41 plots of Block Q5, and,
- 62 plots of Block Q6.

Each of the blocks has been established at different time intervals. Results for each of the blocks is therefore discussed separately below and include survey results against rehabilitation and species composition targets established in the LMP.

8.2.1 Block Q1

This is the fifth of the biannual surveys for this block and represents 30 months of growth after the start of rehabilitation of this block. Data for Block Q1 is presented in **Table 24** and relates to information collected from the July 2019 and January 2020 monitoring events comparing progress to the previous surveys and against targets established in the LMP.

Table 24: Progression of average monitoring parameter data and target projections for Block Q1

Parameter	Target	Rehab status Jan 2018	Rehab status Jul 2018	Rehab status Jan 2019	Rehab status Jul 2019	Rehab status Jan 2020	Percentage Target Achieved (Jan 20)
Average Cover (%)	**80**	36.09	36.38	55.20	65.36	57.71	72.14
Average height (cm)	**230**	29.9	33.15	43.01	63.33	66.62	28.97
Ave. No. of plants (plants/4 m^2)	**40**	23.2	16.38	27.74	23.78	17.14	42.86
Ave. No. Fire resistant species (plants/4 m^2)	**1**	1.9	1.80	2.41	1.78	1.46	146.38
Ave. Species Richness (species/4 m^2)	**12**	9.3	7.30	9.38	8.46	6.04	50.12
Ave. Ground stratum proportion (%)	**27**	25.91	14.96	25.43	25.78	43.54	161.24
Ave. Shrub stratum proportion (%)	**61**	39.67	36.94	40.02	45.17	29.40	48.20
Ave. Midstorey stratum proportion (%)	**7**	11.89	19.17	12.24	12.01	14.60	208.51
Ave. Overstorey stratum proportion (%)	**5**	8.03	12.99	6.36	11.25	12.47	249.39

8.2.2 Block Q2

This is the third annual survey for Block Q2. Data for Block Q2 is presented in Table 25. Block Q2 suffers from relatively poor species diversity, with many species present being exotic weeds This block is relatively older than the other first surveyed blocks and this is reflected in the average height and cover parameters.

Table 25: Results of the initial rehabilitation monitoring for Block Q2

Parameter	Target	Rehab status Jan 2019	Rehab status Jul 2019	Rehab status Jan 2020	Percentage Target Achieved (Jan 20)
Average Cover (%)	**80**	53.30	61.33	59.00	73.75
Average height (cm)	**230**	41.62	37.19	54.65	23.76
Ave. No. of plants (plants/4 m^2)	**40**	32.67	27.73	18.86	47.17
Ave. No. Fire resistant species (plants/4 m^2)	**1**	1.27	0.53	1.46	146.67
Ave. Species Richness (species/4 m^2)	**12**	8.73	6.6	6.0	50.00
Ave. Ground stratum proportion (%)	**27**	50.77	41.20	46.59	172.54
Ave. Shrub stratum proportion (%)	**61**	34.36	40.09	19.25	31.56
Ave. Midstorey stratum proportion (%)	**7**	13.31	16.93	25.19	359.91
Ave. Overstorey stratum proportion (%)	**5**	1.56	1.78	8.97	179.37

8.2.3 Block Q3

Block Q3 has been rehabilitated for approximately 18 months and appears to have suffered from die back as a result of the drought conditions experienced over the second half of 2019 – refer Table 26.

Table 26: Results of the initial rehabilitation monitoring for Block Q3

Parameter	Target	Rehab status Jan 2019	Rehab status Jul 2019	Rehab status Jan 2020	Percentage Target Achieved (Jan 20)
Average Cover (%)	**80**	33.70	42.10	27.03	33.80
Average Height (cm)	**230**	21.42	28.75	27.49	11.96
Ave. No. of plants (plants/4 m^2)	**40**	56.70	52.27	29.00	72.50
Ave. No. Fire resistant species (plants/4 m^2)	**1**	2.04	2.10	1.74	174.07
Ave. Species Richness	**12**	15.44	17.34	13.00	108.33

Parameter	Target	Rehab status Jan 2019	Rehab status Jul 2019	Rehab status Jan 2020	Percentage Target Achieved (Jan 20)
(species/4 m^2)					
Ave. Ground stratum proportion (%)	**27**	5.98	5.30	8.31	30.79
Ave. Shrub stratum proportion (%)	**61**	82.75	81.39	79.04	129.58
Ave. Midstorey stratum proportion (%)	**7**	5.17	4.65	6.31	90.20
Ave. Overstorey stratum proportion (%)	**5**	6.09	5.21	6.33	126.58

8.2.4 Block Q4

This is the third survey undertaken on Block Q4. The rehabilitation parameters for this block have improved over the of the course of the monitoring – refer Table 27.

Table 27: Results of the initial rehabilitation monitoring for Block Q4

Parameter	Target	Rehab status Jan 2019	Rehab status Jul 2019	Rehab status Jan 2020	Percentage Target Achieved (Jan 20)
Average Cover (%)	**80**	2.48	20.48	41.84	52.31
Average height (cm)	**230**	13.84	10.02	13.86	32.93
Ave. No. of plants (plants/4 m^2)	**40**	12.83	18.26	29.97	74.93
Ave. No. Fire tolerant species (plants/4 m^2)	**1**	1.13	1.57	1.41	141.10
Ave. Species Richness (species/4 m^2)	**12**	5.11	7.64	10.94	91.21
Ave. Ground stratum proportion (%)	**27**	2.28	2.88	7.47	27.66
Ave. Shrub stratum proportion (%)	**61**	75.97	74.67	78.02	127.90
Ave. Midstorey stratum proportion (%)	**7**	6.34	10.21	8.07	115.31
Ave. Overstorey stratum proportion (%)	**5**	11.40	12.23	6.44	128.83

8.2.5 Block Q5

Block Q5 has been surveyed for the third time and appears to have suffered from the drier than normal conditions in 2019– refer to Table 28 for survey data. Average cover and height have decreased from

the previous survey. Conversely the plant density has increased to 40 plants per 4m^2, which is due to the increase of coverage of weedy species, especially *Eragrostis curvula* (African Lovegrass) which is indicated by the increase in the proportion of groundcover species to 53% of all species recorded.

Table 28: Results of the initial rehabilitation monitoring for Block Q5

Parameter	Target	Rehab status Jan 2019	Rehab status Jul 2019	Rehab status Jan 2020	Percentage Target Achieved (Jan 20)
Average Cover (%)	**80**	42.20	58.98	31.60	39.51
Average height (cm)	**230**	28.64	51.56	32.93	14.32
Ave. No. of plants (plants/4 m^2)	**40**	39.10	21.48	40.56	101.40
Ave. No. Fire resistant species (plants/4 m^2)	**1**	4.85	4.36	3.56	356.10
Ave. Species Richness (species/4 m^2)	**12**	12.88	8.73	8.60	71.75
Ave. Ground stratum proportion (%)	**27**	46.13	35.72	53.93	199.74
Ave. Shrub stratum proportion (%)	**61**	38.56	44.96	22.66	37.15
Ave. Midstorey stratum proportion (%)	**7**	12.17	15.37	22.71	324.48
Ave. Overstorey stratum proportion (%)	**5**	3.14	3.95	0.70	13.92

8.2.6 Block Q6

This was the first survey undertaken on Block Q6 which was rehabilitated approximately six months previously, and when combined with the low rainfall will present low rehabilitation numbers – refer to Table 29. This was the case with low average cover, height, and plant density. The stratum proportions were as expected for this age rehabilitation with the shrub stratum dominating. Due to the planting program the midstorey and canopy species also over target.

Table 29: Results of the initial rehabilitation monitoring for Block Q6

Parameter	Target	Rehab status Jan 2020	Percentage Target Achieved (Jan 20)
Average Cover (%)	**80**	6.11	7.64
Average height (cm)	**230**	14.65	6.37
Ave. No. of plants (plants/4 m^2)	**40**	19.14	47.87
Ave. No. Fire resistant species (plants/4 m^2)	**1**	2.14	214.75
Ave. Species Richness (species/4 m^2)	**12**	6.93	57.79
Ave. Ground stratum proportion (%)	**27**	7.49	27.76
Ave. Shrub stratum proportion (%)	**61**	60.22	98.72
Ave. Midstorey stratum proportion (%)	**7**	12.59	179.93
Ave. Overstorey stratum proportion (%)	**5**	19.69	393.79

8.3 Weeds

Weed control operations were undertaken by Sibelco staff in July 2019, with areas along the haul roads adjacent to Block Q and within the block sprayed with herbicides.

As has been reported previously (Kleinfelder, 2020) weeds are a major problem for the Northern Dune Extension. Weeds are starting to encroach into blocks Q3, Q4 and Q6 from the adjoining haul roads and weed infested areas. The northern section of block Q1, the whole of Q2 and Q5 are heavily weed infested. Table 30 lists the major weeds identified from the survey – but is not a comprehensive list of weed species - and calculates their density.

Table 30: Numbers of the major weed species across the North Dunes Extension by block. Please note these are calculated densities based on survey data undertaken in January 2020.

Scientific Name	Common Name	Block Density					
		Q1	Q2	Q3	Q4	Q5	Q6
Acanthospermum australe	-	14996	53	0	0	999	1235
Conyza spp.	Fleabane	48608	1440	0	0	17701	112
Eragrostis curvula	African Lovegrass	110143	1440	0	176	11708	1067
Megathyrsus maximus	Guinea Grass	25855	4533	0	0	4661	0
Melinis repens	Red Natal Grass	36197	107	0	117	18366	0
Oenothera mollissima	-	7239	0	0	0	1498	0

Block Q1 – this block has good revegetation along its eastern portion, but at its western end, near the turning circle, *Eragrostis curvula* has formed a dense infestation. This species is now starting to encroach into Block Q4. The northern section of Q1, between the haul road and the northern boundary is densely weed infested, the major weed being *E. curvula*, but this is by no means the only weed species present, with the weedy grasses *Megathyrsus maximus* (Guinea Grass), *Melinis repens* (Red

Natal Grass), *Axonopus fissifolius* (Narrow-leafed Carpet Grass) and *Eleusine indica* (Crowsfoot Grass) also recorded. These weed issues are compounded by relatively low native plant numbers and diversity, with the majority of the plants identified in the surveys either target species that have been planted or *Acacia longifolia*, one of the few natives that has germinated from the topsoil and survived the drought conditions.

Block Q2 – this is small block to the east of Q1 and presents the same issues as Q1 with a high density of weeds, and a lack of native species diversity. Just to the east of this block in the Offsets area, several other weed species have been identified and treated. However, the major concern here is the *Phyllostachys aurea* (Fishpole Bamboo) that, despite multiple treatments, was still observed to be re-growing. Further ongoing and frequent treatment of this species is required.

Block Q3 - has no recorded weed species within the rehabilitation but does have a few weeds along the haul road boundary.

Block Q4 - has a few grassy weeds, mainly *E. curvula* encroaching from Block Q1 along its northern boundary and scattered along the haul road (southern) boundary.

Block Q5 – sits to adjacent to The Knoll, between the haul road and the northern boundary of the site. It too is heavily weed infested but does have a greater species richness than the adjacent portions of Block Q1 and Block Q2.

Block Q6 – this is the latest block to be rehabilitated and as such has small, young plants and low coverage. Weeds are starting to encroach from Block Q5. In addition, during sand extraction it appears a short haul road was constructed using road base. This has not been removed prior to rehabilitation and is now a source of weeds with *Acanthospermum australe*, an exotic prostrate groundcover having become established.

8.4 Plantings

Planting was undertaken on Block Q and along the haul road from June 2019 to July 2019. And consisted of infill plantings of *Leptospermum polygalifolium.* These plantings are detailed in the table below.

Table 31: Details of species and numbers planted during 2018

Species	Number	Area	Units	Method
Leptospermum polygalifolium	**2880**	Q	Forestry Tubes	Hand Planted

8.5 Performance Indicators

At each stage of monitoring, rehabilitation is compared to the performance indicators outlined in Table 11 of the LMP. Those relevant to the rehabilitation stages of the Tanilba Northern Dunes Extension area (years 1 to 3) are summarised below in Table 32. Performance indicators are relevant to age of each rehabilitation quadrat. As such, performance indicators not relevant to each quadrat in **Table 32** are listed as 'NA – Not Applicable'. If rehabilitation areas do not meet these performance indicators, specific management measures are required to be outlined in the AR.

Table 32: Performance Indicators for Tanilba Northern Dune Extension rehabilitation

Aims for Each Strategic Ecosystem Development Stage	Year	Performance Indicators	Compliance						
			Q1 (Sth Haul Road)	Q1 (Nth Haul Road)	Q2	Q3	Q4	Q5	Q6
Monitoring will be on a bi-annual basis until achieving the early pioneer stage with the following features: • Topsoil stabilised by primary colonisers (e.g. acacias & pea species); • Key species present and densities increasing towards target numbers • No significant erosion problems; and • Weed control program in place	1	Early pioneer stage appearing small seedlings (<5cm) regenerating from topsoil, <5% cover.	NA	NA	NA	NA	NA	Y	Y
		At least 25 mature Grass Trees per hectare.	NA	NA	NA	NA	NA	Y	Y
		Brush matting evident.	NA	NA	NA	NA	NA	Y	Y
		Adequate store of fresh local seed.	NA	NA	NA	NA	NA	N	N
	2	Natural regeneration of pioneer species covering 20% of ground surface, average 20cm tall.	Y	N	N	P	Y	P	NA
		Seedling developing under brush-matting.	Y	N	N	Y	Y	Y	NA
		Planted trees and shrubs in predetermined numbers according to revegetation strategy, 20-30cm tall.	Y	Y	Y	Y	Y	N	NA
		No significant problems.	Y	Y	Y	Y	N	Y	NA
		Noxious or significant environmental weeds control program in place	P*[1]	N	N	Y	Y	N	NA
		Rehabilitation area is clean of rubbish.	Y	Y	Y	Y	Y	Y	NA
	3	All structural species present in predetermined density, 30-90 cm tall.	Y	Not Applicable to these Monitoring Quadrats within the Northern Dune Extension Area.					
		Shrub layer and ground cover strata intact.	Y						
		Natural regeneration covering 40-60% of surface, average 50-80cm tall.	P						
		No significant erosion problems.	N						
		Weed control program in place and weeds successfully controlled.	N						
		Rehabilitation area is clean of rubbish.	Y						

Partial Compliance: Weed Control undertaken in July 2019. An increase in weed control frequency is advised for complete compliance.

8.6 Rehabilitation Actions

A summary of the results of the 2019/20 monitoring program, including an outline of rehabilitation actions to be undertaken during the 2020 – 2021 reporting period are provided in **Table 33** below. Rehabilitation actions have been derived from recommendations from both the January 2020 Monitoring Report and a letter prepared by Kleinfelder following the July 2019 monitoring event.

Holcim will continue to manage rehabilitation commitments to address action identified in the monitoring program. As progress reports are compiled throughout the reporting period any actions that arise will be managed accordingly to continue our commitment to the Rehabilitation Management Plan (as included within the LMP).

Table 33: Summary of monitoring program and rehabilitation actions to be applied at the Northern Dune Extension area.

Block	Developmental Parameters	Remedial Actions for 2020/21 AR Reporting Period (June 2019 and January 2020 Recommendations)
Q1	Block Q1 This section of the rehabilitation exhibits good canopy density and height, with many of the trees estimated to be up to 5m tall, although most are estimated to be between 1.5m and 2.5m in height. Growth parameters have been negatively affected by the combination of drought and weed infestation in large sections of this block. Species diversity has decreased to its lowest point since monitoring commenced. Additional seeding of shrub species is required to increase the species diversity in those areas where *E. curvula* is densest and after treatment of the weeds.	• Management of key flora species, including planting and/or seeding of *L. trinervium* and *M. nodosa* • Additional seeding of shrub species is recommended. • Weed control of introduced grasses.
Q2	Development parameters are only superficially good, with a very high weed content accounting for the average cover, average number of plants per quadrat, and the high proportion of ground stratum overall. The drought and competition from the weed species – mainly *E. curvula* – has led to the decrease in species diversity, including one of the more successful native species, *Acacia longifolia*	• Additional seeding of native species, especially shrubs and ground covers is required to reach species diversity targets. • Weed control of introduced grasses.
Q3	The drought has adversely affected this block with most growth parameters reduced from the previous survey. this block did record good growth parameters, and many of the groundcover and shrub species may have been mature enough to set seed prior to dieback. With the rainfall experienced in February and early March, any improvements should be recorded in the mid-year survey.	• Continue ongoing planting program. • Additional planting of *L. trinervium* and *L. polygalifolium* numbers to ensure targets are achieved.
Q4	This block has defied the trends observed through the rest of the rehabilitation and has improved its rehabilitation parameters since the previous surveys. The reasons for the apparent success of this block are not obvious but they are on trajectory to achieve targets.	• Weed control of encroaching grasses
Q5	This block is very similar to Blocks Q1 (north of haul road) and Q2. This block is older rehabilitation	• Additional planting / seeding of *L. trinervium*, *M. nodosa* and *B. aemula* to improve this section of the rehabilitation.

Block	Developmental Parameters	Remedial Actions for 2020/21 AR Reporting Period (June 2019 and January 2020 Recommendations)
	with a high level of weed (*E. curvula*) and other woody weeds. This increases the average cover, average ground stratum proportion and average number of plants.	• Additional weed control measures as per Q1 and Q2
Q6	This is the first survey of this block after the initiation of rehabilitation and as such all parameters are still in their early stages. Future surveys will determine what if any remedial actions will be required.	

9 COMMUNITY

9.1 Community Engagement Activities

Throughout the reporting period Sibelco provided information on operations at the Tanilba Northern Dune Extension Project to the public via its Sibelco Australia / New Zealand website. This included a copy of approved strategies, management plans, monitoring data, approvals and annual reviews. This AR will be made available on Holcim's website once accepted.

9.2 Complaints

As part of the website, Sibelco maintained a community complaint register that was updated quarterly throughout the reporting period to include any new community complaints. Any complaints that are received are elevated to a Level 2 incident and investigated internally using the Incident Cause Analysis Method (ICAM) method.

There were no community complaints received during the reporting period.

10 INDEPENDENT AUDIT

Schedule 5 Clause 7 requires an Independent Environmental Audit (IEA) to be commissioned within one month of the completion of quarrying operations. An IEA was commissioned and Pitt and Sherry performed the IEA on 7 August 2019.

Sibelco previously received a warning letter for the late commissioning of the audit team following cessation of mining in December 2018. In accordance with approval conditions, the Audit assessed the environmental performance of the project and a copy was made available on the company website and submitted to the Department. A response to the auditor recommendations was also published on the website as per the requirement of Schedule 5 Clause 9 of MP-09-0091.

11 INCIDENTS AND NON-COMPLIANCE

Schedule 5 Clause 5 requires reporting of any incident associated with the project as soon as practicable after Sibelco becomes aware of the incident. This includes circumstances that cause or threaten to cause material harm to the environment and / or breaches or exceeds the limits of performance measures/criteria in approval MP 09_0091.

No incidents or non-compliances were recorded during this AR period.

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Along with the improvements discussed throughout this document, Holcim will undertake the following activities in the next reporting period (April 1 2020 – March 31 2021) to ensure compliance with the consent and to ensure that effective environmental management controls are in place and operating in accordance with the requirements of the Consent.

Table 34: Proposed works – 2020/21

Item	Requirement		2020-2021 program	Due Date
OPERATIONS/ADMINISTRATION				
1		Site condition	Inspection of site for identification of maintenance requirements including condition of roadside drainage and rehabilitated areas	Monthly
2	S5, Cl 3	Annual Review	Prepare and submit AR to DPIE on activities undertaken in the 2020-2021 reporting period	30 June 2021
3	S5 Cl 2	Performance review	Monitoring requirements will be reviewed to ensure all future monitoring and reporting following closure is relevant to the activities being performed. The review will be performed in consultation with DPI-Water and HWC	Following submission of AR
GROUNDWATER				
4		Groundwater Level Monitoring	Sibelco to monitor bores as per approved GMP.	Monthly (weekly for 4 weeks if >100 mm rain per 7 days)
5		Groundwater quality Monitoring	Third Party contractor to monitor bores as per approved GMP.	As per GMP
6		GMP Review	The GMP will be reviewed to ensure the monitoring and reporting is relevant to the activities being performed. The review will be performed in consultation with DPI-Water and HWC.	Following submission of AR
7		Reporting	The results of the groundwater level and quality monitoring will be reported as per the GMP. Reporting frequency will be determined during the review of the GMP following consultation with DPI-Water and HWC.	Frequency determined following GMP review and consultation with DPI-Water and HWC
Item	**Requirement**		**2020-2021 program**	**Due Date**
S5, Cl 17 - FORMER EXTRACTION AREA (LMP)				
8			Supplementary planting as required following the inspections and biannual monitoring	As required
9	LMP 4.3.9	Weed management	Site wide weed spraying following the completion of the final stage of revegetation planting	As required
10		Maintenance	Follow up inspections to identify and manage regrowth across all rehabilitated areas	As required
11	LMP	Performance	Implement recommendations in Annual	As required

	4.3.6	monitoring	Vegetation Rehabilitation Monitoring Report (Kleinfelder 2019)	
12			Monitoring of rehabilitated areas to assess performance against the requirements of the BMP	Biannual
13			Prepare report to summarise results of rehabilitation program, identify trends and any management measures required to achieve objectives of rehabilitation program	April 2020
14	S5 Cl 2	LMP Review	The LMP will be reviewed to ensure the monitoring and reporting is relevant to the activities being performed. The review will be performed in consultation with DPI-Water and HWC	Following submission of AR
S3, Cl15 - OFFSET AREAS (BMP)				
15	BMP 5.1.2	Nest box installation and monitoring program	Annual monitoring for a minimum six year period within the northern offset area to record uptake and attend to maintenance	October 2019
16 17 18	BMP 5.1.4 BMP 5.1.4, 5.2 BMP 5.2	Fauna survey program	Targeted monitoring across all offset areas for Wallum Froglet to detect changes in recruitment success and assess impacts Targeted monitoring across all offset areas for *Uperoleia sp nov* to identify habitat preferences of spp Monitoring to determine if Koala is utilising areas determined as Preferred Koala Habitat (Swamp Mahogany – Paperbark Swamp Forest) and Supplementary Habitat (Coastal Sand Apple – Blackbutt Forest) within the offset areas	In accordance with seasonal survey requirements In accordance with seasonal survey requirements
  19 20 21	5.1.5 of BMP	Vegetation management and monitoring program	Habitat restoration and rehabilitation program for proposed offset area in Lots 11, 12 and 13: • Inspection to identify areas requiring weed and pest control • Weed and pest management • Rehabilitation of the regenerating Grassland-Heath	 Annual Annual Annual
Item	**Requirement**		**2020-2021 program**	**Due Date**
22 23	BMP 5.1.7 BMP 5.2		• Supplementary planting of *E robusta* within offset area to expand availability of habitat for Koala • Monitoring of the offset area to ensure vegetation and habitat qualities are being maintained	During rehab program
24	S5 Cl 2	BMP Review	The BMP will be reviewed to ensure the monitoring and reporting is relevant to the activities being performed. The review will be performed in consultation with DPI-Water and HWC	Following submission of AR
COMMUNITY				
25	S5, Cl9	Information Access	Upload the Annual Review for 2019-2020 to the company website when approved.	
26		Complaints Register	Maintain and update	Quarterly

13 APPENDICES

APPENDIX 1
Project Approval MP-09-0091

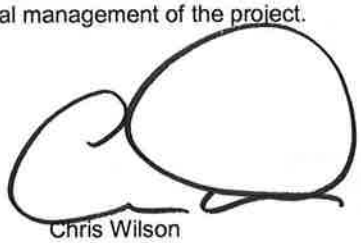
Project Approval

Section 75J of the *Environmental Planning and Assessment Act 1979*

As delegate for the Minister of Planning, I approve the project application referred to in schedule 1, subject to the conditions in schedules 2 to 5.

These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the on-going environmental management of the project.



Chris Wilson
Executive Director
Development Assessment Systems & Approvals

Sydney 8 MARCH 2013

SCHEDULE 1

Project Application:	09_0091
Proponent:	Sibelco Australia Limited
Approval Authority:	Minister for Planning and Infrastructure
Land:	Lots 11, 12, 13 DP601306; Lot 408 DP1041934; and Lots 1, 2 DP406240.
Project:	Tanilba Northern Dune Extension Project

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DEFINITIONS

Annual Review	The review required by condition 3 of schedule 5
Biodiversity Offset Strategy	The conservation and management of the Proponent's offset sites on the Tilligerry Peninsula, being Lots 11, 12, 13 DP601306 and Lot 24 DP579700
Conditions of this approval	Conditions contained in schedules 2 to 5 inclusive
Council	Port Stephens Council
Day	The period from 7.00am to 6.00pm, Monday to Saturday
Department	Department of Planning and Infrastructure
Director-General	Director-General of the Department of Planning and Infrastructure, or nominee
DRE	Division of Resources and Energy (within the Department of Trade and Investment, Regional Infrastructure and Services)
DST	Daylight Savings Time
EA	Environmental Assessment of the project titled *Tanilba Northern Dune Extraction Extension - Environmental Assessment Report* prepared by ERM Australia Pty Limited, dated June 2012 and the Proponent's response to the issues raised in submissions, dated November 2012
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPL	Environment Protection Licence under the *Protection of the Environment Operations Act 1997 (POEO Act)*
EST	Eastern Standard Time
Feasible	Feasible relates to engineering considerations and what is practical to build
HWC	Hunter Water Corporation
Incident	A set of circumstances that causes or threatens to cause material harm to the environment, and/or breaches or exceeds the limits or performance measures/criteria in this approval
Land	Land means the whole of a lot, or contiguous lots owned by the same landowner, in a current plan registered at the Land Titles Office at the date of this approval
m AHD	metres Australian Height Datum
Material harm to the environment	Material harm to the environment as defined in the *Protection of the Environment Operations Act 1997*
Minister	Minister for Planning and Infrastructure, or nominee
NOW	NSW Office of Water (within the Department of Primary Industries)
OEH	Office of Environment and Heritage (within the Department of Premier and Cabinet)
Privately-owned land	Land that is not owned by a public agency or a quarrying company (or its subsidiary)
Project	The development as described in the EA
Proponent	Sibelco Australia Limited, or its successors in title
Quarrying operations	The extraction, processing and transportation of extractive materials on the site and the associated removal of vegetation, topsoil and overburden
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
Rehabilitation	The treatment or management of land disturbed by the project for the purpose of establishing a safe, stable and non-polluting environment
RMS	NSW Roads and Maritime Services
Statement of Commitments	The Proponent's commitments in Appendix 3
Site	Land to which the Project Approval applies, as listed in schedule 1 and shown in Appendix 1

SCHEDULE 2
ADMINISTRATIVE CONDITIONS

Obligation to Minimise Harm to the Environment

1. The Proponent shall implement all reasonable and feasible measures to prevent and/or minimise any material harm to the environment that may result from the construction, operation or rehabilitation of the project.

Terms of Approval

2. The Proponent shall carry out the project generally in accordance with the:
   (a) EA;
   (b) Statement of Commitments; and
   (c) conditions of this approval.

   Note: The general layout of the project is shown in the figure in Appendix 1.

3. If there is any inconsistency between the above documents, the most recent document shall prevail to the extent of the inconsistency. However, the conditions of this approval shall prevail to the extent of any inconsistency.

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.

Limits on Approval

5. The Proponent may carry out quarrying operations on the site until 31 December 2020.

   Note: Under this Approval, the Proponent is required to rehabilitate and revegetate the site and provide and implement a Biodiversity Offset Strategy to the satisfaction of the Director-General. 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 and the Biodiversity Offset Strategy implemented to a satisfactory standard.

6. The Proponent shall not transport more than 150,000 tonnes of extractive materials from the site in any calendar year.

7. The Proponent shall ensure that no more than three hectares of the site would be exposed (ie cleared but not re-vegetated) at any one time.

Staged Submission of any Strategy, Plan or Program

8. With the approval of the Director-General, the Proponent may submit any strategy, plan or program required by this approval on a progressive basis.

Protection of Public Infrastructure

9. The Proponent shall:
   (a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by the project; and
   (b) relocate, or pay the full costs associated with relocating, any public infrastructure that needs to be relocated as a result of the project.

Operation of Plant and Equipment

10. The Proponent shall ensure that all plant and equipment used at the site, or to transport extractive materials from the site, is:
    (a) maintained in a proper and efficient condition; and
    (b) operated in a proper and efficient manner.

Section 94 Contributions

11. For the life of quarrying operations under the project, the Proponent shall pay Council a Section 94 contribution rate in accordance with the *Port Stephens Section 94 Development Contributions Plan 2007*.

Notification of Commencement

12. The Proponent shall notify the Department of its intention to commence quarrying operations at least two weeks prior to the commencement of quarrying operations.

SCHEDULE 3
ENVIRONMENTAL PERFORMANCE CONDITIONS

IDENTIFICATION OF BOUNDARIES

1. Prior to the commencement of quarrying operations, the Proponent shall:
   (a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction; and
   (b) 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.

NOISE

Impact Assessment Criteria

2. The Proponent shall ensure that the operational noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land.

Table 1: Noise impact assessment criteria

Receiver	$L_{Aeq\ (15\ min)}$ ***dB(A)***
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

Notes:

- *Receiver locations are shown in the Figure in Appendix 2; and*
- *Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*

Hours of Operation

3. The Proponent shall only conduct quarrying operations on the site:
   (a) between 7.00 am and 6.00 pm EST, Monday to Friday;
   (b) between 7.00 am and 7.00 pm DST, Monday to Friday; and
   (c) at no time on Saturday, Sunday or public holidays.

Operating Conditions

4. The Proponent shall:
   (a) implement best practice noise management to minimise the construction, operational and traffic noise of the project;
   (b) maintain the effectiveness of any noise suppression equipment on site at all times and ensure defective equipment is not used operationally until fully repaired; and
   (c) conduct extraction activities in a south to north direction so that the topography shields the sensitive receivers,

   to the satisfaction of the Director-General.

Noise Monitoring Program

5. The Proponent shall prepare and implement a Noise Monitoring Program for the project to the satisfaction of the Director-General. This program must:
   (a) be submitted to the Director-General for approval prior to commencing quarrying operations;
   (b) include quarterly attended noise monitoring during at least the first two years of quarrying operations, to be conducted on days when at least 30 truck dispatches occur from the site; and
   (c) include details of how the noise performance of the project would be monitored, and include a noise monitoring protocol for evaluating compliance with the noise criteria in this approval.

AIR QUALITY

Impact Assessment Criteria

6. The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the project do not exceed the criteria listed in Tables 2 to 4 at any privately-owned land.

Table 2: Long term criteria for particulate matter

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

Table 3: Short term criterion for particulate matter

Pollutant	Averaging Period	[d] Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	[a] 50 µg/m^3

Table 4: Long term criteria for deposited dust

Pollutant	Averaging Period	Maximum increase in deposited dust level	Maximum total deposited dust level
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

Notes to Tables 2 to 4:

- [a] *Total impact (i.e. incremental increase in concentrations due to the projects plus background concentrations due to all other sources);*
- [b] *Incremental impact (i.e. incremental increase in concentrations due to the projects on their own);*
- [c] *Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method.*
- [d] *Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents, illegal activities or any other activity agreed by the Director-General in consultation with DECCW.*

Dust Management

7. The Proponent shall:
   (a) implement best management practice to minimise the dust emissions of the project;
   (b) regularly assess air quality monitoring data and relocate, modify, and/or stop operations on site as may be required to ensure compliance with the relevant conditions of this approval;
   (c) minimise any visible off-site air pollution; and
   (d) minimise surface disturbance of the site, other than as permitted under this approval.

Dust Monitoring Program

8. 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 for approval prior to commencing quarrying operations;
   (b) include a program for the use of a water tanker on unsealed roads;
   (c) include details of how the air quality performance of the project would be monitored, and a protocol for evaluating compliance with the relevant air quality criteria in this approval.

SOIL AND WATER

Pollution of Waters

9. Except as may be expressly provided for by an EPL, the Proponent shall comply with section 120 of the *Protection of the Environment Operations Act 1997* in carrying out the project.

Management and Monitoring

10. The Proponent shall not extract sand or other extractive materials or carry out any work in the extraction area below a level of 0.7 m above the predicted maximum groundwater elevation (see condition 14 of schedule 3), other than the construction of any bores approved by NOW.

11. The Proponent shall ensure that the final landform of the extraction area must be at least 1 metre above the predicted maximum groundwater elevation.

12. The Proponent shall prepare and implement a Soil and Water Management Plan for the project to the satisfaction of the Director-General. This plan must:
    (a) be prepared:
        - by suitably qualified person(s), approved by the Director-General; and
        - in consultation with HWC and NOW;
    (b) include a(n):
        - Erosion and Sediment Control Plan; and
        - Groundwater Monitoring Program; and
    (c) be submitted to the Director-General for approval prior to commencing quarrying operations.

13. The Erosion and Sediment Control Plan shall:
    (a) be consistent with the requirements of *Managing Urban Stormwater, Soils and Construction Volume 2E Mines and Quarries,* (DECC 2008), or the latest edition;
    (b) identify activities that could cause soil erosion and generate sediment;
    (c) describe measures to minimise soil erosion and the potential for the transport of sediment off site;
    (d) describe the location, function, and capacity of erosion and sediment control structures; and
    (e) describe what measures would be implemented to maintain these structures over time.

14. 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 groundwater levels and quality;
    (d) a protocol for the investigation, notification and mitigation of any identified exceedances of the groundwater impact assessment criteria;
    (e) the outcome of groundwater modelling to establish the predicted maximum groundwater elevation for the site;
    (f) a program to monitor any impacts of the project on groundwater dependent ecosystems, and
    (g) a contingency plan to manage any acid sulfate soils and potentially acid sulfate soils encountered during quarrying operations.

BIODIVERSITY

Biodiversity Management Plan

15. The Proponent shall prepare and implement a Biodiversity Management Plan for the project to the satisfaction of the Director-General. This plan must:
    (a) be prepared:
        - by suitably qualified person(s), approved by the Director-General; and
        - in consultation with Council and OEH;
    (b) be submitted to the Director-General for approval prior to commencing quarrying operations;
    (c) address both the project site and the offset areas;
    (d) provide for the retention of hollow-bearing trees, wherever practicable;
    (e) ensure the establishment and on-going monitoring (at least 6 years) of a least 2 nest boxes for each tree hollow removed during clearing;
    (f) include a program to undertake targeted surveys for the novel *Uperoleia sp*.;

(g) identify any areas within the offset areas requiring rehabilitation and/or re-vegetation and implement a program for this;
(h) include a detailed description of the measures that would be implemented, including the procedures to be implemented for:
- enhancing the quality of existing vegetation, fauna habitat and wildlife corridors;
- landscaping the site to minimise any visual impacts of the project;
- maximising the salvage of resources within the approved disturbance area – including vegetative, soil and cultural heritage resources – for beneficial reuse in the offset areas and/or rehabilitation areas;
- minimising the impacts of the project on fauna, including undertaking pre-clearance surveys and minimising the use of insecticides, herbicides, pesticides and biocides;
- controlling weeds and feral pests;
- maintenance of a buffer zone at the northern edge of the extraction area;
- controlling access;
- minimising edge effects; and
- bushfire management; and

(i) include:
- management measures;
- monitoring procedures;
- performance indicators; and
- reporting frameworks,

with particular reference to the novel *Uperoleia sp.*, Koala, and Wallum Froglet.

Long-term Security for Offset

16. By 31 December 2013, or otherwise agreed by the Director-General, the Proponent shall:
(a) enter into a Biobanking agreement in respect of the proposed offset areas (see Appendix 4) with the Minister for the Environment, in accordance with Part 7A of the *Threatened Species Conservation Act 1995*, to implement the Biodiversity Offset Strategy; or
(b) enter into an agreement with OEH to transfer the offset areas into the national parks estate,
to the satisfaction of the Director-General.

REHABILITATION AND LANDSCAPING

Landscape Management Plan

17. The Proponent shall prepare and implement a Landscape Management Plan for the project to the satisfaction of the Director-General. This plan must:
(a) be prepared:
- by suitably qualified person(s), approved by the Director-General; and
- in consultation with Council and HWC;

(b) be submitted to the Director-General for approval prior to commencing quarrying operations; and
(c) include:
- a Rehabilitation Management Plan; and
- a Long Term Management Strategy.

18. The Rehabilitation Management Plan must include:
(a) rehabilitation objectives for the site;
(b) a description of the measures that would be implemented to:
- rehabilitate and stabilise the site;
- minimise the removal of mature trees; and
- manage the remnant vegetation and habitat on the site;

(c) detailed performance and completion criteria for the rehabilitation and stabilisation of the site;
(d) a detailed description of how the performance of rehabilitation would be monitored over time to measure achievement of the performance and completion criteria and the rehabilitation objectives;
(e) a detailed description of what measures would be implemented to rehabilitate and manage the landscape of the site, including the procedures to be implemented for:
- progressively rehabilitating and stabilising areas disturbed by quarrying;
- implementing revegetation and regeneration within the disturbance areas;
- protecting areas outside the disturbance areas;

- vegetation clearing protocols, including a protocol for clearing any trees containing hollows and the relocation of hollows from felled trees;
- managing impacts on fauna, particularly threatened fauna and the novel *Uperoleia* sp.;
- controlling weeds and pests;
- controlling access;
- bushfire management; and
- reducing the visual impacts of the project;

(f) a description of the potential risks to successful rehabilitation, and a description of the contingency measures that would be implemented to mitigate these risks; and

(g) details of who is responsible for monitoring, reviewing, and implementing the plan.

19. The Long Term Management Strategy must:
    (a) define the objectives and criteria for quarry closure and post-extraction management;
    (b) investigate and/or describe options for the future use of the site;
    (c) describe the measures that would be implemented to minimise or manage the ongoing environmental effects of the project; and
    (d) describe how the performance of these measures would be monitored over time.

Rehabilitation Bond

20. Prior to commencing quarrying operations, the Proponent shall lodge a rehabilitation bond for the project with the Director-General. The Proponent may lodge the rehabilitation bond in two portions. The first portion for 4.5 hectares must be lodged with the Department prior to commencing quarrying operations, with no land disturbance to exceed 4.5 hectares until the second portion of the bond is accepted by the Department.

    The sum of the bond shall be calculated at $\$2.50/m^2$ for the area to be disturbed by quarrying operations, to the satisfaction of the Director-General.

    If rehabilitation and revegetation works have been completed in accordance with the Rehabilitation Management Plan and to the satisfaction of the Director-General, the Director-General will release the rehabilitation bond.

    If rehabilitation and revegetation works are not completed to the satisfaction of the Director-General, the Director-General will call in all or part of the rehabilitation bond, and arrange for the satisfactory completion of the relevant works.

21. Within 3 months of each Independent Environmental Audit (see condition 8 of schedule 5), the Proponent shall review, and if necessary revise, the sum of the rehabilitation bond to the satisfaction of the Director-General. This review must consider:
    (a) the effects of inflation; and
    (b) performance under the Rehabilitation Management Plan to date.

ABORIGINAL CULTURAL HERITAGE

Aboriginal Cultural Heritage Management Plan

22. The Proponent shall prepare and implement an Aboriginal Cultural Heritage Management Plan to the satisfaction of the Director-General. This plan must:
    (a) be prepared in consultation with all relevant local Aboriginal communities;
    (b) be submitted to the Director-General for approval prior to commencing quarrying operations; and
    (c) include:
        - measures for the protection and management of site 38-4-0318 within Lot 13 DP601306;
        - a program to complete prospective pre-clearance surveys of the extraction area in consultation with Aboriginal stakeholders;
        - measures for ongoing consultation with local Aboriginal communities and the involvement of these communities in pre-clearance surveys and the ongoing management of any Aboriginal cultural heritage values identified within the site;
        - an Aboriginal cultural education program for the induction of personnel and contractors involved in quarrying operations; and

- a description of the measures that would be implemented if any new Aboriginal objects or skeletal remains are discovered during the project.

TRAFFIC

Haulage Route

23. All extractive materials dispatched from the site must be delivered to Sibelco's Salt Ash Sand Processing Plant by the most direct route available.

Road Signage

24. Prior to commencing quarrying operations, the Proponent shall:
    (a) install "Trucks Crossing" and "Trucks Entering" warning signs on Nelson Bay Road on both the western and eastern approaches to the intersection of Lemon Tree Passage Road; and
    (b) pay the full cost of this installation,
    to the satisfaction of RMS.

On-Site Traffic Management

25. The Proponent shall ensure that:
    (a) all vehicles do not exceed a speed of 25 kph on the site;
    (b) all loaded vehicles entering or leaving the site have their loads covered; and
    (c) all loaded vehicles leaving the site are cleaned of sand and other materials that may fall on the road, before leaving the site.

Traffic Management Plan

26. The Proponent shall prepare and implement a Traffic Management Plan for the project, to the satisfaction of the Director-General. This plan must:
    (a) be submitted to the Director-General for approval prior to commencing quarrying operations;
    (b) include a drivers' code of conduct to minimise the impacts of project-related trucks on local residents and road users; and
    (c) describe the measures that would be put in place to ensure compliance with the drivers' code of conduct.

VISUAL

Visual Amenity

27. The Proponent shall minimise the visual impacts of the project to the satisfaction of the Director-General.

WASTE MANAGEMENT

28. The Proponent shall minimise the amount of waste generated by the project to the satisfaction of the Director-General.

29. The Proponent shall ensure that wastewater and/or sewage disposal is not undertaken on the site.

30. The Proponent shall not undertake any refuelling or maintenance of vehicles or equipment on the site, except to the extent necessary to remove vehicles or equipment from the site in the case of breakdowns.

31. The Proponent must not cause, permit or allow any waste generated outside the site to be received at the site for storage, treatment, processing, reprocessing or disposal or any waste generated at the site to be disposed of at the site, except with the approval of the Director-General and as expressly permitted by a licence under the *Protection of the Environment Operations Act 1997.*

Note: This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the site if it requires an EPL under the Protection of the Environment Operations Act 1997.

EMERGENCY AND HAZARDS MANAGEMENT

Dangerous Goods

32. The Proponent shall ensure that chemicals and/or petroleum products are not stored on site.

Safety

33. The Proponent shall ensure public safety at the site to the satisfaction of the Director-General.

PRODUCTION DATA

34. The Proponent shall:
    (a) provide annual quarry production data to DRE using the standard form for that purpose; and
    (b) include a copy of this data in the Annual Review (see condition 3 of Schedule 5).

SCHEDULE 4
ADDITIONAL PROCEDURES

NOTIFICATION OF LANDOWNERS

1. If the results of the monitoring required in schedule 3 identify that the impacts generated by the project on site are greater than the relevant impact assessment criteria, and there is no negotiated agreement in place to allow the impact, then within 2 weeks of obtaining the monitoring results the Proponent shall:
   (a) notify the Director-General, the affected landowners and tenants (including tenants of any quarry-owned properties) accordingly, and provide monitoring results to each of these parties until the results show that the project is complying with the relevant criteria in schedule 3; and
   (b) in the case of exceedances of the relevant air quality criteria, send the affected landowners and/or tenants a copy of the NSW Health fact sheet entitled *"Mine Dust and You"* (as may be updated from time to time).

INDEPENDENT REVIEW

2. If a landowner of privately-owned land considers the project to be exceeding the relevant criteria in schedule 3, then he/she may ask the Director-General in writing for an independent review of the impacts of the project on his/her land.

   If the Director-General is satisfied that an independent review is warranted, then within 2 months of the Director-General's decision the Proponent shall:
   (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Director-General, to:
      - consult with the landowner to determine his/her concerns;
      - conduct monitoring to determine whether the project is complying with the relevant criteria in schedule 3; and
      - if the project is not complying with these criteria then identify the measures that could be implemented to ensure compliance with the relevant criteria; and
   (b) give the Director-General and landowner a copy of the independent review.

SCHEDULE 5
ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING

ENVIRONMENTAL MANAGEMENT

Environmental Management Strategy

1. The Proponent shall prepare and implement an Environmental Management Strategy for the project to the satisfaction of the Director-General. The strategy must:
   (a) be submitted to the Director-General for approval prior to the commencement of quarrying activities;
   (b) provide the strategic framework for environmental management of the project;
   (c) identify the statutory approvals that apply to the project;
   (d) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the project;
   (e) describe the procedures that would be implemented to:
      - keep the local community and relevant agencies informed about the operation and environmental performance of the project;
      - receive, handle, respond to, and record complaints;
      - resolve any disputes that may arise during the course of the project;
      - respond to any non-compliance; and
      - respond to emergencies; and
   (f) include:
      - copies of the various strategies, plans and programs that are required under the conditions of this approval once they have been approved; and
      - a clear plan depicting all the monitoring to be carried out in relation to the project.

Management Plan Requirements

2. The Proponent shall ensure that the Management Plans required under this approval are prepared in accordance with any relevant guidelines, and include:
   (a) detailed baseline data;
   (b) a description of:
      - the relevant statutory requirements (including any relevant approval, licence or lease conditions);
      - any relevant limits or performance measures/criteria; and
      - 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;
   (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;
   (d) a program to monitor and report on the:
      - impacts and environmental performance of the project; and
      - effectiveness of any management measures (see (c) above);
   (e) a contingency plan to manage any unpredicted impacts and their consequences;
   (f) a program to investigate and implement ways to improve the environmental performance of the project over time;
   (g) a protocol for managing and reporting any:
      - incidents;
      - complaints;
      - non-compliances with statutory requirements; and
      - exceedances of the impact assessment criteria and/or performance criteria; and
   (h) a protocol for periodic review of the plan.

   Note: At the discretion of the Director-General, some of these requirements may be waived where they are either not relevant or necessary.

Annual Review

3. Within 12 months of the commencement of quarrying operations, and annually thereafter, the Proponent shall review the environmental performance of the project to the satisfaction of the Director-General. This review must:
   (a) describe the works (including rehabilitation) that were carried out in the previous year, and the works that are proposed to be carried out over current year;
   (b) include a comprehensive review of the monitoring results and complaints records of the project over the past year, which includes a comparison of these results against:
      - the relevant statutory requirements, limits or performance measures/criteria;
      - the monitoring results of previous years; and
      - the relevant predictions in the EA;
   (c) identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
   (d) identify any trends in the monitoring data over the life of the project;
   (e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
   (f) describe what measures will be implemented over the next year to improve the environmental performance of the project.

Revision of Strategies, Plans & Programs

4. Within 3 months of:
   (a) the submission of an annual review under condition 3 above;
   (b) the submission of an incident report under condition 5 below;
   (c) the submission of an audit report under condition 8 below; and
   (d) any modifications to this approval,

   the Proponent shall review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Director-General.

   Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.

REPORTING

Incident Reporting

5. The Proponent shall notify the Director-General and any other relevant agencies of any incident associated with the project as soon as practicable after the Proponent becomes aware of the incident. Within 7 days of the date of the incident, the Proponent shall provide the Director-General and any relevant agencies with a detailed report on the incident.

Regular Reporting

6. The Proponent shall 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, and to the satisfaction of the Director-General.

AUDITING

Independent Environmental Audit

7. Within 1 month of the completion of quarrying operations, unless the Director-General directs otherwise, the Proponent shall commission and pay the full cost of an Independent Environmental Audit of the project. This audit must:
   (a) be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General;
   (b) include consultation with the relevant agencies;
   (c) assess the environmental performance of the project and assess whether it is complying with the relevant requirements in this approval and any relevant EPL (including any assessment, plan or program required under these approvals);

(d) review the adequacy of strategies, plans or programs required under the abovementioned approval or licences; and
(e) be completed within 2 months of the approval of the audit team.

Note: This audit team must be led by a suitably qualified auditor and include experts in any fields specified by the Director-General.

8. Within 6 weeks of the completing of this audit, or as otherwise agreed by the Director-General, the Proponent shall submit a copy of the audit report to the Director-General, together with its response to any recommendations contained in the audit report.

ACCESS TO INFORMATION

9. From 1 July 2013, the Proponent shall:
(a) make the following information publicly available on its website:
- a copy of all approved strategies, plans and programs;
- a summary of all monitoring results of the project, which have been reported in accordance with the various plans and programs approved under the conditions of this approval, updated on a quarterly basis;
- a complaints register, updated on a quarterly basis;
- copies of any Annual Reviews;
- copies of any Independent Environmental Audit, and the Proponent's response to the recommendations in any audit;
- copies of the development consent and approved management plans for existing adjacent quarrying operations; and
- any other matter required by the Director-General; and

(b) keep this information up-to-date,
to the satisfaction of the Director-General.

APPENDIX 1
PROJECT SITE

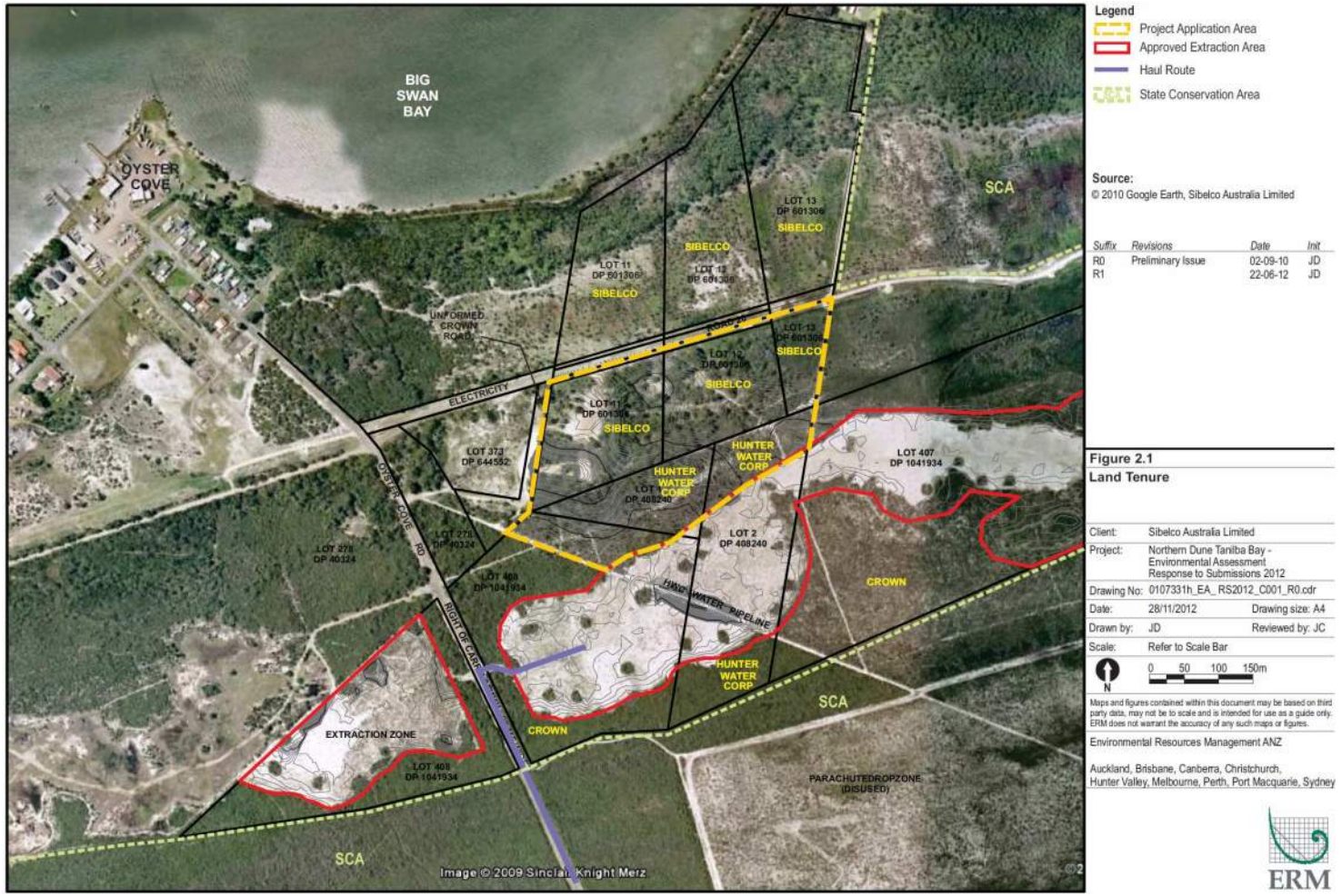


***Figure 1**: Project site*

APPENDIX 2
NOISE RECEIVER LOCATIONS

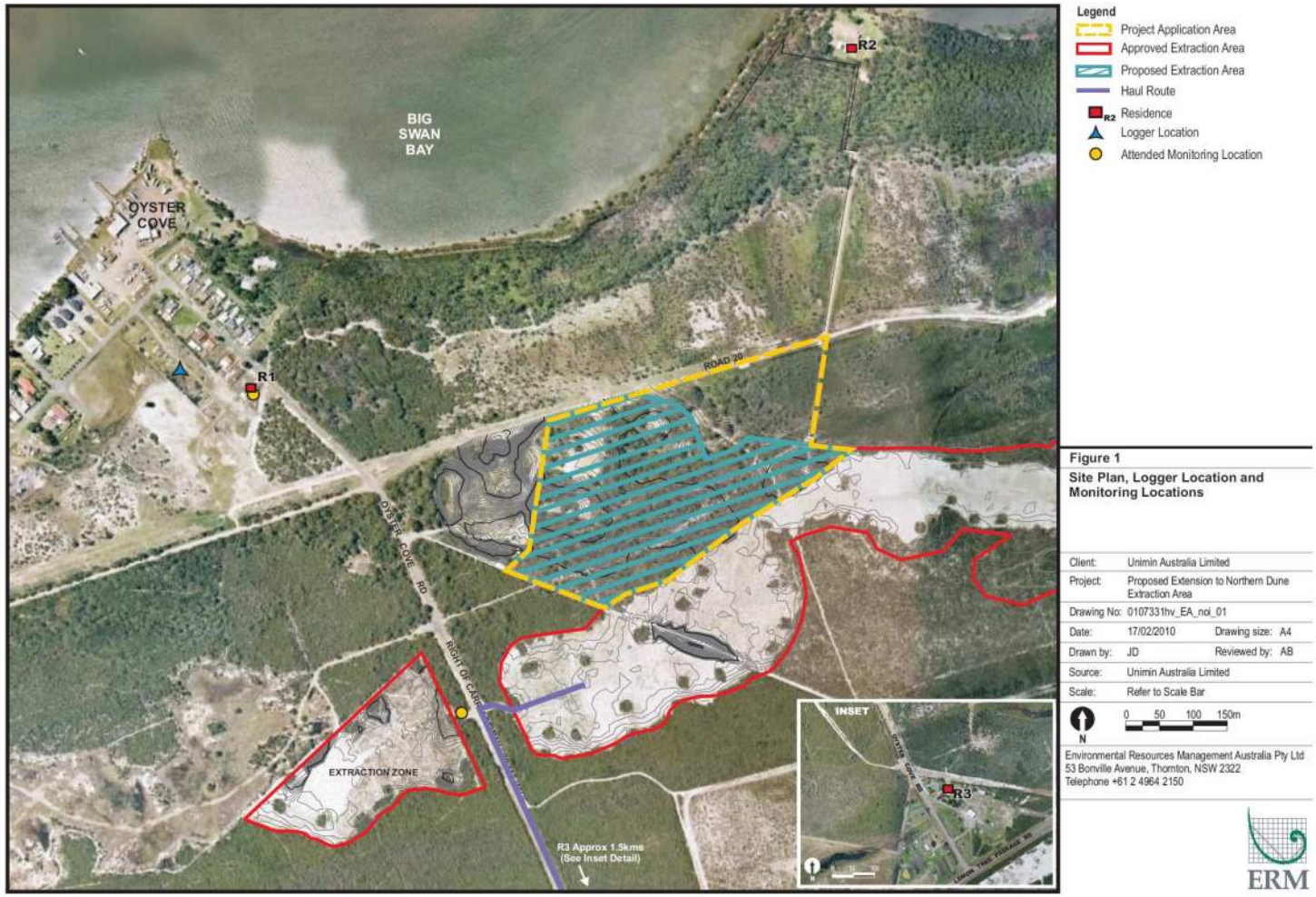


Figure 2: *Noise receivers*

APPENDIX 3
STATEMENT OF COMMITMENTS

Issue	Mitigation Measure/Commitment
Environmental Management Plan	The currently approved EMP (2003) will be applied over all 9 EMPs and updated as necessary to meet the needs of the extension area. These include; • EMP1 - Environmental Induction and Training • EMP2 - Hydrocarbon Spill Procedure • EMP3 - Operations Management Procedure • EMP4 - Extraction Depth and Area Monitoring • EMP5 - Groundwater • EMP6 - Cultural Heritage • EMP7 - Vegetation Rehabilitation • EMP8 - Landform Rehabilitation • EMP9 - Erosion and Sediment Control
Groundwater Monitoring	The Groundwater Management Plan (GMP) in place for the existing operation will be updated to incorporate ongoing monitoring at additional bores SAL4 and SAL5 in accordance with the existing approved monitoring regime.
	Current environmental management commitments will be adopted for the extraction extension, including: • groundwater quality and level monitoring, and reporting as part of the approved groundwater management plan; • regular review of environmental performance through the AEMR process; • maintenance of a minimum 1.0 m vertical buffer between the predicted maximum groundwater elevation and the final landform (extraction will occur to 0.7 m above predicted maximum groundwater elevation, with final rehabilitated landform being 1.0 m above these elevations following placement of 0.3 m topsoil); • staged rehabilitation of extraction areas; • avoiding storing machinery or hazardous materials onsite; and • avoiding servicing or refuelling equipment onsite.
Noise Emissions	The currently approved EMP (2003) would continue to be applied, and updated as necessary to meet the needs of the proposed extension area.
	All reasonable steps would be undertaken to reduce noise emissions during extraction and transport. • sequentially extracting from the south to the north, so that the topography will naturally help shield the sensitive receptors to the north against operational noise emissions; • ensuring all machines are in good working condition, with particular attention to exhaust silencers, engine covers and other noise reduction devices;

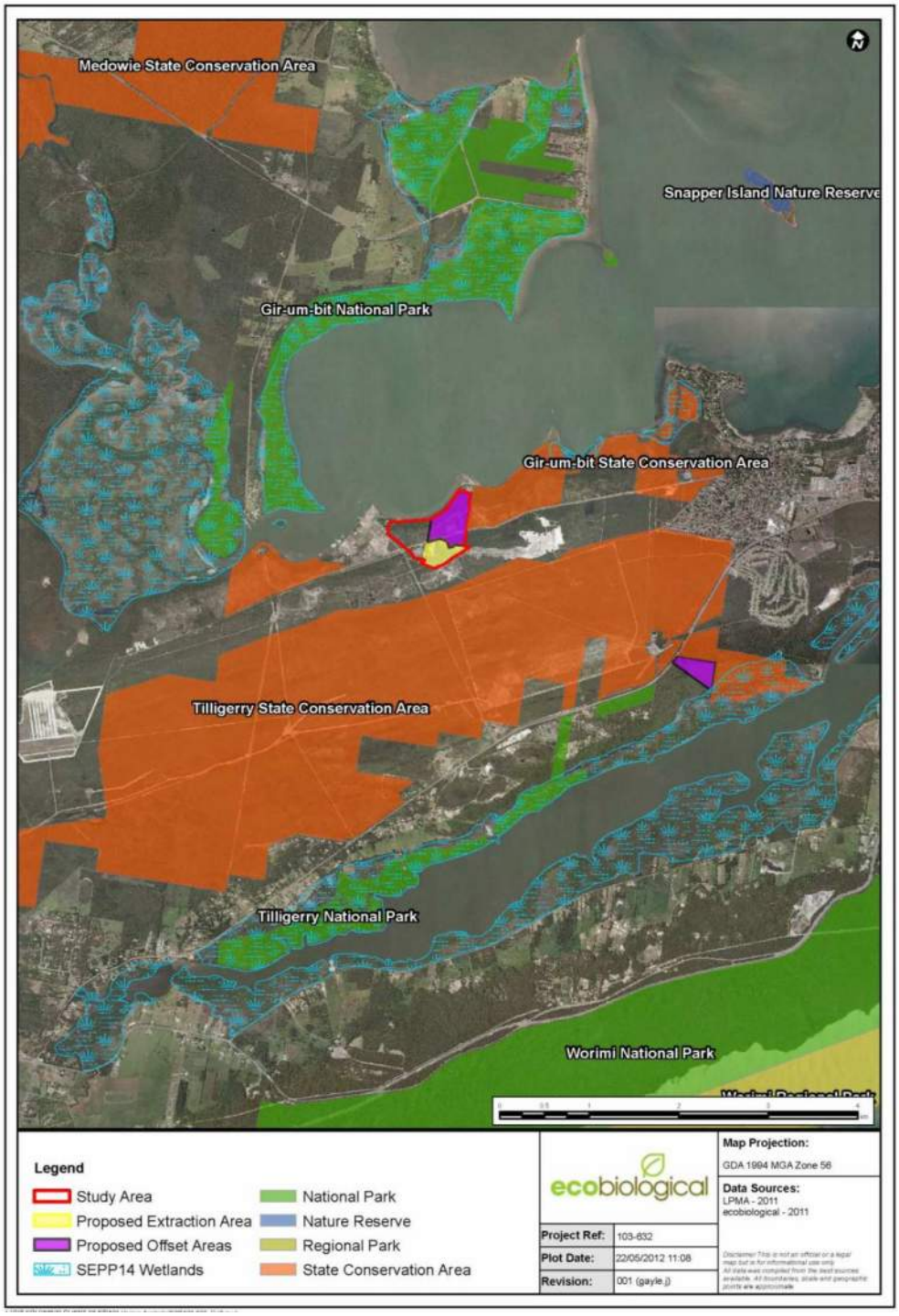
Issue	Mitigation Measure/Commitment
	• all work and transport will be restricted to daylight hours, typically from 7:00am to 6:00pm Monday to Friday, but when light permits continuing to 7:00pm; and • site imposed speed limits up to 25 km/hr to be enforced to minimise noise generation.
Air Emissions	Air emissions related management measures are already in place and proposed to continue as part of the extension of operations to reduce the generation of particulate emissions.
	A water tanker will be used on all unsealed roads on an as-needs basis, dependant on weather conditions.
	Sand extraction cells will be progressively rehabilitated throughout the life of the extraction. It is anticipated that no more than three hectares will be exposed at any one time.
Surface and Groundwater Quality	Surface water management principles will be implemented to prevent contamination of surface (and therefore groundwater) quality. Management and monitoring actions stipulated in the existing Groundwater Management Plan (2011) for current operations will be
	Additional documents will be produced for the extraction extension area to mitigate any impacts to the quality of the groundwater, the adjoining forested wetlands and, to aid in the rehabilitation of the extraction area post sandmining including: • Surface Water Management Plan to prevent runoff, pollution and sedimentation from the extraction area entering into adjoining forested wetlands; • Vegetation and Weed Management Plan for rehabilitation of the proposed sand extraction area; and • Offset Strategy and associated Habitat Management Plan which will detail management actions to be undertaken on the remaining portions of Lots 11, 12 and 13 and on Lot 24. This plan will cover vegetation, weed, fire and stormwater management, minimisation of edge effects, control of public access and management of habitat enhancement measures.
Ecology	Hollow bearing trees 16, 17, 18 and 20 (refer to Figure 2.2, Northern Dune Submission Report) to be retained.
	• avoidance of the use of biocides and implementing erosion and sediment controls; • incorporating implementation of pre-clearing surveys, a fauna displacement mitigation protocol, Koala mitigation measures, nestbox installation and monitoring, and a monitoring plan for the Wallum Froglet as detailed in Annex M of the EA; • staged rehabilitation of the extraction area (to be supported by a Vegetation Rehabilitation Management Plan), to be conducted in the same fashion as successful rehabilitation of Sibelco's existing approved extraction areas directly to the south; and • implementation of an Offset Strategy as detailed in Section 11.6.4 if the EA.
Vegetation Clearing	At least one week prior to any vegetation clearing, a survey of habitat trees will be conducted in the planned clearing area in accordance

Issue	Mitigation Measure/Commitment
	with the survey methodology outlined in Section 11.6.1 of the EA.
	Pre-clearing surveys will be conducted to check for the presence of any Koalas within the proposed extraction area.
	Hollow-bearing trees will be left standing for two nights after the surrounding vegetation has been cleared to encourage any native fauna species utilising the habitat hollows to self-relocate. The actual felling of any habitat trees will be attended by a suitably experienced fauna ecologist in order to ensure the safety of any fauna found to be in the hollows. On all occasions, trees having potential habitat hollows should be 'soft felled' by an experienced machine operator in accordance with the procedure outlined in section 11.6.1 of the EA.
Fauna Displacement Protocol	A fully qualified, experienced and licensed ecologist will supervise clearing and encourage movement of any displaced animals into adjoining vegetation.
	Captured fauna and/or displaced fauna will be relocated to adjacent habitat by an ecologist. During tree removal or any other construction activity, Fauna Displacement protocols outlined in Section 11.6.2 of the EA will be followed in the case of an injured animal.
Wallum Froglet Management Plan	A management plan for the Wallum Froglet (*Crinia tinnula*) will be developed in accordance with the management guidelines outlined under Section 6 of the National Recovery Plan for the Wallum Sedgefrog and Other Wallum- dependent Frog Species. In particular this will include specifications on: • minimising affects from soil disturbance; • ensuring sufficient retention of vegetation particularly around breeding sites; and • monitoring the habitat condition and frog numbers to ensure the threats to the species are properly managed. This should be undertaken with sufficient regularity and should preferably be carried out a year or more before development starts and continue for the duration of extraction operations, including rehabilitation works.
Nestbox Installation and Monitoring Program	A nestbox installation and monitoring program will be implemented on a ratio of 2:1 to replace 38 hollows present in the 17 hollow-bearing trees mapped within the proposed extraction area. Nestboxes should be erected prior to clearing commencing in order to provide alternative den and/or nest sites for any displaced fauna.

Issue	Mitigation Measure/Commitment
	Nestboxes are to be erected within the Proposed Offset Areas on Lots 11, 12 and 13. Nest box designs should be selected to replace the natural hollow sizes removed (ie, 20 small, 16 medium and 2 large) and will target insectivorous bats, gliders and possums. Annual monitoring for a minimum 6-year period post installation is recommended to record uptake of the nestboxes and to attend to any maintenance issues. A brief letter confirming annual inspection of the nestboxes and documentation of results should be provided to OEH.
Vegetation Management and Monitoring Plan	Weed Management and Vegetation Management and Monitoring Plans will be prepared for the rehabilitation area and proposed Offset Areas on Lots 11, 12, 13 and 24, which will include a thorough and intensive program to protect the adjoining forested wetland communities against weed invasion, and surface and underground run-off that may occur both during and after sand extraction activities. The management and monitoring plans will consider: • the nature and control of sediment run-off during the extraction phase particularly as a result of an exceptional storm event; • the volume, path and content of stormwater discharging from the site during and after extraction; • the handling of hydrocarbon spills on the site ; • existing flow regime of surface and groundwater flow from the proposed extraction area into the forested wetlands; and • weed invasion
Biodiversity Offset Strategy	A biodiversity offset strategy will be adopted as outlined in detail in Annex P of the EA. Biodiversity offsets are proposed on lands currently owned by Sibelco, comprising portions of Lots 11 to 13, DP601306 (approximately 18.35 ha) and all of Lot 24, DP579700 (approximately 9.44 ha) (the offset lands). A secure offset mechanism (through a Voluntary Conservation Agreement or other similar tool for management in perpetuity) will be placed over these offset lands, which will result in permanent protection and management of the land and result in numerous ecological benefits.
Aboriginal Heritage	As ground visibility is limited within the extraction extension area, further archaeological work is required prior to commencement of extraction operations. The further assessment will be undertaken in accordance with any conditions of consent and will consist of a prospective clearing program that will be undertaken to improve ground visibility and allow the registered Aboriginal stakeholders to inspect the ground surface within the approved extraction area, to provide greater certainty of the presence or otherwise of Aboriginal archaeological sites. Sibelco will contact the three Aboriginal stakeholder groups at least three weeks prior to the proposed clearing and invite them to attend. Details of the methodology as agreed by the registered Aboriginal stakeholders is presented in Chapter 7 of Annex N of the EA, including procedures for undertaking the required site clearance, required actions should Aboriginal sites or artefacts be found during the prospective clearing program, and the requirements for updating the Cultural Heritage Management Plan, which will be undertaken prior to commencement of any extraction.

Issue	Mitigation Measure/Commitment
Bushfire	• provision of a separation distance (minimum of 10 m) between stockpiles of combustible material and remnant vegetation;
	• managing operations and the site to minimise likelihood of ignition sources through good 'housekeeping' (for example, all waste in bins);
	• emergency planning procedures in the event of a fire occurring on the site;
	• fitting of all earth moving machinery with spark arresting mufflers and haul trucks have serviceable exhaust systems to prevent accidental ignition of vegetation; and
	• equipping the operations to assist in the management of any fires on-site, including presence of fire extinguishers, water cart (as contracted), and the site front-end loader and bulldozer for any requisite fire fighting purposes.
Waste Management	• no burning of waste;
	• any noxious plant species will be removed from the site, bagged and disposed of at a licensed landfill;
	• any waste will be removed daily and recycled or disposed of directly at a licensed landfill; and
	• the site will be maintained and kept free of rubbish and cleaned up at the end of each working day.

APPENDIX 4
BIODIVERSITY OFFSET STRATEGY


Medowie State Conservation Area
Snapper Island Nature Reserve
Gir-um-bit National Park
Gir-um-bit State Conservation Area
Tilligerry State Conservation Area
Tilligerry National Park
Worimi National Park
Legend
Study Area
Proposed Extraction Area
Proposed Offset Areas
SEPP14 Wetlands
National Park
Nature Reserve
Regional Park
State Conservation Area
ecobiological
Map Projection:
GDA 1994 MGA Zone 56
Data Sources:
LPMA - 2011
ecobiological - 2011
Project Ref: 103-632
Plot Date: 22/05/2012 11:08
Revision: 001 (gayle.j)

APPENDIX 2
NOISE MONITORING REPORTS

Northern Dune

Environmental Noise Monitoring

Quarter 2 2019

Prepared for

Sibelco Australia Limited

Global Acoustics

Noise and Vibration Analysis and Solutions

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Northern Dune

Quarter 2 2019
Environmental Noise Monitoring

Reference: 19143_R01
Report date: 30 May 2019

Prepared for

Sibelco Australia Limited
8 Oakvale Drive
Salt Ash NSW 2333

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322

Prepared:	Jason Cameron Consultant	QA Review:	Jesse Tribby Consultant

Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Sibelco Australia to conduct a quarterly noise survey around its Northern Dune site, located off Oyster Cove Road near Salt Ash, NSW. The survey purpose was to quantify and describe the existing acoustic environment around the quarry and compare results with relevant limits.

Attended environmental noise monitoring described in this report was undertaken during the day of 20 May, 2019. Figure 1 shows the monitoring locations.

1.2 Monitoring Locations

There were three monitoring locations during this survey as detailed in Table 1.1 and shown on Figure 1. It should be noted that this figure shows the actual monitoring position, not the location of residences.

Table 1.1: NORTHERN DUNE MONITORING LOCATIONS

Report Descriptor	Monitoring Location
R1	18 Oyster Cove Road, Oyster Cove
R2	16 Rutile Road, Oyster Cove
R3	2 Oyster Cove Road, Salt Ash

1.3 Quarry Operations

Monitoring was conducted on a day when at 20-30 truck dispatches were anticipated to occur from the site. The Noise Monitoring Program (NMP) for site states that monitoring shall be conducted on a day when at least 30 truck dispatches are scheduled. However, due to reduced operations at Northern Dune during the quarter, monitoring was conducted on a day where normal operations were observed.

Figure 1 Northern Dune Attended Noise Monitoring Locations

1.4 Terminology & Abbreviations

Some definitions of terms and abbreviations, which may be used in this report, are provided in Table 1.2.

Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
L_A	The A-weighted root mean squared (RMS) noise level at any instant
L_{Amax}	The maximum A-weighted noise level over a time period or for an event
L_{A1}	The noise level which is exceeded for 1 per cent of the time
L_{A10}	The noise level which is exceeded for 10 percent of the time, which is approximately the average of the maximum noise levels
L_{A50}	The noise level which is exceeded for 50 per cent of the time
L_{A90}	The level exceeded for 90 percent of the time, which is approximately the average of the minimum noise levels. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes
L_{Amin}	The minimum A-weighted noise level over a time period or for an event
L_{Aeq}	The average noise energy during a measurement period
L_{pk}	The unweighted peak noise level at any instant
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise
ABL	Assessment background level (ABL), the 10th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. Estimated from wind speed and sigma theta data
IA	Inaudible. When site only noise is noted as IA, there was no noise from the source of interest audible at the monitoring location
NM	Not Measurable. If site only noise is noted as NM, this means some noise from the source of interest was audible at low-levels, but could not be quantified
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 REGULATOR REQUIREMENTS AND NOISE CRITERIA

2.1 Project Approval

The Tanilba Northern Dune Extension Project was granted Project Approval (PA) 09_0091 by the Minister for Planning and Infrastructure, in March 2013.

Schedule 3 of the PA details the impact assessment criteria for the monitoring locations and also requirements for a Noise Monitoring Program.

Northern Dune has approval for the following hours of operation:

- Monday to Friday EST – 7:00am to 6:00pm;
- Monday to Friday EDT – 7:00am to 7:00pm; and
- Saturday, Sunday and Public holidays – Nil.

Relevant sections of the Project Approval have been included in Appendix A.

2.2 Environment Protection Licence

Sibelco holds Environment Protection Authority (EPA) Environment Protection Licence (EPL) No. 11633. Noise requirements are detailed in L2 of the licence.

Relevant sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

Sibelco have prepared a Noise Monitoring Program (NMP) for their Northern Dune site, as required by their PA. Relevant sections have been reproduced in Appendix A.

Section 3.2 of the NMP details monitoring conditions, including the requirement for monitoring to occur during normal operating hours as detailed in Section 2.1 above, and also that monitoring is to be conducted on a day where at least 30 truck movements are scheduled.

As detailed in the NMP, monitoring will also not occur in the following situations:

- If it is raining;
- If wind speeds are over 5 m/s (18 km/h); and
- If extraneous noise sources are present (noise not typical to the area).

Quantitative weather conditions from the BOM Williamtown automatic weather station (AWS), provided in Section 4.1, have been used to determine the applicability of criteria, while qualitative weather conditions have been provided in Section 4.2.

2.4 Project Specific Criteria

Day time impact assessment criteria for the Northern Dune site are detailed in Table 2.1. These criteria are consistent between the Project Approval and EPL.

Table 2.1: $L_{Aeq,15minute}$ PROJECT SPECIFIC CRITERIA

Receiver	Impact Assessment Criterion $L_{Aeq,15minute}$
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

3 METHODOLOGY

3.1 Overview

Attended environmental noise monitoring was conducted in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise', relevant NSW EPA requirements, and Northern Dune NMP. Meteorological data was obtained from the Williamtown AWS which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended Noise Monitoring

During this survey, monthly attended monitoring was undertaken during the day period at each location. The duration of each measurement was 15 minutes. Atmospheric condition measurement was also undertaken at each monitoring location.

Attended monitoring is preferred to the use of noise loggers when determining compliance with prescribed limits as it allows an accurate determination of the contribution, if any, to measured noise levels by the source of interest (in this case Northern Dune).

This survey presents noise levels gathered during attended monitoring that are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of Northern Dune's contribution, if any, to measured levels. At each receptor location, Northern Dune's $L_{Aeq,15minute}$ and $L_{A1,1minute}$ (in the absence of any other noise) was measured directly, where possible, or, determined by frequency analysis.

If the exact contribution of the source of interest cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise descriptors in accordance with Section 7.1 of the NPfI. This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- Site noise levels were extremely low and unlikely, in many cases, to be even noticed;
- Site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or

- It was not feasible, nor reasonable to employ methods such as move closer and back calculate. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

A measurement of $L_{A1,1minute}$ corresponds to the highest noise level generated for 0.6 second during one minute. In practical terms this is the highest noise level, or L_{Amax}, received from the site during the entire measurement period (i.e. the highest level of the worst minute during the 15 minute measurement).

3.3 Modifying Factors

Modifying factors have not been considered as part of this compliance assessment as it consists of daytime operations only in a complex acoustic environment including frequent noise from aircraft.

3.4 Monitoring Equipment

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix B.

Table 3.1: MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	01070590	25/06/2020
Pulsar 105 acoustic calibrator	79631	22/01/2021

4 RESULTS

4.1 Attended Noise Monitoring

Noise levels measured at each location during attended surveys are provided in Table 4.1. Discussion as to the noise sources responsible for these measured levels is provided in Chapter 5 of this report.

Table 4.1: MEASURED NOISE LEVELS – QUARTER 2 2019

Location	Start Date and Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{A50} dB	L_{Aeq} dB	L_{A90} dB	L_{Amin} dB	L_{Ceq} dB
R1	20/05/2019 14:43	55	47	42	37	39	33	30	57
R2	20/05/2019 13:50	75	62	51	40	50	33	26	55
R3	20/05/2019 15:08	85	74	49	39	61	34	29	68

Notes:

1. *Levels in this table are not necessarily the result of activity at the Northern Dune site.*

Table 4.2 compares measured $L_{Aeq,15minute}$ levels from the Northern Dune site with impact assessment criteria.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY NORTHERN DUNE AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 2 2019

Location	Start Date and Time	Wind Speed m/s[3,4]	Rain mm[3,4]	Criterion dB	Criterion Applies?[3]	Northern Dune $L_{Aeq,15min}$ dB[1,2]	Exceedance[2,3]
R1	20/05/2019 14:43	2.1	0	37	Yes	<30	Nil
R2	20/05/2019 13:50	2.1	0	37	Yes	IA	Nil
R3	20/05/2019 15:08	3.1	0	37	Yes	IA	Nil

Notes:

1. *Estimated or measured $L_{Aeq,15minute}$ attributed to the Northern Dune site;*
2. *Bold results in red are exceedance of relevant limit;*
3. *NA in exceedance column means criterion is not applicable due to atmospheric conditions outside those specified in the NMP. Noise criteria apply under all meteorological conditions except during rain or wind speeds greater than 5 m/s.*
4. *Meteorological data sourced from the Bureau of Meteorology Williamtown AWS.*

4.2 Atmospheric Conditions

Atmospheric condition data measured by the operator at each location using a Kestrel hand-held weather meter is shown in Table 4.3. Atmospheric condition data is routinely recorded on a site-by-site basis to show conditions during the monitoring period. The wind speed, direction and temperature were measured at 1.8 metres.

Table 4.3: MEASURED ATMOSPHERIC CONDITIONS – QUARTER 2 2019

Location	Start Date and Time	Temperature ° C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
R1	20/05/2019 14:43	24	0.9	0	6
R2	20/05/2019 13:50	22	0.0	-	7
R3	20/05/2019 15:08	25	0.8	0	6

Notes:

1. *"-" indicates calm conditions at 1.8 metres.*

5 DISCUSSION

5.1 Noted Noise Sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are taken into account in each measurement via statistical descriptors. From these observations, summaries have been derived for each location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50} and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 2 where it can be seen that frogs and insects are generating noise at frequencies above 1000 Hz while mining noise is at frequencies less than 1000 Hz, which is typical. Adding levels at frequencies that relate to mining only allows separate statistical results to be calculated. This analysis cannot always be performed if there are significant levels of other noise at the same frequencies as mining, such as dogs, cows, or (most commonly) road traffic.

It should be noted that the method of summing statistical values up to a cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq}.

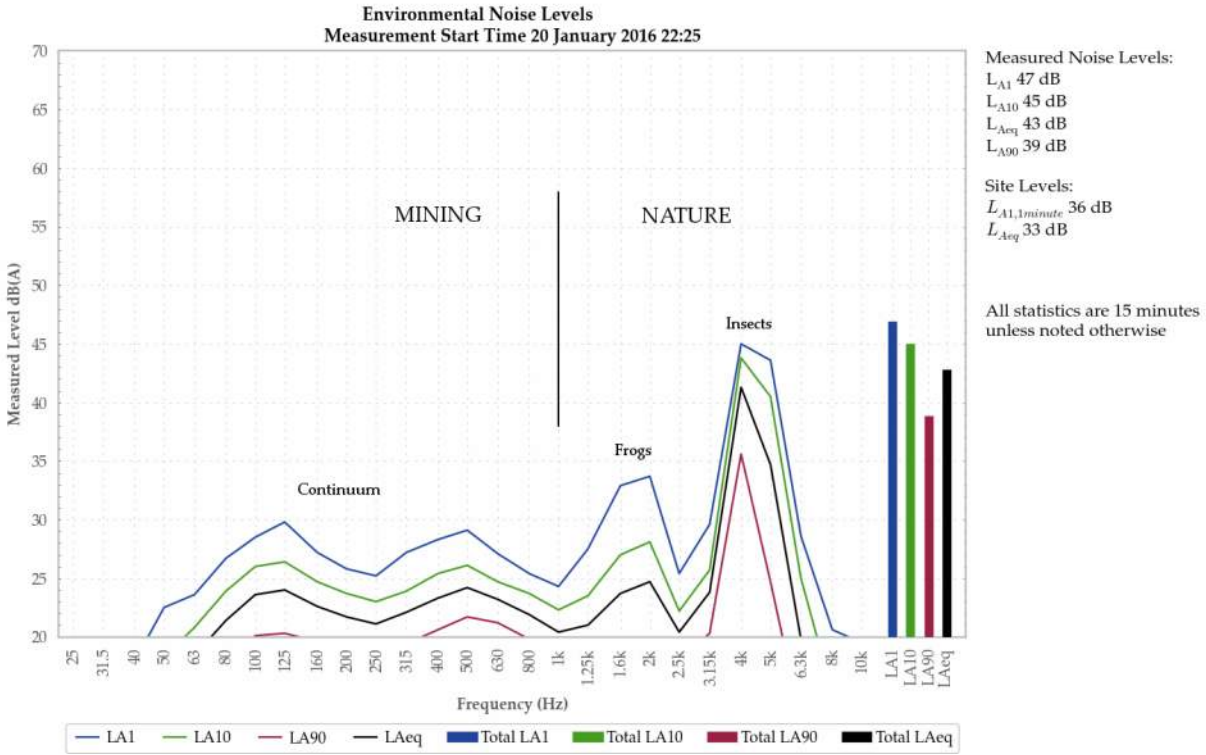

Figure 2: Sample Graph (see Section 5.1 for explanatory note)

5.1.1 R1

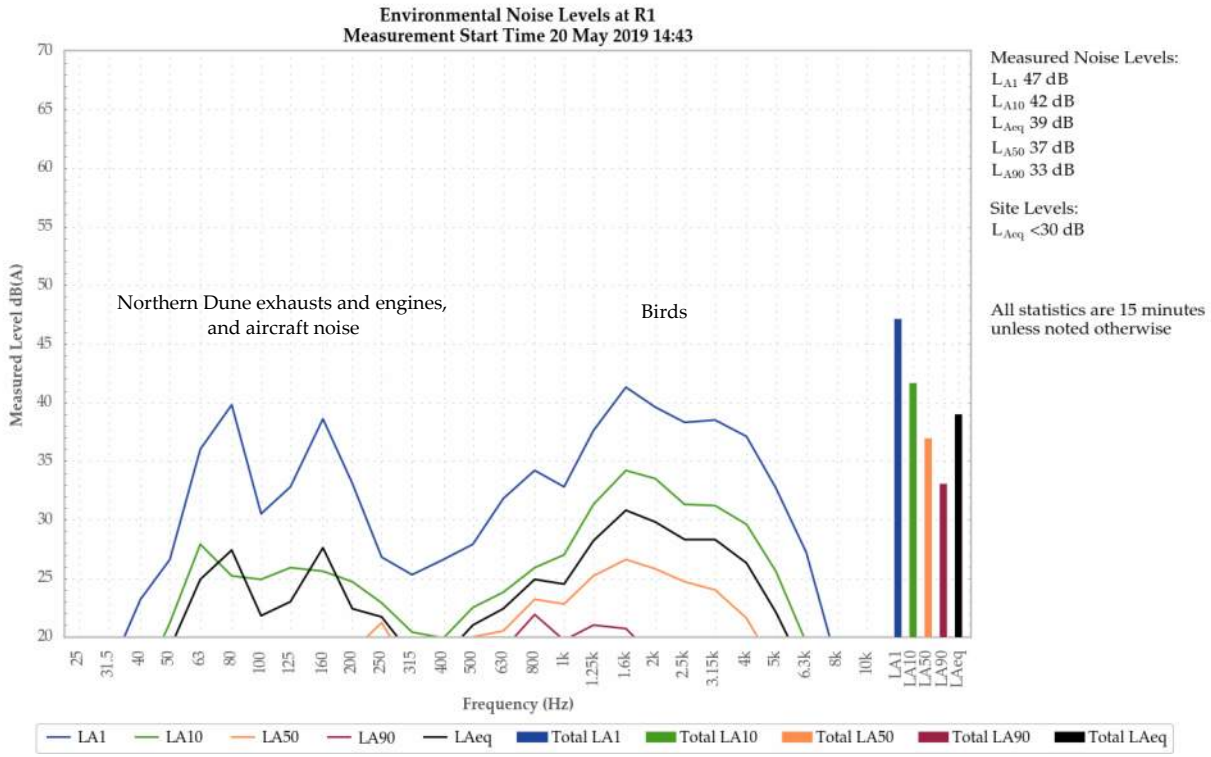

Figure 3: Environmental Noise Levels, R1

Truck engine and exhaust surges from Northern Dune were audible during the measurement, generating a site-only $L_{Aeq,15minute}$ of less than 30 dB.

Northern Dune trucks and birds generated the measured L_{A1}, L_{A10} and L_{Aeq}. Birds were responsible for the measured L_{A50} and L_{A90}.

A pump was also noted.

5.1.2 R2

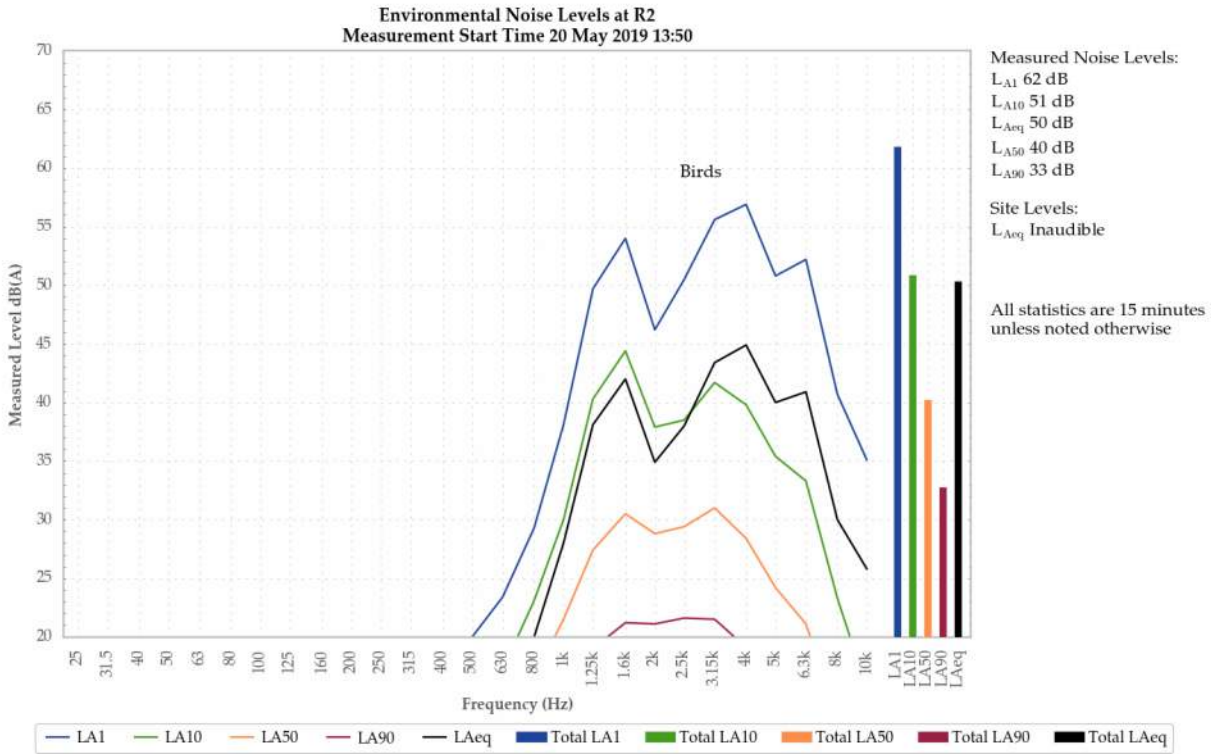

Figure 4: Environmental Noise Levels, R2

Northern Dune was inaudible during the measurement.

Birds generated all measured noise levels.

Industrial continuum was also noted.

5.1.3 R3

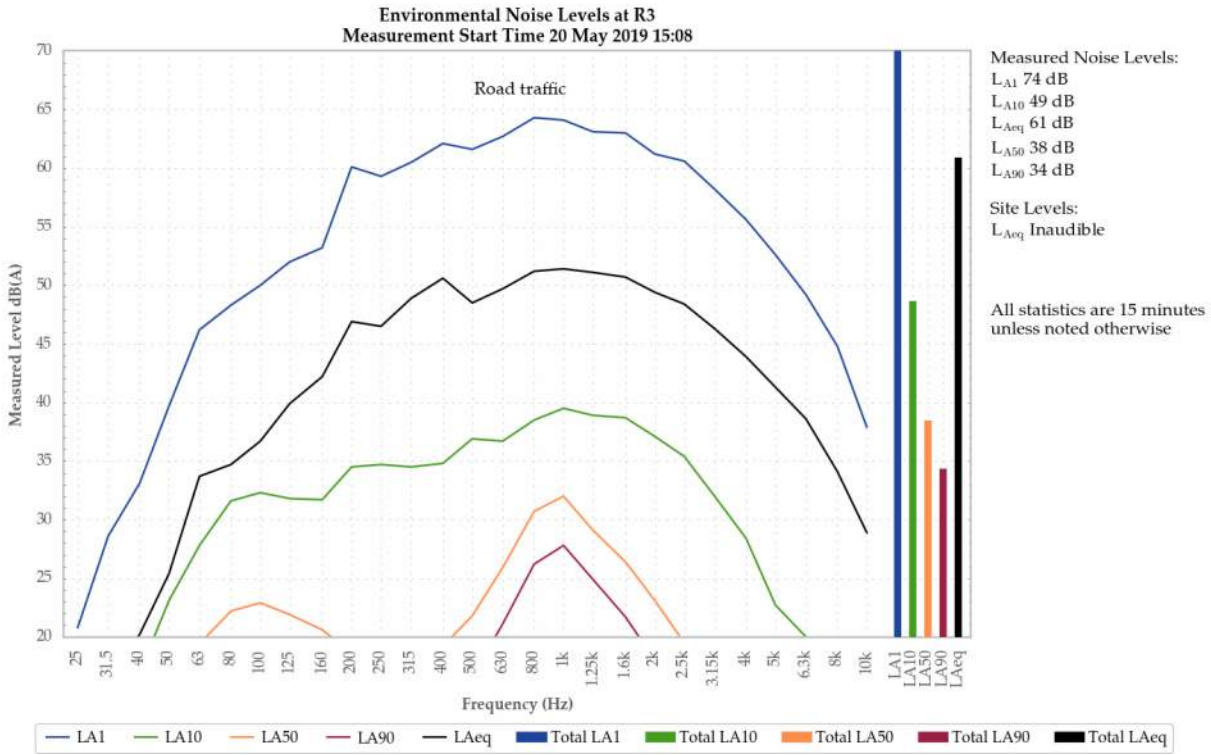

Figure 5: Environmental Noise Levels, R3

Northern Dune was inaudible during the measurement.

Road traffic generated all measured noise levels.

Birds and aircraft were also noted.

6 SUMMARY

Global Acoustics was engaged by Sibelco Australia to conduct a quarterly noise survey around its Northern Dune site, located off Oyster Cove Road near Salt Ash, NSW. The survey purpose was to quantify and describe the existing acoustic environment around the quarry and compare results with relevant limits.

During this assessment, noise levels from Northern Dune complied with the relevant impact assessment criterion at all monitoring locations.

Global Acoustics Pty Ltd

APPENDIX

A REGULATOR DOCUMENTS

Sections of the Noise Management Plan are reproduced below.

A.2 Noise Criteria

Noise criteria have been provided for the project in the Development Approval. This is contained in Schedule 3, condition 2. The condition requires that operational noise generated by the project does not exceed the noise impact assessment criteria in the below table, at any residence on privately-owned land.

Table E1 – Noise criteria

Receiver	$L_{Aeq\ (15\ min)}$ dB(A)
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

A.3 Noise Monitoring

The noise monitoring program has been written to comply with the NSW Industrial Noise Policy.

A.3.1 Monitoring program

Monitoring will be conducted as per the below schedule:

Table E2 – Monitoring Program

Location	Monitoring	Frequency
Resident R1 – 18 Oyster Cove Road	Attended noise monitoring	At least once prior to operation commencing Quarterly for first two years

Location	Monitoring	Frequency
Resident R2 – 16 Rutile Road	Attended noise monitoring	At least once prior to operation commencing Quarterly for first two years
Resident R3 – 2 Oyster Cove Road	Attended noise monitoring	At least once prior to operation commencing Quarterly for first two years

A.3.2 Monitoring conditions

Monitoring will be conducted during normal operating hours and must be conducted on a day where at least 30 truck movements are scheduled.

Monitoring will **not** occur in the following situations:

- If it is raining
- If wind speeds are over 5 m/s (18km/hr)
- If extraneous noise sources are present (ie noise not typical to the area)

A.3.3 Monitoring equipment

Sound level meters used for monitoring must meet the specifications of a precision (Type 0 or 1) or general purpose (Type 2) sound level meter, as outlined in AS 1259 and referenced in the NSW Industrial Noise Policy.

It is noted that AS 1259 has been superseded by AS IEC 61672.1:2004.

For the purposes of noise monitoring at Northern Dune, a Type 2/ Class 1 or 2 sound level meter is required. This type of meter is suitable for general field applications.

Noise meters should be supplied with a current laboratory calibration certificate in accordance with AS IEC 61672.1:2004.

Sections of the Project Approval (09_991) are reproduced below.

Impact Assessment Criteria

2. The Proponent shall ensure that the operational noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land.

Table 1: Noise impact assessment criteria

Receiver	$L_{Aeq\ (15\ min)}$ ***dB(A)***
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

Notes:

- *Receiver locations are shown in the Figure in Appendix 2; and*
- *Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*

Hours of Operation

3. The Proponent shall only conduct quarrying operations on the site:
   (a) between 7.00 am and 6.00 pm EST, Monday to Friday;
   (b) between 7.00 am and 7.00 pm DST, Monday to Friday; and
   (c) at no time on Saturday, Sunday or public holidays.

Operating Conditions

4. The Proponent shall:
   (a) implement best practice noise management to minimise the construction, operational and traffic noise of the project;
   (b) maintain the effectiveness of any noise suppression equipment on site at all times and ensure defective equipment is not used operationally until fully repaired; and
   (c) conduct extraction activities in a south to north direction so that the topography shields the sensitive receivers,

   to the satisfaction of the Director-General.

Noise Monitoring Program

5. The Proponent shall prepare and implement a Noise Monitoring Program for the project to the satisfaction of the Director-General. This program must:
   (a) be submitted to the Director-General for approval prior to commencing quarrying operations;
   (b) include quarterly attended noise monitoring during at least the first two years of quarrying operations, to be conducted on days when at least 30 truck dispatches occur from the site; and
   (c) include details of how the noise performance of the project would be monitored, and include a noise monitoring protocol for evaluating compliance with the noise criteria in this approval.

Sections of the EPL (No. 11633) are reproduced below.

L2 Noise limits

L2.1 Noise generated at the premises must not exceed the noise limits specified in the table below.

Receivers	Noise Limit dB(A) - Day - LAeq (15 minute)	Noise Limit dB(A) - Evening - LAeq (15 minute)
R1, R2, R3 and all residences in Oyster Cove	37	37
All other receivers	35	35

Note: For the purposes of the noise table above receiver locations are shown in Appendix 2 of Project Approval 09_0091, dated 8 March 2012.

L2.2 For the purposes of the conditions of this licence:
- Day is defined as the period from 7am to 6pm; and
- Evening is defined as the period 6pm to 10pm.

L2.3 To determine compliance with the LAeq(15 minute) noise limits referred to above, the noise measurement equipment must be located;
a) at the most effected point at a location where there is no dwelling at the location; or
b) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
c) within 30 metres of a dwelling fascade, but not closer than 3 metres, where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or
d) where applicable, within approximately 50 metres of the boundary of a National Park or a Nature Reserve.

L2.4 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

APPENDIX

B CALIBRATION CERTIFICATES

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013

Calibration Certificate

Calibration Number C18363

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	Rion NA-28
Instrument Serial Number :	01070590
Microphone Serial Number :	08184
Pre-amplifier Serial Number :	52329

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	21.3°C	**Ambient Temperature :**	22.7°C
Relative Humidity :	41.7%	**Relative Humidity :**	39.2%
Barometric Pressure :	100.95kPa	**Barometric Pressure :**	100.89kPa

Calibration Technician : Lucky Jaiswal **Secondary Check:** Lewis Boorman
Calibration Date : 25 Jun 2018 **Report Issue Date :** 25 Jun 2018

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Least Uncertainties of Measurement :

		Environmental Conditions	
Acoustic Tests			
31.5 Hz to 8kHz	*±0.12dB*	*Temperature*	*±0.05°C*
12.5kHz	*±0.18dB*	*Relative Humidity*	*±0.46%*
16kHz	*±0.31dB*	*Barometric Pressure*	*±0.017kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Accredited for compliance with ISO/IEC 17025 - calibration.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Calibrator

IEC 60942-2017

Calibration Certificate

Calibration Number C19029

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar Model 106
Instrument Serial Number : 79631

Atmospheric Conditions
Ambient Temperature : 23.1°C
Relative Humidity : 58.2%
Barometric Pressure : 99.49kPa

Calibration Technician : Charlie Neil
Calibration Date : 22 Jan 2019
Secondary Check: Lewis Boorman
Report Issue Date : 24 Jan 2019

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.3	1000.38

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.11dB*	*Temperature*	*±0.2°C*
Frequency	*±0.01%*	*Relative Humidity*	*±2.4%*
Distortion	*±0.5%*	*Barometric Pressure*	*±0.013kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Accredited for compliance with ISO/IEC 17025 - calibration.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

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PAGE 1 OF 1

Northern Dune

Environmental Noise Monitoring

Quarter 3 2019

Prepared for

Sibelco Australia Limited

Global Acoustics

Noise and Vibration Analysis and Solutions

Global Acoustics Pty Ltd
PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333
Email global@globalacoustics.com.au
ABN 94 094 985 734

Northern Dune

Quarter 3 2019
Environmental Noise Monitoring

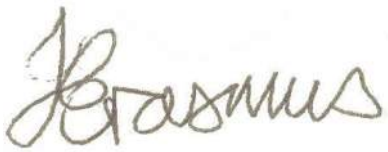
Reference: 19206_R01
Report date: 10 September 2019

Prepared for

Sibelco Australia Limited
8 Oakvale Drive
Salt Ash NSW 2333

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared:	Jonathan Erasmus Consultant	QA Review:	Jesse Tribby Consultant

Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Sibelco Australia to conduct a quarterly noise survey of operations at the Northern Dune site, a sand quarry located near Salt Ash, NSW. The survey purpose was to quantify and describe the existing acoustic environment around the quarry and compare results with relevant limits.

Attended environmental noise monitoring described in this report was undertaken during the day period of 4 September 2019 at three monitoring locations.

1.2 Monitoring Locations

Monitoring locations are detailed in Table 1.1 and shown on Figure 1. It should be noted that Figure 1 shows the actual monitoring position, not the location of residences.

Table 1.1: NORTHERN DUNE MONITORING LOCATIONS

Report Descriptor	Monitoring Location
R1	18 Oyster Cove Road, Oyster Cove
R2	16 Rutile Road, Oyster Cove
R3	2 Oyster Cove Road, Salt Ash

1.3 Quarry Operations

The Noise Monitoring Program (NMP) for site states that monitoring shall be conducted on a day when at least 30 truck dispatches are scheduled. Monitoring is generally conducted on a day when 30+ truck dispatches are anticipated to occur from the site.

Figure 1 Northern Dune Attended Noise Monitoring Locations

1.4 Terminology & Abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise.
L_{Amax}	The maximum A-weighted noise level over a time period.
L_{A1}	The noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The average noise A-weighted energy during a measurement period.
L_{A50}	The noise level which is exceeded for 50 per cent of the time and the median noise level during a measurement period.
L_{A90}	The level exceeded for 90 percent of the time. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
SC	Stability class (or category) is determined from measured wind speed and either sigma-theta or VTG.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	This is the period 7:00am to 6:00pm.
Evening	This is the period 6:00pm to 10:00pm.
Night	This is the period 10:00pm to 7:00am.

2 REGULATOR REQUIREMENTS AND NOISE CRITERIA

2.1 Project Approval

The most current approval associated with activities at the Tanilba Northern Dune Extension Project is Project Approval 09_0091 (PA, March 2013). Schedule 3 of the project approval details specific conditions relating to noise generated by Northern Dune. Relevant sections of the Project Approval have been included in Appendix A.

2.2 Environment Protection Licence

Sibelco holds Environment Protection Authority (EPA) Environment Protection Licence (EPL) No. 11633. Noise requirements are detailed in condition L2 of the EPL. Relevant sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

Sibelco have prepared a Noise Monitoring Program (NMP) for their Northern Dune site, as required by their PA. Relevant sections have been reproduced in Appendix A.

Section 3.2 of the NMP details monitoring conditions, including the requirement for monitoring to occur on a day where at least 30 truck movements are scheduled. Monitoring will also not occur in the following situations:

- If it is raining;
- If wind speeds are over 5 m/s (18 km/h); and
- If extraneous noise sources are present (noise not typical to the area).

2.4 Noise Critiera

Day time impact assessment criteria for the Northern Dune site are detailed in Table 2.1. These criteria are consistent between the Project Approval and EPL.

Table 2.1: $L_{Aeq,15minute}$ PROJECT SPECIFIC CRITERIA

Receiver	Impact Assessment Criterion $L_{Aeq,15minute}$
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

3 METHODOLOGY

3.1 Overview

Attended environmental noise monitoring was conducted in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise', relevant NSW EPA requirements, and Northern Dune NMP. Meteorological data was obtained from the Bureau of Meteorology Williamtown automatic weather station (AWS) which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended Noise Monitoring

During this survey, monthly attended monitoring was undertaken during the day period at each location. The duration of each measurement was 15 minutes. Atmospheric condition measurement was also undertaken at each monitoring location.

Attended monitoring is preferred to the use of noise loggers when determining compliance with prescribed limits as it allows an accurate determination of the contribution, if any, to measured noise levels by the source of interest (in this case Northern Dune).

This survey presents noise levels gathered during attended monitoring that are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of Northern Dune's contribution, if any, to measured levels. At each receptor location, Northern Dune's $L_{Aeq,15minute}$ and $L_{A1,1minute}$ (in the absence of any other noise) was measured directly, where possible, or, determined by frequency analysis.

If the exact contribution of the source of interest cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise descriptors in accordance with Section 7.1 of the NPfI. This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- Site noise levels were extremely low and unlikely, in many cases, to be even noticed;
- Site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or

- It was not feasible, nor reasonable to employ methods such as move closer and back calculate. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

3.3 Modifying Factors

Modifying factors have not been considered as part of this compliance assessment as it consists of daytime operations only in a complex acoustic environment including frequent noise from aircraft.

3.4 Monitoring Equipment

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix B.

Table 3.1: MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	1070590	25/06/2020
Pulsar 106 acoustic calibrator	79631	22/01/2021

4 RESULTS

4.1 Total Measured Noise Levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.1: MEASURED NOISE LEVELS – QUARTER 3 2019

Location	Start Date and Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB	L_{Ceq} dB
R1	04/09/2019 07:50	62	57	43	43	36	33	30	56
R2	04/09/2019 08:20	61	51	40	39	32	30	28	53
R3	04/09/2019 07:00	57	51	46	44	43	41	38	57

Notes:

1. *Levels in this table are not necessarily the result of activity at the Northern Dune site.*

4.2 Attended Noise Monitoring

Table 4.2 details noise levels from Northern Dune in the absence of other noise sources. Noise criteria are applicable if weather conditions were within specified parameters during the measurement.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY NORTHERN DUNE AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 3 2019

Location	Start Date and Time	Wind Speed m/s	Rain mm	Criterion dB	Criterion Applies?[1]	Northern Dune $L_{Aeq,15min}$ dB[2,3]	Exceedance[3,4]
R1	04/09/2019 07:50	3.1	0.0	37	Yes	NM	Nil
R2	04/09/2019 08:20	3.6	0.0	37	Yes	30	Nil
R3	04/09/2019 07:00	3.6	0.0	37	Yes	IA	Nil

Notes:

1. *Noise criteria apply under all meteorological conditions except during rain or wind speeds greater than 5 m/s;*
2. *Site-only $L_{Aeq,15minute}$ attributed to the Northern Dune site;*
3. *Bold results in red are exceedance of relevant limit; and*
4. *NA in exceedance column means criterion is not applicable due to atmospheric conditions outside those specified in the NMP.*

4.3 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.3. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.3: MEASURED ATMOSPHERIC CONDITIONS – QUARTER 3 2019

Location	Start Date and Time	Temperature ° C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
R1	04/09/2019 07:50	14	0.6	300	0
R2	04/09/2019 08:20	15	0.0	-	0
R3	04/09/2019 07:00	11	0.0	-	0

Notes:

1. *"-" indicates calm conditions at monitoring location.*

Meteorological data used for compliance assessment is sourced from the Williamtown AWS.

5 DISCUSSION

5.1 Noted Noise Sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are taken into account in each measurement via statistical descriptors. From these observations, summaries have been derived for each location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50} and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 2 where it can be seen that frogs and insects are generating noise at frequencies above 1000 Hz while mining noise is at frequencies less than 1000 Hz, which is typical. Adding levels at frequencies that relate to mining only allows separate statistical results to be calculated. This analysis cannot always be performed if there are significant levels of other noise at the same frequencies as mining, such as dogs, cows, or (most commonly) road traffic.

It should be noted that the method of summing statistical values up to a cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq}.

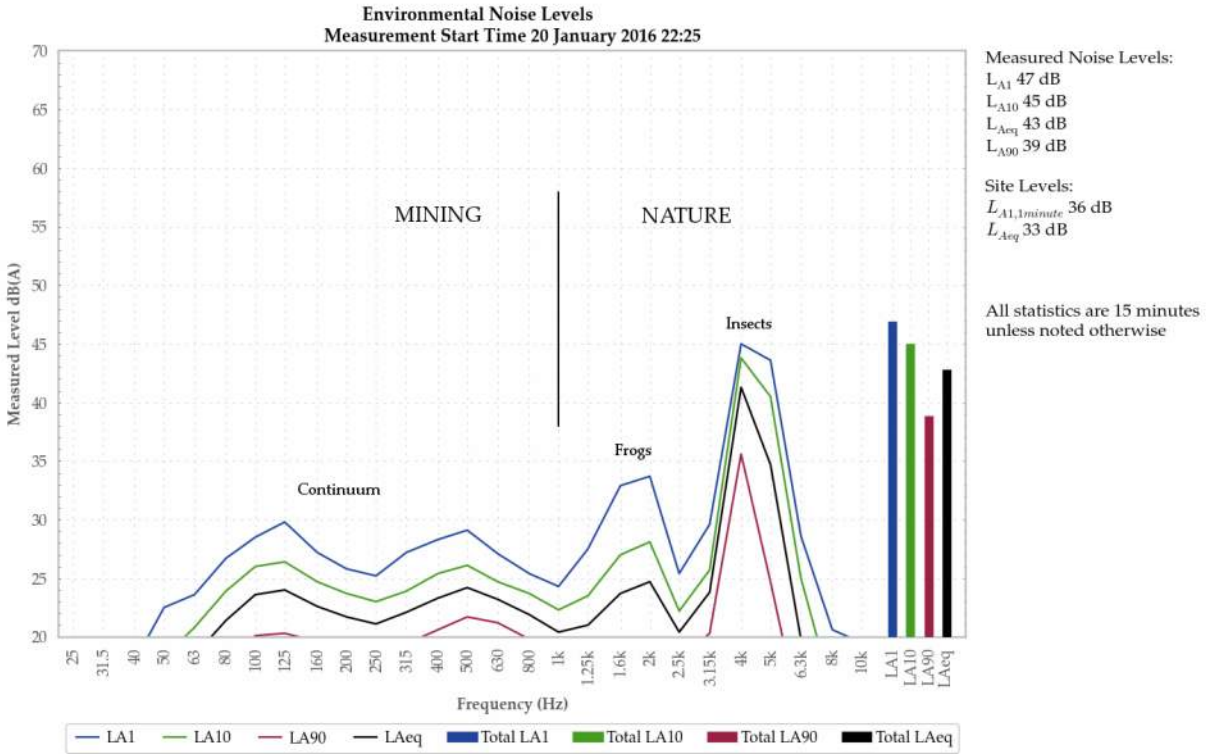


Figure 2: Sample Graph (see Section 5.1 for explanatory note)

5.1.1 R1

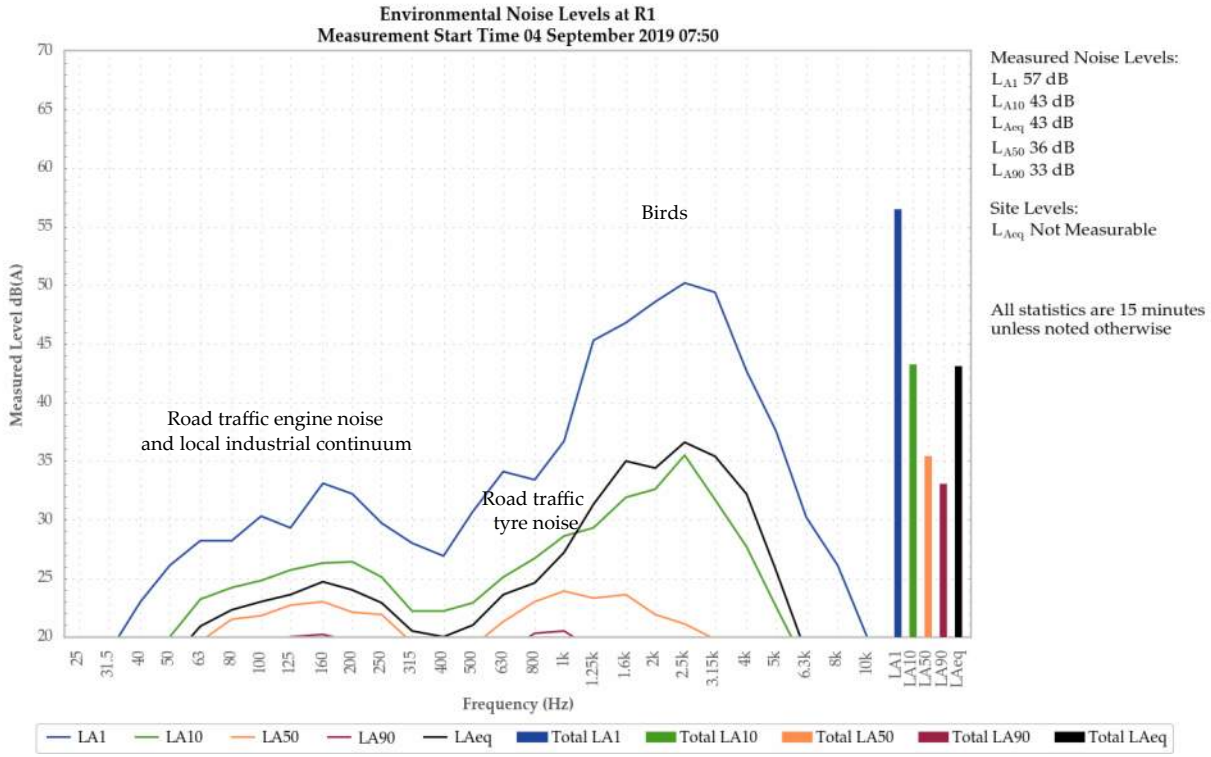


Figure 3: Environmental Noise Levels, R1

A low-level engine continuum from Northern Dune was audible throughout the measurement at noise levels that were not measurable due to interference from other low-frequency noise sources.

Birds were primarily responsible for the measured L_{A1}, L_{A10}, and L_{Aeq}. Road traffic and a local industrial continuum generated the measured L_{A50} and L_{A90}, and contributed to the measured L_{Aeq}.

5.1.2 R2

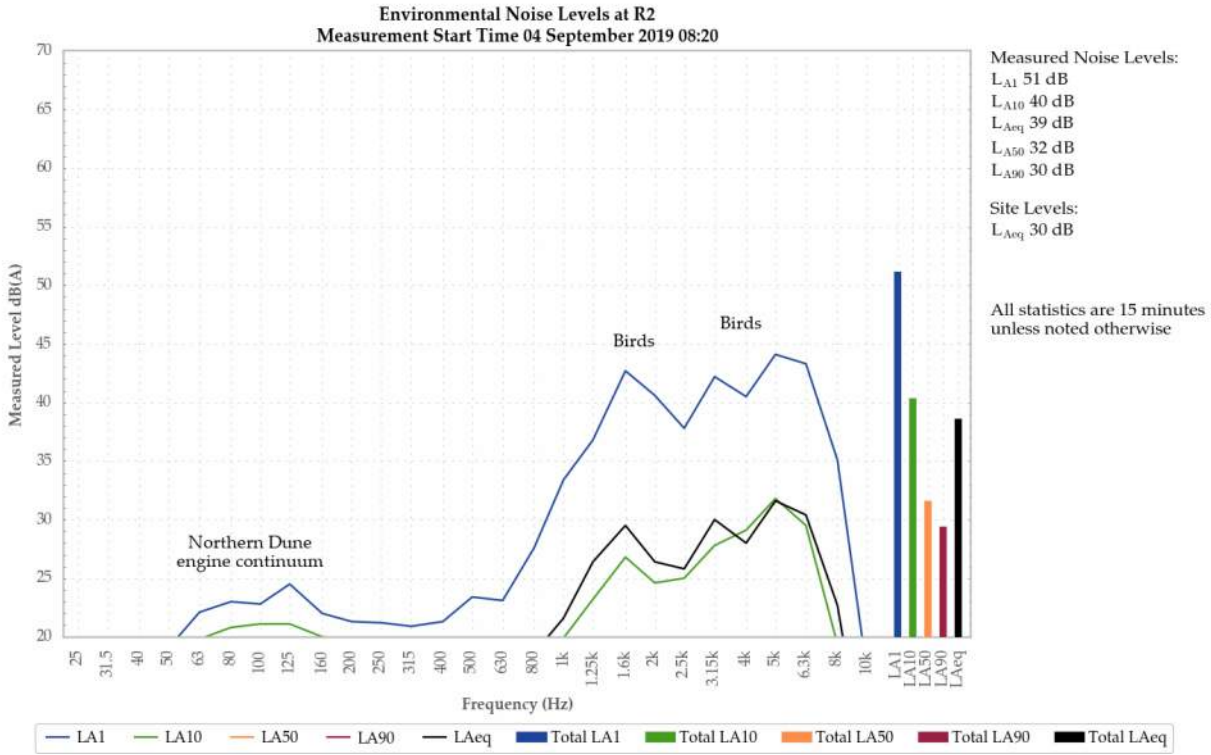


Figure 4: Environmental Noise Levels, R2

An engine continuum from Northern Dune was audible throughout the measurement generating the site-only L_{Aeq} of 30 dB. Track noise was also noted.

Birds generated the measured L_{A1}, L_{A10}, and L_{Aeq}. Birds and continuum from Northern Dune generated the measured L_{A50} and L_{A90}.

An aircraft was also noted.

5.1.3 R3

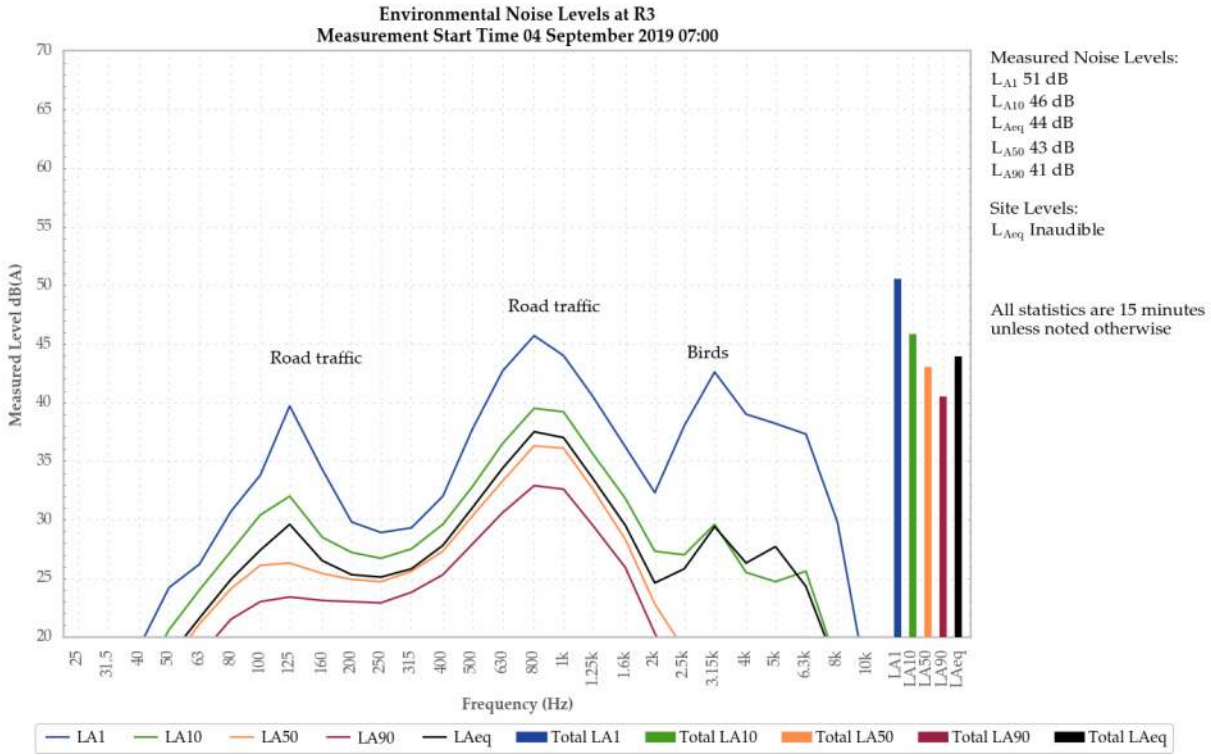


Figure 5: Environmental Noise Levels, R3

Northern Dune was inaudible during the measurement.

Road traffic noise generated all measured noise levels.

Birds were also noted.

6 SUMMARY

Global Acoustics was engaged by Sibelco Australia to conduct a quarterly noise survey of operations at the Northern Dune site, a sand quarry located near Salt Ash, NSW. The survey purpose was to quantify and describe the existing acoustic environment around the quarry and compare results with relevant limits.

Noise levels from Northern Dune complied with the relevant criteria at all monitoring locations during the Quarter 3 2019 survey.

Global Acoustics Pty Ltd

APPENDIX

A REGULATOR DOCUMENTS

Sections of the Noise Management Plan are reproduced below.

A.2 Noise Criteria

Noise criteria have been provided for the project in the Development Approval. This is contained in Schedule 3, condition 2. The condition requires that operational noise generated by the project does not exceed the noise impact assessment criteria in the below table, at any residence on privately-owned land.

Table E1 – Noise criteria

Receiver	$L_{Aeq\ (15\ min)}$ dB(A)
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

A.3 Noise Monitoring

The noise monitoring program has been written to comply with the NSW Industrial Noise Policy.

A.3.1 Monitoring program

Monitoring will be conducted as per the below schedule:

Table E2 – Monitoring Program

Location	Monitoring	Frequency
Resident R1 – 18 Oyster Cove Road	Attended noise monitoring	At least once prior to operation commencing Quarterly for first two years

Location	Monitoring	Frequency
Resident R2 – 16 Rutile Road	Attended noise monitoring	At least once prior to operation commencing Quarterly for first two years
Resident R3 – 2 Oyster Cove Road	Attended noise monitoring	At least once prior to operation commencing Quarterly for first two years

A.3.2 Monitoring conditions

Monitoring will be conducted during normal operating hours and must be conducted on a day where at least 30 truck movements are scheduled.

Monitoring will **not** occur in the following situations:

- If it is raining
- If wind speeds are over 5 m/s (18km/hr)
- If extraneous noise sources are present (ie noise not typical to the area)

A.3.3 Monitoring equipment

Sound level meters used for monitoring must meet the specifications of a precision (Type 0 or 1) or general purpose (Type 2) sound level meter, as outlined in AS 1259 and referenced in the NSW Industrial Noise Policy.

It is noted that AS 1259 has been superseded by AS IEC 61672.1:2004.

For the purposes of noise monitoring at Northern Dune, a Type 2/ Class 1 or 2 sound level meter is required. This type of meter is suitable for general field applications.

Noise meters should be supplied with a current laboratory calibration certificate in accordance with AS IEC 61672.1:2004.

Sections of the Project Approval (09_991) are reproduced below.

Impact Assessment Criteria

2. The Proponent shall ensure that the operational noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land.

Table 1: Noise impact assessment criteria

Receiver	$L_{Aeq\ (15\ min)}$ dB(A)
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

Notes:

- *Receiver locations are shown in the Figure in Appendix 2; and*
- *Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*

Hours of Operation

3. The Proponent shall only conduct quarrying operations on the site:
   (a) between 7.00 am and 6.00 pm EST, Monday to Friday;
   (b) between 7.00 am and 7.00 pm DST, Monday to Friday; and
   (c) at no time on Saturday, Sunday or public holidays.

Operating Conditions

4. The Proponent shall:
   (a) implement best practice noise management to minimise the construction, operational and traffic noise of the project;
   (b) maintain the effectiveness of any noise suppression equipment on site at all times and ensure defective equipment is not used operationally until fully repaired; and
   (c) conduct extraction activities in a south to north direction so that the topography shields the sensitive receivers,

   to the satisfaction of the Director-General.

Noise Monitoring Program

5. The Proponent shall prepare and implement a Noise Monitoring Program for the project to the satisfaction of the Director-General. This program must:
   (a) be submitted to the Director-General for approval prior to commencing quarrying operations;
   (b) include quarterly attended noise monitoring during at least the first two years of quarrying operations, to be conducted on days when at least 30 truck dispatches occur from the site; and
   (c) include details of how the noise performance of the project would be monitored, and include a noise monitoring protocol for evaluating compliance with the noise criteria in this approval.

Sections of the EPL (No. 11633) are reproduced below.

L2 Noise limits

L2.1 Noise generated at the premises must not exceed the noise limits specified in the table below.

Receivers	Noise Limit dB(A) - Day - LAeq (15 minute)	Noise Limit dB(A) - Evening - LAeq (15 minute)
R1, R2, R3 and all residences in Oyster Cove	37	37
All other receivers	35	35

Note: For the purposes of the noise table above receiver locations are shown in Appendix 2 of Project Approval 09_0091, dated 8 March 2012.

L2.2 For the purposes of the conditions of this licence:
- Day is defined as the period from 7am to 6pm; and
- Evening is defined as the period 6pm to 10pm.

L2.3 To determine compliance with the LAeq(15 minute) noise limits referred to above, the noise measurement equipment must be located;
a) at the most effected point at a location where there is no dwelling at the location; or
b) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
c) within 30 metres of a dwelling fascade, but not closer than 3 metres, where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or
d) where applicable, within approximately 50 metres of the boundary of a National Park or a Nature Reserve.

L2.4 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

APPENDIX

B CALIBRATION CERTIFICATES

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013

Calibration Certificate

Calibration Number C18363

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	Rion NA-28
Instrument Serial Number :	01070590
Microphone Serial Number :	08184
Pre-amplifier Serial Number :	52329

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	21.3°C	**Ambient Temperature :**	22.7°C
Relative Humidity :	41.7%	**Relative Humidity :**	39.2%
Barometric Pressure :	100.95kPa	**Barometric Pressure :**	100.89kPa

Calibration Technician : Lucky Jaiswal
Calibration Date : 25 Jun 2018
Secondary Check: Lewis Boorman
Report Issue Date : 25 Jun 2018

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.12dB*	*Temperature*	*±0.05°C*
12.5kHz	*±0.18dB*	*Relative Humidity*	*±0.46%*
16kHz	*±0.31dB*	*Barometric Pressure*	*±0.017kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Accredited for compliance with ISO/IEC 17025 - calibration.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Calibrator

IEC 60942-2017

Calibration Certificate

Calibration Number C19029

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : Pulsar Model 106
Instrument Serial Number : 79631

Atmospheric Conditions
Ambient Temperature : 23.1°C
Relative Humidity : 58.2%
Barometric Pressure : 99.49kPa

Calibration Technician : Charlie Neil
Calibration Date : 22 Jan 2019
Secondary Check: Lewis Boorman
Report Issue Date : 24 Jan 2019

Approved Signatory : Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Measured Output	94.0	1000.0	94.3	1000.38

The sound calibrator has been shown to conform to the class 2 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.11dB*	*Temperature*	*±0.2°C*
Frequency	*±0.01%*	*Relative Humidity*	*±2.4%*
Distortion	*±0.5%*	*Barometric Pressure*	*±0.013kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

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PAGE 1 OF 1

Northern Dune

Environmental Noise Monitoring

Quarter 4 2019

Prepared for

Sibelco Australia Limited

Global Acoustics

Noise and Vibration Analysis and Solutions

Global Acoustics Pty Ltd
PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333
Email global@globalacoustics.com.au
ABN 94 094 985 734

Northern Dune

Quarter 4 2019
Environmental Noise Monitoring

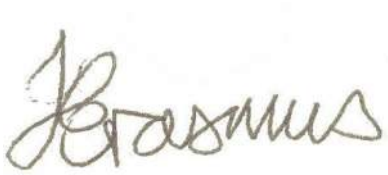
Reference: 19311_R01
Report date: 5 December 2019

Prepared for

Sibelco Australia Limited
8 Oakvale Drive
Salt Ash NSW 2333

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared:	Jonathan Erasmus Consultant	QA Review:	Robert Kirwan Consultant

Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

Table of Contents

Appendices

1 INTRODUCTION

1.1 Background

Global Acoustics was engaged by Sibelco Australia to conduct a quarterly noise survey of operations at the Northern Dune site, a sand quarry located near Salt Ash, NSW. The survey purpose was to quantify and describe the existing acoustic environment around the quarry and compare results with relevant limits.

Attended environmental noise monitoring described in this report was undertaken during the day period of 28 November 2019 at three monitoring locations.

1.2 Monitoring Locations

Monitoring locations are detailed in Table 1.1 and shown on Figure 1. It should be noted that Figure 1 shows the actual monitoring position, not the location of residences.

Table 1.1: NORTHERN DUNE MONITORING LOCATIONS

Report Descriptor	Monitoring Location
R1	18 Oyster Cove Road, Oyster Cove
R2	16 Rutile Road, Oyster Cove
R3	2 Oyster Cove Road, Salt Ash

1.3 Quarry Operations

The Noise Monitoring Program (NMP) for site states that monitoring shall be conducted on a day when at least 30 truck dispatches are scheduled.

Figure 1 Northern Dune Attended Noise Monitoring Locations

1.4 Terminology & Abbreviations

Some definitions of terms and abbreviations which may be used in this report are provided in Table 1.2.

Table 1.2: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
dB(A)	Noise level measurement units are decibels (dB). The "A" weighting scale is used to describe human response to noise.
L_{Amax}	The maximum A-weighted noise level over a time period.
L_{A1}	The noise level which is exceeded for 1 per cent of the time.
$L_{A1,1minute}$	The noise level which is exceeded for 1 per cent of the specified time period of 1 minute.
L_{A10}	The noise level which is exceeded for 10 percent of the time.
L_{Aeq}	The average noise A-weighted energy during a measurement period.
L_{A50}	The noise level which is exceeded for 50 per cent of the time and the median noise level during a measurement period.
L_{A90}	The level exceeded for 90 percent of the time. The L_{A90} level is often referred to as the "background" noise level and is commonly used to determine noise criteria for assessment purposes.
L_{Amin}	The minimum A-weighted noise level over a time period.
L_{Ceq}	The average C-weighted noise energy during a measurement period. The "C" weighting scale is used to take into account low-frequency components of noise within the audibility range of humans.
SPL	Sound pressure level. Fluctuations in pressure measured as 10 times a logarithmic scale, with the reference pressure being 20 micropascals.
Hertz (Hz)	The frequency of fluctuations in pressure, measured in cycles per second. Most sounds are a combination of many frequencies together.
AWS	Automatic weather station used to collect meteorological data, typically at an altitude of 10 metres
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude.
Sigma-theta	The standard deviation of the horizontal wind direction over a period of time.
SC	Stability class (or category) is determined from measured wind speed and either sigma-theta or VTG.
IA	Inaudible. When site noise is noted as IA then there was no site noise at the monitoring location.
NM	Not Measurable. If site noise is noted as NM, this means some noise was audible but could not be quantified.
Day	This is the period 7:00am to 6:00pm.
Evening	This is the period 6:00pm to 10:00pm.
Night	This is the period 10:00pm to 7:00am.

2 REGULATOR REQUIREMENTS AND NOISE CRITERIA

2.1 Project Approval

The most current approval associated with activities at the Tanilba Northern Dune Extension Project is Project Approval 09_0091 (PA, March 2013). Schedule 3 of the project approval details specific conditions relating to noise generated by Northern Dune. Relevant sections of the Project Approval have been included in Appendix A.

2.2 Environment Protection Licence

Sibelco holds Environment Protection Authority (EPA) Environment Protection Licence (EPL) No. 11633. Noise requirements are detailed in condition L2 of the EPL. Relevant sections of the licence are reproduced in Appendix A.

2.3 Noise Monitoring Program

Sibelco have prepared a Noise Monitoring Program (NMP) for their Northern Dune site, as required by their PA. Relevant sections have been reproduced in Appendix A.

Section 3.2 of the NMP details monitoring conditions, including the requirement for monitoring to occur on a day where at least 30 truck movements are scheduled. Monitoring will also not occur in the following situations:

- If it is raining;
- If wind speeds are over 5 m/s (18 km/h); and
- If extraneous noise sources are present (noise not typical to the area).

2.4 Noise Critiera

Day time impact assessment criteria for the Northern Dune site are detailed in Table 2.1. These criteria are consistent between the Project Approval and EPL.

Table 2.1: $L_{Aeq,15minute}$ PROJECT SPECIFIC CRITERIA

Receiver	Impact Assessment Criteria $L_{Aeq,15minute}$
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

3 METHODOLOGY

3.1 Overview

Attended environmental noise monitoring was conducted in general accordance with Australian Standard AS1055 'Acoustics, Description and Measurement of Environmental Noise', relevant NSW EPA requirements, and Northern Dune NMP. Meteorological data was obtained from the Bureau of Meteorology Williamtown automatic weather station (AWS) which allowed correlation of atmospheric parameters with measured noise levels.

3.2 Attended Noise Monitoring

During this survey, monthly attended monitoring was undertaken during the day period at each location. The duration of each measurement was 15 minutes. Atmospheric condition measurement was also undertaken at each monitoring location.

Attended monitoring is preferred to the use of noise loggers when determining compliance with prescribed limits as it allows an accurate determination of the contribution, if any, to measured noise levels by the source of interest (in this case Northern Dune).

This survey presents noise levels gathered during attended monitoring that are the result of many sounds reaching the sound level meter microphone during monitoring. Received levels from various noise sources were noted during attended monitoring and particular attention was paid to the extent of Northern Dune's contribution, if any, to measured levels. At each receptor location, Northern Dune's $L_{Aeq,15minute}$ and $L_{A1,1minute}$ (in the absence of any other noise) was measured directly, where possible, or, determined by frequency analysis.

If the exact contribution of the source of interest cannot be established, due to masking by other noise sources in a similar frequency range, but site noise levels are observed to be well below (more than 5 dB lower than) any relevant criterion, a maximum estimate of the potential contribution of the site might be made based on other measured site-only noise descriptors in accordance with Section 7.1 of the NPfI. This is generally expressed as a 'less than' quantity, such as <20 dB or <30 dB.

The terms 'Inaudible' (IA) or 'Not Measurable' (NM) may also be used in this report. When site noise is noted as IA, no site noise was audible at the monitoring location. When site noise is noted as NM, this means some noise was audible but could not be quantified. If site noise was NM due to masking but estimated to be significant in relation to a relevant criterion, we would employ methods (e.g. measure closer and back calculate) to determine a value for reporting.

All sites noted as NM in this report are due to one or more of the following reasons:

- Site noise levels were extremely low and unlikely, in many cases, to be even noticed;

- Site noise levels were masked by another relatively loud noise source that is characteristic of the environment (e.g. breeze in foliage or continuous road traffic noise) that cannot be eliminated by moving closer; and/or

- It was not feasible, nor reasonable to employ methods such as move closer and back calculate. Cases may include, but are not limited to, rough terrain preventing closer measurement, addition/removal of significant source to receiver shielding caused by moving closer, and meteorological conditions where back calculation may not be accurate.

3.3 Modifying Factors

Modifying factors have not been considered as part of this compliance assessment as it consists of daytime operations only in a complex acoustic environment including frequent noise from aircraft.

3.4 Monitoring Equipment

The equipment used to measure environmental noise levels is detailed in Table 3.1. Calibration certificates are provided in Appendix B.

Table 3.1: MONITORING EQUIPMENT

Model	Serial Number	Calibration Due Date
Rion NA-28 sound level analyser	30131882	05/02/2021
Pulsar 105 acoustic calibrator	78226	01/02/2021

4 RESULTS

4.1 Total Measured Noise Levels

Overall noise levels measured at each location during attended measurements are provided in Table 4.1. Discussion as to the noise sources responsible for these measured levels is provided in Section 5 of this report.

Table 4.1: MEASURED NOISE LEVELS – QUARTER 4 2019

Location	Start Date and Time	L_{Amax} dB	L_{A1} dB	L_{A10} dB	L_{Aeq} dB	L_{A50} dB	L_{A90} dB	L_{Amin} dB	L_{Ceq} dB
R1	28/11/2019 10:40	62	53	46	43	38	35	32	54
R2	28/11/2019 11:05	67	61	49	48	44	37	33	59
R3	28/11/2019 09:42	67	59	57	56	56	54	50	57

Notes:

1. *Levels in this table are not necessarily the result of activity at the Northern Dune site.*

4.2 Attended Noise Monitoring

Table 4.2 details noise levels from Northern Dune in the absence of other noise sources. Noise criteria are applicable if weather conditions were within specified parameters during the measurement.

Table 4.2: $L_{Aeq,15minute}$ GENERATED BY NORTHERN DUNE AGAINST IMPACT ASSESSMENT CRITERIA – QUARTER 4 2019

Location	Start Date and Time	Wind Speed m/s	Rain mm	Criterion dB	Criterion Applies?[1]	Northern Dune $L_{Aeq,15min}$ dB[2,3]	Exceedance[3,4]
R1	28/11/2019 10:40	4.1	0.0	37	Yes	IA	Nil
R2	28/11/2019 11:05	4.1	0.0	37	Yes	IA	Nil
R3	28/11/2019 09:42	2.1	0.0	37	Yes	IA	Nil

Notes:

1. *Noise criteria apply under all meteorological conditions except during rain or wind speeds greater than 5 m/s;*
2. *Site-only $L_{Aeq,15minute}$ attributed to the Northern Dune site;*
3. *Bold results in red indicate exceedance of relevant criterion; and*
4. *NA in exceedance column means criterion was not applicable due to atmospheric conditions outside those specified in the NMP.*

4.3 Atmospheric Conditions

Atmospheric condition data measured by the operator during each measurement using a Kestrel hand-held weather meter is shown in Table 4.3. The wind speed, direction and temperature were measured at approximately 1.8 metres. Attended noise monitoring is not undertaken during rain, hail, or wind speeds above 5 m/s at microphone height.

Table 4.3: MEASURED ATMOSPHERIC CONDITIONS – QUARTER 4 2019

Location	Start Date and Time	Temperature ° C	Wind Speed m/s	Wind Direction ° Magnetic North[1]	Cloud Cover 1/8s
R1	28/11/2019 10:40	25	1.3	320	0
R2	28/11/2019 11:05	28	1.0	210	0
R3	28/11/2019 09:42	25	0.0	-	2

Notes:

1. *"-" indicates calm conditions at monitoring location.*

Meteorological data used for compliance assessment is sourced from the Williamtown AWS.

5 DISCUSSION

5.1 Noted Noise Sources

During attended monitoring, the time variations (temporal characteristics) of noise sources are taken into account in each measurement via statistical descriptors. From these observations, summaries have been derived for each location and provided in this chapter. Statistical 1/3 octave-band analysis of environmental noise was undertaken and the following figures display frequency ranges of various noise sources at each location for L_{A1}, L_{A10}, L_{Aeq}, L_{A50} and L_{A90} descriptors. These figures also provide, graphically, statistical information for these noise levels.

An example is provided as Figure 2 where it can be seen that frogs and insects are generating noise at frequencies above 1000 Hz while mining noise is at frequencies less than 1000 Hz, which is typical. Adding levels at frequencies that relate to mining only allows separate statistical results to be calculated. This analysis cannot always be performed if there are significant levels of other noise at the same frequencies as mining, such as dogs, cows, or (most commonly) road traffic.

It should be noted that the method of summing statistical values up to a cut-off frequency can overstate the L_{A1} result by a small margin but is entirely accurate for L_{Aeq}.

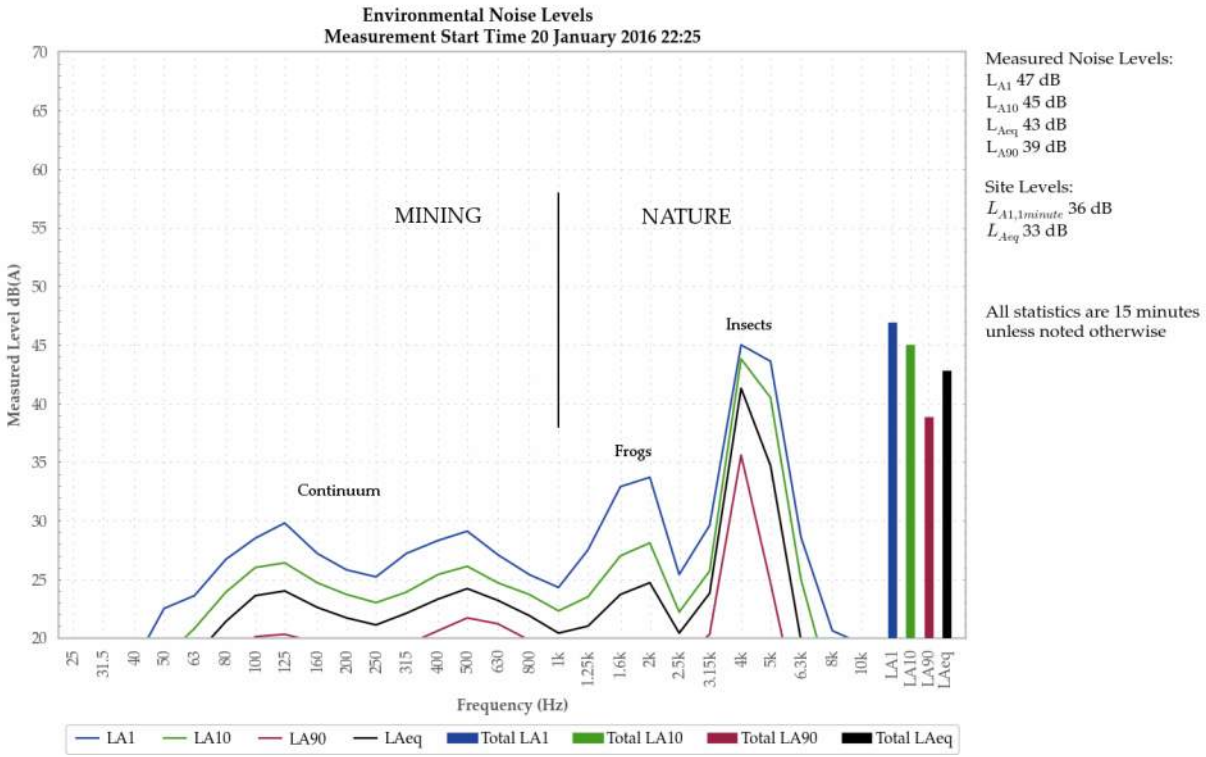


Figure 2: Sample Graph (see Section 5.1 for explanatory note)

5.1.1 R1

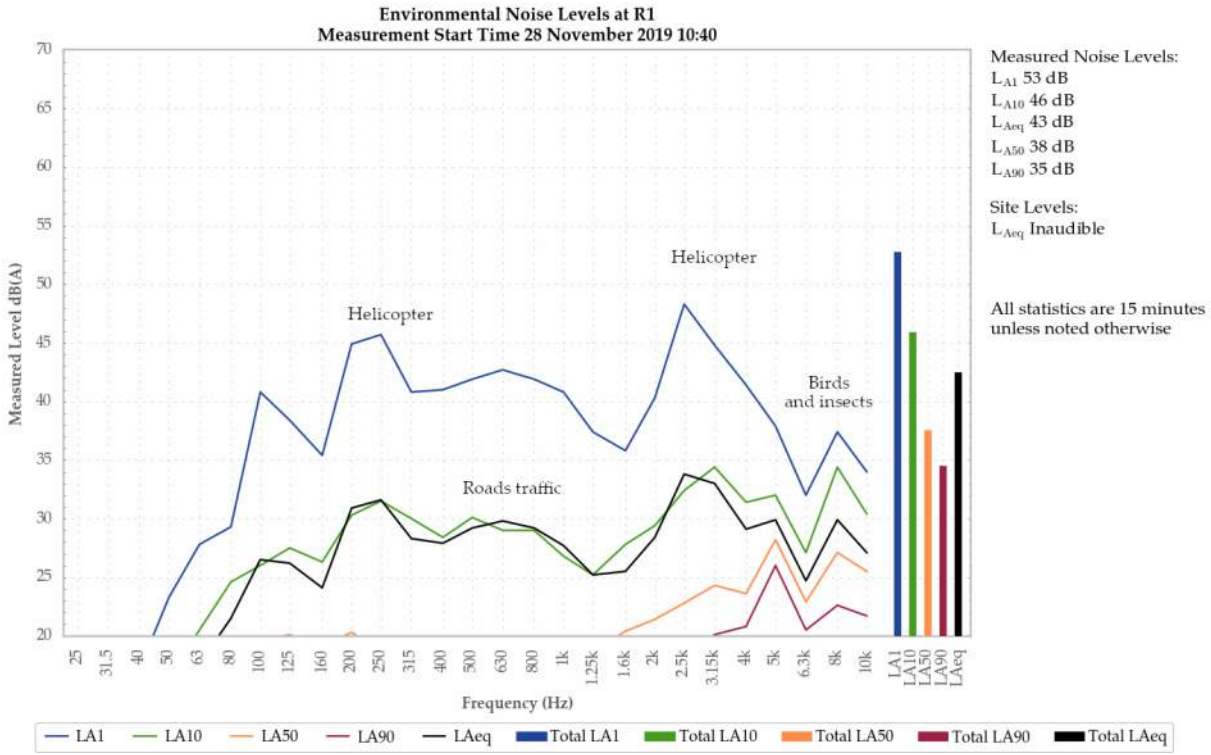


Figure 3: Environmental Noise Levels, R1

Northern Dune was inaudible during the measurement.

A helicopter generated the measured L_{A1}, L_{A10}, and L_{Aeq}. Insects generated the measured L_{A50} and L_{A90}.

A local continuum and road traffic were also noted.

5.1.2 R2

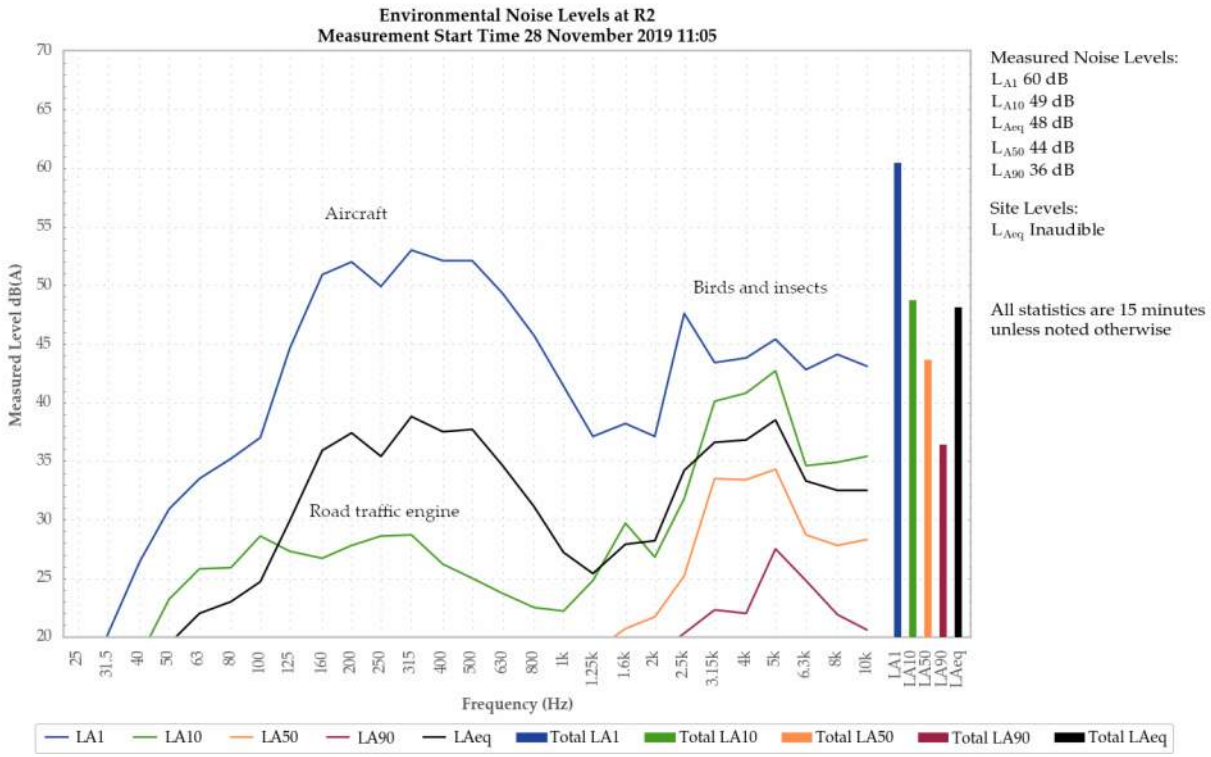


Figure 4: Environmental Noise Levels, R2

Northern Dune was inaudible during the measurement.

Aircraft, birds, and insects generated the measured L_{A1} and L_{Aeq}. Insects generated the measured L_{A10}, L_{A50}, and L_{A90}.

Road traffic was also noted.

5.1.3 R3

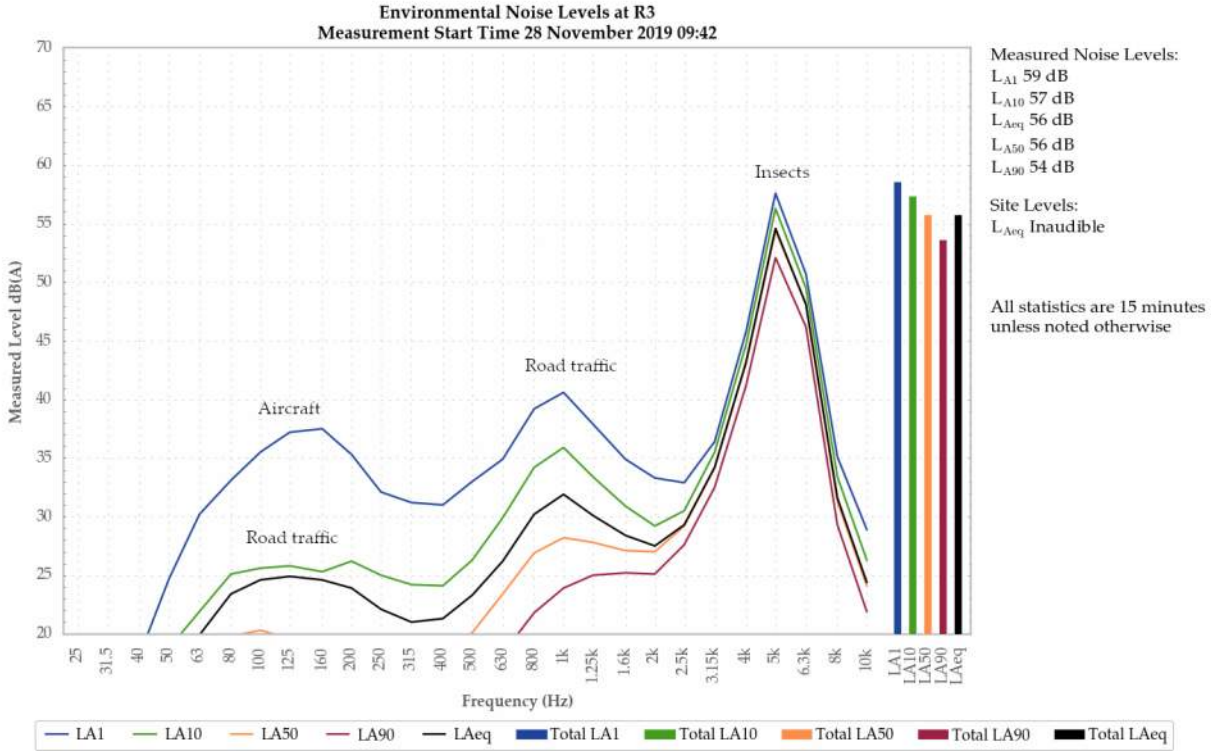


Figure 5: Environmental Noise Levels, R3

Northern Dune was inaudible during the measurement.

Insects generated the measured L_{A1}, L_{A10}, L_{Aeq}, L_{A50}, and L_{A90}.

Road traffic, aircraft, and dogs were also noted.

6 SUMMARY

Global Acoustics was engaged by Sibelco Australia to conduct a quarterly noise survey of operations at the Northern Dune site, a sand quarry located near Salt Ash, NSW. The survey purpose was to quantify and describe the existing acoustic environment around the quarry and compare results with relevant limits.

Noise levels from Northern Dune complied with the relevant criteria at all monitoring locations during the Quarter 4 2019 survey.

Global Acoustics Pty Ltd

APPENDIX

A REGULATOR DOCUMENTS

Sections of the Noise Management Plan are reproduced below.

A.2 Noise Criteria

Noise criteria have been provided for the project in the Development Approval. This is contained in Schedule 3, condition 2. The condition requires that operational noise generated by the project does not exceed the noise impact assessment criteria in the below table, at any residence on privately-owned land.

Table E1 – Noise criteria

Receiver	$L_{Aeq\ (15\ min)}$ dB(A)
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

A.3 Noise Monitoring

The noise monitoring program has been written to comply with the NSW Industrial Noise Policy.

A.3.1 Monitoring program

Monitoring will be conducted as per the below schedule:

Table E2 – Monitoring Program

Location	Monitoring	Frequency
Resident R1 – 18 Oyster Cove Road	Attended noise monitoring	At least once prior to operation commencing Quarterly for first two years

Location	Monitoring	Frequency
Resident R2 – 16 Rutile Road	Attended noise monitoring	At least once prior to operation commencing Quarterly for first two years
Resident R3 – 2 Oyster Cove Road	Attended noise monitoring	At least once prior to operation commencing Quarterly for first two years

A.3.2 Monitoring conditions

Monitoring will be conducted during normal operating hours and must be conducted on a day where at least 30 truck movements are scheduled.

Monitoring will **not** occur in the following situations:

- If it is raining
- If wind speeds are over 5 m/s (18km/hr)
- If extraneous noise sources are present (ie noise not typical to the area)

A.3.3 Monitoring equipment

Sound level meters used for monitoring must meet the specifications of a precision (Type 0 or 1) or general purpose (Type 2) sound level meter, as outlined in AS 1259 and referenced in the NSW Industrial Noise Policy.

It is noted that AS 1259 has been superseded by AS IEC 61672.1:2004.

For the purposes of noise monitoring at Northern Dune, a Type 2/ Class 1 or 2 sound level meter is required. This type of meter is suitable for general field applications.

Noise meters should be supplied with a current laboratory calibration certificate in accordance with AS IEC 61672.1:2004.

Sections of the Project Approval (09_991) are reproduced below.

Impact Assessment Criteria

2. The Proponent shall ensure that the operational noise generated by the project does not exceed the noise impact assessment criteria in Table 1 at any residence on privately-owned land.

Table 1: Noise impact assessment criteria

Receiver	$L_{Aeq\ (15\ min)}$ dB(A)
R1, R2, R3 and all residences in Oyster Cove	37
All other receivers	35

Notes:

- *Receiver locations are shown in the Figure in Appendix 2; and*
- *Noise generated by the project is to be measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the NSW Industrial Noise Policy.*

Hours of Operation

3. The Proponent shall only conduct quarrying operations on the site:
   (a) between 7.00 am and 6.00 pm EST, Monday to Friday;
   (b) between 7.00 am and 7.00 pm DST, Monday to Friday; and
   (c) at no time on Saturday, Sunday or public holidays.

Operating Conditions

4. The Proponent shall:
   (a) implement best practice noise management to minimise the construction, operational and traffic noise of the project;
   (b) maintain the effectiveness of any noise suppression equipment on site at all times and ensure defective equipment is not used operationally until fully repaired; and
   (c) conduct extraction activities in a south to north direction so that the topography shields the sensitive receivers,

   to the satisfaction of the Director-General.

Noise Monitoring Program

5. The Proponent shall prepare and implement a Noise Monitoring Program for the project to the satisfaction of the Director-General. This program must:
   (a) be submitted to the Director-General for approval prior to commencing quarrying operations;
   (b) include quarterly attended noise monitoring during at least the first two years of quarrying operations, to be conducted on days when at least 30 truck dispatches occur from the site; and
   (c) include details of how the noise performance of the project would be monitored, and include a noise monitoring protocol for evaluating compliance with the noise criteria in this approval.

Sections of the EPL (No. 11633) are reproduced below.

L2 Noise limits

L2.1 Noise generated at the premises must not exceed the noise limits specified in the table below.

Receivers	Noise Limit dB(A) - Day - LAeq (15 minute)	Noise Limit dB(A) - Evening - LAeq (15 minute)
R1, R2, R3 and all residences in Oyster Cove	37	37
All other receivers	35	35

Note: For the purposes of the noise table above receiver locations are shown in Appendix 2 of Project Approval 09_0091, dated 8 March 2012.

L2.2 For the purposes of the conditions of this licence:
- Day is defined as the period from 7am to 6pm; and
- Evening is defined as the period 6pm to 10pm.

L2.3 To determine compliance with the LAeq(15 minute) noise limits referred to above, the noise measurement equipment must be located;
a) at the most effected point at a location where there is no dwelling at the location; or
b) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
c) within 30 metres of a dwelling fascade, but not closer than 3 metres, where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or
d) where applicable, within approximately 50 metres of the boundary of a National Park or a Nature Reserve.

L2.4 For the purposes of determining the noise generated at the premises the modification factors in Section 4 of the NSW Industrial Noise Policy must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

APPENDIX

B CALIBRATION CERTIFICATES

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013

Calibration Certificate

Calibration Number C19073

Client Details Global Acoustics Pty Ltd
12/16 Huntingdale Drive
Thornton NSW 2322

Equipment Tested/ Model Number : NA-28
Instrument Serial Number : 30131882
Microphone Serial Number : 04739
Pre-amplifier Serial Number : 11942

Pre-Test Atmospheric Conditions
Ambient Temperature : 24.5°C
Relative Humidity : 54.5%
Barometric Pressure : 99.39kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 23.6°C
Relative Humidity : 51%
Barometric Pressure : 99.36kPa

Calibration Technician : Charlie Neil
Calibration Date : 5 Feb 2019
Secondary Check: Lewis Boorman
Report Issue Date : 6 Feb 2019

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	Pass	17: Level linearity incl. the level range control	Pass
13: Electrical Sig. tests of frequency weightings	Pass	18: Toneburst response	Pass
14: Frequency and time weightings at 1 kHz	Pass	19: C Weighted Peak Sound Level	Pass
15: Long Term Stability	Pass	20: Overload Indication	Pass
16: Level linearity on the reference level range	Pass	21: High Level Stability	Pass

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed.

As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation test performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2013

Least Uncertainties of Measurement -

Acoustic Tests
31.5 Hz to 8kHz ±0.15dB
12.5kHz ±0.2dB
16kHz ±0.29dB
Electrical Tests
31.5 Hz to 20 kHz ±0.11dB

Environmental Conditions
Temperature ±0.2°C
Relative Humidity ±2.4%
Barometric Pressure ±0.015kPa

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

PAGE 1 OF 1

Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Calibrator
IEC 60942-2017

Calibration Certificate

Calibration Number C19074

Client Details	Global Acoustics Pty Ltd 12/16 Huntingdale Drive Thornton NSW 2322
Equipment Tested/ Model Number :	Model 105
Instrument Serial Number :	78226

Atmospheric Conditions

Ambient Temperature :	23.8°C
Relative Humidity :	53.7%
Barometric Pressure :	100.09kPa

Calibration Technician :	Charlie Neil	**Secondary Check:**	Lewis Boorman
Calibration Date :	1 Feb 2019	**Report Issue Date :**	6 Feb 2019
Approved Signatory :			Ken Williams

Characteristic Tested	Result
Generated Sound Pressure Level	*Pass*
Frequency Generated	*Pass*
Total Distortion	*Pass*

	Nominal Level	Nominal Frequency	Measured Level	Measured Frequency
Pre Adjustment	94.0	1000.0	94.4	1000.38
Post Adjustment	94.0	1000.0	94.1	1000.39

The sound calibrator has been shown to conform to the class 1 requirements for periodic testing, described in Annex B of IEC 60942:2017 for the sound pressure level(s) and frequency(ies) stated, for the environmental conditions under which the tests were performed.

Least Uncertainties of Measurement -

Specific Tests		Environmental Conditions	
Generated SPL	*±0.11dB*	*Temperature*	*±0.2°C*
Frequency	*±0.01%*	*Relative Humidity*	*±2.4%*
Distortion	*±0.45%*	*Barometric Pressure*	*±0.015kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

PAGE 1 OF 1

APPENDIX 3
NEST BOX MONITORING REPORT

Kleinfelder Australia Pty Ltd
ABN: 23 146 082 500
95 Mitchell Road
Cardiff NSW 2285
T| 02 4949 5200 **F|** 1300 881 035
www.kleinfelder.com/australia

12 February 2020
Document No: NCA20R105843

Attention: Michael Lynch
QSE Coordinator
Sibelco Australia Limited
8 Oakvale Drive
Salt Ash NSW 2318

Delivered by email: Michael.Lynch.ext@sibelco.com.au

Subject: 2019 Annual Nest Box Monitoring at the Northern Offset Area – Northern Dune Extension Project

This report outlines the 2019 findings of the annual nest box monitoring program at the Northern Offset Area – Northern Dune Extension Project, Oyster Bay NSW.

Background

In December 2015, Kleinfelder installed 52 nest boxes within the Northern Offset Area as per the offset requirements for the Tanilba Northern Dune Extension Project (**Figure 1**). The following types of nest boxes were installed within the Northern Offset Area:

- 16 Microchiropteran bat boxes;
- 34 Glider boxes; and
- 2 Possum boxes.

As per the Nest Box Installation and Monitoring Protocol within the Biodiversity Management Plan – Tanilba Northern Dune Extension (Kleinfelder 2014), the 52 nest boxes were required to be monitored annually for a period of six years (**Figure 2**). In 2018 fire destroyed six nest boxes (three Bat and three Glider boxes) which were replaced after the 2018 monitoring. This is the third survey conducted by Kleinfelder on behalf of Sibelco Australia.

Monitoring methods

Two Kleinfelder Ecologists, Nigel Fisher and Kane Blundell, with experience and accreditation in handling animals and working at heights attended the site on 3 December 2019.

km
0 0.1 0.2 0.4 0.6 0.8 1

N

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PROJECT REFERENCE: 20202773

DATE DRAWN: 2020/02/11 12:32 Version 1

DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2018
NSW OEH - 2019

Locality

Sibelco Australia Limited
Nest Box Project
Northern Offset Area

FIGURE:

1

L:\GIS FOLDER\00 CLIENT FILES\89345_UniminAustralia\20202773_NestBox_NorthDunes_2019\Mapping\20202773_Fig1_Locality.mxd

Kleinfelder Australia Pty Ltd
ABN: 23 146 082 500
95 Mitchell Road
Cardiff NSW 2285
T| 02 4949 5200 **F|** 1300 881 035
www.kleinfelder.com/australia

Nest boxes were monitored using a wireless GoPro™ camera mounted on an extension pole capable of reaching heights of over 6 m. A live video feed is transferred wirelessly from the camera to an iPhone device capable of capturing still HD images or video. Images were captured in the field and processed in the office.

A handheld Global Positioning System (GPS), pre-loaded with co-ordinates, was used to locate the boxes. Once a box was located, the pole camera was used to open the lid and to observe the contents.

Status of the boxes were recorded as either:

- A – Animal present;
- E1 – Fresh evidence of use (i.e. fresh nest or scats);
- E2 – Moderately fresh evidence of use (i.e. green leaves but beginning to age);
- E3 – Old signs of use (i.e. old leaf nest, old scats);
- N – No evidence of use;
- NA – Not available for use; and
- X – Missing.

If a box was found to be occupied, an attempt was made to capture the animal for positive identification, where required.

Signs of use include the presence of hair, scats, nesting material or evidence of scratches/physical marks on the entrance of the nest box.

Boxes which contained wasp nests or other pest species, had lids which were open or missing, or had fallen or were missing/destroyed were deemed to be not available for use by target animals.

Results

In 2019, the percentage of all nest boxes exhibiting any sign of use was 48% (25) (**Chart 1**). Eight percent (4) of the total number of nest boxes were determined to be unavailable for use resulting from occupation by pest species such as wasps or bees. This reduces the number of available boxes to 48, but the remaining statistics regarding usage are based upon the original number (52) to provide a more accurate comparison. Use of nest boxes by insects is generally a temporary feature, and as the insects move on, the box becomes available for use by vertebrates.

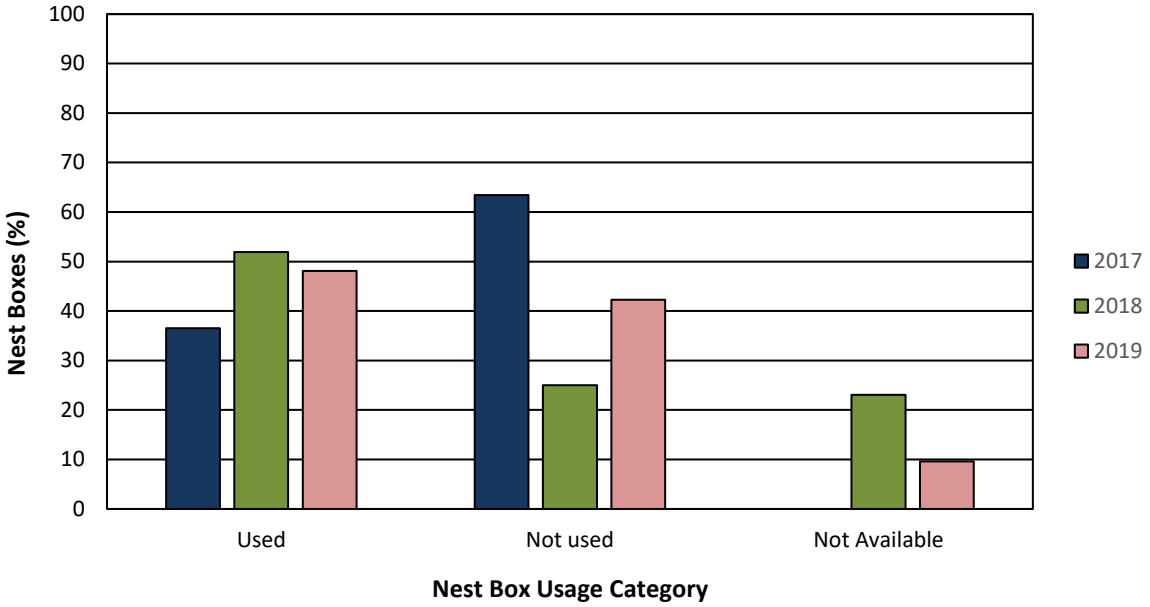

Chart 1: **General usage rates of nest boxes in 2019 and comparison to 2017 & 2018 surveys**

In 2019, no boxes (0%) were observed to have animals present (A). There were no boxes showing recent evidence, and the total number of boxes showing old evidence was 25 boxes, or 48% (**Chart 1**).

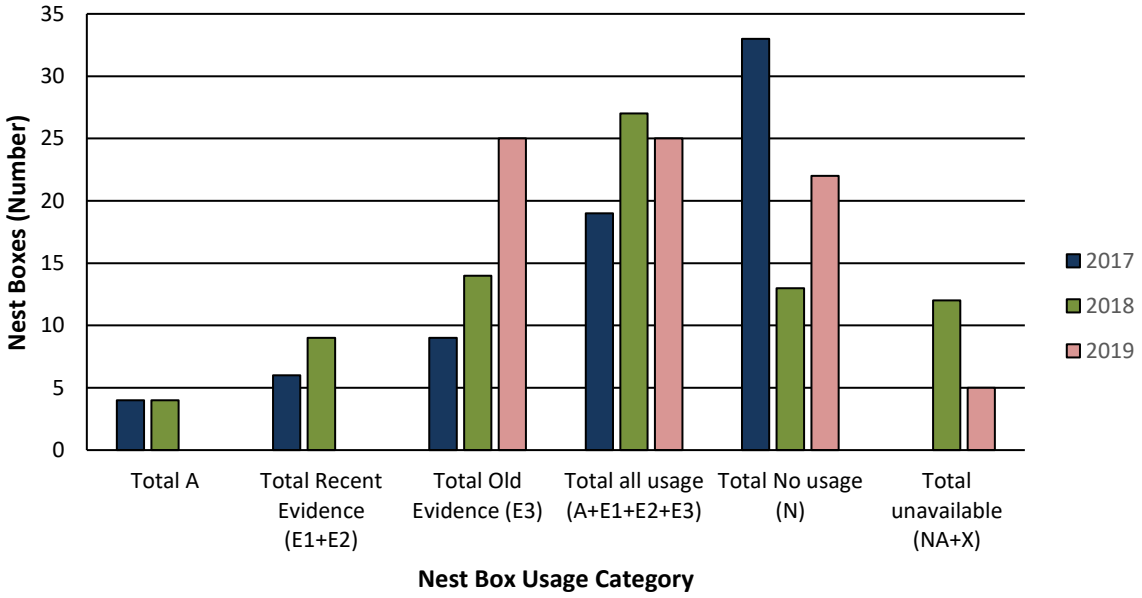

Chart 2: **Detailed usage of nest boxes for the 2019 survey and comparison to the 2017 and 2018 surveys**

Usage per box type in 2019 is shown in **Chart 2**. None of the Possum boxes showed evidence of use, Glider boxes had a utilisation rate of 74% (25 out of 34 boxes) and none of the Bat boxes showed evidence of use.

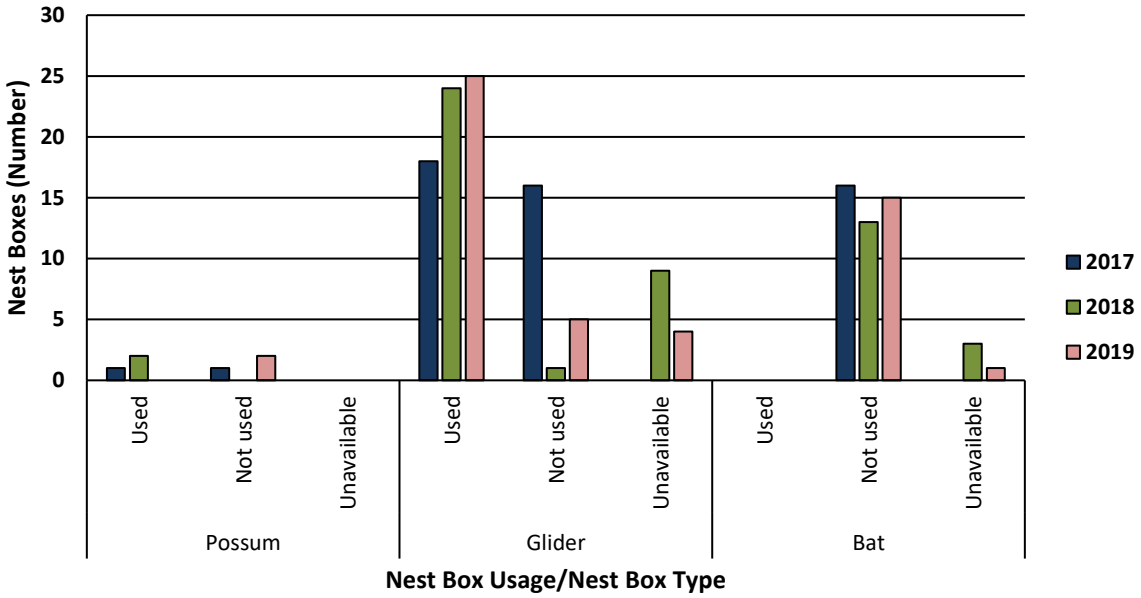

Chart 3: **Detailed usage per nest box type for the 2018 and comparison to the 2017 & 2018 surveys**

An overview of nest box locations and the results of the 2019 monitoring is shown in **Figure 2**. A selection of photographs taken during the 2019 survey are provided in **Appendix 1**.

Metres
0 10 20 40 60 80 100

N

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PROJECT REFERENCE: 20202773

DATE DRAWN: 2020/02/11 12:28 Version 1

DRAWN BY: GJoyce

DATA SOURCE:
Nearmap - 2019
NSW DFSI - 2018
OEH - 2018

Nest Box Locations and Use Northern Offset Area

Sibelco Australia Limited
Nest Box Project
Northern Offset Area

FIGURE:

2

L:\GIS FOLDER\00 CLIENT FILES\89345_UniminAustralia\20202773_NestBox_NorthDunes_2019\Mapping\20202773_Fig2_NestBoxes_Use.mxd

Discussion

This was the third annual monitoring event, and as such results can be compared to the previous surveys undertaken in 2017 and 2018. The 2019 monitoring survey recorded a combined usage rate (incorporating animal's present, recent and old evidence of use) of 48%. This is a slight decrease of 4% from the 2018 survey of 52%. However, there were an extra six boxes available this year after the replacement of the nest boxes destroyed by fire. Raw numbers show that neither of the possum boxes had evidence of usage in 2019, while there were 25 glider boxes showing some evidence of use this year, an increase of one from the 2018 survey. This was one of the replacement boxes (Box No. 2) and as such may have been classified as E2 (moderately recent use) as opposed to E3 (old use).

Last year's survey showed a rapid increase in uptake of the boxes, and several animals were observed in the boxes. This year, no animals were observed. This absence of animals may be explained by the timing of the survey. The 2019 survey was conducted later in the year (December 2019) as opposed to October for the 2018 survey. The animals may have moved out of the boxes with the increase in temperature, prefering to use better insulated natural hollows. This later survey combined with the hotter temperatures may have led to the age of the nesting material being overestimated i.e. nesting material recorded as E3 rather than E2. The prevailing drought conditions may have made food resources scarcer in this area, and thus the Offset was not as attractive as previous years, with the animals moving away into adjoining vegetation.

Summary

The 2019 nest box monitoring program at the Northern Dunes Extension Project site did record any fauna sightings, which given the previous survey results was disappointing. In the absence of actual fauna occupation of the nest boxes and the lack of obviously fresh nesting materials suggests that fauna were not actively using the boxes at the time of the survey. It is strongly recommended that the 2020 survey be conducted in September or October when temperatures are cooler, and fauna are actively raising young.

References

Beyer G and Goldingay R, 2006. The value of nest boxes in the research and management of Australian hollow-using arboreal marsupials. *Wildlife Research* 33(3), 161-174.

Kleinfelder 2014. *Biodiversity Management Plan – Tanilba Northern Dune Extension*. Report prepared by Kleinfelder Australia Pty Ltd for Sibelco Australia Limited.

Kleinfelder 2017. *2017 Annual Nest Box Monitoring at The Northern Offset Area – Northern Dunes Extension Project.* Report prepared by Kleinfelder Australia Pty Ltd for Sibelco Australia Limited.

Kleinfelder 2018. *2018 Annual Nest Box Monitoring at The Northern Offset Area – Northern Dunes Extension Project.* Report prepared by Kleinfelder Australia Pty Ltd for Sibelco Australia Limited.

APPENDIX 1 – SELECTED 2019 FIELD PHOTOGRAPHS

Plate 1: **Old Nest and Chew marks surrounding the entrance of Box 49**

Plate 2: Bees and Wasps occupying Box 34

APPENDIX 4
AMPHIBIAN MONITORING REPORT

14 February 2020
File Ref: NCA20L107439
Document Ref: NCA20L107439

Sibelco Australia Limited
Level 16, 111 Pacific Highway,
North Sydney, NSW 2060

Attention: Peter Dunn

Delivered by email: peter.dunn@sibelco.com.au

Subject: **Targeted Nocturnal Fauna Monitoring within the Northern Dune Extension Biodiversity Offset Areas.**

Targeted fauna monitoring for the Wallum Froglet (*Crinia tinnula*) and Mahony's Toadlet (*Uperoleia mahonyi*) was conducted by Kleinfelder ecologists as part of the requirements outlined in section 5.1.4 of the Biodiversity Management Plan Tanilba Northern Dunes Extension (Kleinfelder, 2014). Monitoring was proposed to be conducted during December 2019, however, limited rainfall prevented surveys during this period. In the interests of conducting surveys during more suitable conditions, conducive to detecting amphibians, surveys were postponed until reasonable rainfall was received. As such, monitoring was conducted by two ecologists over four nights between late January and early February 2020, following periods of rainfall. Surveys were undertaken at night, after rainfall was received (**Table 1**). **Figure 1** represents the northern dune offset areas in which the nocturnal surveys were conducted.

Table 1. Weather conditions during surveys

Date	Temperature (°C)	Humidity (%)	Barometric pressure (hPa)	Wind (spd/direction)	Rain past 24 hours (mm)	Rain past 3 days (mm)
23/01/2020	32	68	1000	-	(light shower at 6pm)	0.8
29/01/2020	26.8	76	1014	2km/h	23	42.3
10/02/2020	20.5	92	1008	9km/h E	66.2	119.2
11/02/2020	24.2	84	1007	11km/h NE	16.2	110.4

Source: Bureau of Meteorology – Williamtown RAAF (061078). Note: no rainfall data for Williamtown on 29/01. Data was collected from Nelson Bay station (061054).

A prior diurnal assessment of the offset areas was conducted to determine habitat suitability. Surveys consisted of a meandering search in each of the designated offset areas for one hour per offset.

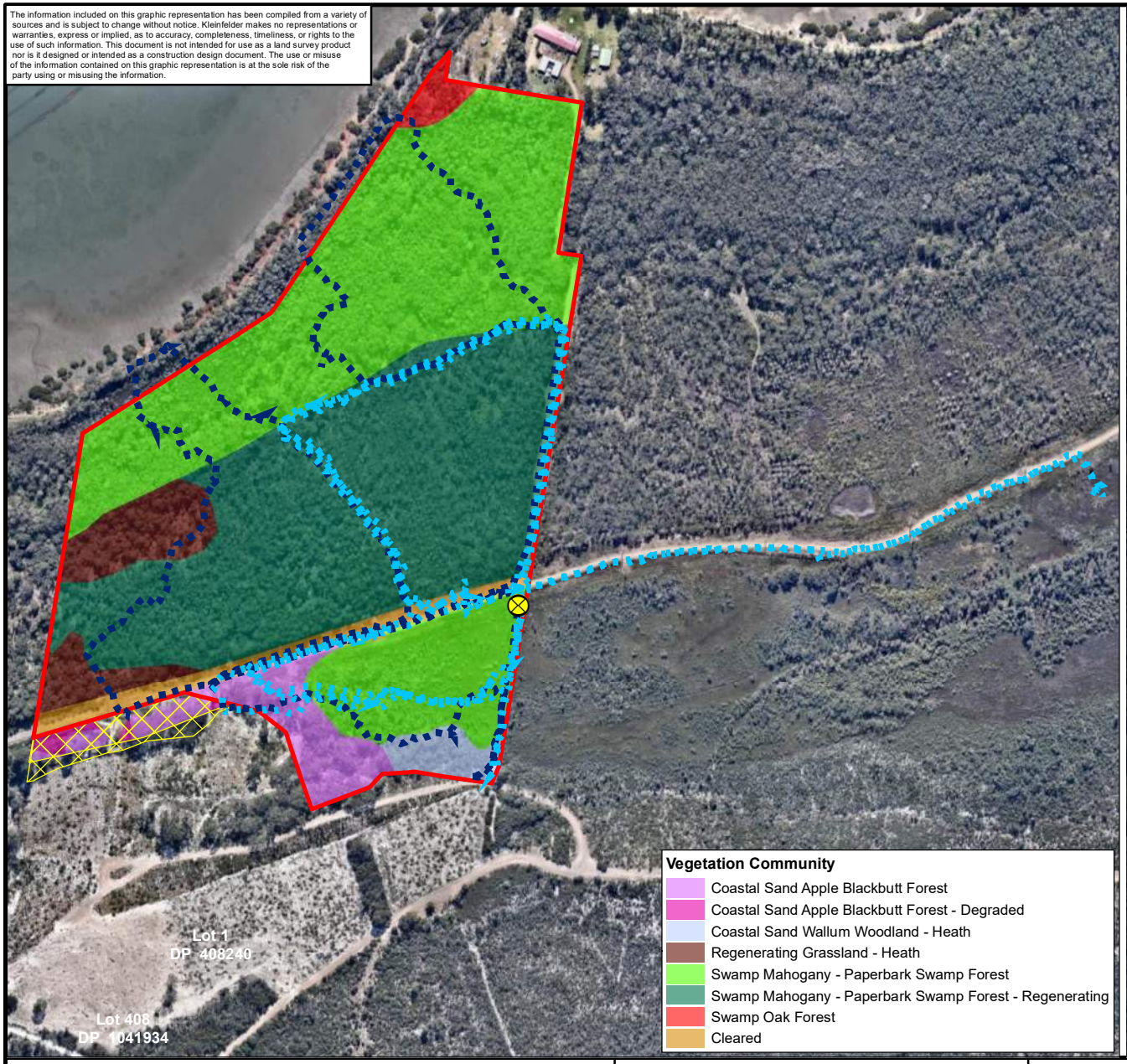
Survey effort was focused around ephemeral and semi-permanent water bodies using both spotlighting and call-playback techniques. Surveys revealed that no permanent water existed within either offset areas. Several areas were noted which had the potential to contain water after rainfall and later became the target of nocturnal surveys. The greatest potential to detected threatened amphibian species was identified within the northern offset with habitats including areas of Melaleuca/Swamp Mahogany forest and low-lying areas dominated by herbs, rushes and/or emergent vegetation. The southern offset contained the least suitable habitat with the only ephemeral water body dominated by saw-sedge (*Gahnia spp.*). Only one species of amphibian, *Limnodynastes peronii*, was recorded during the survey efforts at the southern offset. Nocturnal surveys of amphibian species employed visual and audible detection techniques with the aid of spotlights. Both the Wallum Froglet (*Crinia tinnula*) and a species of Uperoleia (*Uperoleia mahonyi*) were detected on two of the four survey nights within or adjacent to the offset areas. Of the two species, *C. tinnula* was recorded within the northern offset area while *U. mahonyi* was identified calling from a semi-permanent waterbody approximately 300m to the east of the northern offset area. The adjacent waterbody was visited to confirm the presence of *U. mahonyi* after audibly detecting the species from within the offset area. While the species was found to be breeding in the adjacent waterbody, it is likely that the species utilises habitats within the northern offset site for foraging and over-wintering (refuge). **Table 2** represents amphibian records for the four nights of surveys in January and February of 2020. Opportunistic sightings of non-target amphibian species were also recorded. Photos of amphibians taken over the duration of the monitoring period are included in **Appendix 1**. Addition opportunistic sightings of non-amphibian species within the offset areas include the Grey-headed flying fox (*Pteropus poliocephalus*), Feathertail glider (*Acrobates pygmaeus*), Long-necked turtle (*Chelodina longicollis*) and a species of freshwater crayfish.

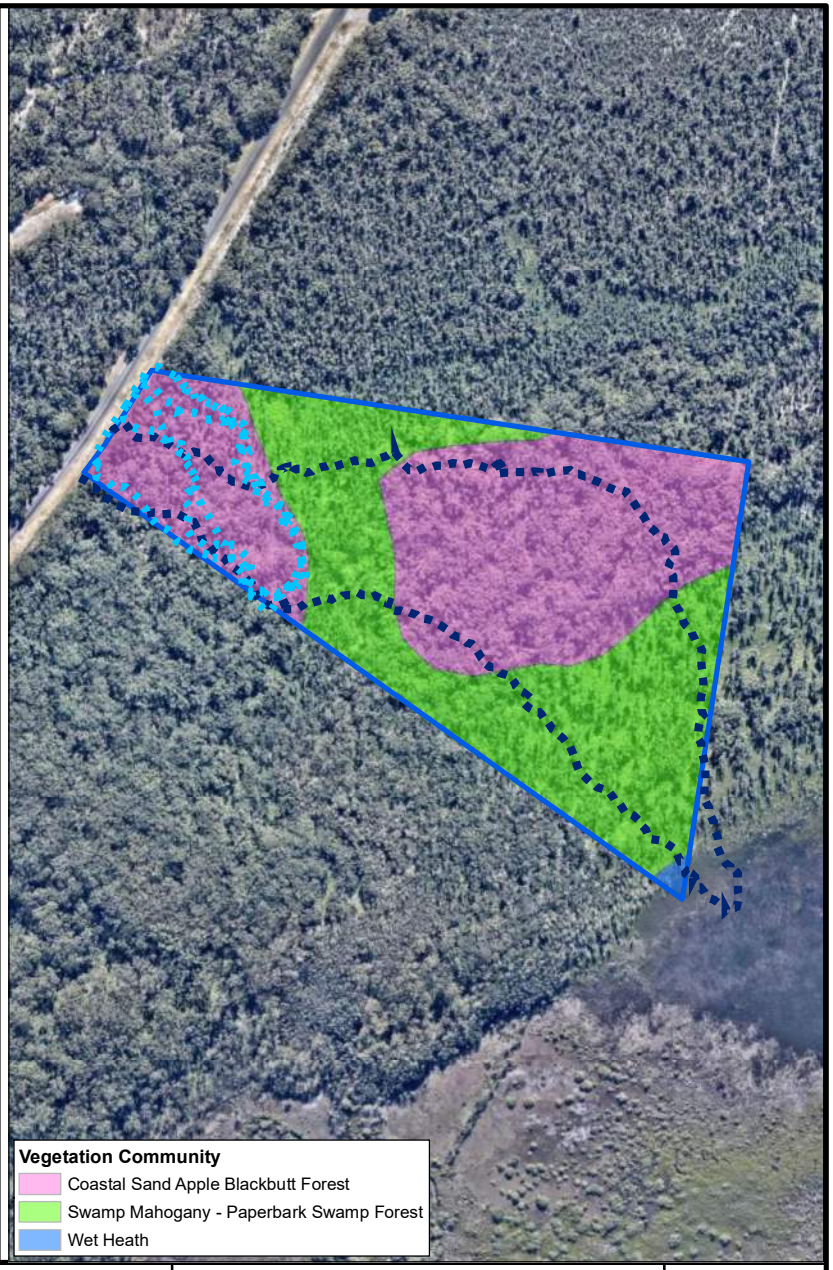
For any further questions, please do not hesitate to contact me.

Sincerely,
Kleinfelder Australia Pty Ltd

Ben Stewart MMsc & Mgmt
Ecologist

Email: BSStewart@kleinfelder.com
Mobile: 0427 487 991





Legend

- Northern Biodiversity Offset Area
- Southern Biodiversity Offset Area
- Visual Amenity and Connectivity Buffer
- *Crinia tinnula* (Wallum Froglet) Observation
- Diurnal Herp Search
- Nocturnal Herp Search

Metres
0 25 50 100 150 200 250

N

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(CLIENT) - PROJECT: 20201367
DATE DRAWN: 2020/02/14 09:54 Version 1
DRAWN BY: GJoyce
DATA SOURCE:
NSW DFSI - 2017
Nearmap - 2019

Herpetological Searches

Sibelco
Fauna Monitoring 2019
Oyster Cover Road, Tanilba Bay NSW

FIGURE:
1

L:\GIS FOLDER\00 CLIENT FILES\89345_UniminAustralia\20201367_NorthDunesExtensionFaunaMonitoring_2019\Mapping\20201367_Fig1_FrogSurveys.mxd

Table 2: Amphibian presence during targeted nocturnal monitoring

Species detected	Observation type	Comments	23/01/2020	29/01/2020	10/02/2020	11/02/2020
Crinia signifera	observed	northern offset			+	+
Crinia tinnula	heard	northern offset			+	+
Limnodynastes peronii	observed	southern and northern offsets	+		+	+
Litoria fallax	heard	calling outside northern offset			+	
Litoria freycineti	observed	northern offset	+	+	+	+
Litoria nasuta	heard	calling outside of northern offset			+	
Platyplectrum ornatum	observed / heard	northern offset	+	+	+	+
Uperoleia mahonyi	heard	calling outside of northern offset			+	+

APPENDIX 1

Plate 1: ***Platyplectrum ornatum***

Plate 2: ***Uperoleia mahonyi***

Plate 3: ***Litoria freycineti***

Plate 4: ***Litoria nasuta***

APPENDIX 5
KOALA MONITORING REPORT

19 August 2019
Document No: NCA19L99527

Attention: Liam O'Grady
Sibelco Australia Limited
Level 16, 111 Pacific Highway,
North Sydney, NSW 2060

Delivered by email: Liam.OGrady@sibelco.com.au

Subject: Koala Monitoring within the Northern Dune Extension Biodiversity Offset Areas.

Background

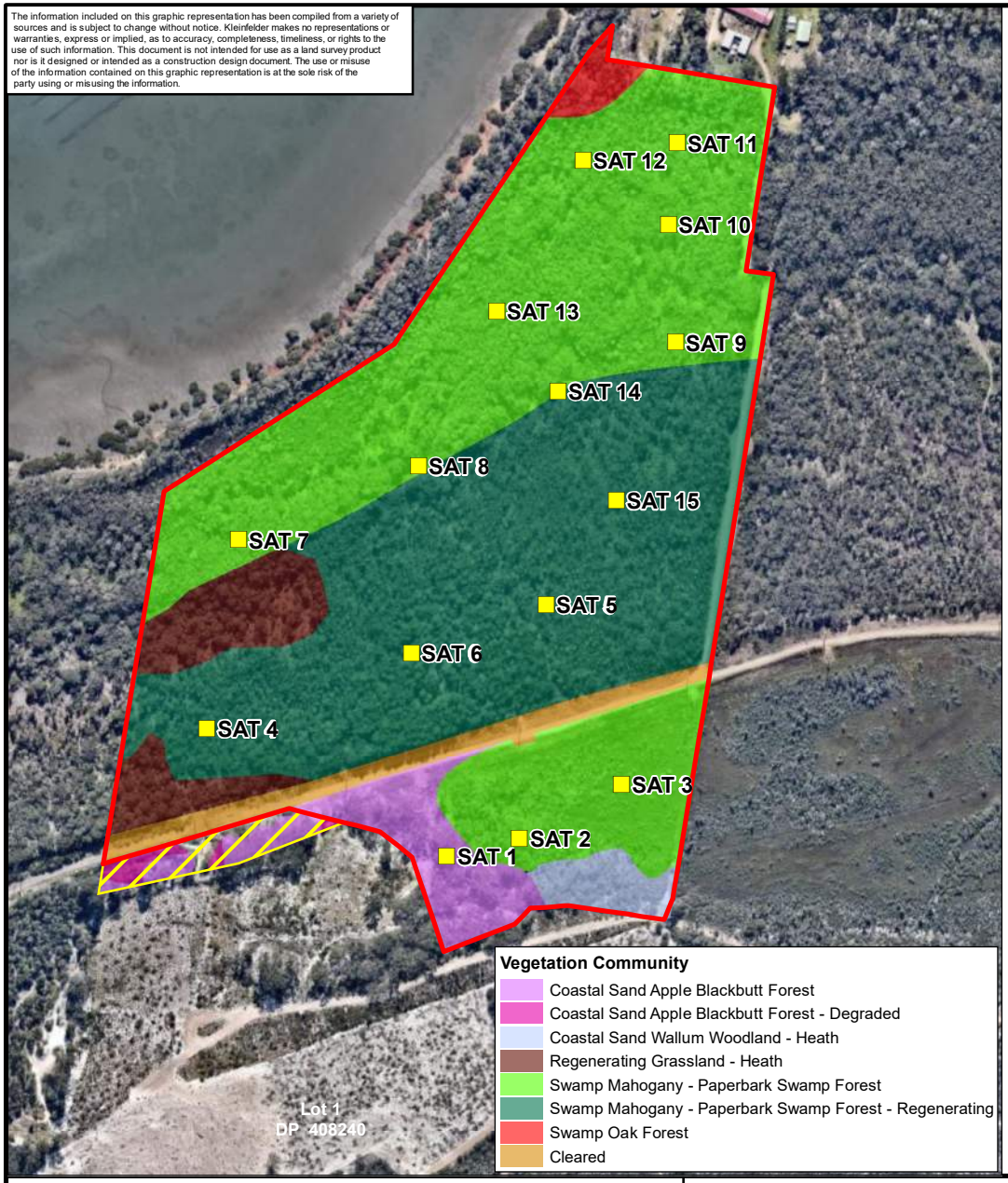
Koala monitoring for the Tanilba Northern Dunes Offsets was undertaken by Kleinfelder as part of the requirements of section 5.1.4 of the of the Biodiversity Management Plan Tanilba Northern Dunes Extension (Kleinfelder, 2014).

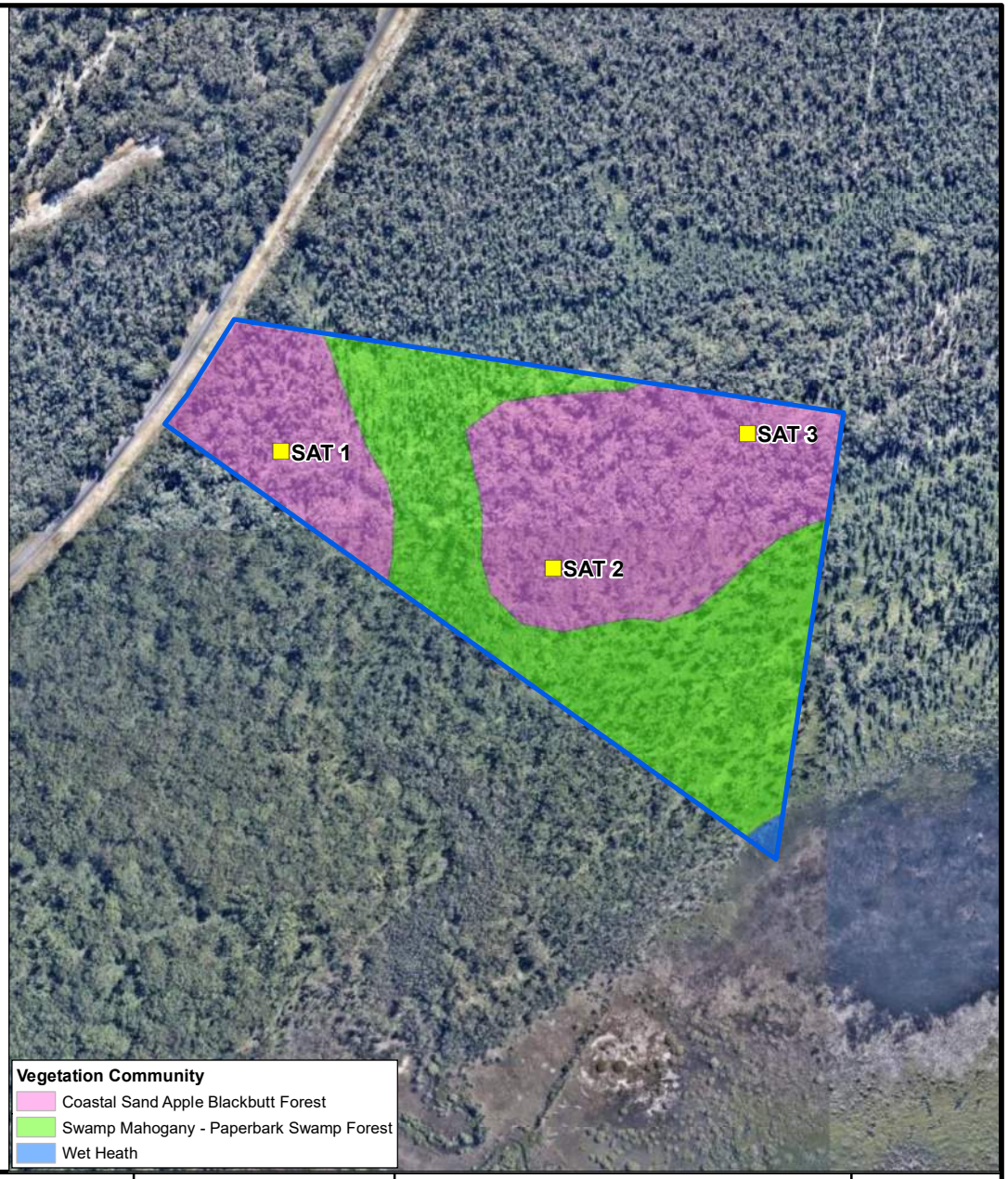
Monitoring

Koala monitoring was undertaken using the Spot Assessment Technique (SAT) within the Northern and Southern offset areas. Kleinfelder ecologists conducted SAT surveys between the 3rd and 8th August 2019. A total of 18 SAT tests were conducted over the two areas - 15 within the Northern Offsets and three within the Southern Offsets (**Figure 1**).

The SAT surveys found Koala activity in both the Northern and Southern offset areas. Please see **Table 1** for Koala activity levels for each SAT test for both the offset areas. Within the Northern Offset area, the greater activities were found to be within the preferred Koala habitat to the north of the offset area where there are more mature trees for feeding, although evidence of use was found throughout the extent of the Northern offset area. The Southern Offset area was found to have high levels of activity within one SAT test result for the area.

The Northern Offset area has good habitat suitability for the koala with plenty of mature *Eucalyptus robusta* (Swamp Mahogany), *Melaleuca quinquenervia* (Broad-leaved Paperbark) and *Casuarina glauca* (Swamp She-oak) to the north of the area, although parts of this area are hard to move through. There is thick *Lantana camara* (Lantana) which has the potential to hinder Koala movement through the site. Kleinfelder has been contracted to conduct weed mapping of the Northern Offsets, but this work had not been completed at the of writing this report. The remaining southern areas of the Northern Offset are still regenerating but have shown promising signs of koala use which will continue to improve as the trees mature. This will provide koalas with more habitat and a greater food source in the future.





Legend

- SAT Location
- Northern Biodiversity Offset Area
- Southern Biodiversity Offset Area
- Visual Amenity and Connectivity Buffer

Metres
0 25 50 100 150 200 250
N

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(CLIENT) - PROJECT: 20201367

DATE DRAWN: 16/08/2019 16:33 Version 1

DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2017
Nearmap - 2019

Koala Survey

Sibelco
Fauna Monitoring 2019
Oyster Cover Road, Tanilba Bay NSW

FIGURE:

1

L:\GIS FOLDER\00 CLIENT FILES\89345_UniminAustralia\20201367_NorthDunesExtensionFaunaMonitoring_2019\Mapping\20201367_Fig1_KoalaSurvey.mxd

The Southern offset area has good suitability for the koala with minimal weeds and a good variety of tree species important to koalas in the Port Stephens area. These trees include *Eucalyptus haemastoma* (Scribbly Gum), *Eucalyptus pilularis* (Blackbutt) and *Angophora costata* (Spotted Gum).

Table 1: Spot Assessment Technique Results

Location	Low Activity	Medium Activity	High Activity
Northern Offset Area			
1	+		
2	+		
3	+		
4	+		
5	+		
6	+		
7		+	
8		+	
9	+		
10	+		
11	+		
12	+		
13	+		
14	+		
15	+		
Southern Offset Area			
1			+
2	+		
3	+		

If you have any questions, please do not hesitate to contact me.

Kind regards,

Mark Dean

Ecologist

Mdean@kleinfelder.com

Ph: (02) 4949 5200

M: (04) 55 381 346

References

Kleinfelder (2014) Biodiversity Management Plan – Tanilba Northern Dune Extension (Sibelco Australia Limited)

Port Stephens Council (2002) Port Stephens Council Comprehensive Koala Plan of Management (CKPoM).

S, Phillips and J, Callaghan (2011) *The Spot Assessment Technique:* a tool for determining localised levels of habitat use by Koalas *Phascolarctos cinereus.*

APPENDIX 6

OCTOBER 2019 BIANNUAL GROUNDWATER MONITORING REPORT

SIBELCO AUSTRALIA

October 2019 Biannual Groundwater Report

Tanilba Northern Dune Projects

Reporting Period Commencement	1st April 2018
Reporting Period Completion	31st March 2019
Name of Approval Holder	**SIBELCO AUSTRALIA LIMITED** PO Box 114 Tanilba Bay NSW 2319
Operations Manager	Peter Radzievic Operations Manager Sibelco Australia Limited **Sibelco Salt Ash** 8 Oakvale Road Salt Ash NSW 2318 **Mob:** +61 409 241 488 Shane.Pont@sibelco.com.au www.sibelco.com
Environmental Coordinator	Michael Lynch Quality, Safety and Environment Coordinator Sibelco Australia Limited **Sibelco Salt Ash** 8 Oakvale Road Salt Ash NSW 2318 **Tel** +61 2 4982 6399 **M** 0418 952 697 paul.bourne@sibelco.com.au www.sibelco.com

DOCUMENT HISTORY AND STATUS

Version	Date issued	Reviewed	Approved	Date Approved for Issue	Revision type
Version 1	09/01/2020				Draft for Sibelco Review

Author:	Kleinfelder Australia Pty Ltd
Name of Site:	Tanilba Northern Dune Extension
Name of Project:	Annual Environmental Management Report
Document Version:	1

DISTRIBUTION OF COPIES

Version	Copy	Quantity	Issued to
1	pdf (email) / hard copy	1	Peter Dunn, Sibelco Australia Ltd
1	pdf (email)	1	Liam O'Grady, Sibelco Australia
1	pdf (email)	1	Hunter Water Corporation (HWC)
1	pdf (email)	1	NSW Department of Planning Industry and Environment (DPIE)

CONTENTS

TABLES

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Appendix 1: Extraction Zones
Appendix 2: Monitoring Locations
Appendix 3: PGME Surface and Piezometer PMGE
Appendix 4: Monitoring Location Trigger Values and PMGE

1. INTRODUCTION

Sibelco Australia Limited (Sibelco) manage a white silica sand extraction operation at Tanilba Northern Dune on the Tilligerry Peninsula, NSW. Sand is extracted as a rolling west to east cycle in approved zones of clearing native vegetation, extracting sand, reforming a new surface and planting of native vegetation.

Biannual groundwater reports (this report) are a requirement of the Groundwater Management Plan which states:

The results of the groundwater level and quality monitoring will be compiled in a summary report which will be submitted to DPI-Water and HWC on a six-monthly basis

The aim of this report is to present the results of groundwater quality against the pre-determined trigger values for the 6 month biannual reporting period April 2019 – October 2019 and to assess groundwater elevations against the pre-determined maximum predicted groundwater levels for this reporting period.

The previous bi-annual report for the reporting period October 2018 to April 2019 was provided as part of the 2019 Annual Environmental Report, submitted six months prior to this report in July 2019, available at: https://www.sibelco.com/aus-nz-reporting-nsw/

2. REGULATORY REQUIREMENTS

Environmental Management issues at the site are managed by a court approved Environmental Management Plan (EMP) supplemented by an Environmental Assessment for extraction in extension areas. Groundwater Management issues are managed by the regulatory approved Groundwater Management Plan (GMP), as stipulated in the EMP. The GMP has been developed to ensure compliance with the conditions of consent and licensing requirements stipulated by the relevant regulatory authorities, during development and operation at Northern Dune. The GMP provides a formal framework for ongoing monitoring of groundwater at the site to manage the potential impact of sand extraction on groundwater level and quality. The EMP stipulates that:

- No excavation is to be carried out to a depth greater than 0.7m above the maximum predicted elevation of the water table;
- The land surface is to be restored, following mining, to a level at least 1m above the maximum predicted elevation of the water table; and
- If concentrations of any analyte are found to exceed the provisional trigger levels given in the GMP, that monitoring point will be re-sampled within fourteen days, with investigatory monitoring implemented should re-sampling also be in exceedance of the trigger values.
- The relevant Regulatory Authorities will be contacted if any recorded water level exceeds the benchmark maximum predicted groundwater levels.

3. GROUNDWATER MONITORING METHODOLGY

3.1 GROUNDWATER MONITORING NETWORK

The monitoring network consists of 21 Sibelco installed piezometers and 3 Government bores. Groundwater level data is routinely collected from 23 piezometers with reporting against the 22 piezometers used to create PMGE surfaces for the extraction zones. Groundwater quality is routinely collected from 10 piezometers with reporting against operational trigger levels in extraction areas.

The entire network covers both the Northern Dune and the Northern Dune Extension approved project areas. As such not all monitoring locations are considered to provide accurate reflection of conditions at each site due to the distance from each operational boundary. Monitoring locations can be viewed in Appendix 2. Groundwater monitoring wells ACI-3, ACI-4, ACI-12 and SAL-4 are monitored to assess potential impacts from the Northern Dune Extension Project Approval area. All other monitoring wells depicted in Appendix 2 are used to assess potential impacts from activities within the Northern Dune project area.

3.2 GROUNDWATER LEVEL MONITORING

3.2.1 Baseline Groundwater Level Monitoring and Predicted Maximum Groundwater Elevation

Baseline groundwater level monitoring is undertaken within a planned zone prior to commencing sand extraction. Planned sand extraction is based on a predicted maximum groundwater elevation (PMGE) surface created from the PMGE of baseline groundwater levels in monitored piezometers.

3.2.2 Operational Groundwater Level Monitoring

Operational groundwater level monitoring is undertaken to ensure compliance with the PMGE. Groundwater levels in monitoring wells are routinely measured monthly, increasing in frequency to weekly for a period of four weeks following any period when rainfall at Williamtown equals or exceeds 100 millimetres over a seven day rolling period, or when water levels are

within 100 millimetres of the maximum predicted groundwater levels. Monitoring will continue for the duration of mining, and until the release of the obligation by the NOW and HWC. General (visual) observation of currently mined and progressively rehabilitated areas will be carried out regularly to check for the occurrence of surface water ponding or the presence of groundwater windows.

3.2.3 Exceedence Investigation

If analysis of groundwater level monitoring sample shows anomalous levels above the PMGE then groundwater in the effected monitoring well will be retested again as soon as possible and in any case within fourteen days to confirm the results. If retesting confirms the anomaly, NOW and HWC will be notified immediately, by telephone and in writing, and within fourteen days of confirmation and an investigation will be initiated.

3.3 GROUNDWATER QUALITY MONITORING

3.3.1 Baseline Groundwater Quality Monitoring and Setting of Trigger Values

Baseline groundwater quality samples are collected for establishing baseline hydro-geochemical conditions and to create Trigger Values for comparison against sample concentrations during and post extraction operations to assist in detecting any changes in groundwater quality at the site. Baseline groundwater quality monitoring ceases when sand extraction commences and the Operational Monitoring Plan is initiated. Trigger Values have been determined for the water quality parameters of EC, Arsenic, Manganese, Iron and TPH.

3.3.2 Operational Groundwater Quality Monitoring

Operational groundwater quality monitoring will be carried out six monthly once mining commences in a zone, and will continue at a lower frequency for four years after mining ceases or as otherwise determined by the NOW and HWC. The monitoring frequency is subject to review in consultation with the NOW and HWC.

3.3.3 Exceedance Investigation

If analysis of water quality monitoring sample shows anomalous concentrations of any analyte above Trigger Values, then groundwater in the effected monitoring well will be resampled and tested again as soon as possible and in any case within fourteen days to confirm the results. If resampling confirms the anomaly, NOW and HWC will be notified immediately, by telephone and in writing, and a Groundwater Assessment Plan will be prepared within twenty eight days of confirmation. The Groundwater Assessment Plan will identify the specific groundwater quality parameters; establish the spatial and temporal variability of the water quality parameters; determine whether the anomaly is natural variability (background) or potentially related to a site activity and provide an assessment of the potential impact upon the groundwater resource. If the exceedance is determined to be potentially related to a site activity then the Groundwater Assessment Plan will outline a proposed sampling plan to obtain sufficient information to prepare a Groundwater Contamination Remediation Plan if and as required.

4. PERFORMANCE AGAINST REQULATORY REQUIREMENTS

Groundwater monitoring at Northern Dune has been conducted by AECOM for Sibelco since March 2008. AECOM continues to undertake this monitoring in accordance with their QA/QC and Sibelco's Groundwater Monitoring Guidelines.

4.1 GROUNDWATER LEVEL ASSESSMENT

There were no exceedances of groundwater level thresholds during the monitoring period.

4.2 GROUNDWATER QUALITY ASSESSMENT

Groundwater quality at Northern Dune is driven by the nature of rainfall and properties of the unsaturated zone. Rainfall entering the soil zone undergoes significant changes in chemical composition and pH by processes such as root respiration and decomposition of organic matter via chemical reactions such as sorption and redox. The chemical constituency of infiltrating water in turn modifies groundwater chemistry by processes such as leaching, dilution but not concentration (which is protected against by licence conditions limiting depth to groundwater) as well as dissolution/precipitation. The effect of multiple processes on groundwater quality parameters and therefore setting Trigger Values is that water quality data is often multiple-modal (non-normal distribution) and so simple statistical analysis using mean and standard deviation may not adequately represent processes leading to water quality change. Water quality is dependent upon the nature of rainfall (ie. timing, intensity, duration...etc) which determines whether infiltration provides a diluting effect and/or a leaching effect on ions and/or metals. Water quality can improve or deteriorate with rainfall and therefore timing of a small limited sample set strongly influences the calculated Trigger Value.

Groundwater quality trigger value exceedances may be attributed to a number of reasons including:

1. Aquifer compromised by sand extraction: measurable change in groundwater quality due to the removal of vegetation and the reduction in thickness of the unsaturated zone
2. Trigger Value set too low because of insufficient benchmark monitoring: Benchmarking should be untaken at a frequency which would allow the likely detection of water quality

maxima and minima if also required. Trigger levels for piezometers ACI-2, ACI-5, ACI-11, ACI-13, ACI-14 and ACI-16 almost certainly underestimate actual background water quality parameter levels and therefore water quality trigger level breaches will occur, particularly if sampling follows a major rainfall event

3. Trigger Value set too low because of poor Trigger Value determination methodology: The best method for determining trigger levels is simply observed pre-mining maxima based from targeted sampling in wet and dry conditions. Statistical methods introduce uncertainty on calculated trigger values.
4. Loss of bore integrity: Loss of bore integrity can be due to construction related issue and/or vandalism
5. Incorrect data: Administrative error

Exceedances of the groundwater quality trigger values were experienced at two monitoring locations during the reporting period, these being ACI-2 and ACI-16. Exceedances relate to Total Iron, Dissolved Iron, Total Manganese and Dissolved Manganese as detailed in

Table 1.

The two monitoring locations relating to the exceedances have exhibited exceedances for the same parameters in previous reporting periods as detailed in reports previously provided. These groundwater wells are used to monitor potential impacts from the Northern Dune project area, not the Northern Dune extension area. These exceedances are not related to the extension area and, consequently, have not been reported to the DPIE under Project Approval MP09_0091.

It is noted that extraction activities within proximity to these monitoring wells ceased in 2005 and therefore the elevated iron and manganese levels observed are unlikely to be the result of Sibelco activities.

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Table 1: Groundwater Quality Exceedances During Reporting Period

Monitoring Location	Exceedence No.	Monitoring Parameter	Monitoring Result	Trigger Value (Threshold)	Date of Exceedence	Date of Resample	Note
ACI-2	1	Dissolved Iron	3.92 (3.55 resample)	3.058	10/10/2019	1/11/2019	Resampled and still exceeded
	2	Total Iron	4.75 (3.51 resample)	3.623	10/10/2019	1/11/2019	Resampled and compliant
	3	Dissolved Manganese	0.016 (0.018 resample)	0.015	10/10/2019	1/11/2019	Resampled and still exceeded
	4	Total Manganese	0.017 (0.018 resample)	0.014	10/10/2019	1/11/2019	Resampled and still exceeded
ACI-16	6	Dissolved Iron	13.00 (6.40 resample)	0.188	10/10/2019	1/11/2019	Resampled and still exceeded
	7	Total Iron	13.40 (6.95 resample)	11.419	10/10/2019	1/11/2019	Resampled and compliant
	8	Dissolved Manganese	0.181 (0.251 resample)	0.061	10/10/2019	1/11/2019	Resampled and still exceeded
	9	Total Manganese	0.189 (0.242 resample)	0.104	10/10/2019	1/11/2019	Resampled and still exceeded

4.2.1 ACI-2

ACI-2 is located in Zone 1, mining Block B1 which was rehabilitated in May 2005.

Iron results are on a rising trend and have exceeded the assigned triggers (3.058mg/L dissolved Fe and 3.62mg/L Total Fe) in the September monitoring events Sept 2017. Results have been below trigger values during the March/April monitoring events.

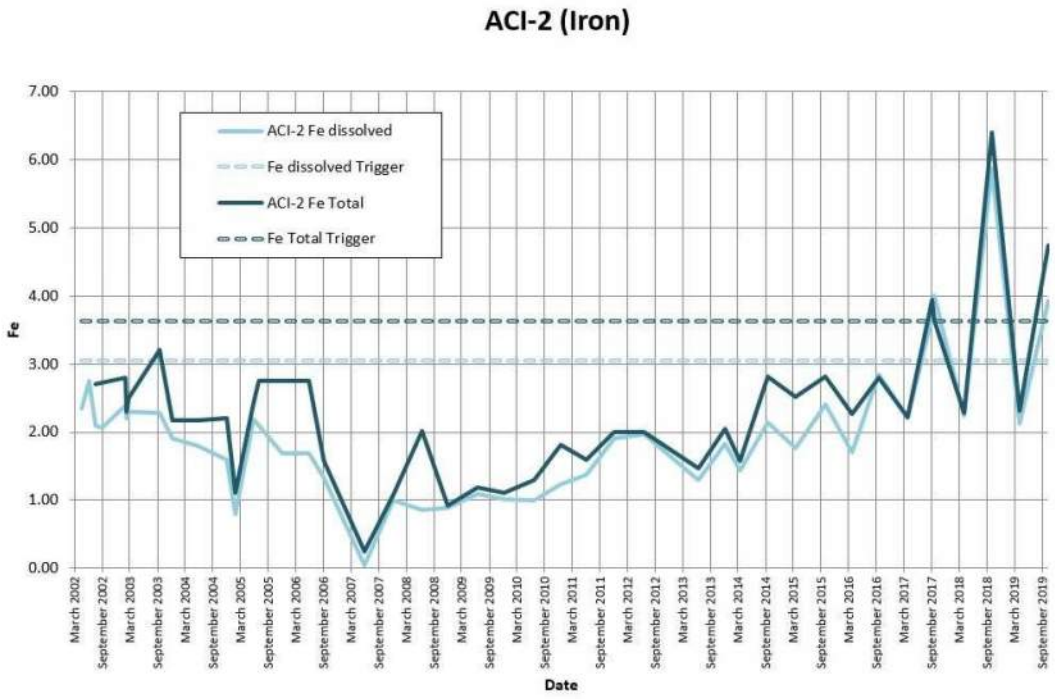

Figure 1 : ACI-2 Iron Results Trend

Demonstrating a similar trend to Iron, Manganese results are on a rising trend and have exceeded the assigned triggers in the September monitoring events Sept 2017. Results have been below trigger values during the March/April monitoring events.

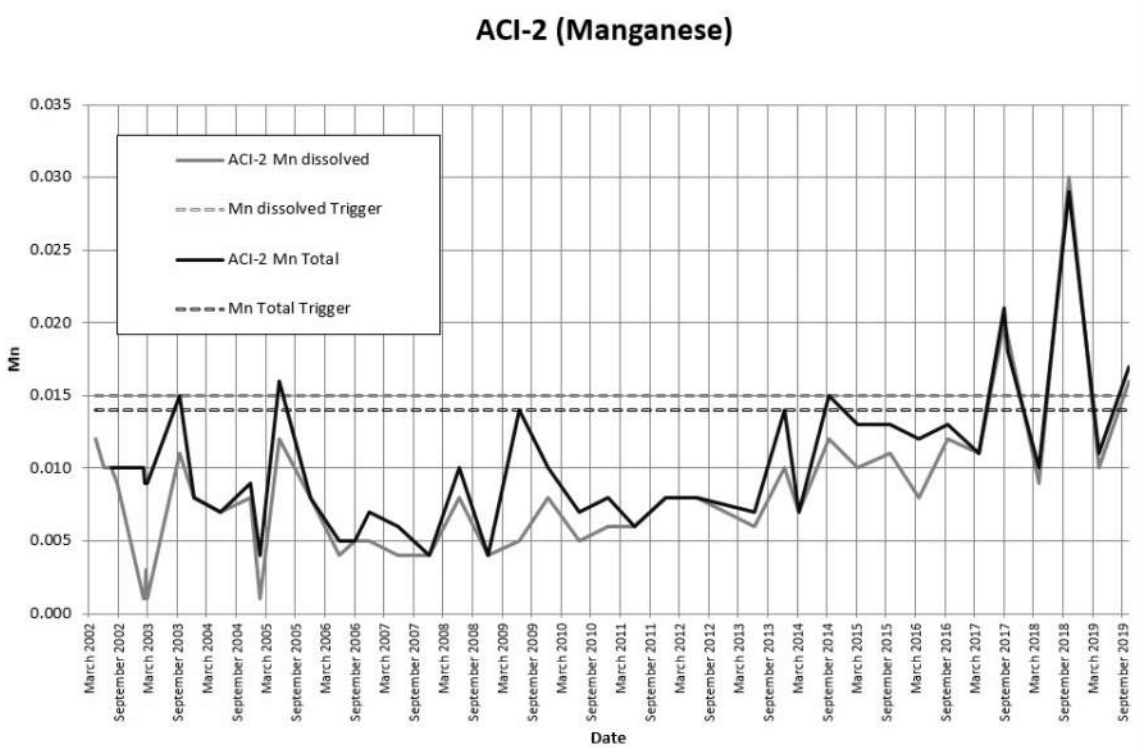

Figure 2 : ACI-2 Manganese Results Trend

4.2.2 ACI-16

ACI-16 is in an area from which sand was extracted in 2010-12 and has since undergone rehabilitation.

Iron results have declined in recent years but the latest sampling has shown higher levels returned for both dissolved and total iron since March 2018. The Fe dissolved trigger level for ACI-16 has been set too low at 0.188mg/L compared to the Fe total trigger of 11.419mg/L

Following an anomalous spike in both total and dissolved results in 2018, manganese results have returned a lower reading more in line with trends observed throughout the ongoing monitoring at ACI-16, however they remain in slight exceedance of the trigger values. A purging exercise of the bore should be undertaken prior to the next sampling round performed at ACI-16.

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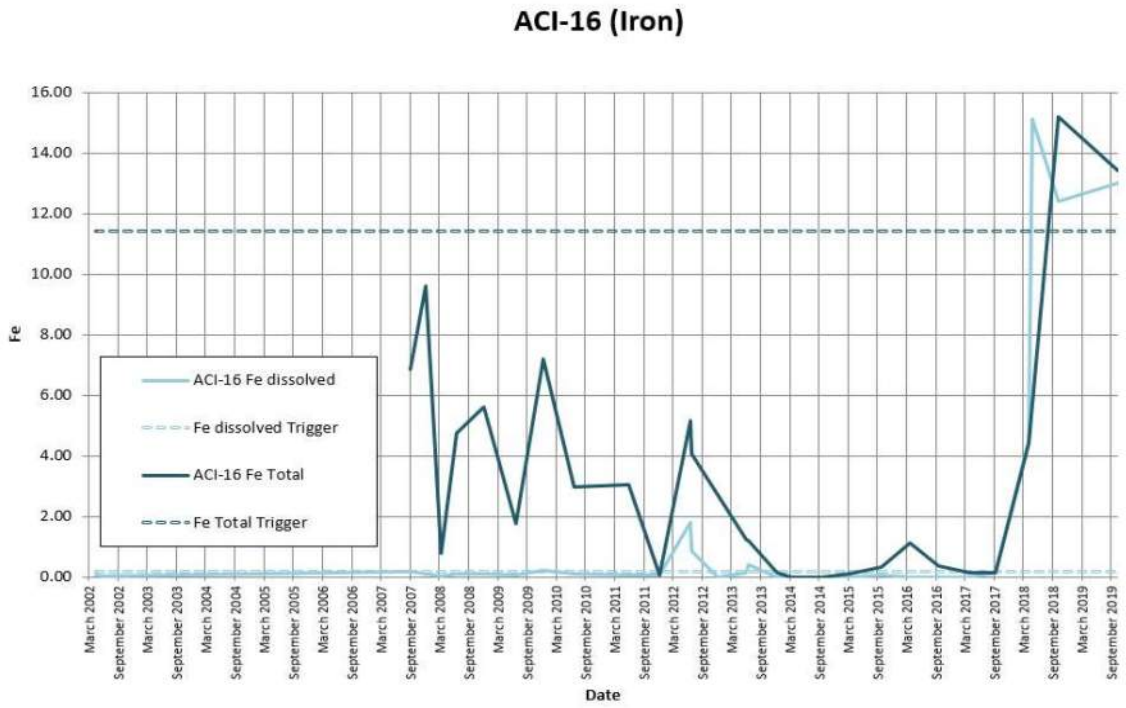


Figure 3 : ACI-16 Iron Results Trend

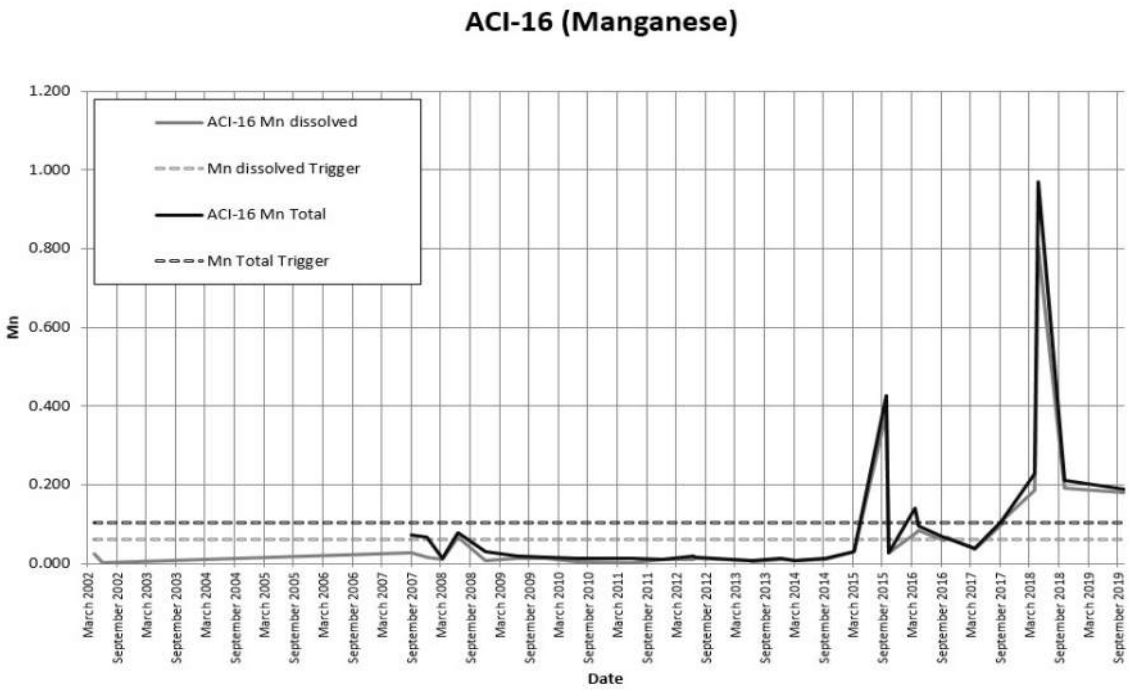
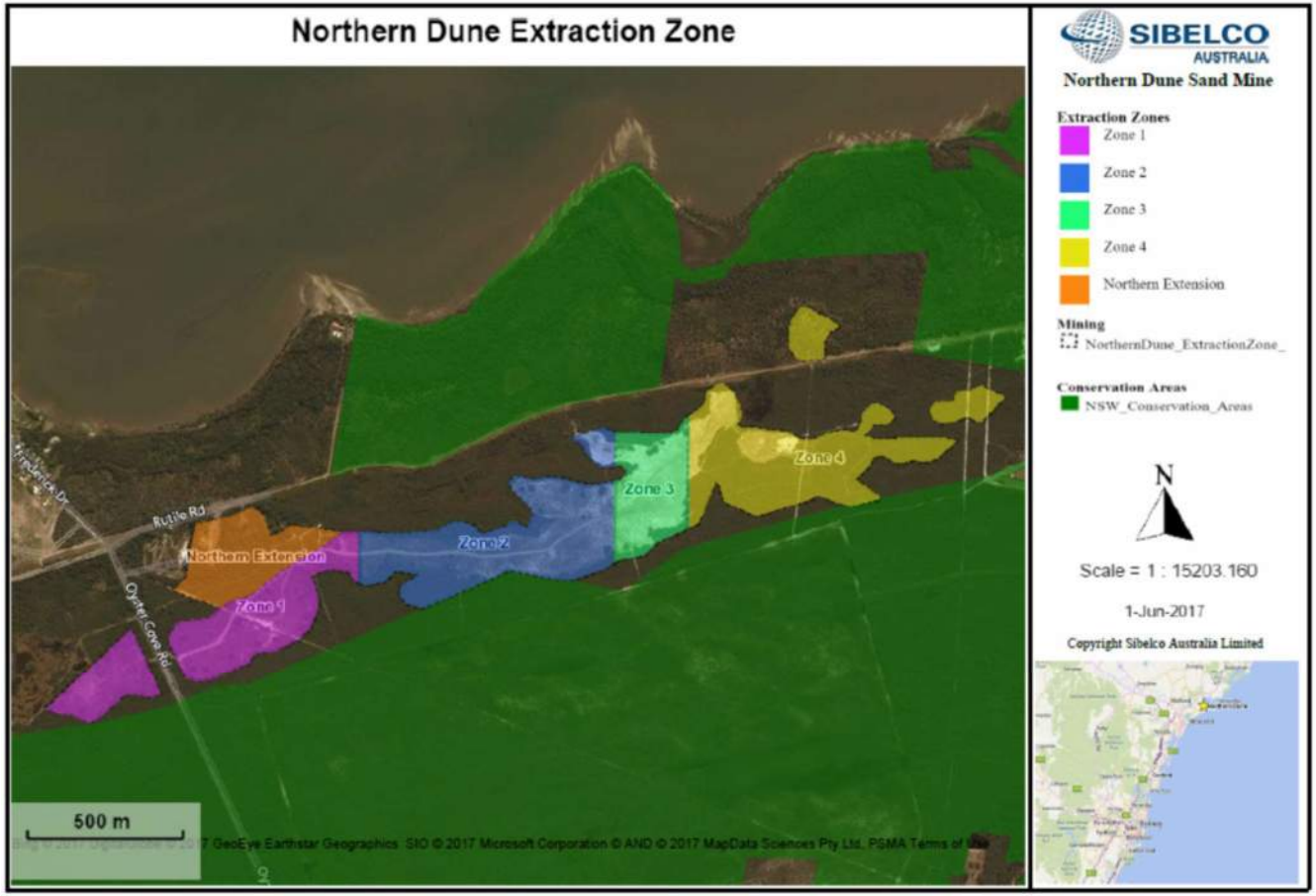


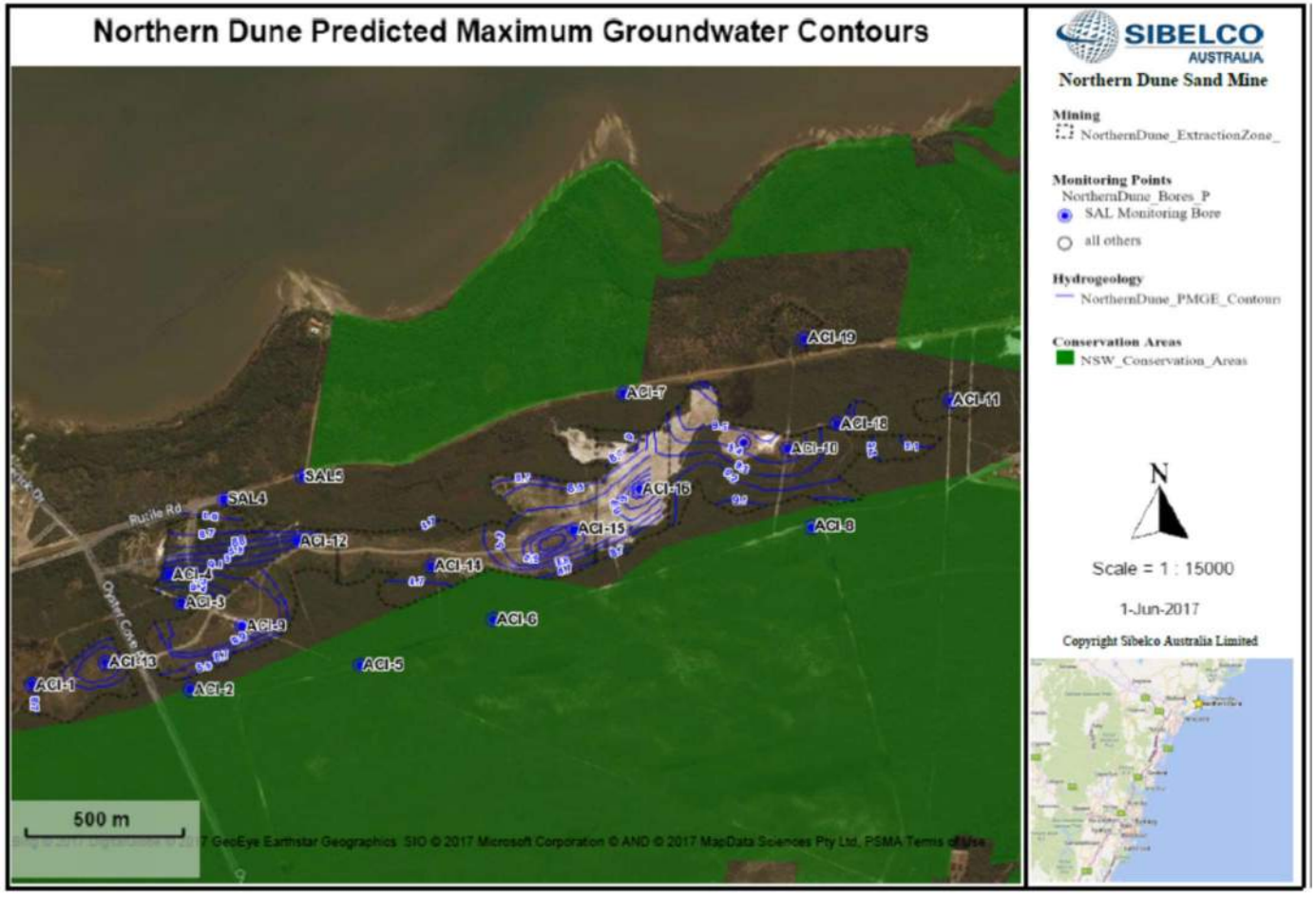
Figure 4 : ACI-16 Manganese Results Trend

Appendix 1: Extraction Zones



Appendix 2: Monitoring Locations

Appendix 3: PGME Surface and Piezometer PMGE



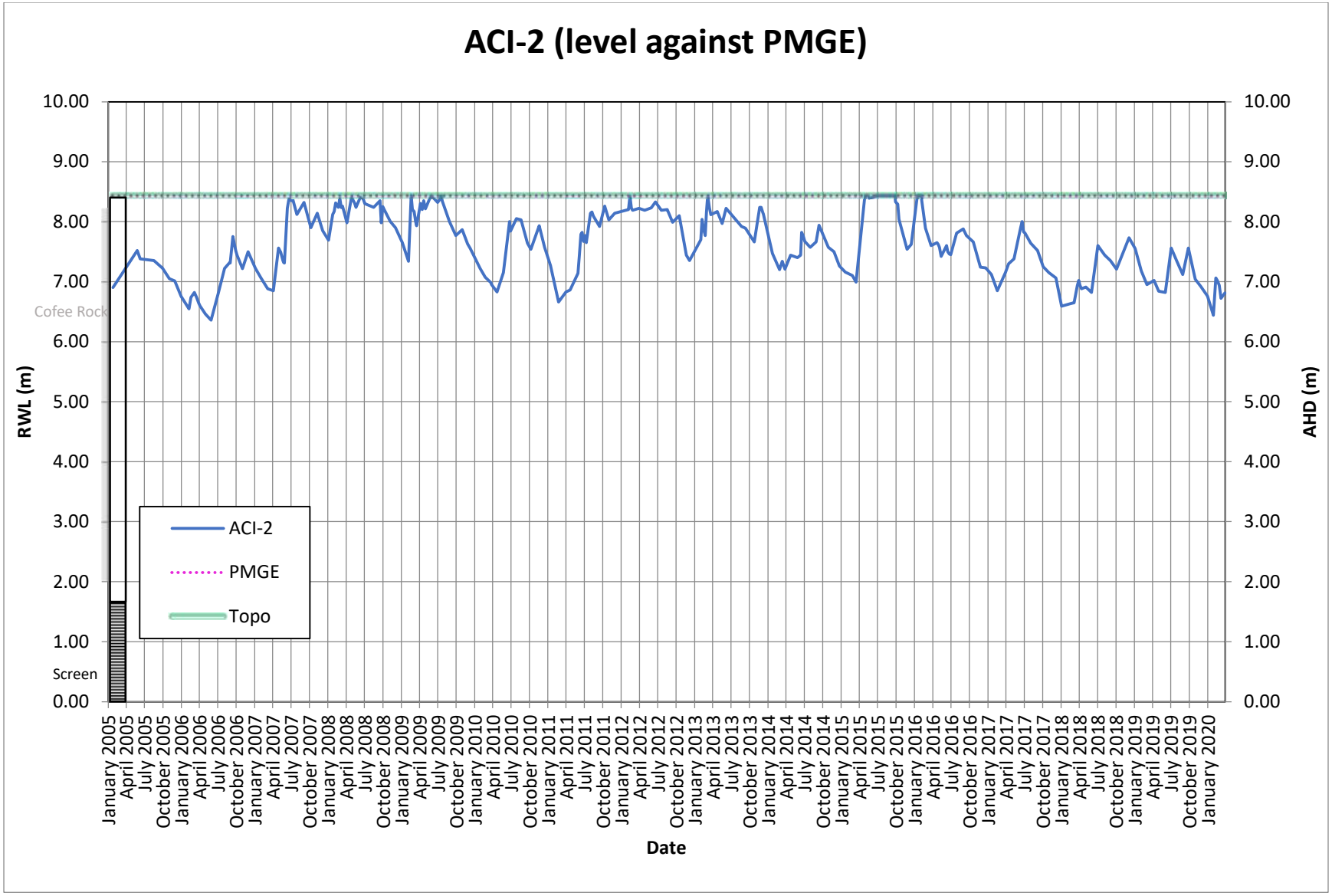
Appendix 4: Monitoring Location Trigger Values and PMGE

Extraction Zone	Bore	PMGE	GROUNDWATER QUALITY TRIGGER VALUES											
			pH	EC	Iron mg/L		Arsenic mg/L		Manganese mg/L		TPH mg/L			
					Dissolved	*Total*	*Dissolved*	*Total*	*Dissolved*	*Total*	*C6-C9*	*C10-C14*	*C15-C28*	*C29-C40*
1	ACI-1	8.82	x	x	x	x	x	x	x	x	x	x	x	x
	ACI-12	9.28	x	x	x	x	x	x	x	x	x	x	x	x
	ACI-13	**9.20**	x	x	1.547	6.428	0.001	0.012	0.061	0.056	0.02	0.05	1.00	1.00
	ACI-2	**8.44**	x	x	3.058	3.623	0.001	0.010	0.015	0.014	0.02	0.05	1.00	1.00
	ACI-3	9.47	x	x	x	x	x	x	x	x	x	x	x	x
	ACI-4	9.31	x	x	x	x	x	x	x	x	x	x	x	x
	ACI-5	**8.16**	x	x	2.048	3.286	0.001	0.015	0.014	0.036	0.02	0.05	1.00	1.00
	ACI-9	9.31	x	x	x	x	x	x	x	x	x	x	x	x
2	**ACI-14**	**9.02**	x	x	1.532	2.262	0.001	0.008	0.070	0.082	0.02	0.05	1.00	1.00
	ACI-15	9.26	x	x	x	x	x	x	x	x	x	x	x	x
	ACI-6	**8.29**	x	x	0.493	0.935	0.001	0.001	0.006	0.006	0.02	0.05	1.00	1.00
3	**ACI-16**	**9.26**	x	x	0.188	11.419	0.001	0.002	0.061	0.104	0.02	0.05	1.00	1.00
	ACI-7	8.92	x	x	x	x	x	x	x	x	x	x	x	x
4	ACI-10	9.49	x	x	x	x	x	x	x	x	x	x	x	x
	ACI-17	9.47	x	x	x	x	x	x	x	x	x	x	x	x
	ACI-8	**8.86**	x	x	1.108	1.410	0.002	0.002	0.006	0.006	0.02	0.05	1.00	1.00
	ACI-18	**9.12**	x	x	7.590	10.870	0.002	0.003	0.262	0.378	0.02	0.05	1.00	1.00
n/a	**ACI-11**	**9.54**	x	x	4.344	5.116	0.002	0.002	0.028	0.030	0.02	0.05	1.00	1.00
Lots 11-13	**SAL4**	**8.65**	4.44-6.63	213	3.210	3.640	0.001	0.002	0.093	0.116	0.02	0.05	1.00	1.00
-	ACI-19	9.06	x	x	x	x	x	x	x	x	x	x	x	x
	SAL5	x	x	x	x	x	x	x	x	x	x	x	x	x
	SK284	8.49	x	x	x	x	x	x	x	x	x	x	x	x
	SK3525	9.55	x	x	x	x	x	x	x	x	x	x	x	x
	SK3530	9.25	x	x	x	x	x	x	x	x	x	x	x	x

Trigger levels for Extraction Zones 1-4 calculated by AECOM have been retained which includes spurious data eg. ACI-13 Total Mn > Dissolved Mn and is based on a methodology. Lots 11-13 baseline data is simply maxiumum observed.

APPENDIX 7

GROUNDWATER LEVEL TREND HYDROGRAPHS


ACI-2 (level against PMGE)
RWL (m)
AHD (m)
10.00
9.00
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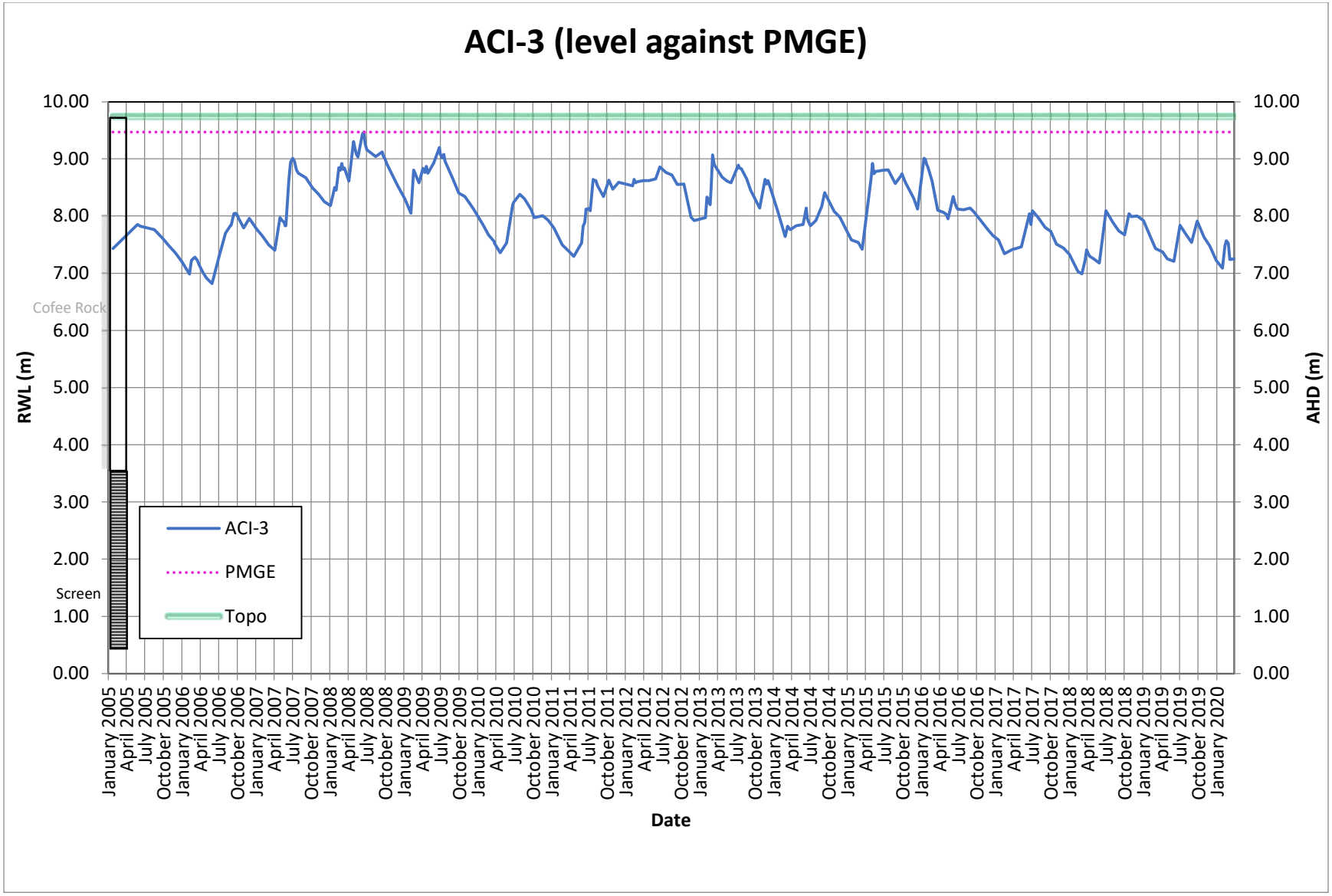
ACI-3 (level against PMGE)
RWL (m)
AHD (m)
10.00
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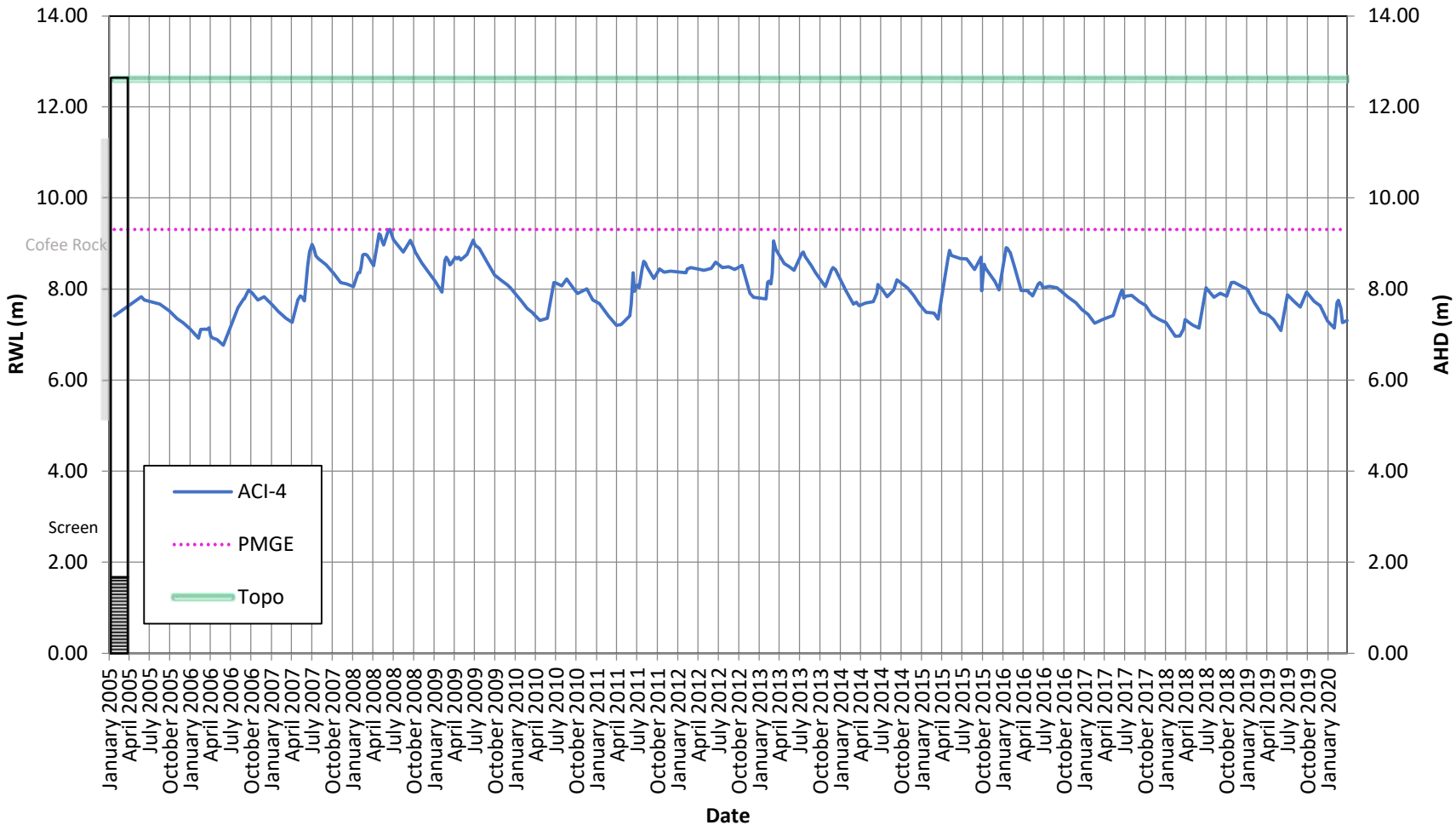
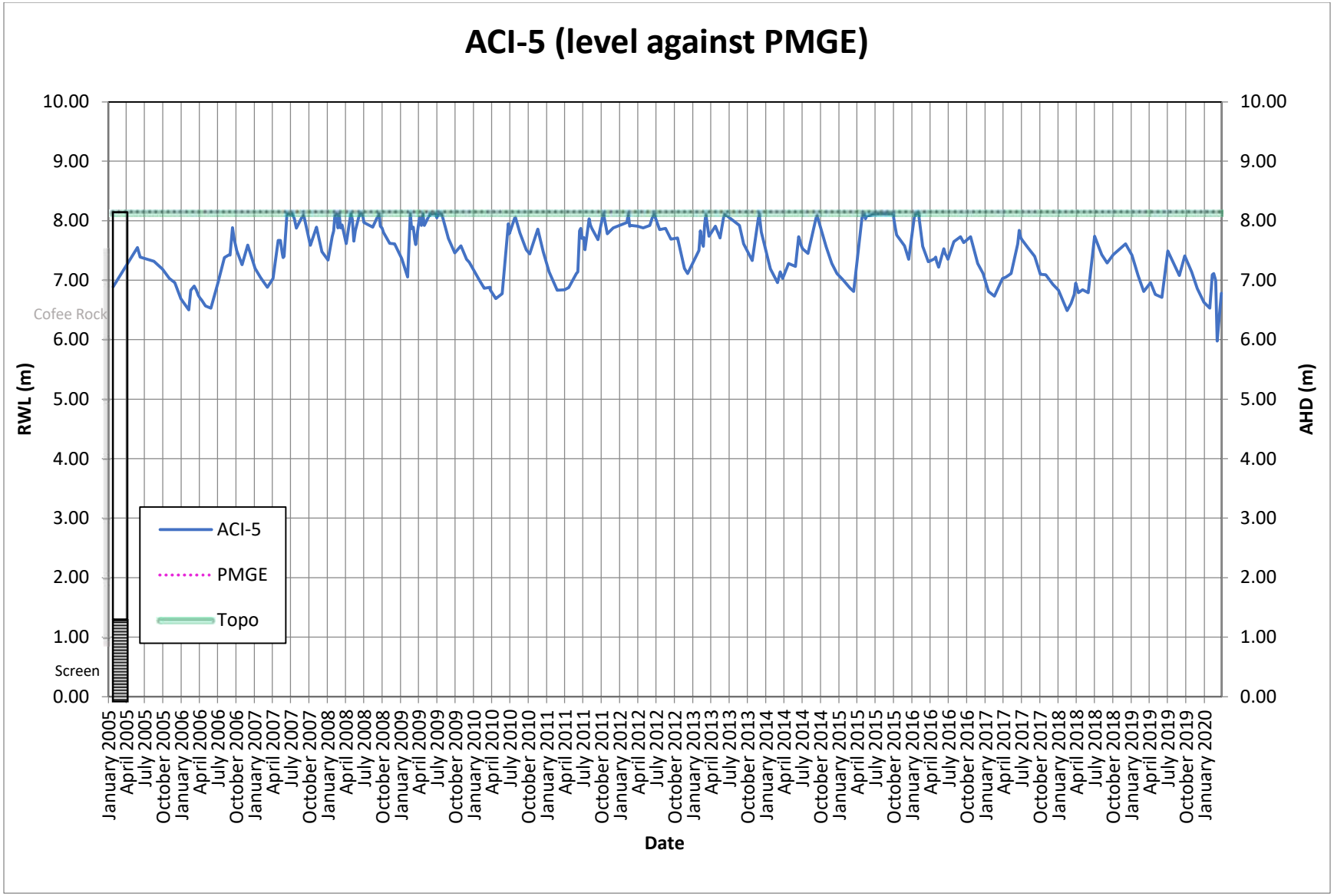
ACI-4 (level against PMGE)




ACI-5 (level against PMGE)
RWL (m)
AHD (m)
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9.00
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4.00
3.00
2.00
1.00
0.00
Cofee Rock
Screen
ACI-5
PMGE
Topo
January 2005
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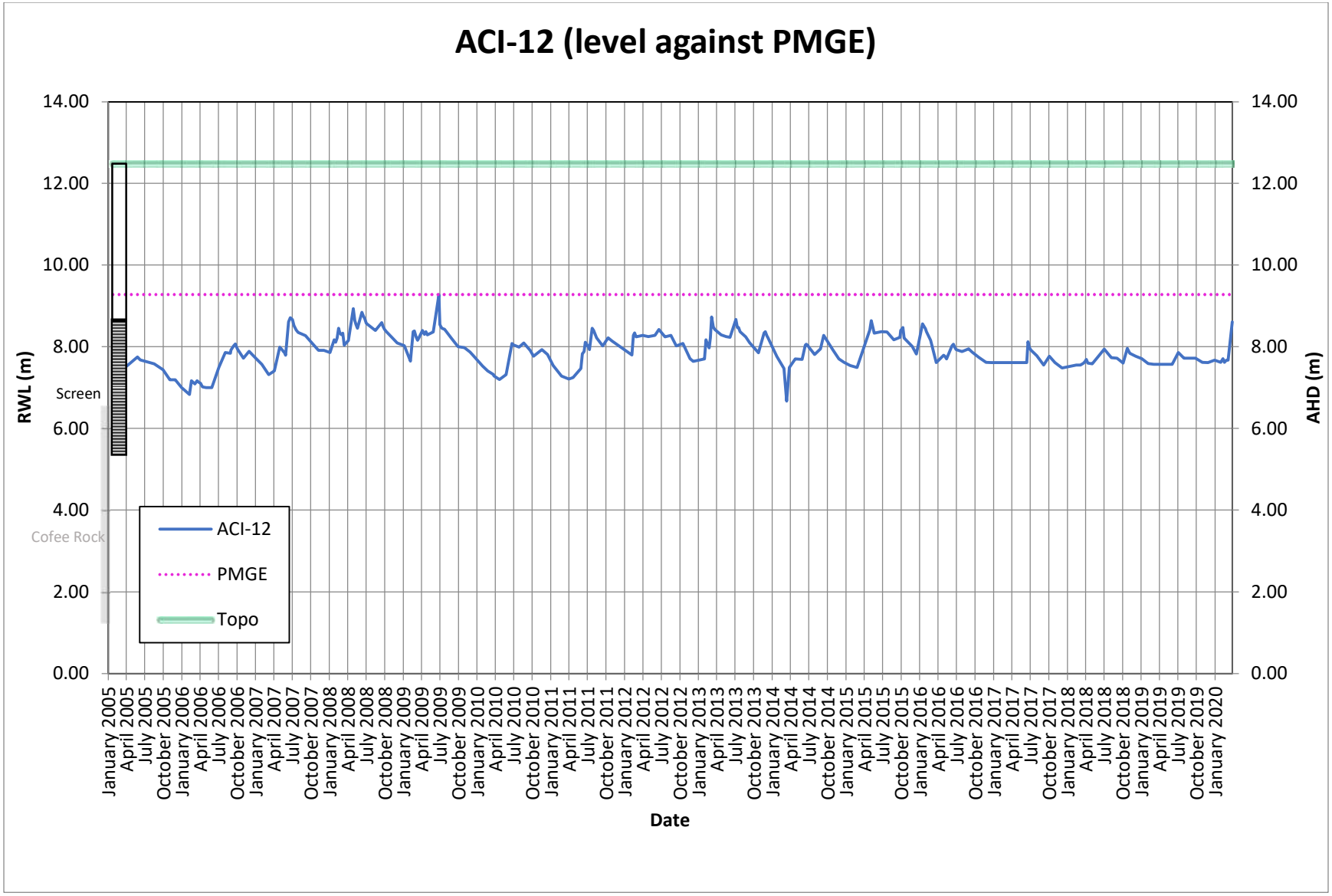
ACI-12 (level against PMGE)
RWL (m)
AHD (m)
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12.00
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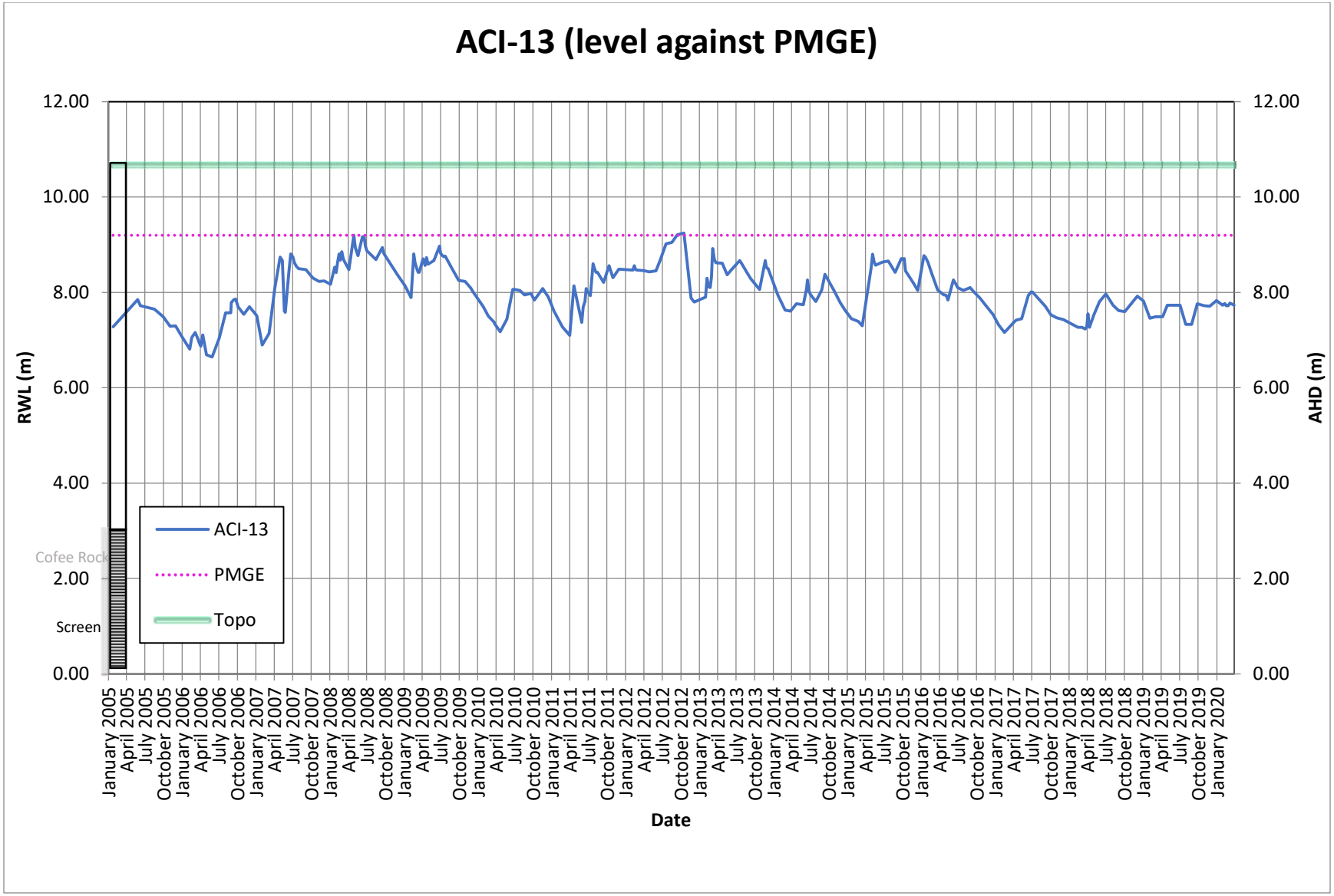
ACI-13 (level against PMGE)
RWL (m)
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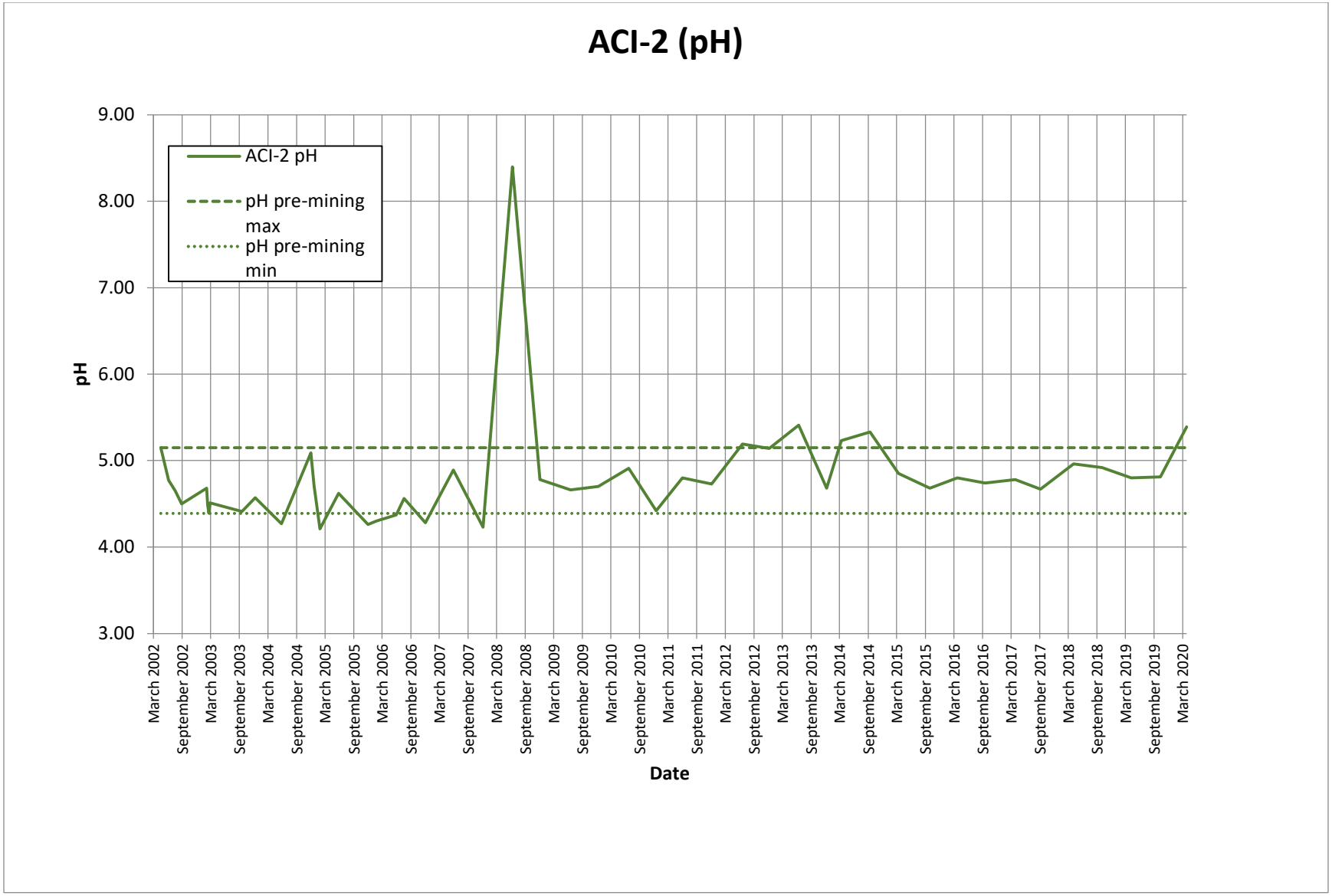
APPENDIX 8

GROUNDWATER QUALITY TREND HYDROGRAPHS (QUALITY VS. TRIGGER VALUES)


ACI-2 (pH)
ACI-2 pH
pH pre-mining max
pH pre-mining min
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7.00
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4.00
3.00
March 2002
September 2002
March 2003
September 2003
March 2004
September 2004
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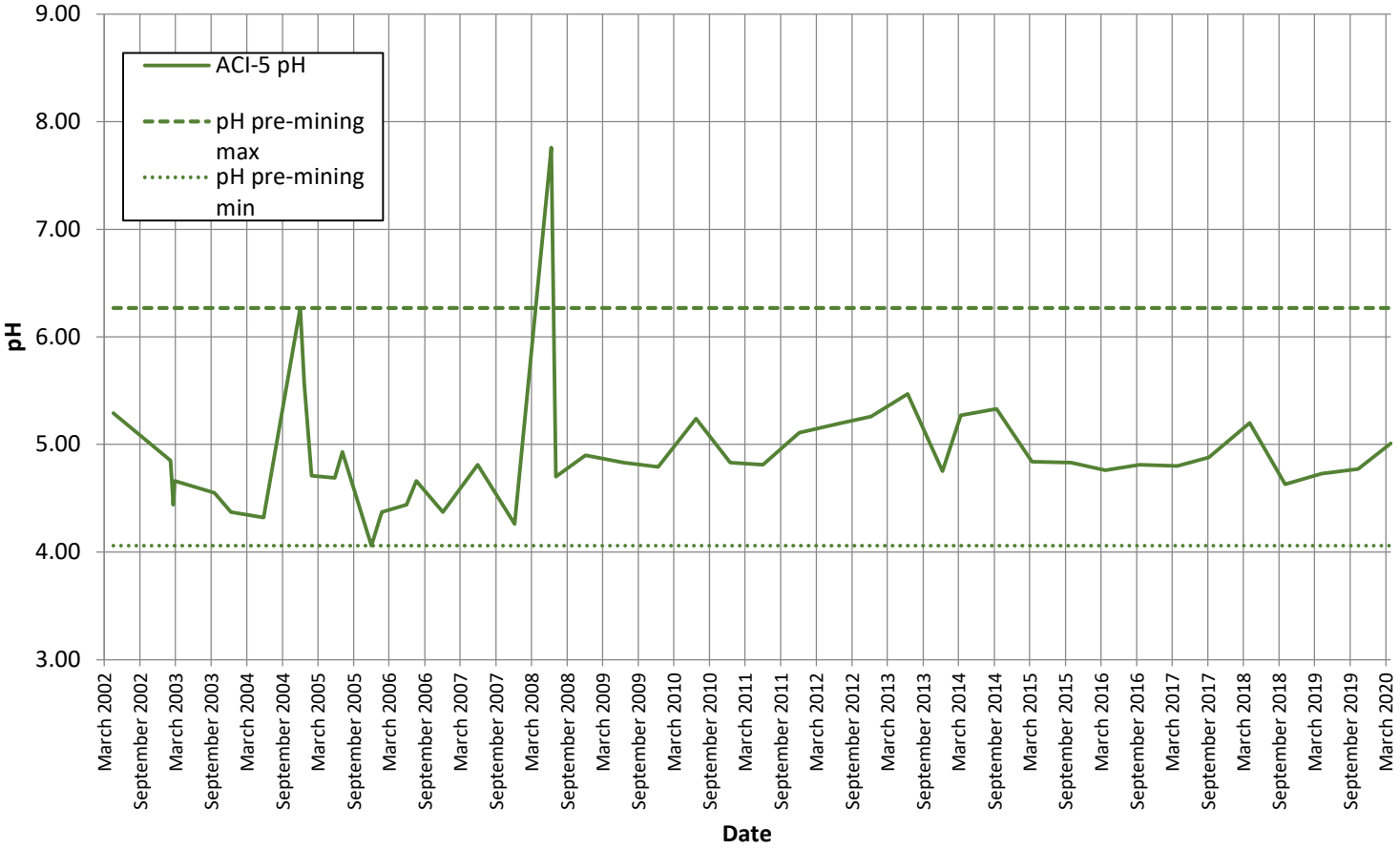
ACI-5 (pH)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7.00
6.00
5.00
4.00
3.00
pH
ACI-5 pH
pH pre-mining max
pH pre-mining min
March 2002
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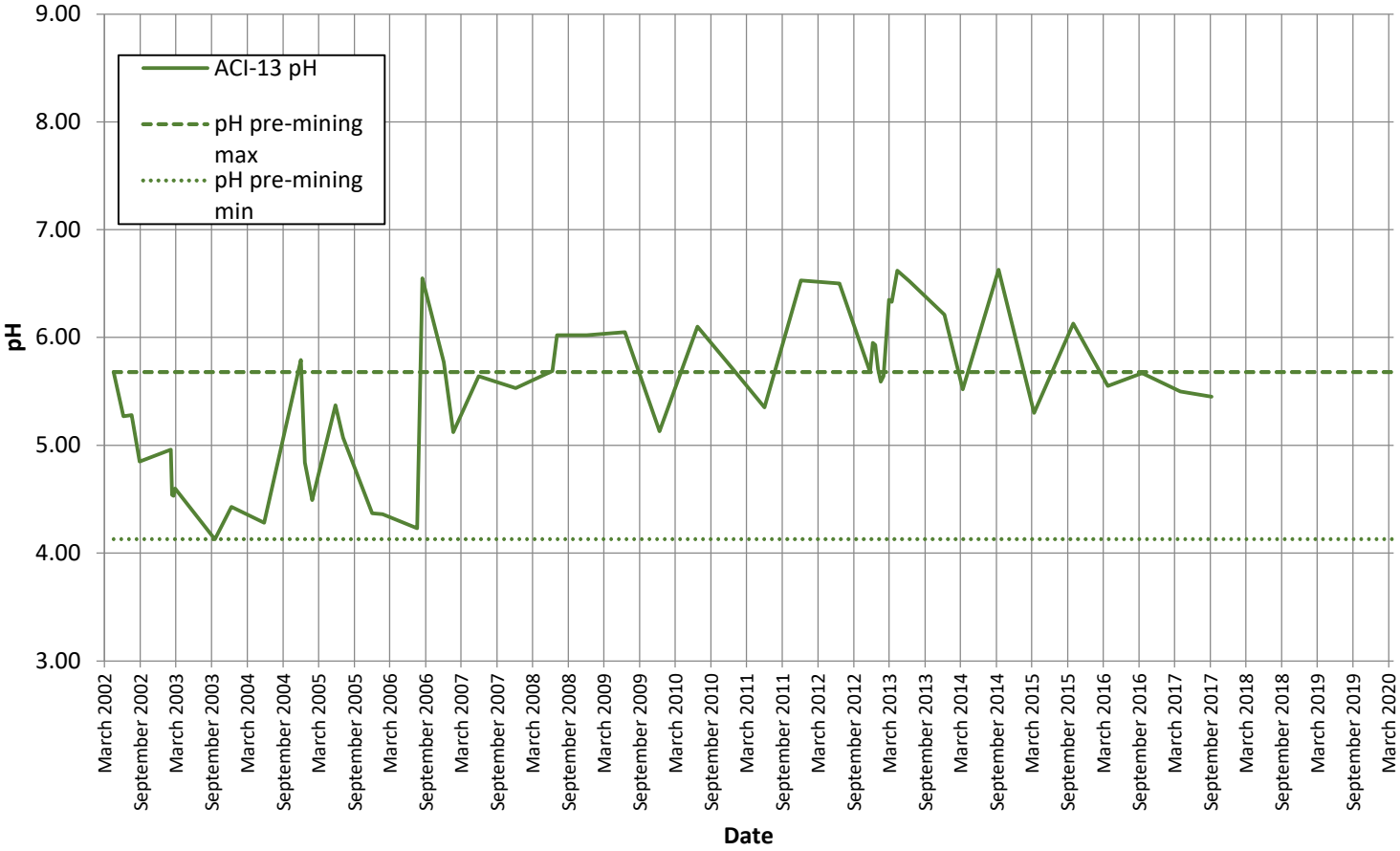
ACI-13 (pH)


ACI-13 pH
pH pre-mining max
pH pre-mining min
pH
9.00
8.00
7.00
6.00
5.00
4.00
3.00
March 2002
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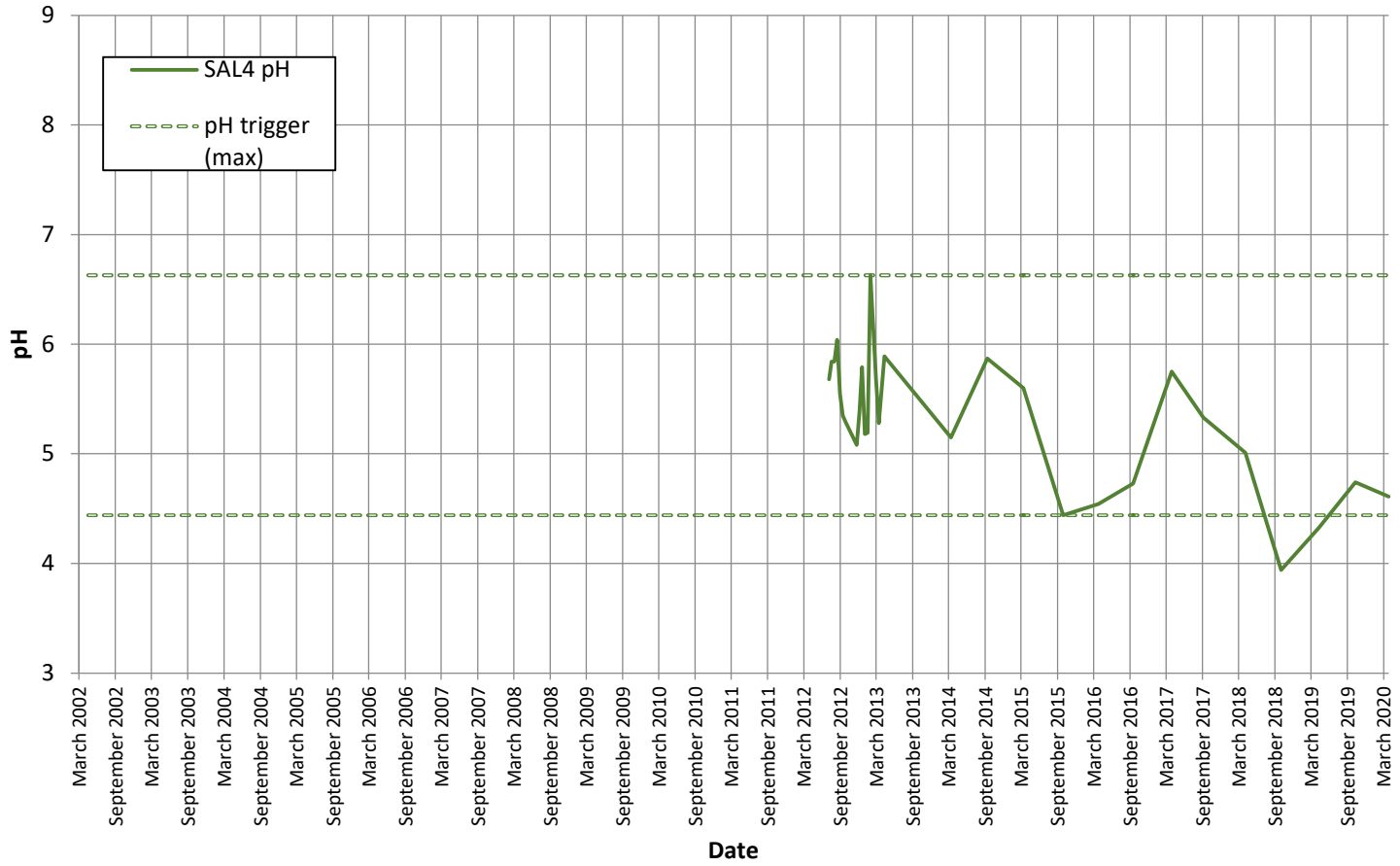
SAL4 (pH)


SAL4 pH
pH trigger (max)
pH
9
8
7
6
5
4
3
March 2002
September 2002
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September 2004
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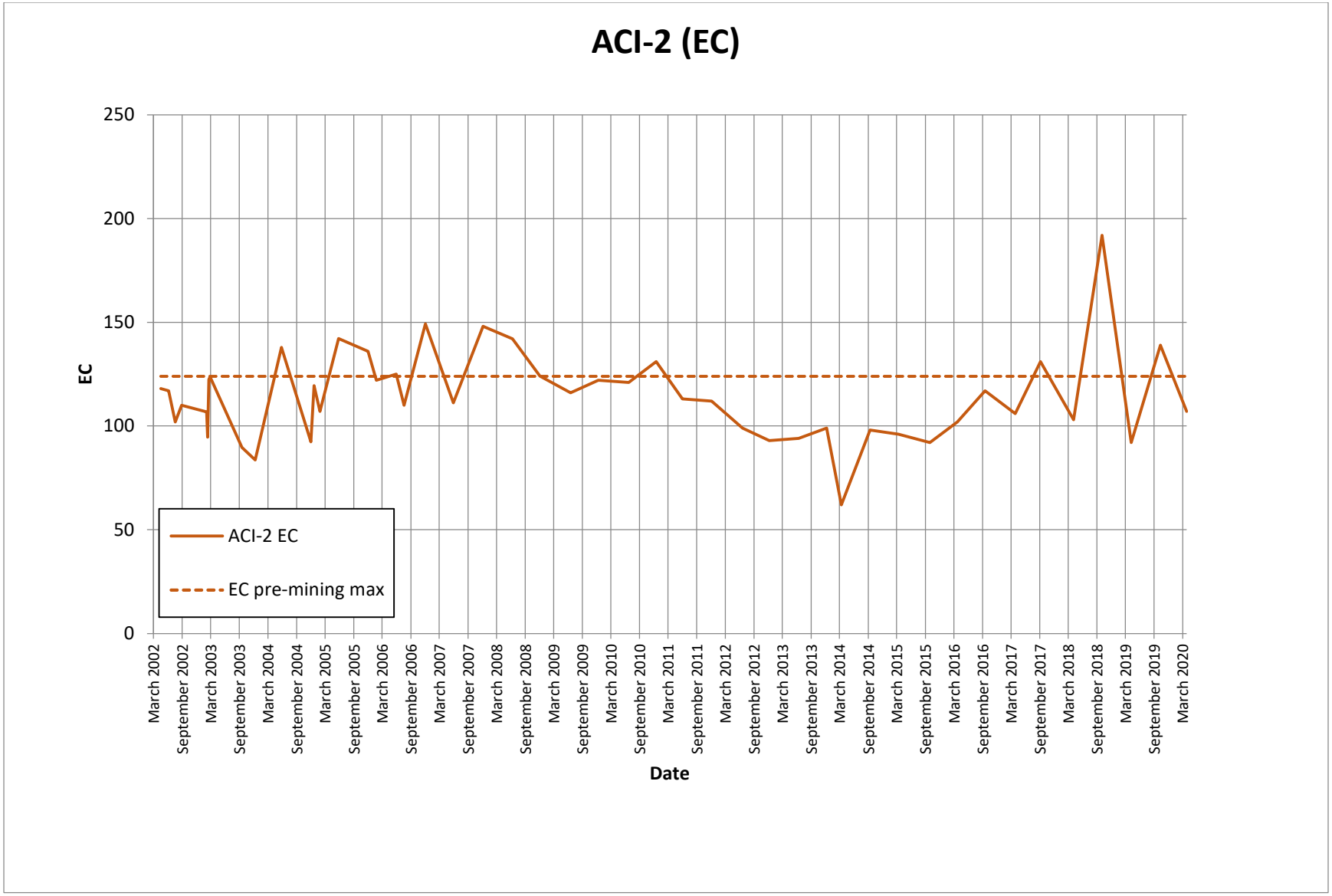
ACI-2 (EC)
250
200
150
100
50
0
EC
ACI-2 EC
EC pre-mining max
March 2002
September 2002
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September 2003
March 2004
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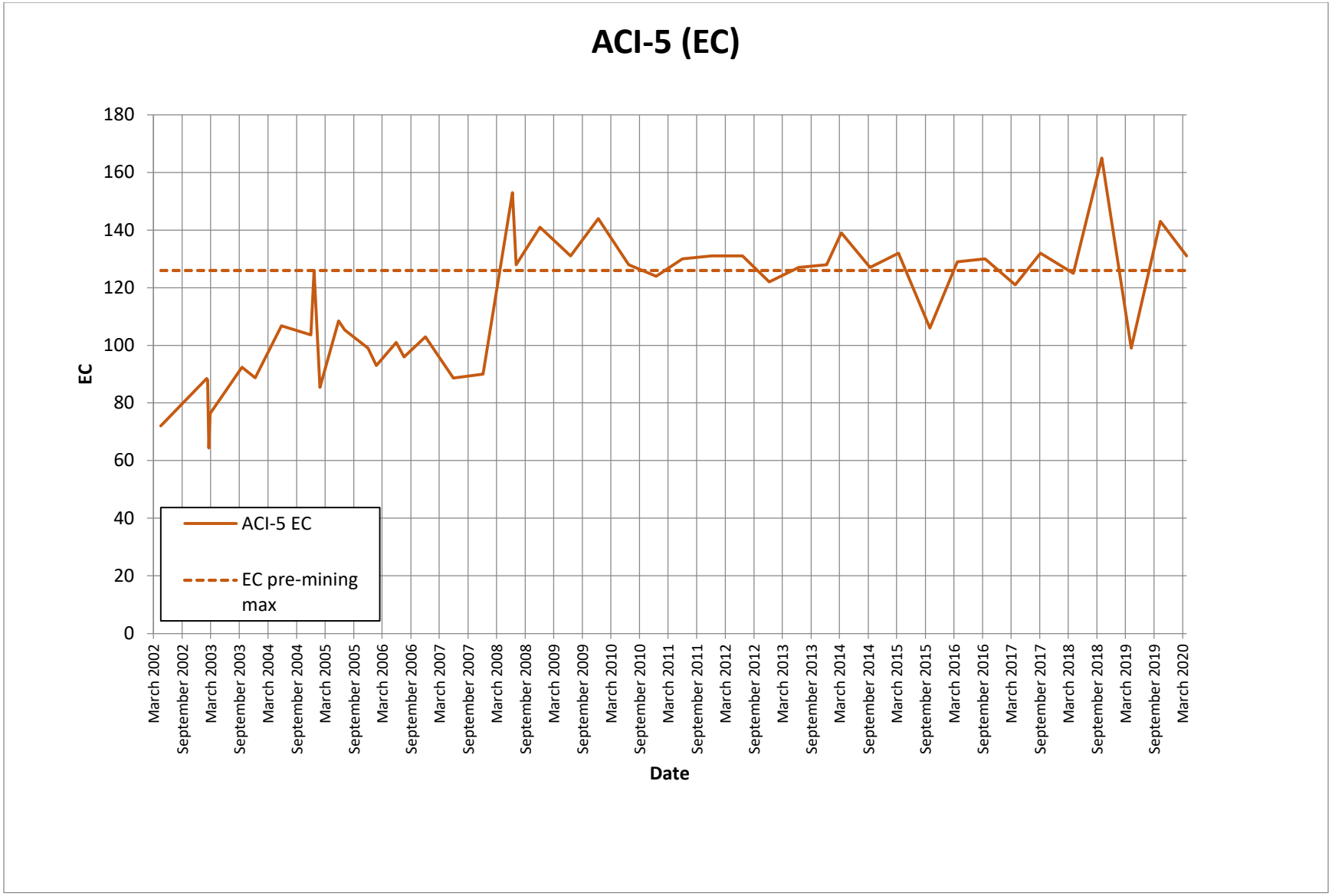
ACI-5 (EC)
EC
180
160
140
120
100
80
60
40
20
0
ACI-5 EC
EC pre-mining max
March 2002
September 2002
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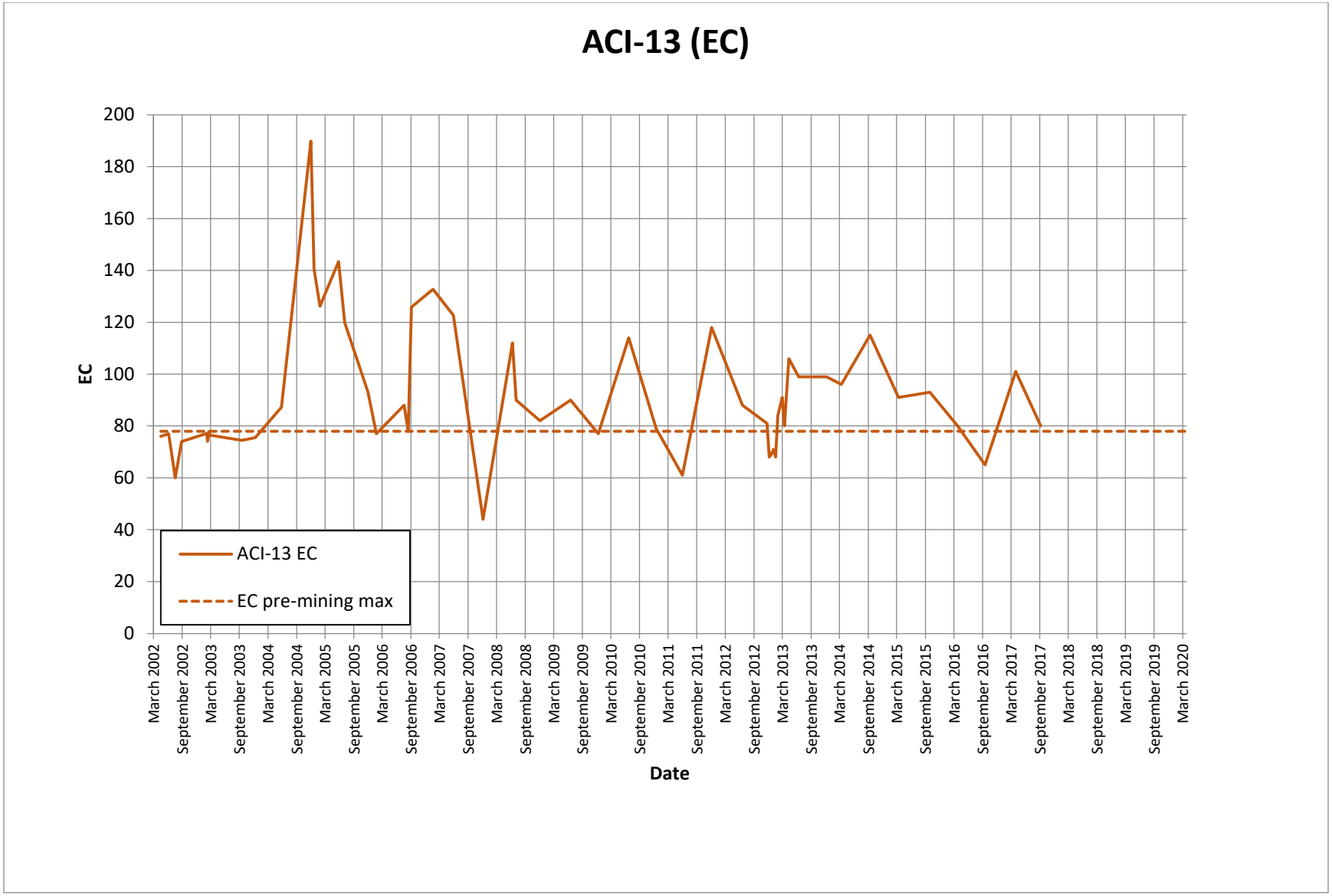
ACI-13 (EC)
EC
200
180
160
140
120
100
80
60
40
20
0
ACI-13 EC
EC pre-mining max
March 2002
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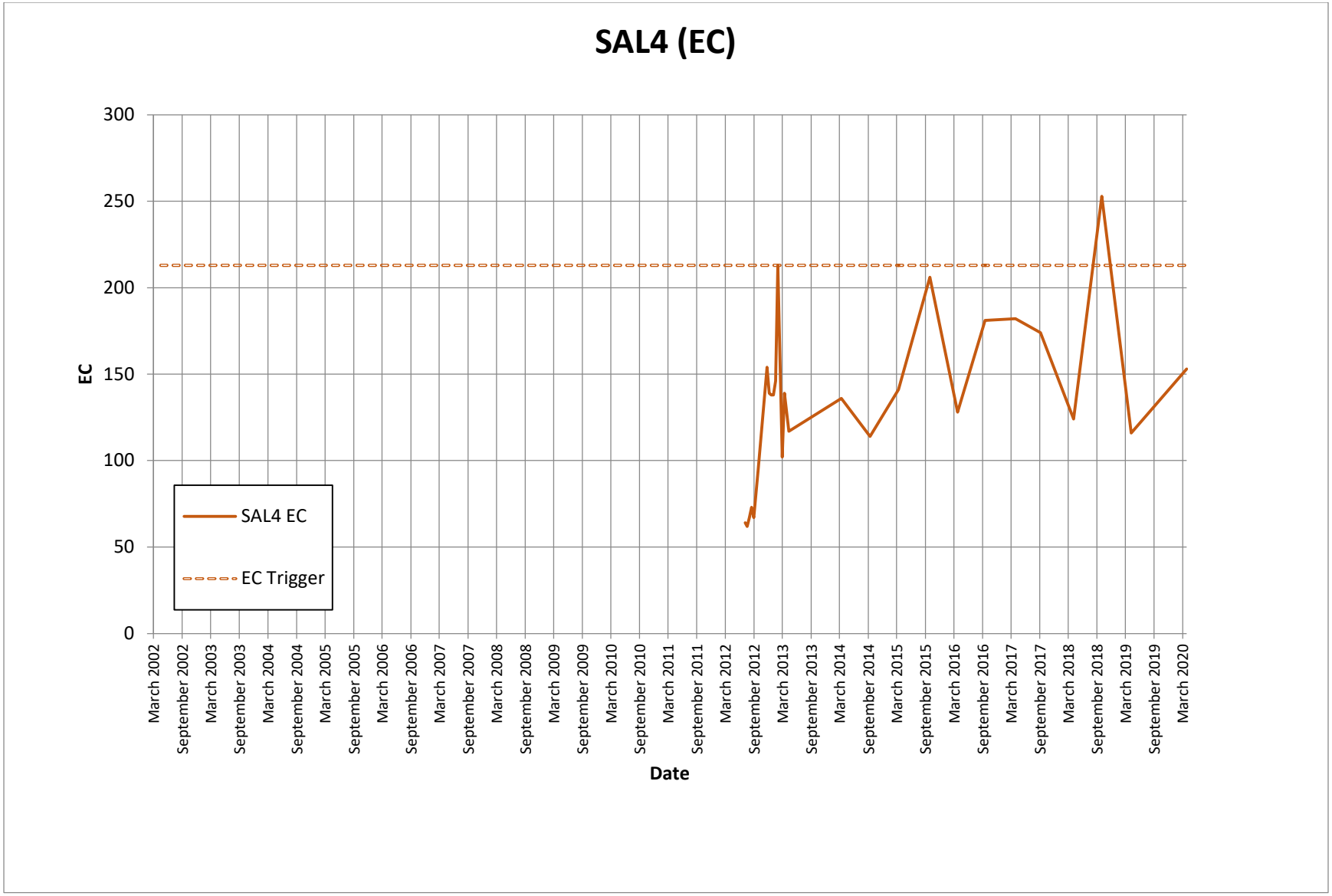
Date


SAL4 (EC)
300
250
200
150
100
50
0
EC
SAL4 EC
EC Trigger
March 2002
September 2002
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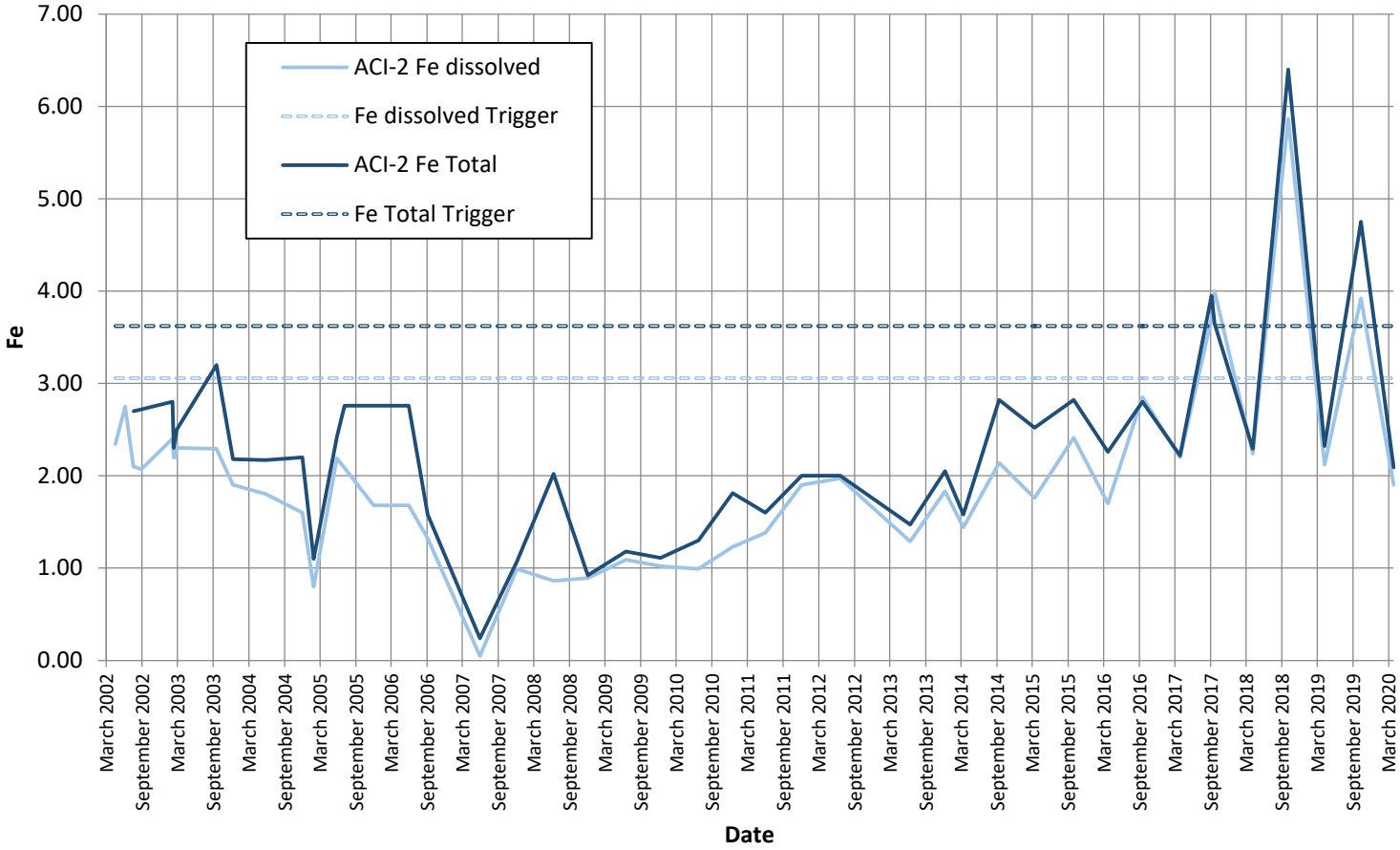
ACI-2 (Iron)


ACI-2 Fe dissolved
Fe dissolved Trigger
ACI-2 Fe Total
Fe Total Trigger
Fe
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
March 2002
September 2002
March 2003
September 2003
March 2004
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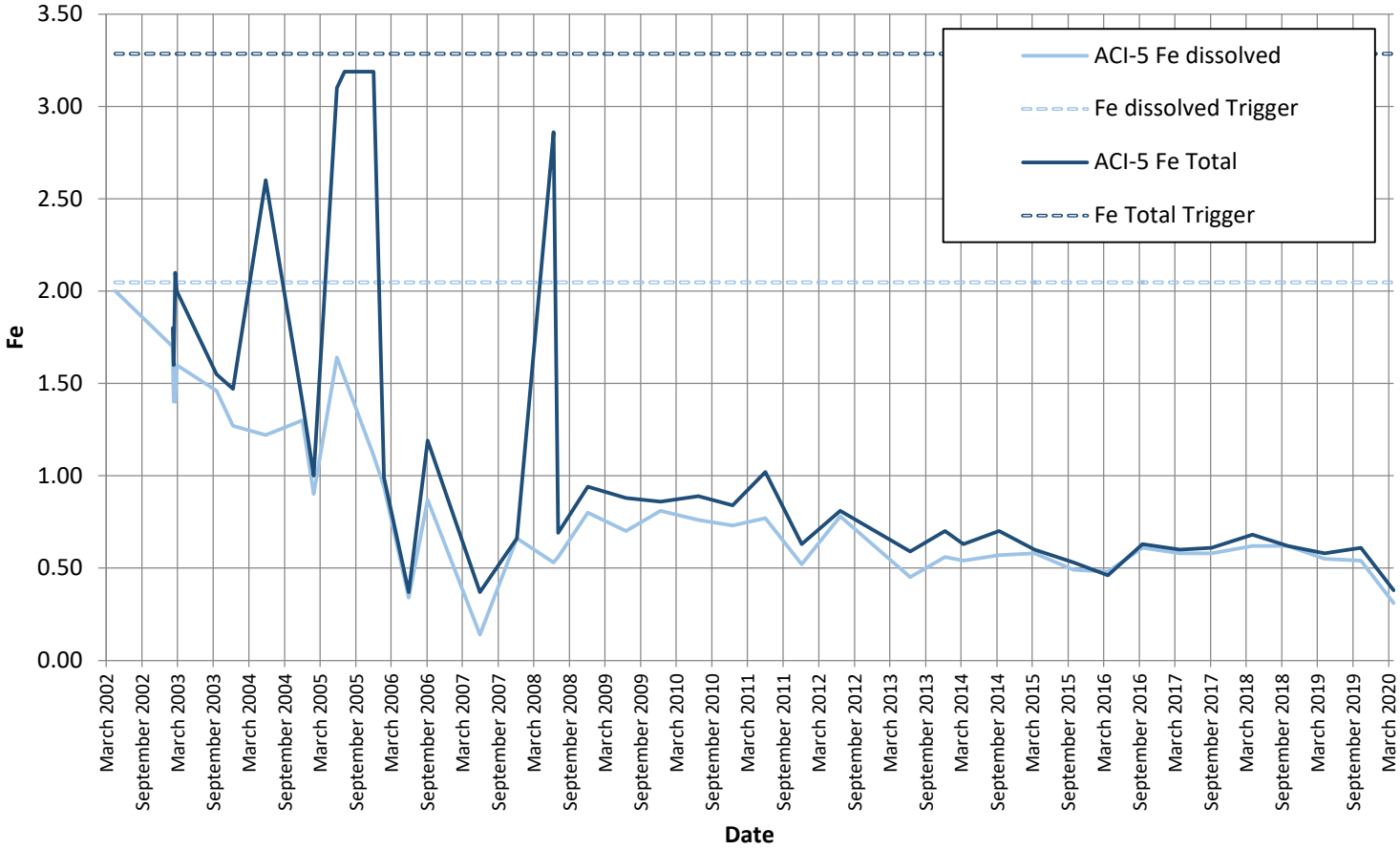
ACI-5 (Iron)


3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Fe
ACI-5 Fe dissolved
Fe dissolved Trigger
ACI-5 Fe Total
Fe Total Trigger
March 2002
September 2002
March 2003
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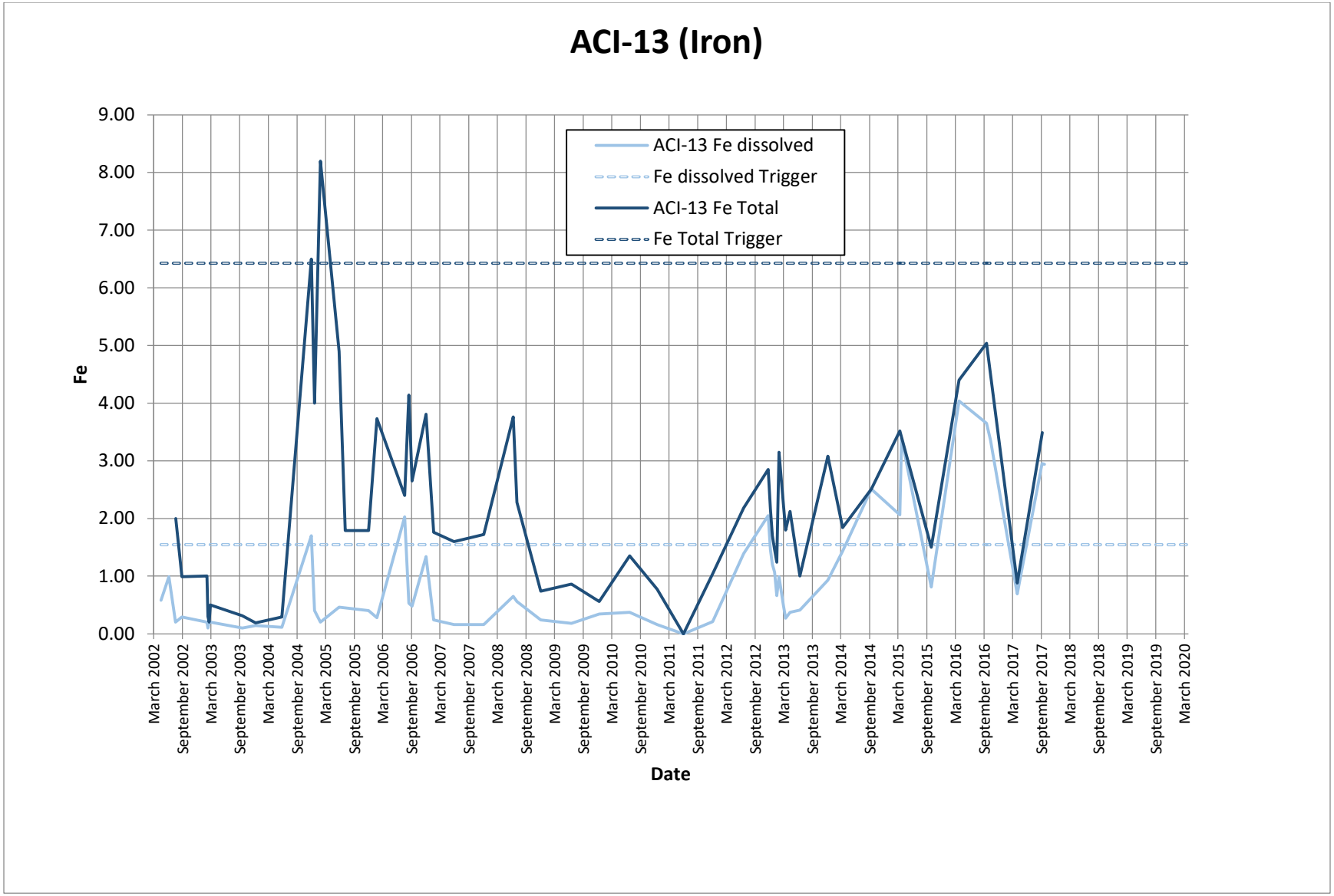
ACI-13 (Iron)
ACI-13 Fe dissolved
Fe dissolved Trigger
ACI-13 Fe Total
Fe Total Trigger
Fe
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
March 2002
September 2002
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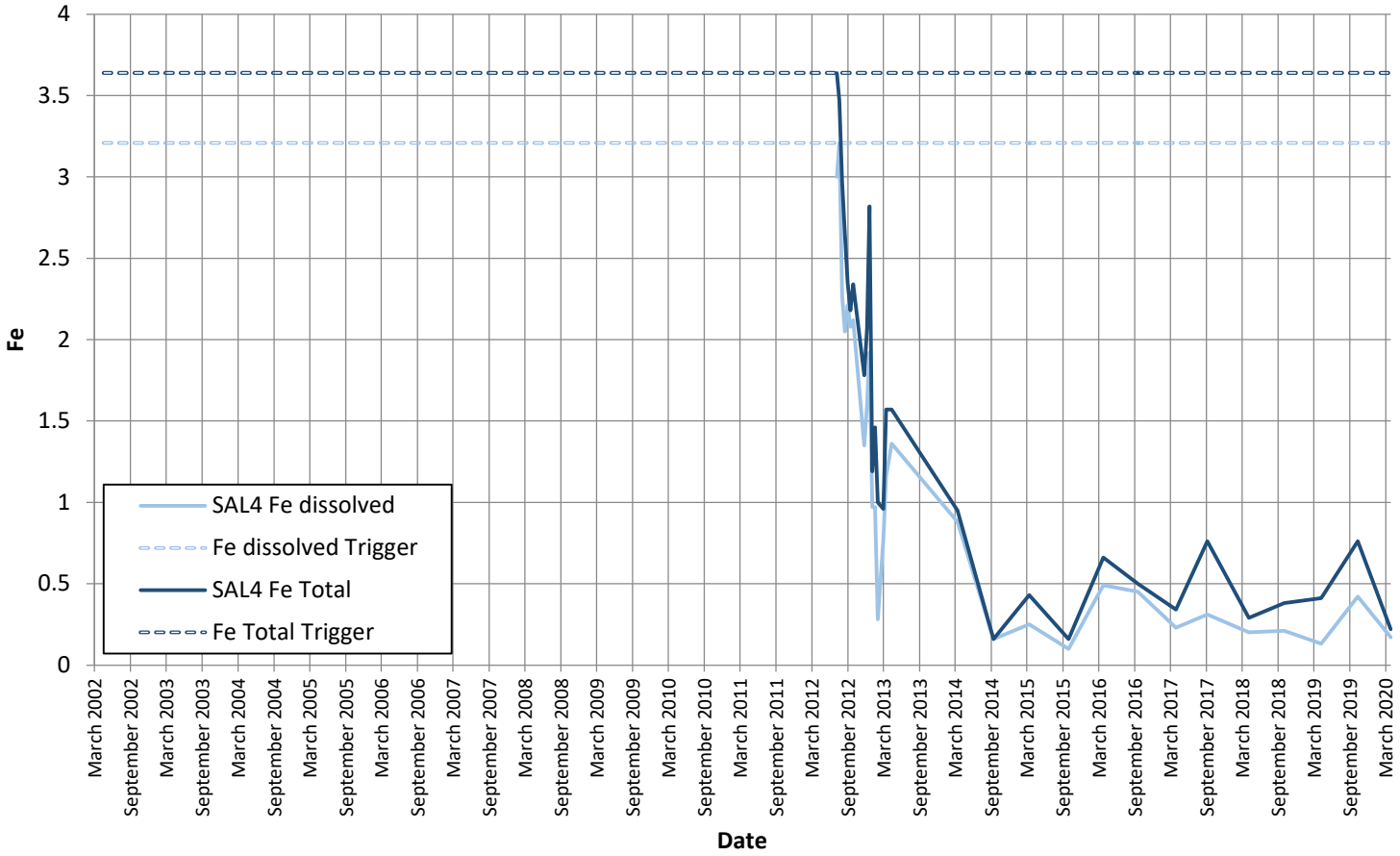
SAL4 (Iron)


Fe
4
3.5
3
2.5
2
1.5
1
0.5
0
SAL4 Fe dissolved
Fe dissolved Trigger
SAL4 Fe Total
Fe Total Trigger
March 2002
September 2002
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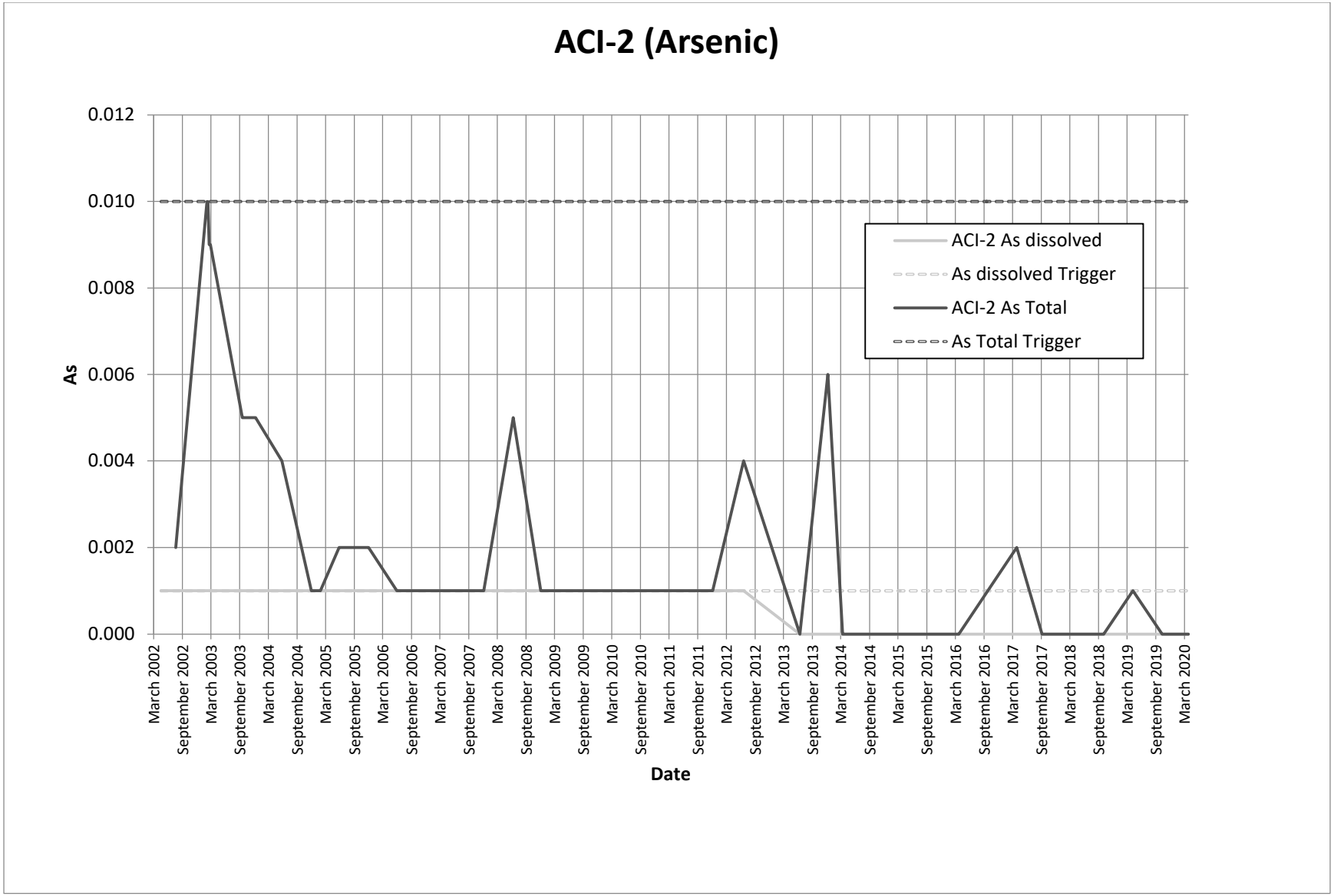
ACI-2 (Arsenic)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
As
March 2002
September 2002
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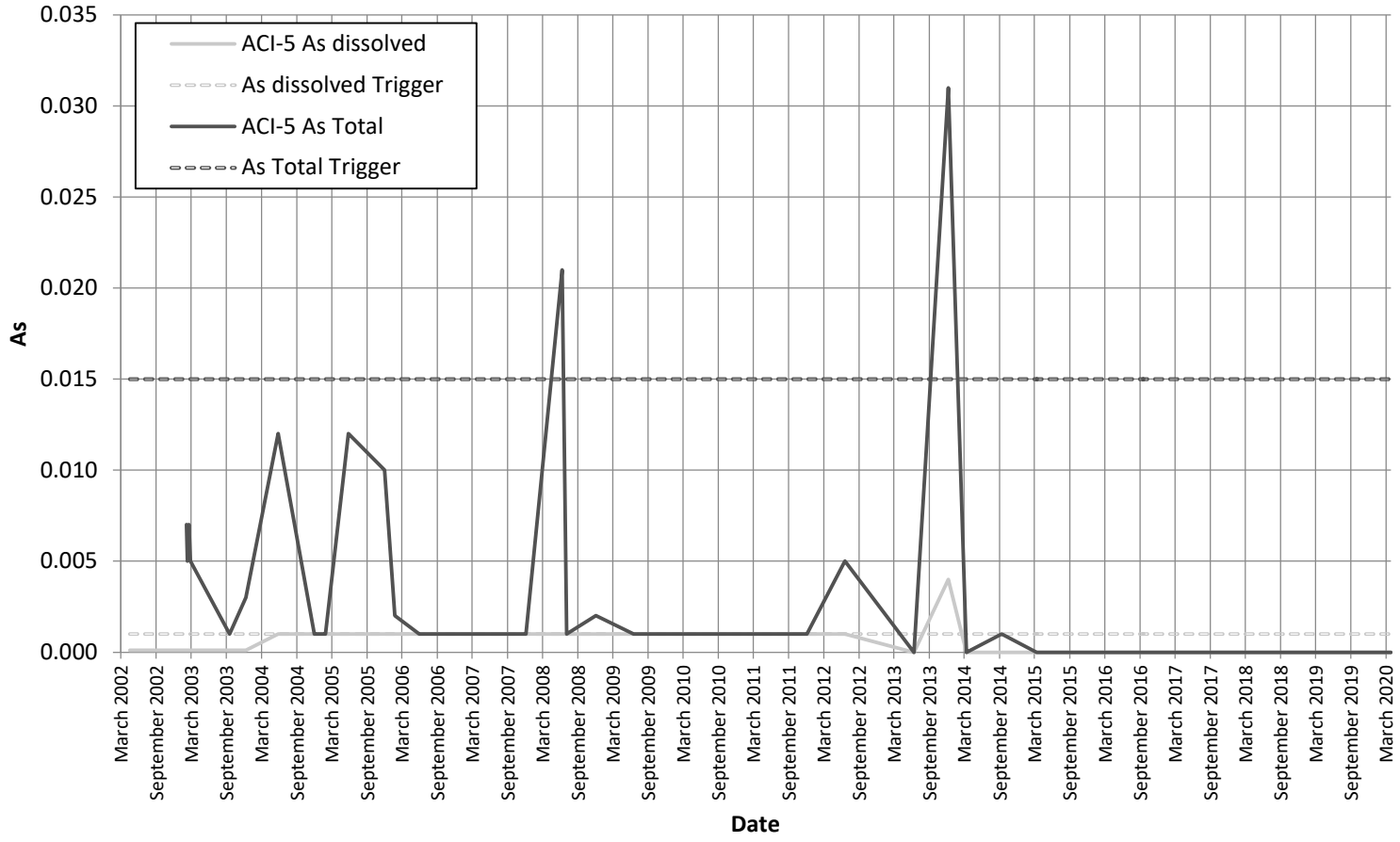
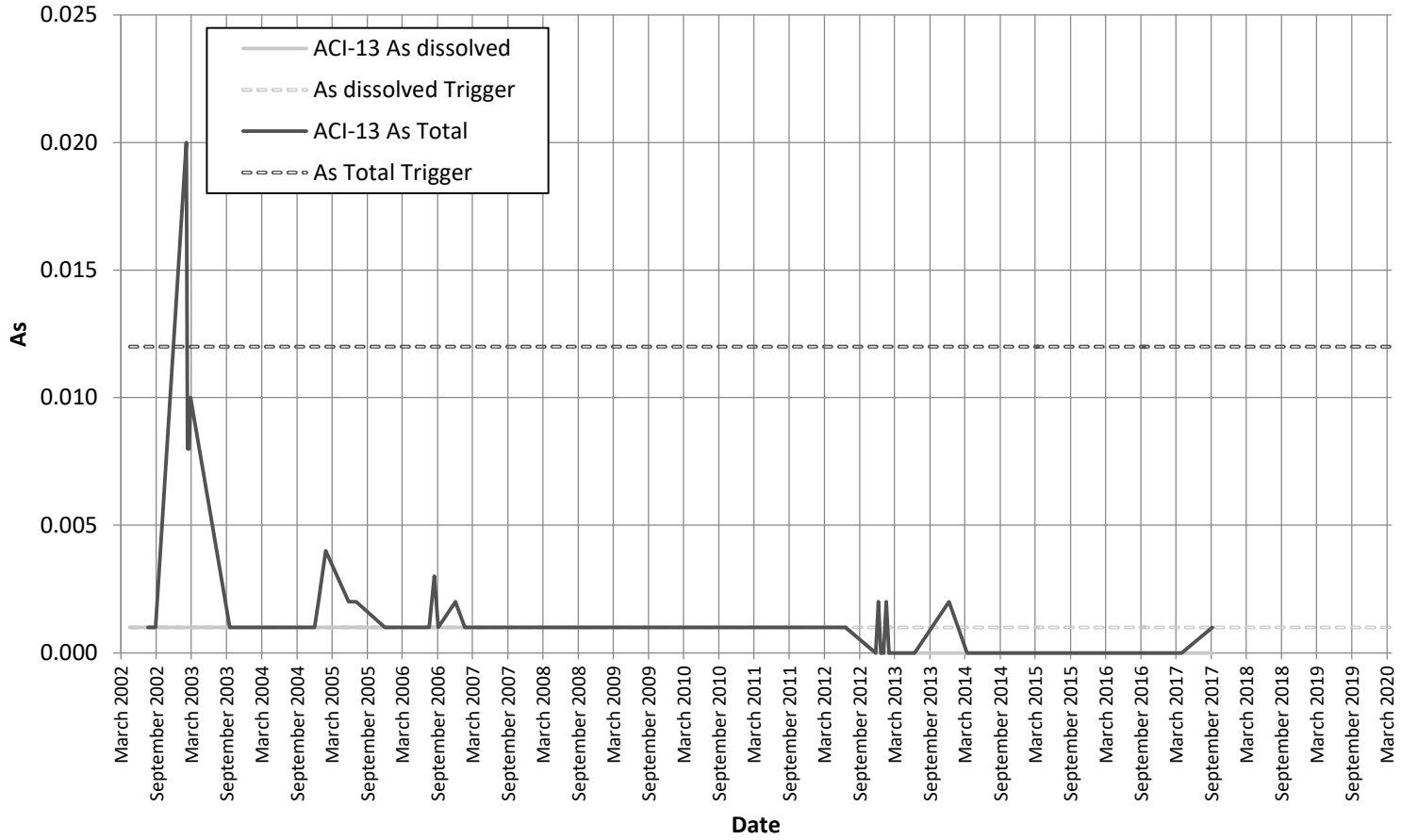
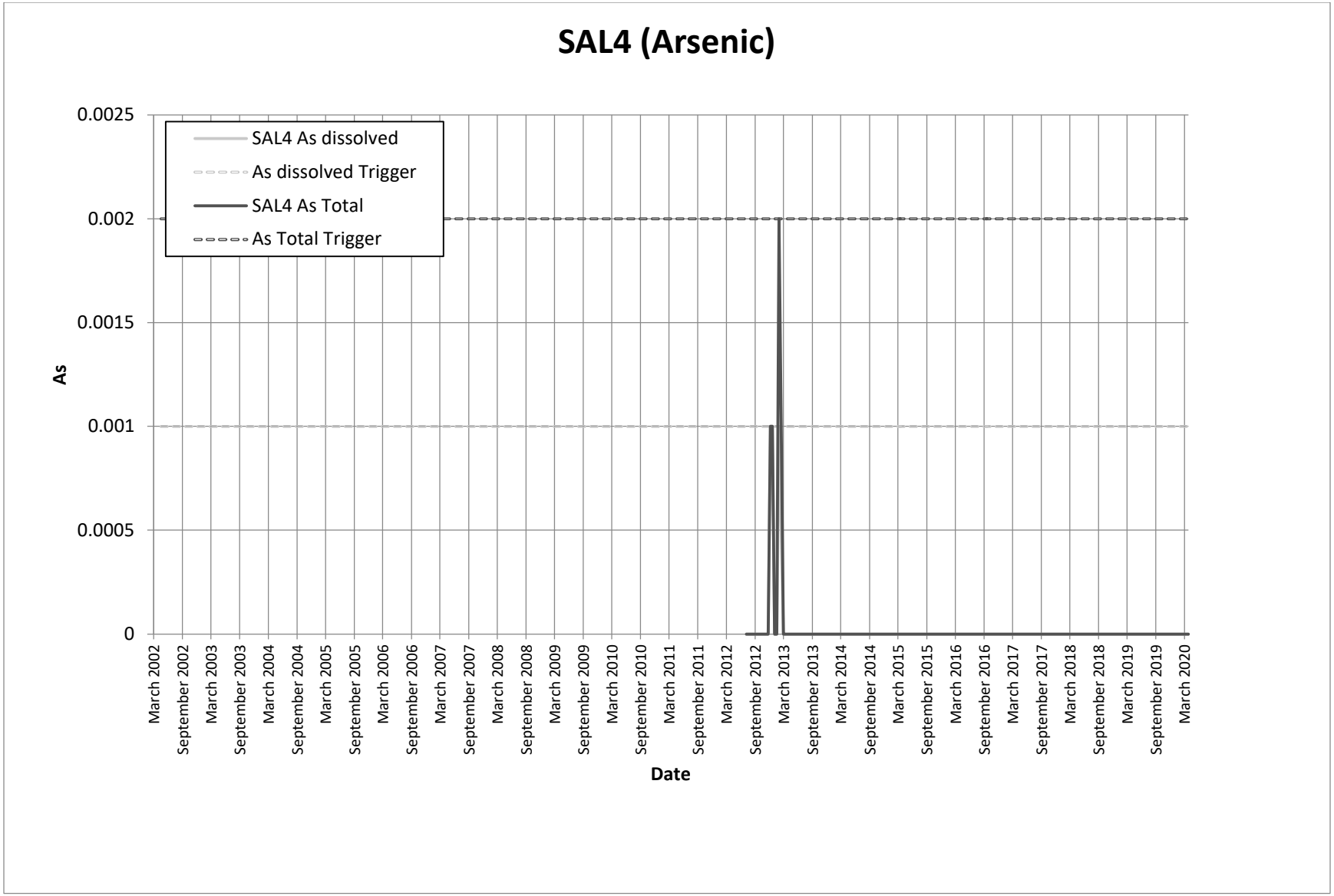
Date
ACI-2 As dissolved
As dissolved Trigger
ACI-2 As Total
As Total Trigger

ACI-5 (Arsenic)



ACI-13 (Arsenic)




SAL4 (Arsenic)
SAL4 As dissolved
As dissolved Trigger
SAL4 As Total
As Total Trigger
0.0025
0.002
0.0015
0.001
0.0005
0
As
March 2002
September 2002
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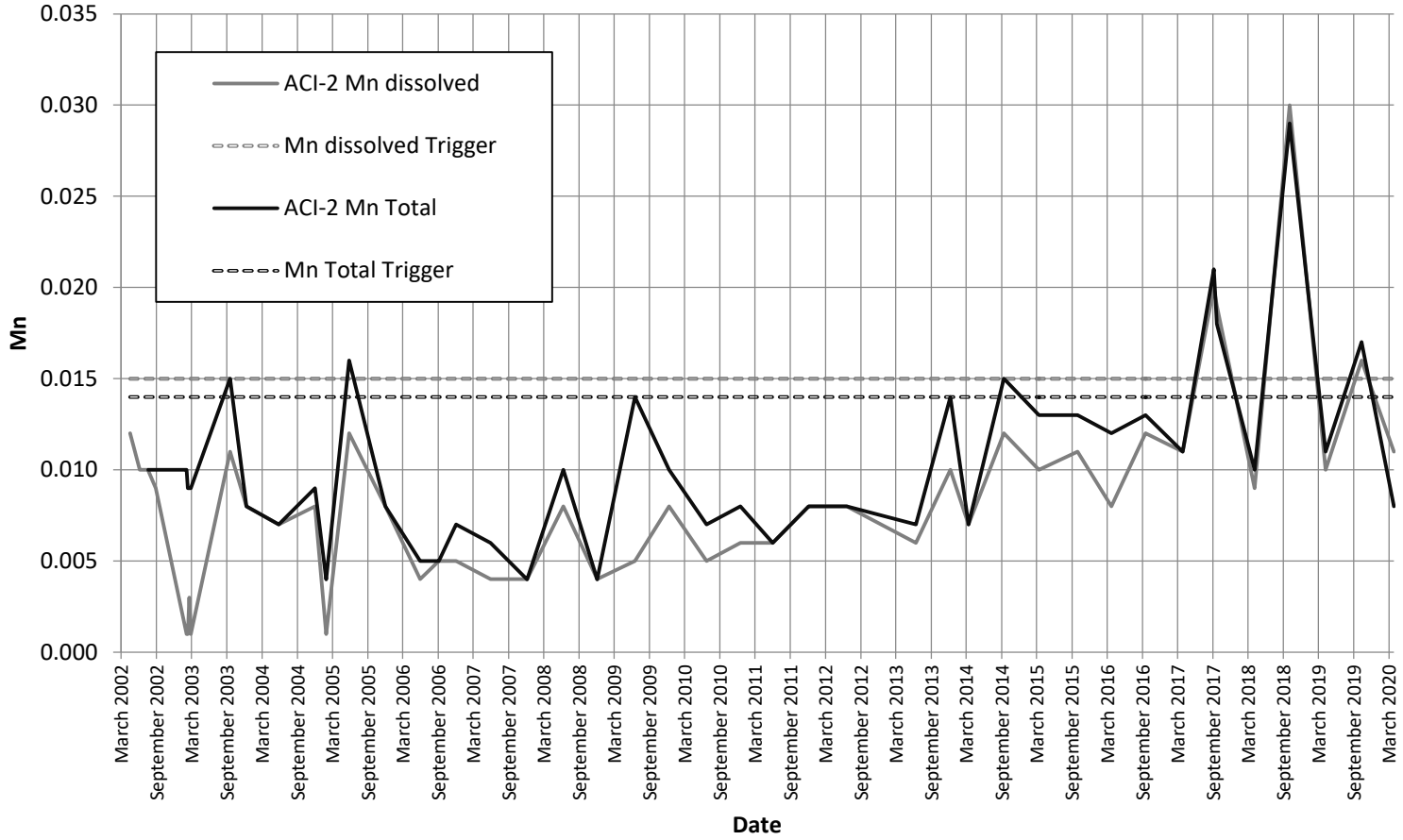
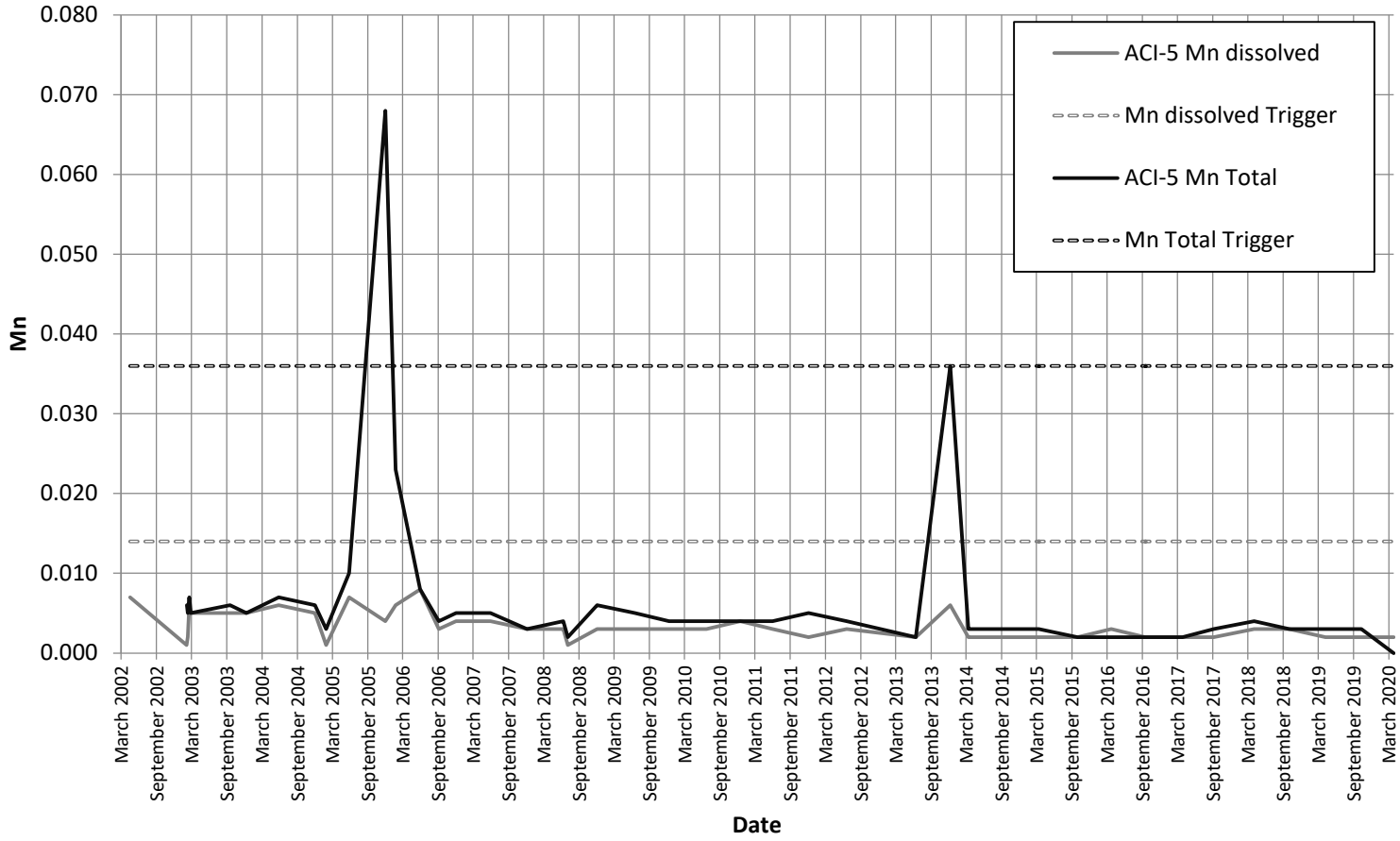
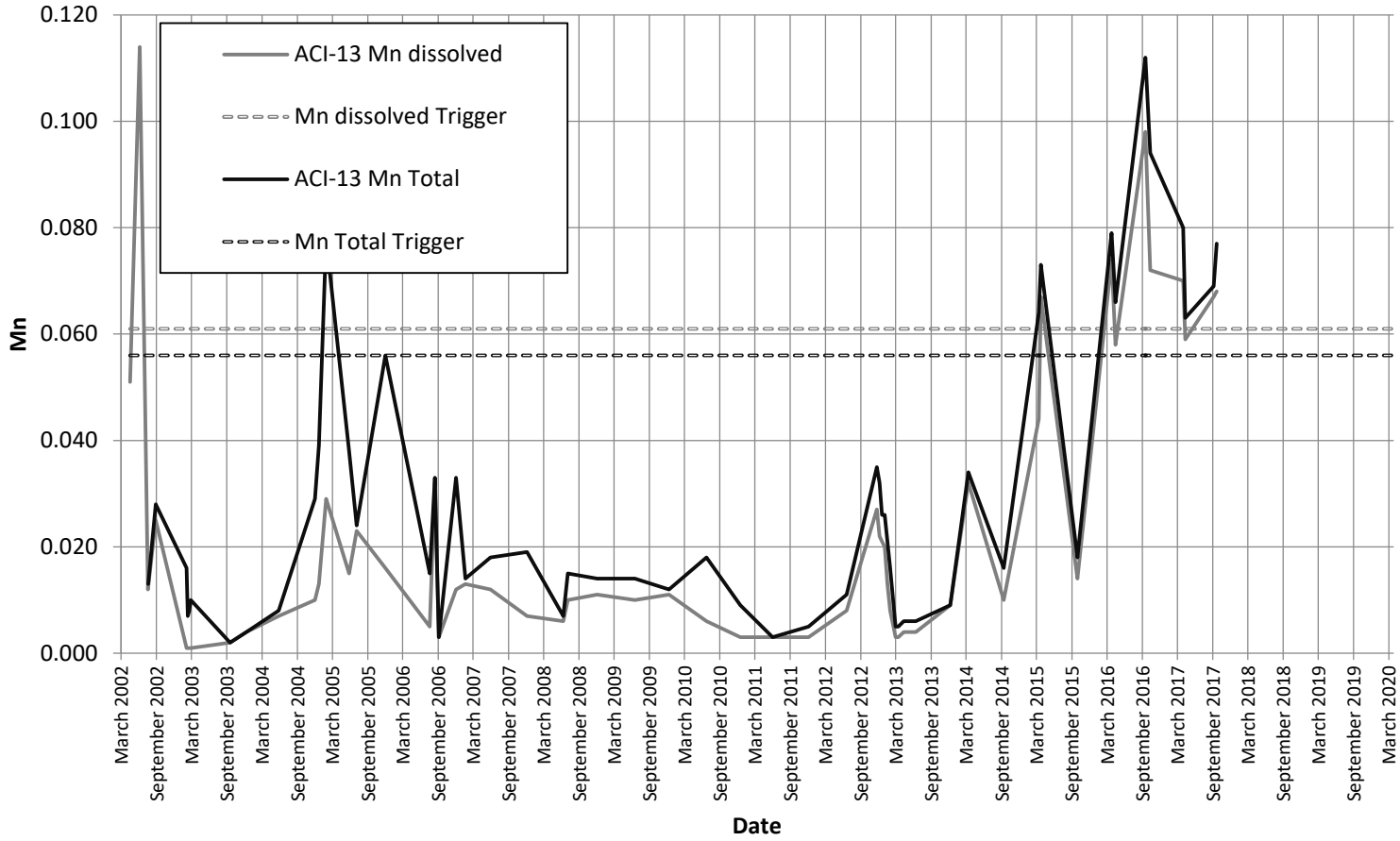
ACI-2 (Manganese)



ACI-5 (Manganese)



ACI-13 (Manganese)



SAL4 (Manganese)