Name of operation	**Cabbage Tree Road Sand Quarry**
Name of operator	**Newcastle Sand**
Development consent #	**SSD-6125**
Name of holder of development consent / project approval	**Williamtown Sand Syndicate Pty Ltd**
Mining lease #	***Not applicable***
Water licence #	***Not applicable***
MOP/RMP	***Not applicable***
Annual Review start date	**1 January 2019**
Annual Review end date	**31 December 2019**

I, **Darren Williams**, certify that this audit report is a true and accurate record of the compliance status of the **Cabbage Tree Road Sand Quarry** for the period **1 January 2019 to 31 December 2019** and that I am authorised to make this statement on behalf of **Newcastle Sand**.

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	Darren Williams
Title of authorised reporting officer	**Operations Manager**
Signature of authorised reporting officer	
Date	15 September 2020

Version 2.0 of 15 Sept 2020

STATEMENT OF COMPLIANCE

A statement of compliance is shown below in **Table 1**, where non-compliances were identified these are outlined in **Table 2**, based on the compliance status key shown in **Table 3**.

Table 1: Statement of Compliance

Where all conditions of the relevant approvals complied with?	
SSD_6125	No

Table 2: Non-compliances

Relevant Approval	Condition	Condition Summary	Compliance Status (see Table 3)	Comment	Where Addressed in Annual Review
SSD_6125	38	Biodiversity and Rehabilitation Bond	**Non-Compliant** Administrative non-compliance	Administrative error and delays resulted in the rehabilitation bond not being submitted within 6 months of the management plan approval.	Section 7.5.1 and Section 9.0

Table 3: Compliance status key for Table 2 above.

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

2019
Annual Environmental Review

Cabbage Tree Road Sand Quarry

Cabbage Tree Road, Williamtown

WILLIAMTOWN SAND SYNDICATE PTY LTD
P.O Box 186, Waratah NSW 2298

NEWCASTLE SAND
Quarry Manager
Paul Bourne
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Document Control:

Version	Description	Date	Author
The first submission of this document submitted to DPIE was authored by R.Townsend of Kleinfelder Australia Pty Ltd and dated 27 March 2020. Wedgetail Project Consulting Pty Ltd on behalf of Newcastle Sand in conjunction with Williamtown Sand Syndicate Pty Ltd have used components of the first submission in compiling this document.			
2.0	Updated version based on DPIE comments dated 4 August 2020	15 Sept 2020	J.Berry (Wedgetail Project Consulting Pty Ltd)

Contents

Tables

Figures

Appendices

1. INTRODUCTION

1.1 SCOPE

Schedule 5 Condition 11 of Development Consent SSD-6125 requires an Annual Review (AR) of the environmental performance of Cabbage Tree Road Sand Quarry. This AR has been prepared for the Cabbage Tree Road Sand Quarry to report on environmental performance in the calendar year 1 January 2019 – 31 December 2019.

Works commenced onsite on 14 August 2019 and focused on construction of the access road and office and workshop compound, no sand extraction and sale (i.e. quarry operations) occurred during the period.

This AR will be distributed to the NSW Department of Planning, Industry and Environment (DPIE), Hunter Water Corporation (HWC) and Port Stephens Council (PSC) and will also be provided to the Community Consultative Committee (CCC) and made publicly available on Newcastle Sands website.

1.2 PURPOSE OF REPORT

On 9 of May 2018, Development Consent SSD-6125 was approved under Section 4.38 of the *Environment Planning and Assessment Act 1979* (EPA Act 1979).

Schedule 5 Condition 11 of SSD-6125 requires that:

By the end of March each year, or other timing as may be agreed by the Secretary, the Applicant must submit a review to the Department reviewing the environmental performance of the development to the satisfaction of the secretary. This review must:

a) *Describe the development (including any progressive 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.*

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;*
- *Requirements of any plan or program required under this consent;*
- *Monitoring results of previous years; and*
- *Relevant predictions in the documents listed in condition 2(a) of Schedule 2;*

c) *Identify any non-compliance over the past calendar 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 development;*

e) *Identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and*

f) *Describe what measures will be implemented over the current calendar year to improve the environmental performance of the development.*

1.3 PROJECT SUMMARY

The key details of the Project are shown in **Table 4** with the general arrangement and resource extent shown by **Figure 1**.

Table 4: Key Aspects of the Cabbage Tree Road Sand Project.

Aspect	Key Aspects of the Project
Key elements	Sand quarry extracting up to 530,000 tonnes per annum over a period of 6 to 15 years including the construction of an intersection with Cabbage Tree Road, sealed and gravel access roads, site office, workshop and weighbridges. Progressive rehabilitation of quarried land returning to native vegetation communities with potential future use of the facilities area.
Location	398 Cabbage Tree Road, Williamtown, within the Port Stephens local government area.
Property Titles	Four titles within the Parish of Stockton, County of Gloucester including: • Lot 1 DP 224587 at 398 Cabbage Tree Road, Williamtown • Lot 121 DP 556403 at 282B Cabbage Tree Road, Williamtown. • Lot 11 DP 629503 at 282A Cabbage Tree Road, Williamtown. • Lot 1012 DP 814078 at 282 Cabbage Tree Road Williamtown.
Land Owner	Port Stephens Shire Council under lease to Williamtown Sand with royalty of up to $17.5 million over the Project life.
Area	Total Project Area of approximately 42.3 hectares from a Subject Land Area of approximately 176.2 hectares.
Proponent	Williamtown Sand Syndicate Pty Ltd, the owner of the quarry operator Newcastle Sand.
Stakeholders	Key stakeholders include: • Adjacent landowners and local community • NSW Planning & Environment (DPE) • NSW Office of Environment & Heritage (OEH) • NSW Department of Primary Industries – Office of Water • Hunter Water Corporation (HWC) • Port Stephens Council (PSC) • Commonwealth Department of Environment. Copies of correspondence by these stakeholders regarding the required content for this document is included within **Appendix 2.**
Project Life	Up to 15 years. At expected demand the quarry will have an eight (8) year life, or six (6) years at maximum extraction rates.
Extraction Rate	Maximum of 530,000 tonnes per annum, and maximum daily rate of 3,000 tonnes.

Aspect	Key Aspects of the Project
Operating Hours	Construction of intersection, access and workshop and office: • 7:00am to 5:00pm Monday to Friday. • 8:00am to 1:00pm Saturday. • No works on Sunday or public holidays. Quarrying Operations: • 7:00am to 5:00pm Monday to Friday. • 7:00am to 4:00pm on Saturday. • No quarrying on Sunday or a Public Holiday. Loading and dispatch of trucks: • 6:00am to 6:00pm Monday to Friday. • 7:00am to 4:00pm Saturday. • No works on Sunday or public holidays.
Transport Rate	• Up to 6 laden trucks per hour (12 trips per hour) during the hours of 6 am to 7 am Monday to Friday. • Up to 10 laden trucks per hour (20 trips per hour) during hours of 7 am to 6 pm Monday to Friday (i.e. all haulage hours excluding the morning peak). • Up to 10 laden trucks per hour (20 trips per hour) during hours of 7 am to 4 pm Saturdays. • Haulage between 5 am and 6 am is subject to agreement from adjacent landowners as per Schedule 3, Condition 1. • Up to 6 vehicles of employees would be expected to arrive from approximately 5:30 am to 7 am and leave between 5 pm and 7 pm.
Quarry Access	Upgrade of existing property access to a left in left out intersection with deceleration and acceleration lanes. Incoming speed limits of: • 40 km/h from Cabbage Tree Road to the weigh bridge. • 20 km/h from weigh bridge to processing plant and extraction face. Outgoing speed limits of: • 20 km/h from processing plant and extraction face to weigh bridge. • 60 km/h weigh bridge to Cabbage Tree Road.
Resource and products	Approximately 3.25 Mt of sand, comprising the following products to be extracted from site by truck onto Cabbage Tree Road for transport to markets: • Raw fill sand. • Screened sand. • Sandy loam. • Concrete sand. • Glass sand (estimated at about 16% of total resource). The Project covers approximately 42.3 hectares (including access roads) with extraction to a depth of not more than 1m above the highest predicted groundwater level.
Extraction	• Maximum extraction rate of 530,000 tonnes per annum. • Excavator and/or bulldozer to clear vegetation and strip topsoil. • Bulldozer or grader to windrow sand. • Front-end loader to feed conveyors to convey sand to the processing plant. • Front-end loader and haul truck to convey sand when conveyor unsuitable.
Processing Methods	• Raw sand product extracted directly from face with no processing. • Sand fed into electrically powered screen. • Screened sand sold as product or fed to electrically powered air separator. • Products stockpiled for loading directly into truck or fill bulker bags for removal from the site by truck.

Aspect	Key Aspects of the Project
Support facilities and utilities	• Site office, workshop, stores, car parking. • Power supply from local network • Water supply from local network.
Water demand and supply	• Water required for stockpile dust suppression and gravel haul road dust suppression. • Water sourced from mains supply fed into the site from Cabbage Tree Road. • Rainwater tanks at office and workshop area to collect rainwater from rooved areas for use in dust suppression. • Water demand estimated at less than 140KL per annum. • No groundwater use. • No capture or storage of surface runoff.
Employment	Full time staff for up to six persons. Opportunities for approximately 20 contract and customer truck haulage operators.
Community and amenity	The following measures are proposed to mitigate and offset adverse impacts to the community: • Up to $17.5 million over the Project life in royalty payments to Port Stephens Council. • A 20 m vegetated buffer from Cabbage Tree Road to minimise visual impacts for passing motorists and adjacent residents. • A 75m long road side buffer of retained vegetation along the sides on the access from Cabbage Tree Road. • Real time triggers on air quality monitors to manage potential air quality impacts. • Six monthly attended noise monitoring and noise model confirmation based on actual data prior to extraction of areas 8, 9 or 10 (estimated at Year 6).
Biodiversity Offset Strategy	A biodiversity offset strategy that incorporates: • The in-perpetuity conservation of the remaining subject land, through the establishment of a Biobank Site. • Purchase and retirement of additional Koala species credits, as required to meet credit requirements at the impact site. • Reinstatement of lost hollows with suitable nest boxes within rehabilitation area at a ratio of one to one. • Long term conservation and security of the majority of the rehabilitated lands.

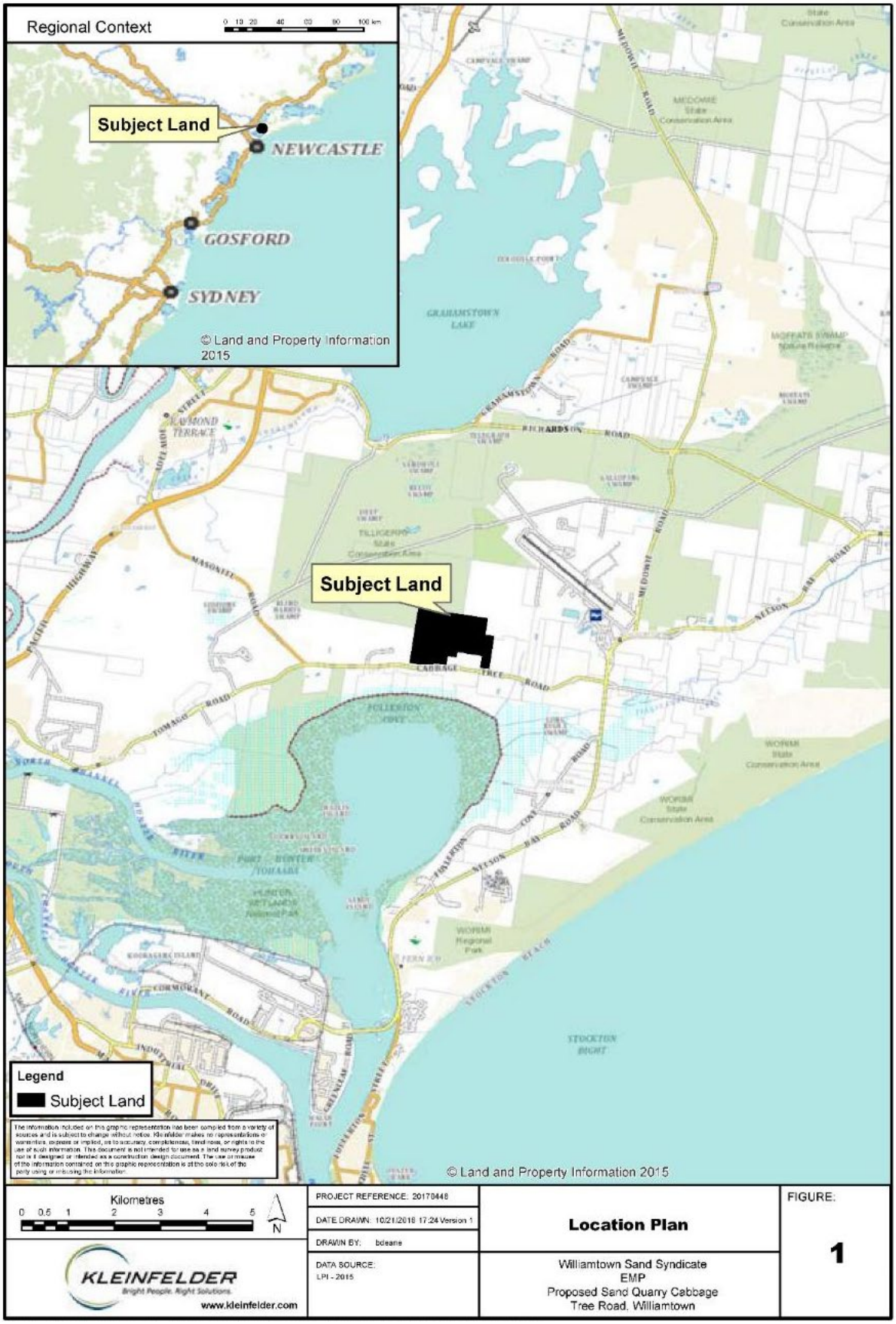


Figure 1: Location of the Cabbage Tree Road Sand Quarry

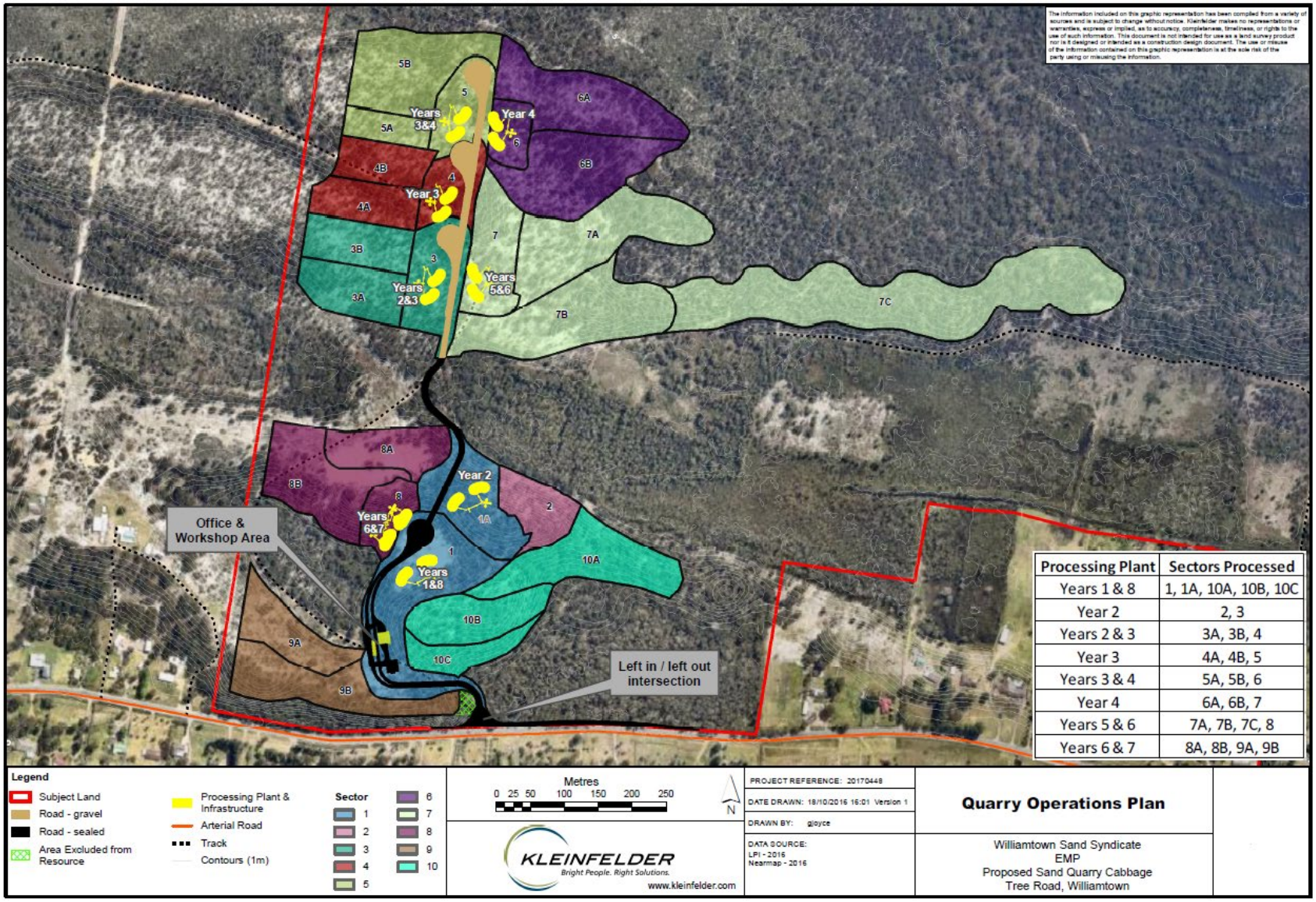
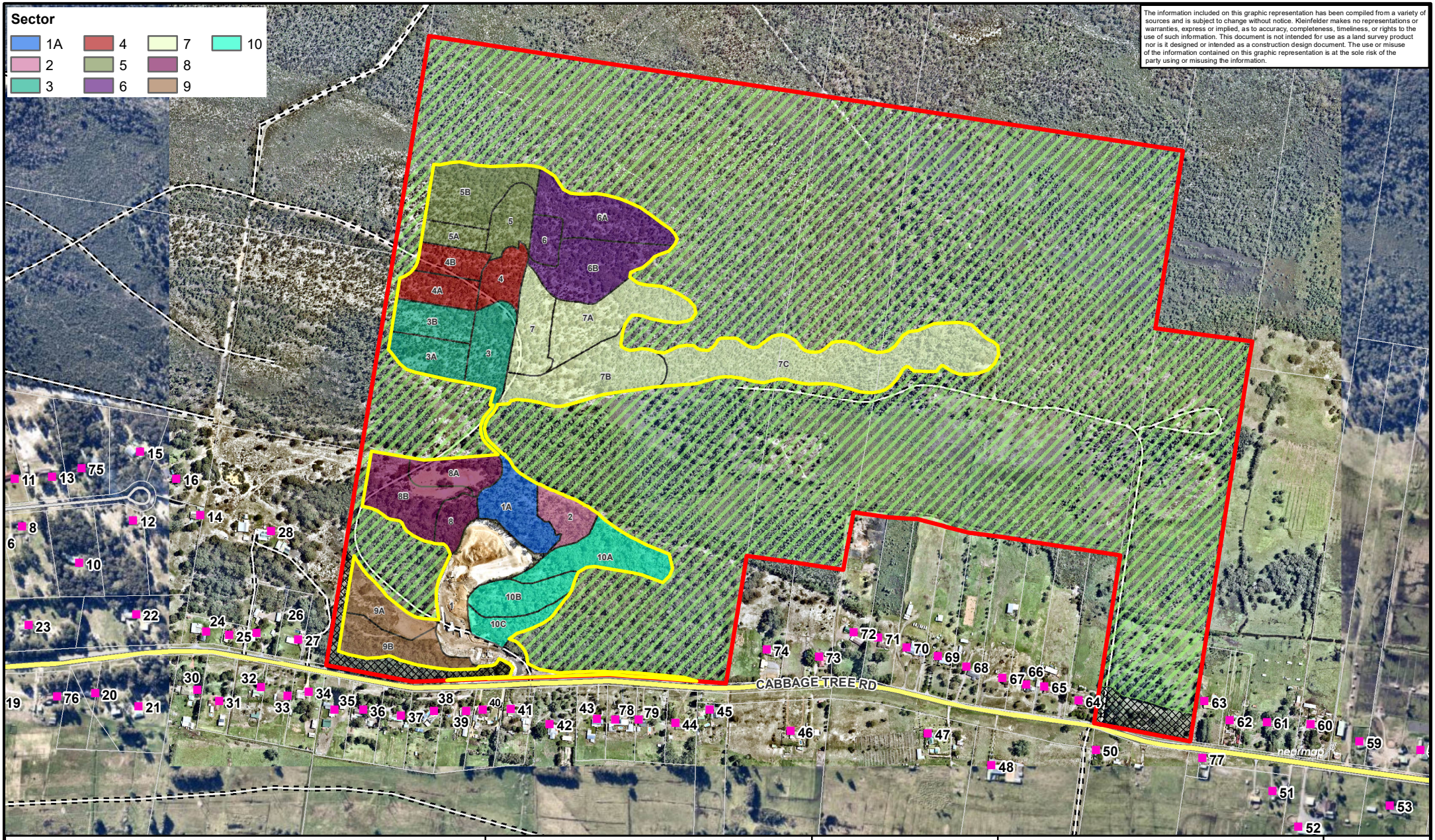


Figure 2: Resource and sequence plan (as per EIS)



Legend

- Subject Land Boundary
- Development Site
- Onsite Offset Area
- Offset Exclusion Areas
- Arterial Road
- Local Road
- Track
- Receptor
- Lot Boundary

Metres
0 50 100 200 300 400 500
N

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Bright People. Right Solutions.
www.kleinfelder.com

PROJECT REFERENCE: 20190803
DATE DRAWN: 2020/09/15 10:50 Version 1
DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2017
Nearmap - February 2020

Subject Land and Receptors

2019 Annual Report
Cabbage Tree Road Sand Quarry
Cabbage Tree Road, Williamtown, NSW

FIGURE:
3

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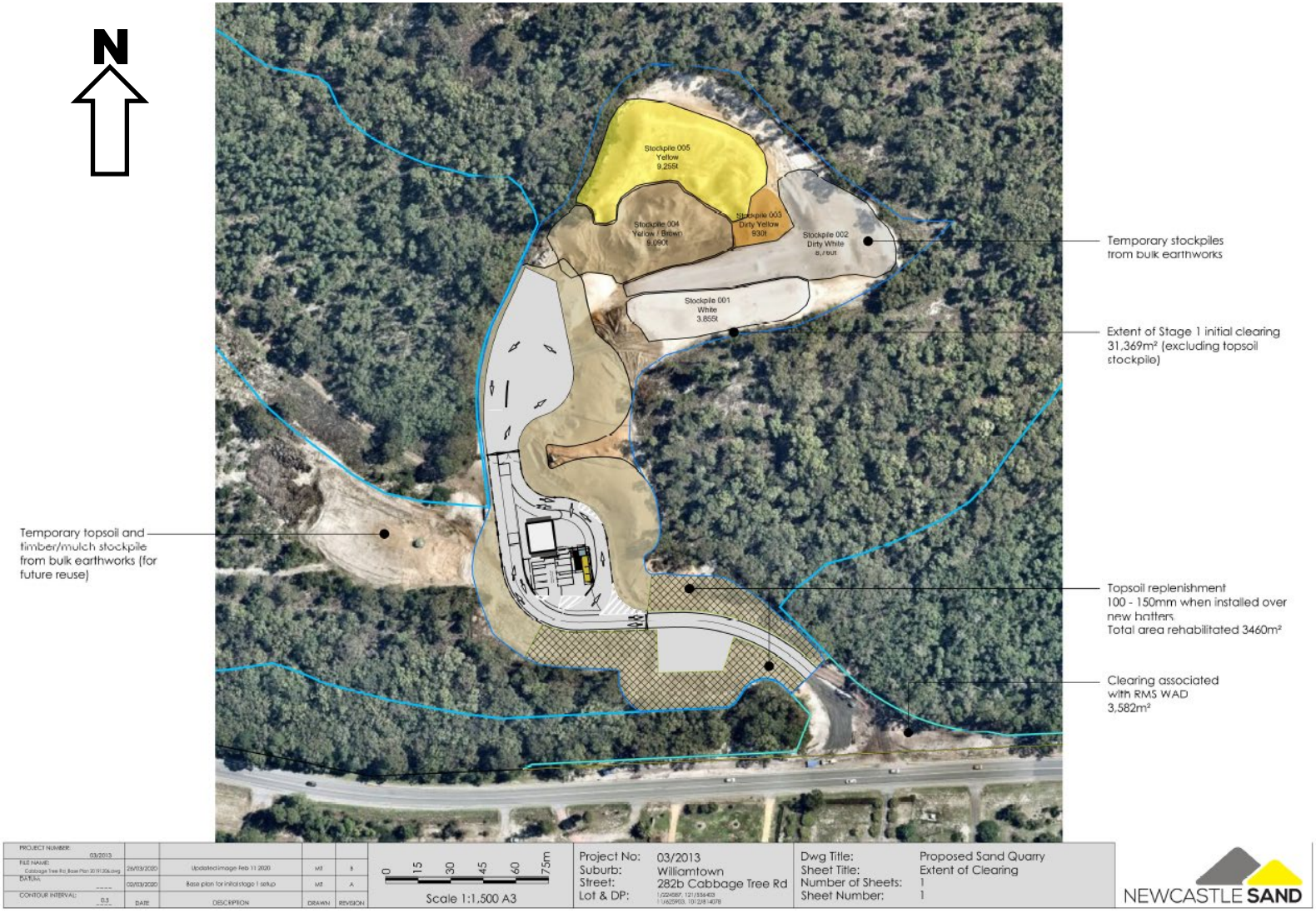

Figure 4: Progress at end of period, showing stockpiles and extent of clearing during the reporting period

1.4 ENVIRONMENTAL SETTING

Key environmental attributes of the subject land and surrounds are:

- **Landform**
  - The site is located on the southern margin of an inner coastal dune barrier system and involves the removal of vegetated Pleistocene age sand dunes that adjoin the Holocene age swamp and tidal margins of Fullerton Cove to the south (Umwelt 2015).
  - Broadly, the landform comprises a gently sloping plain from 3 m AHD in the south to 5.5 m AHD in the north with a two prominent sand dunes reaching up to 17 m AHD elevation, separated by low lying swamp area of 2 m AHD that drains to the east.
- **Water**
  - The majority of the Project is above the Tomago sand beds (a source for up to 25% of Newcastle's water supply) and as such is within the Hunter Water designated special area under the Hunter Water Regulation 2010.
  - The subject land does not contain any defined natural drainage lines, suggesting vertical infiltration into the sand is dominant over runoff and horizontal movement of water.
  - The area surrounding the Project Area is frequently water logged during high rainfall, with the groundwater close to the surface.
  - The area lies just inside the boundary of PFAS management zones, necessitating diligence in groundwater management.
- **Ecology**
  - The low-lying Swamp mahogany – paperbark community is listed as an endangered ecological community protected under NSW legislation.
  - The subject land contains preferred and supplementary Koala habitat.
  - The Project area and subject land comprises threatened flora Earp's Gum and Camfield's stringybark protected under State and Commonwealth legislation.
- **Weather**
  - Weather data is available at the Bureau of Meteorological Station located at the Williamtown Airport approximately 4 km to the north east of the northern portion of the
  - Summer mornings have light variable vectors that are slightly dominant from the south, until morning vectors through Autumn strengthen from the north west and west and become dominant right through the year until November.
  - Summer afternoon vectors are typical of the coastal location with strong onshore winds from the south, south east and east. As winter approaches vectors from the west and north west increase, before westerly and north westerly vectors become dominant. By spring south easterly vectors increase in in dominance during the lead in to summer.
  - The most sensitive time of year for the Project is likely to be during winter north westerly vectors dominate throughout both morning and afternoon periods . **Figure 5** illustrates long term average temperature, evaporation and rainfall data from the Williamtown Airport Bureau of Meteorological Station.
  - Evaporation rates are highest during summer, and are greater than the rate of rainfall. The evaporation rate is similar or less than rainfall rate during the months May, June and July.
  - The driest month on average is September, with the wettest in June.

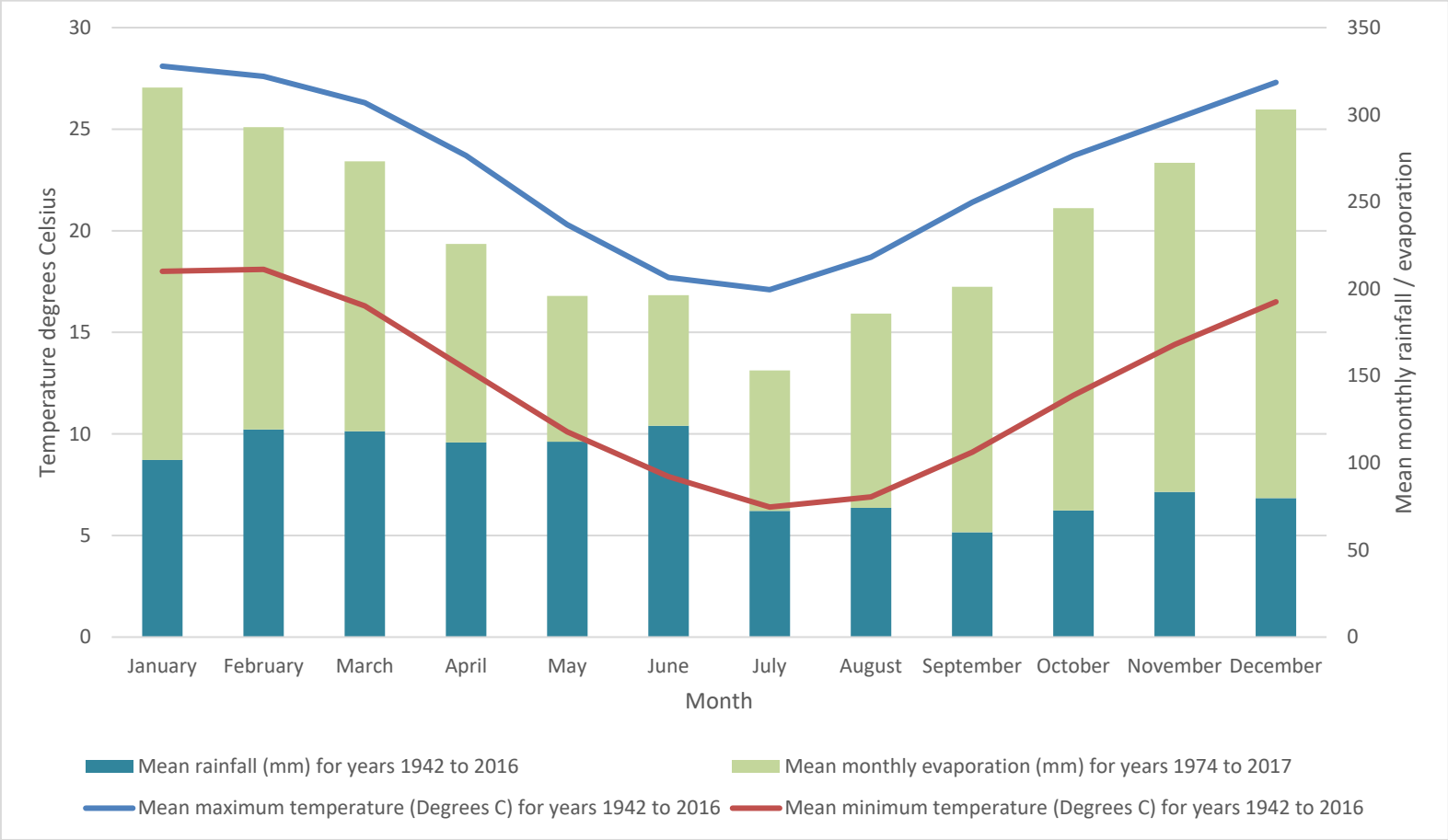

Figure 5: Monthly average rainfall, evaporation, minimum and maximum temperatures recorded at Williamtown Airport weather station

1.5 COMMUNITY OVERVIEW

Dwellings surrounding the subject land comprise:

- No dwellings located to the north.
- East: closest dwelling is 244 m. 15 dwellings are located within 1,000 m to the east and north of Cabbage Tree Road.
- South: closest dwelling is 61 m. 29 dwellings are located within 1,000 m to the south and south of Cabbage Tree Road.
- West: closest dwelling is 83 m. 24 dwellings located within 1,000m to the west and north of Cabbage Tree Road.
- Majority of dwellings located below 3 m AHD.
- The subject land and properties immediately surrounding the area are located within the red zone for the RAAF PFAS contamination. It is noted that a low concentration contamination plume extends over only a portion of the site and some residences south and east of the Project.

Refer to for locations of receptors surrounding the Project.

2. WORKS DURING PERIOD

The development commenced construction on 14 August 2019 and remained in the construction phase for the duration of the reporting period. Construction areas are demonstrated in and **Figure 4**.The Project is currently still in the construction phase and is expected to commence extractive activities in Q2 2020.

2.1.1 Previous Operations

The Project commenced on 14 August 2019, as such this is the first reporting period for the Project.

2.1.2 Activities performed during the Reporting Period

No *'Quarrying Operations'* as defined by the Development Consent occurred during the reporting period (2019 calendar year) with the project in construction phase. Construction commenced on 14 August 2019. While sand was excavated during the construction activities and stockpiled for future use, no material was processed or transported out the gate during the reporting period.

During the reporting period the following construction activities were performed:

- Clearing of vegetation for development (discussed in Section 7.1).
- Earthworks for infrastructure development including:
  - Intersection with Cabbage Tree Road.
  - Topsoil batters.
  - Excavation for pads for office area and operator compound.
  - Stockpiling of raw bulk excavated material for future use.
- Commencement of building of within the Stage 1 clearing area including:
  - Access Roads.
  - Office Area.
  - Operators Compound.
  - Weighbridge.
  - Workshop area.
  - Security camera installation.
  - Irrigation system for batters.
  - Storage of Jersey kerb (**Photograph 1** / **Photograph 2**).
- Rehabilitation activity to occur during the reporting period was the re-spreading of topsoil as described in Section 7.5.2 and the placement of cleared vegetation for ground

stabilisation (See **Photograph 1** / **Photograph 2**) . As no *'Quarrying Operations'* have yet commenced, progressive rehabilitation associated with such activity has not yet begun.

Photograph 1: Jersey Kerb awaiting installation on Cabbage Tree Road and Cleared Vegetation used for ground stabilisation looking into site

Photograph 2: Jersey Kerb Installation and Cleared Vegetation ground stabilisation looking from site to exit gate

2.1.3 Forecast for Future Operations

Throughout the next period (calendar year 2020) the development will move from the construction phase into 'Quarrying Operations'. This transition is expected to occur in May 2020.

Once operational extraction and sales will commence within Sector 1 (see **Figure 2**) recovering stockpiled sand moved during construction activities. A clearing campaign will then occur to enable extraction to progress through Sectors 1A and 2.

Pending product sales it would be expected that at the end of 2020, the central spine road and potentially initial clearing and extraction within Sector 3 may have occurred.

3. APPROVALS AND LICENCES

3.1 NSW DEVELOPMENT CONSENT

Project Approval was granted under the *Environmental Planning and Assessment Act 1979* by the NSW Independent Planning Commission on 9 May 2018 subject to Development Consent SSD-6125 conditions (Appendix 1).

3.2 COMMONWEALTH APPROVAL

Commonwealth Approval was granted on 12 December 2018 to undertake the project. Conditions of the approval are based largely on the NSW approval with some additional checks and to ensure compliance.

3.3 PERMITS AND LICENCES

3.3.1 Environment Protection Licence

Environment Protection Licence (EPL) 21264 has been issued by the NSW Environment Protection Authority (EPA) under the *Protection of Environment Operations Act 1997*. Pursuant to Schedule 1, Clause 16 “Crushing, grinding or separating” and Clause 19 “Extractive activities”.

3.3.2 Further Permits and Licences

The following permits and licences are required and in place to construct and operate the quarry:

- Permit under Section 138 of the *Roads Act 1993* from PSC / RMS.
- Hunter Water agreement to undertake extractive industries within the Tomago Special Area.
- Lease for the land with Port Stephens Council.

3.4 LEGISLATION

In addition to specific requirements referred to project approvals and licences, the Project is to be conducted in accordance with all relevant Commonwealth and New South Wales legislation outlined in **Table 5**.

Table 5: NSW and Commonwealth legislation applicable to the Project.

Act	Jurisdiction
Environment Protection and Biodiversity Conservation Act 1999	Commonwealth
Environmental Planning and Assessment Act 1979	New South Wales
Biodiversity Conservation Act 2016	New South Wales
Biosecurity Act 2015	New South Wales
Protection of the Environment Operations Act 1997	New South Wales
Roads Act 1993	New South Wales
Waste Avoidance and Resource Recovery Act 2001	New South Wales
Water Management Act 2000	New South Wales

4. ADMINISTRATIVE CONDITIONS

4.1 SCHEDULE 2 CLAUSE 18 – PRODUCTION DATA

Throughout the reporting period no extraction of quarrying products occurred so no production data is available. WSS estimate production to commence in April 2020, with first dispatch of material from site anticipated for May 2020.

4.2 SCHEDULE 2 CLAUSE 21 – CONTRIBUTIONS TO COUNCIL

The project was in the construction phase only during the reporting period. No Construction Certificates have been required for the earthworks and installation associated with temporary structures which construction has been limited to, therefore no Contributions were required during the reporting period.

5. MONITORING RESULTS

5.1 WATER MONITORING

Throughout the reporting period baseline water monitoring data was collected to build on the existing baseline data collected during the EIS to enable a better assessment of potential changes in water quality and levels as a result of the quarrying operations.

5.1.1 Regulatory Requirements

Water monitoring is managed by the approved Soil and water Management Plan required by the Development Consent.

5.1.2 Water Monitoring Summary Report

As per the requirement of the Soil and Water Management Plan, groundwater monitoring has been performed over a 12-month period throughout 2019 to provide baseline data by which to assess the impacts of Quarrying Operations. Upon completion of 12 months of water monitoring and analysis the results have been reviewed and compiled within a Baseline Summary report (available in **Appendix 5**) documenting the following keys aspects:

- Statistical distribution of sampling results at each location.
- Sites with potential to be influenced by initial construction activities, and comparison to other monitoring sites.
- Statistical distribution of sampling results considered to be unaffected by construction.
- Trend analysis using Man Kendall software.
- Comparison of results with accepted water quality guidelines, including:
  - Australian and New Zealand Environmental Conservation Council (ANZECC) Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 triggers for slightly disturbed ecosystems.
  - National Health and Medical Research Council Australian Drinking Water Guidelines 2018 and HEPA NEMP (2018).
- Document trigger values for use in evaluation of ongoing monitoring data.
- Comment on suitability of sites, frequency and analytes for ongoing monitoring.

The findings of the report are summarised below throughout Section 5.1.3 to 5.1.6. The full report is available in Appendix 5.

5.1.3 Water Monitoring Network

Water monitoring was initiated in February 2019 and continued each month for a duration of 12 months until January 2020. Sampling times were generally consistent, undertaken each time within the middle of the month (between the 11th and 18th of the month). Within the first two monitoring rounds (February and March) re-insertion of PVC piping was required at fire effected location BH1 and for root bound effected location BH12.

The water monitoring network is presented in .

5.1.4 Groundwater Levels

Groundwater throughout the sampling locations demonstrated a general decline in elevations throughout the 12-month period. Most notably the greatest decline in groundwater elevations was observed in the months following the November 2019 water monitoring event which correlates directly with a significant decrease in rainfall from the mean average and increase in temperatures with the onset of summer. presents the monthly rainfall recorded at Williamtown RAAF, and shows during 2019 there was 485mm less rainfall than average. **Figure 8** provides a graphical representation of groundwater elevation identified during gauging at each location.

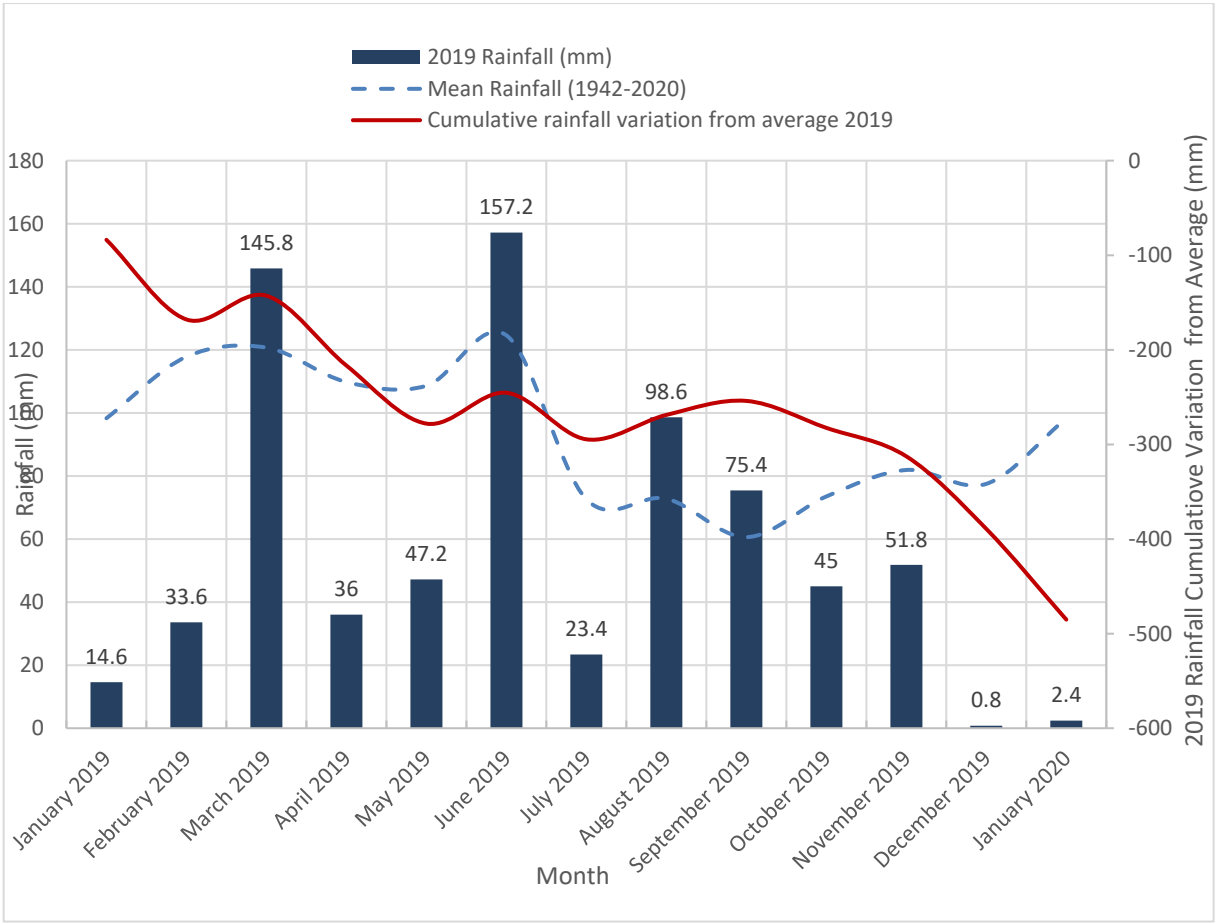

Figure 6: 2019 Monthly Rainfall Totals (Williamtown RAAF) and variation from average

Bore ID	GDA 1994 MGA Zone 56		Water Level	Note
	Easting	Northing		
BH1	387741	6369496	Dip	
BH2	387705	6369175	Logger	Down-gradient monitoring site
BH3	387752	6368964	Logger	
BH4	387855	6368743	Logger	Down-gradient monitoring site
BH5	388769	6369335	Dip	
BH6	388730	6369582	Dip	Up-gradient control site
BH7	388828	6369245	Dip	Down-gradient monitoring site
BH8	389178	6369272	Dip	
BH9	387520	6368799	Dip	Down-gradient monitoring site
BH10	387931	6369744	Dip	
BH11	387651	6369980	Logger	Up-gradient control site
BH12	388203	6369333	Dip	
MW239S	388619	6369307	Logger	Down-gradient monitoring site
SW1	387887	6368734	Marker post	Pond
SW2	387988	6369234	Marker post	Pond
SW3	388465	6369057	Marker post	Channel
SW4	389049	6368969	Marker post	Channel
SW5	388248	6368707	Culvert depth	High rainfall only

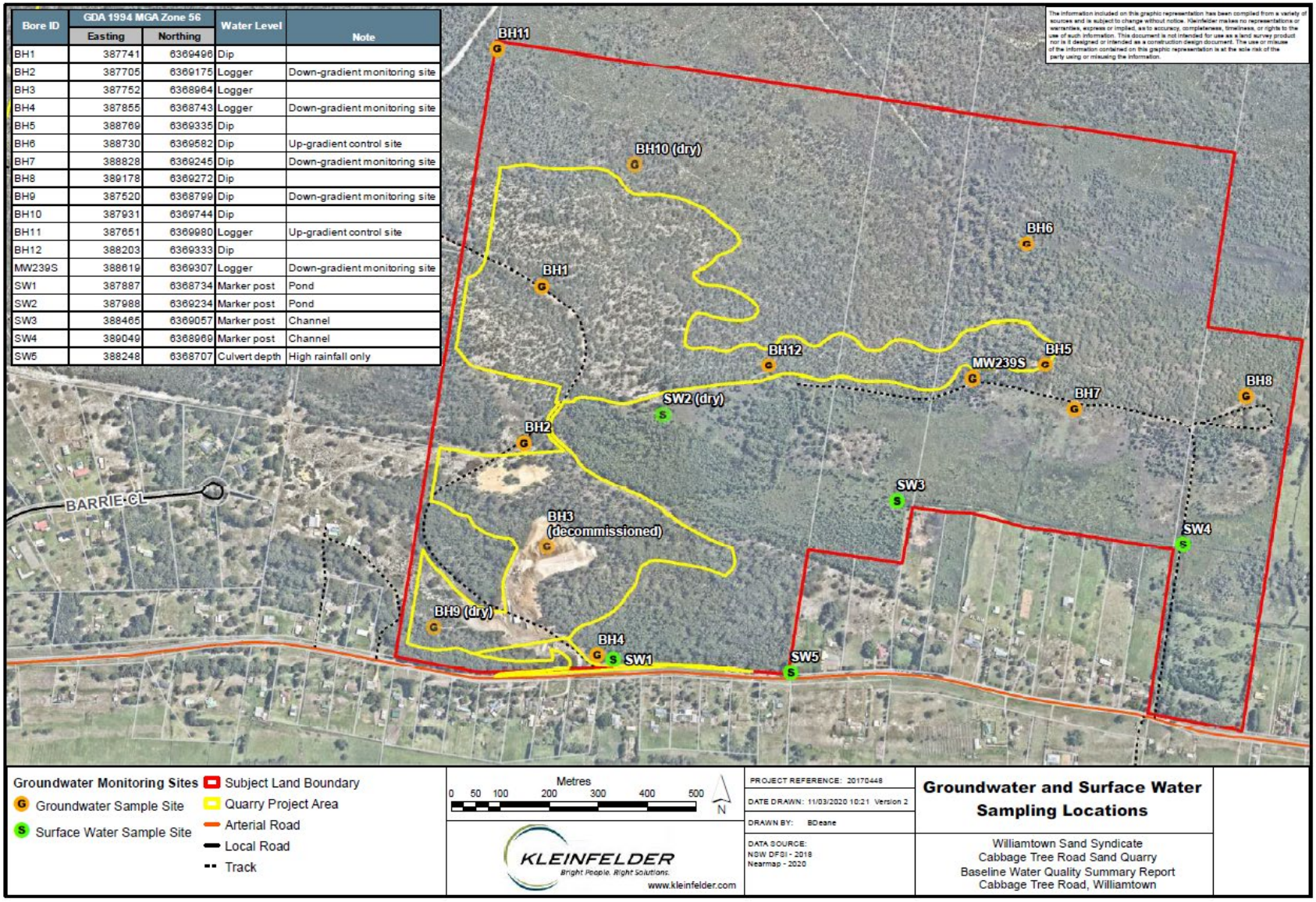

Figure 7: Water Monitoring Network - Monitoring Locations

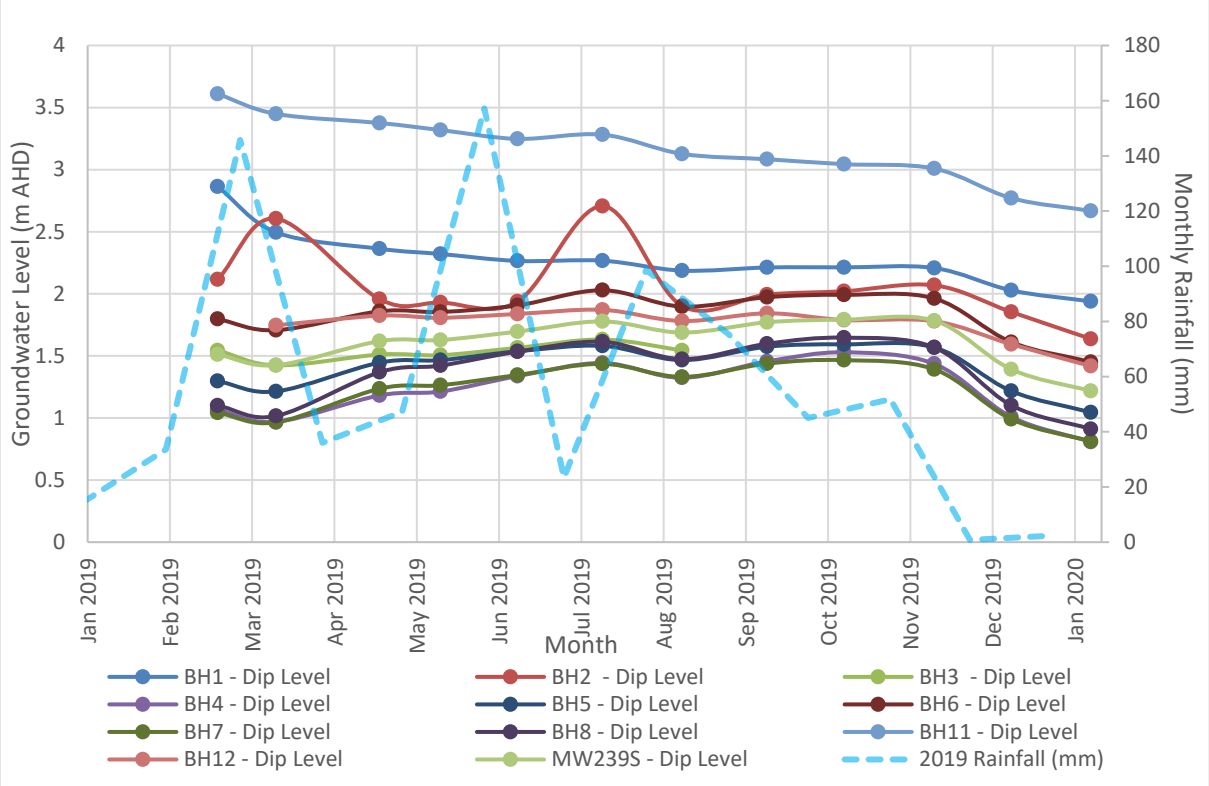

Figure 8: Monthly groundwater elevation from manual gauging and 2019 monthly rainfall

Prior to the commencement of construction activities two anomalies where observed within BH2 for the manual gauging records. A review of the gauging records suggest these may be the result of sampling error, with the groundwater level logger showing negligible change during the same period. A chart for each of the wells with loggers installed is included as **Appendix 6**.

BH9 was dry during 2019. The monitoring network was developed based on the levels measured on seven occasions since monitoring wells were installed in 2014, BH9 appears to have been dry on two of these preceding monitoring events leading up to 2019. BH10 has been infiltrated by roots, making reliable measurement unfeasible.

The Maximum Extraction Depth report provides for a series of trigger action response plan (TARP) levels for each bore. Where monitoring shows groundwater levels are less than 0.5m from the maximum inferred groundwater level, additional monitoring is recommended. Owing to the low rainfall and low ground water levels, no monitoring well reached TARP Level 1 for groundwater levels.

5.1.5 Water Quality

The analytical results available in Appendix 5 indicate that metals, namely barium, chromium, copper, iron manganese, nickel and zinc, were detected regularly throughout the monitoring period, and at the majority of the sample locations, indicating likely natural background

concentrations. Iron concentrations were typically higher at BH1 throughout the baseline monitoring program which are likely indicative of concentrations in this area.

BTEXN, TPH and TRH were generally not detected across the majority of the Site with the exception of BH1 and BH4. At the initiation of the baseline sampling program in February 2019 BH1 was refitted with a PVC pipe to replace a previously fire damaged one. In the process an acrylic adhesive was applied to fuse the pipes together which likely initiated increased concentrations of TPH C6 - C9 (1,710µg/L) and TRH C6 - C10 (1,690µg/L) within the well. The subsequent months following reinstallation of the well concentrations of TPH and TRH fell to below LOR.

Concentration of hydrocarbons detected at BH4 are most likely influenced by the adjacent Cabbage Tree Road. Concentrations were detected following some form of rainfall in the region and ongoing detections are likely given the location of BH4 being in close proximity to a relatively busy carriageway. Ongoing monitoring of hydrocarbons is recommended, for due diligence purposes, given the potential likelihood for spills to occur from operational vehicles.

PFAS detections above LOR were recorded at locations BH4, BH6 and SW4. Concentrations of PFAS identified at BH6 and SW4 are likely sourced from an upgradient source from the Site, namely the Williamtown RAAF Base where historical use of PFAS containing materials have been used. A review of such PFAS pathways is available in Appendix 12. PFAS identified at location BH4, and directly adjacent to Cabbage Tree Road, is likely to have occurred from a different historical source.

Key water quality parameters are illustrated in the **Figures 9 to 16** below, a more complete set of water quality graphs is included within **Appendix 5**. A summary of these figures and the results are as follows:

- pH: for the site is acidic, ranging between a pH of 4 and 7, BH1 is typically the highest, SW4 is typically the lowest.
- Electrical conductivity is generally relatively fresh and is typically below 1000 µS/cm, with the exception of SW1 adjacent to Cabbage Tree Road.
- Iron (Fe) is relatively low, with levels relative to the pH, BH1 has consistently the highest levels.
- Sulphate (SO_4) levels are relatively low and consistent, with SW1 showing the most variability.
- Manganese (Mn) is present, though at low levels across the site, the highest levels were found at SW1 and BH4.
- Arsenic (As) was on occasion detected above the laboratory detection levels at BH8 and SW3, however, in the majority no arsenic was measured in water across the site.
- Copper (Cu) was typically highest in BH4 and BH2, with levels starting to increase in June, possibly in response to the high June rainfall.

- A light fraction of total petroleum hydrocarbons (TPH), C_6-C_9 were found in BH1 associated with repairs to the piezometer. It is possible that the variability of several parameters in BH1 is the result of repairs (e.g. zinc, chromium, TPH, iron).
- Total recoverable hydrocarbons (TRH) C_{10}-C_{36}, characteristic of heavy hydrocarbons (e.g. diesel, grease and oil) were detected in BH4 on two occasions, likely due to proximity of Cabbage Tree Road.
- PFAS was detected above the limit of reporting at three sites, SW1 and SW4 and BH6. Levels at SW1 is consistent with Defence sampling of plume to the south, while SW4 is located on a drainage channel on the eastern side of property, and BH6 located to the north east as shown by **Figure 18**.

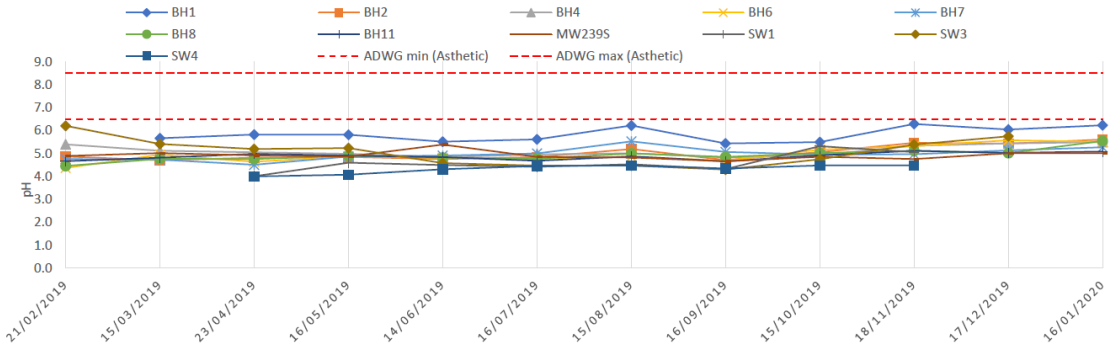

Figure 9: Laboratory pH

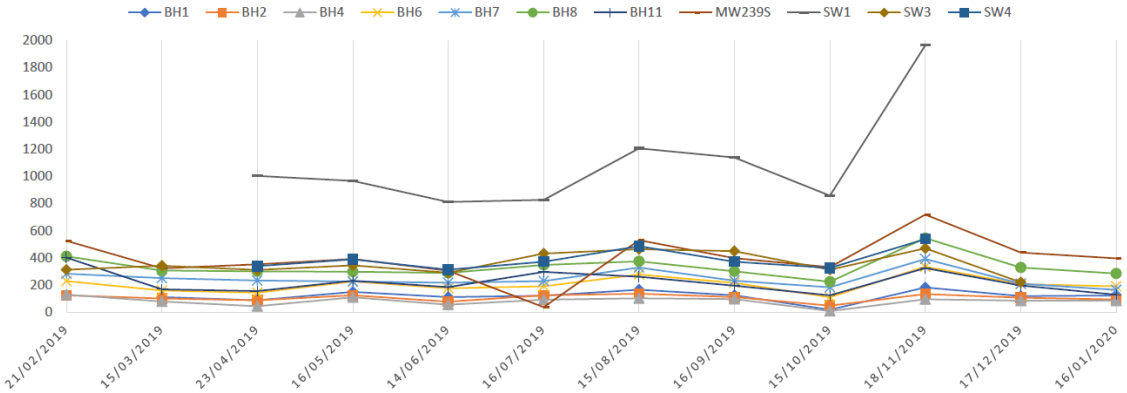

Figure 10: Field electrical conductivity (µS/cm)

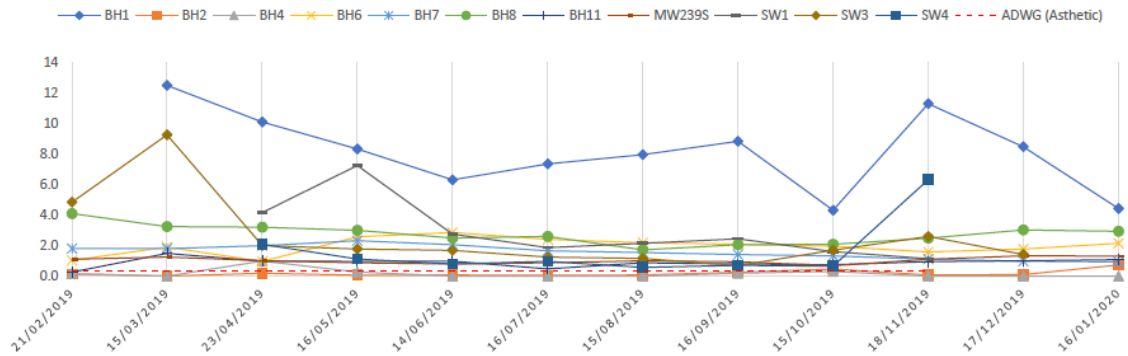

Figure 11: Iron (Fe) in mg/L

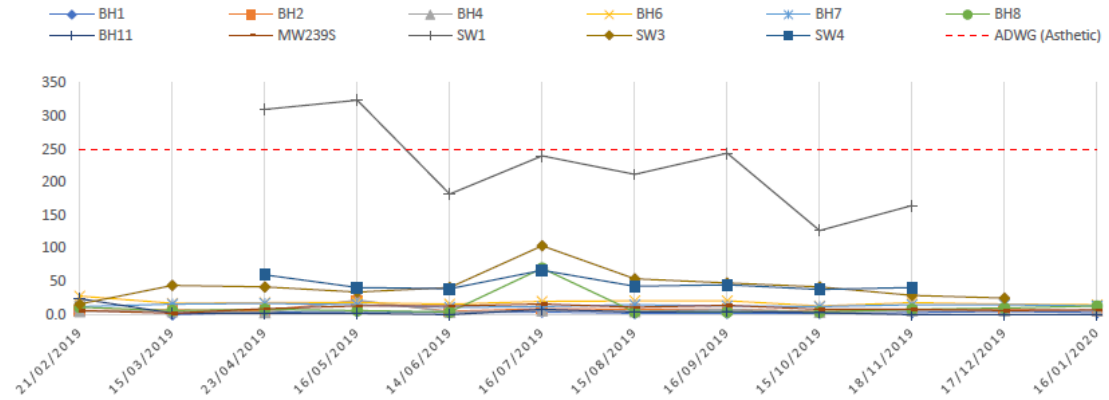

Figure 12: Sulphate (SO4) in mg/L

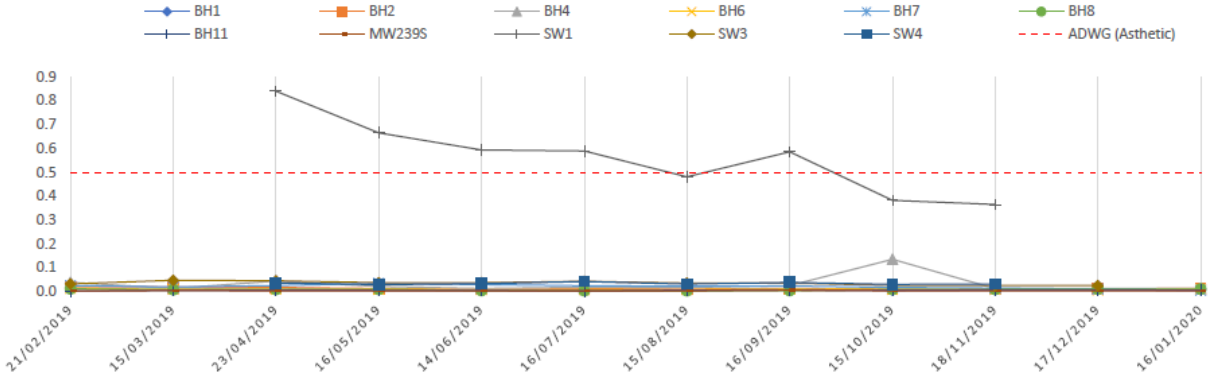

Figure 13: Manganese (Mn) in mg/L

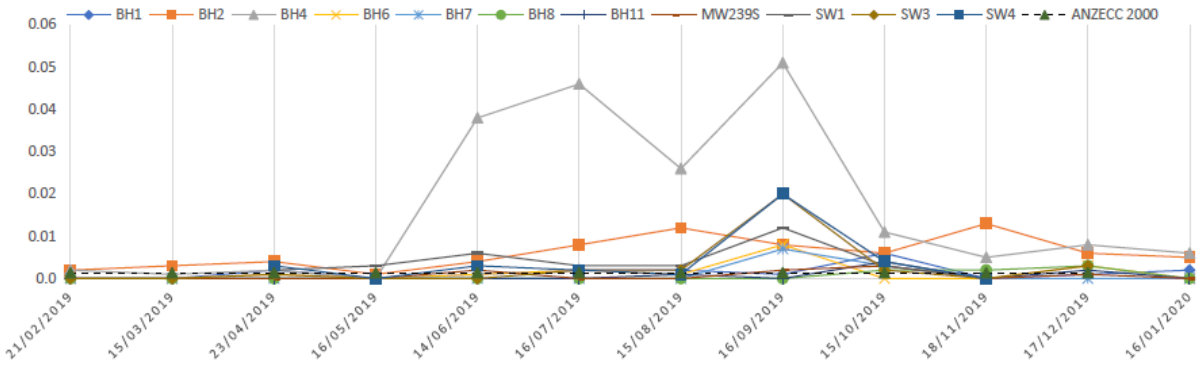

Figure 14: Copper (Cu) in mg/L

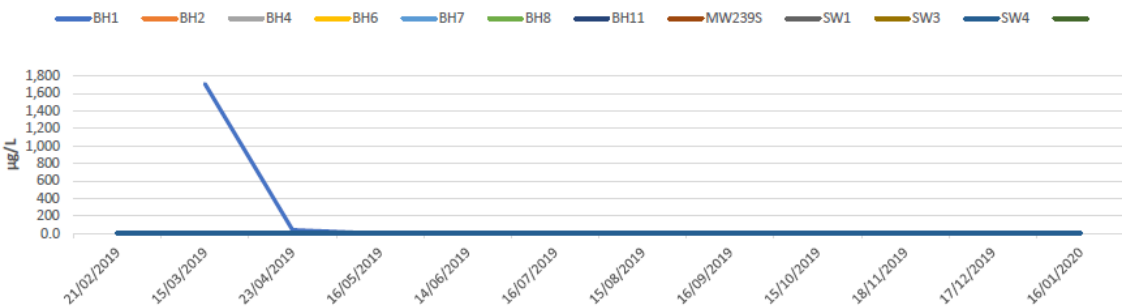

Figure 15: Total petroleum hydrocarbons (TPH) C_6 - C_9 in µg/L

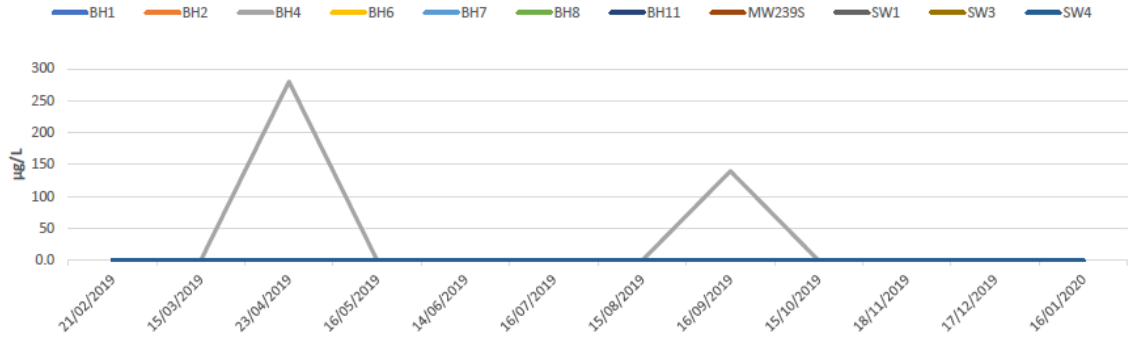

Figure 16: Total recoverable hydrocarbons (TRH) C_{10}-C_{36} in µg/L

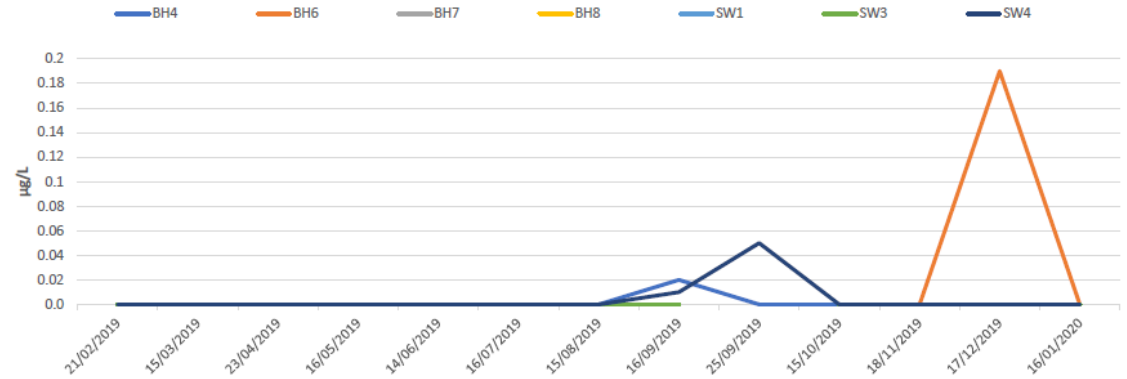

Figure 17: Sum of PFAS in µg/L

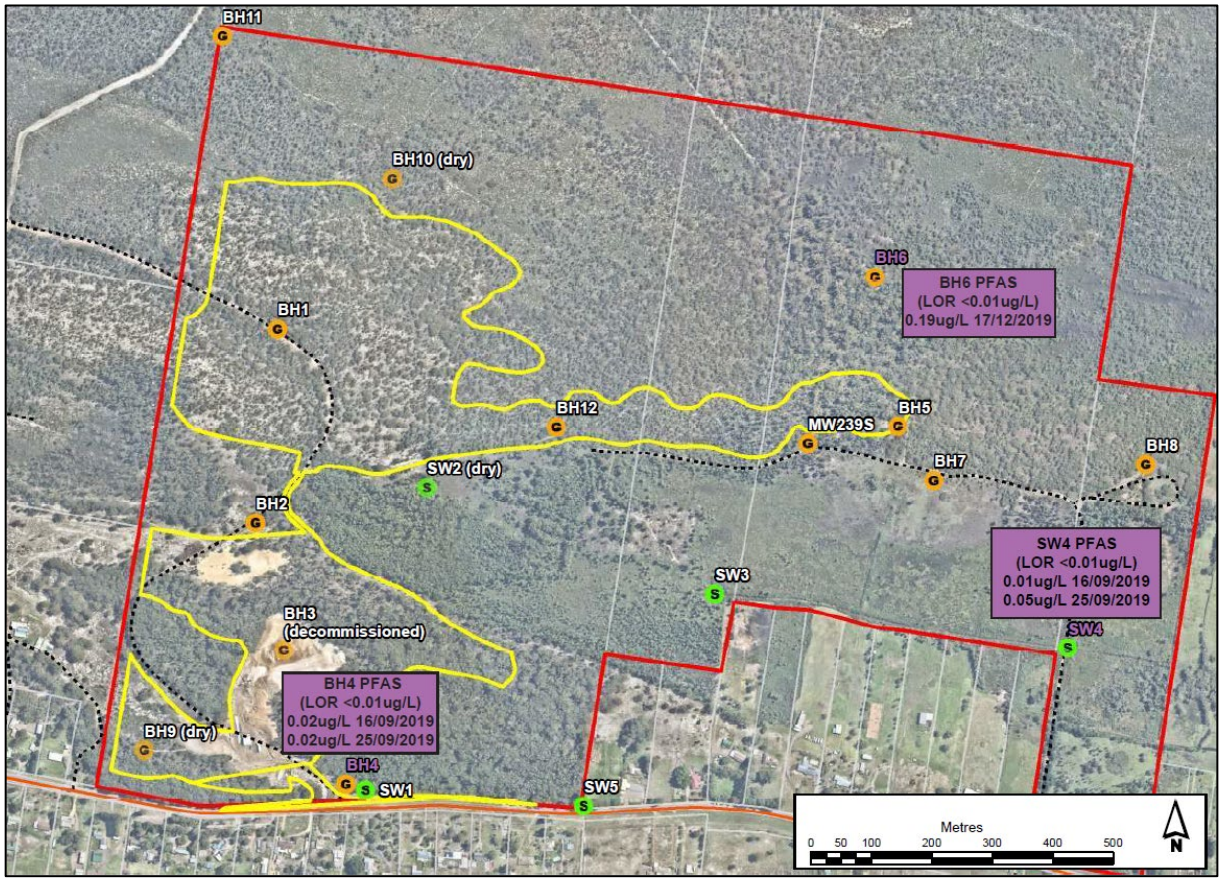

Figure 18: Locations where PFAS was detected during the period

5.1.6 Data Trends Over Life of Project

As discussed in Section 5.1.2 this report provides the initial annual monitoring results. As such there are no previous years to compare a trend to beyond the discussion provided in Appendix 5 for the 2019 calendar year. During 2019 Mann-Kendall trend analysis has identified potential trends within the data, though not consistently between sites or elements. It is expected that these trends are likely the result of changing water levels and the associated changes in chemistry they control, ongoing monitoring is in place to further examine the potential for change.

It should also be noted that the Project site and regional area has experienced a significant drought over the past couple of years and this may have a bearing on groundwater and surface water conditions should significant rainfall reoccur in the region.

5.2 NOISE MONITORING

Noise monitoring events have occurred as per the requirements of the construction management plan. Two noise monitoring events occurred during the reporting period. The results which demonstrate compliance with the criteria are presented in **Table 6**, with the accompanying report provided in Appendix 11 .

As per Schedule 3 Clause 3 of the project approval, the noise criteria for the project excludes road construction activities associated with the intersection of the quarry access road and Cabbage Tree Road, where a criteria of .48 – 51 dB(A) is considered noise affected, and greater than 75 dB(A) is highly noise affected. Table 6 and Appendix 11.

Appendix 11 demonstrates neither of these criteria were exceeded during the construction noise monitoring events.

Table 6: Construction noise monitoring – LAeq(15min)

Date	Time	TOTAL (dB)	Traffic (dB)	Other identified (dB)	Sand mine (source (dB))	Criterion (dB)	Comply (Y/N)
23/11/2019	1:04 PM	59	59	N/A	35 (reverse alarms)	43	Y
18/12/2019	12:30 PM	61	61	Wind (41)	25 (revs, rev. alarms)	43	Y

5.2.1 Noise Data Trends Over Life of Project

The construction phase commenced on 14 August 2019. As such this AEMR presents the first noise monitoring data to be recorded. A trend over the life of the project cannot yet be identified, however the reporting period provides life of project monitoring to date and resulted in compliance with noise management requirements.

5.2.2 Noise Complaints

One noise complaints was received regarding noise during the reporting period. The matter is described and has been closed out as shown within **Table 10**.

5.1 AIR QUALITY

This section addresses compliance with the approved Air Quality Management Plant (AQMP) required by Condition 9 of Schedule 3 of the Development Consent (SSD-6125). While quarrying did not occur during the reporting period with only construction activities occurring, the monitoring network has been established at the earliest feasible opportunity, prior to the commencement of quarrying onsite to better establish site-specific background conditions as per the commitment within the AQMP. Air monitoring commenced at all sites on 14 September 2019.

5.1.1 Regulatory Requirements

Air Quality is governed by the regulatory approved AQMP. The AQMP provides a formal framework for ongoing monitoring of air quality at the site to manage the potential impact of sand extraction on air quality.

5.1.2 Air Quality Monitoring Network

The air quality monitoring network comprises of the following key components:

- Two Beta Attenuation Monitors (BAM) real-time compliance monitors (RT1 and RT2) measuring PM_{10} installed between the quarry and dwellings to the south and west of the quarry. Each real-time monitor is fitted with wind direction sensors to enable contributions from the quarry to be better determined.
- A High-Volume Air Sampler (HVAS) with a PM_{10} inlet is located to the east of the quarry.
- A HVAS measuring TSP is located to the south of the quarry, adjacent to RT2.

The network has been established prior to the commencement of quarrying onsite to better establish site-specific background conditions.

Locations of the installed air quality monitoring units are provided in **Figure 18.**

WSS utilise local meteorological data to observe current and predicted wind speed and direction data and also generate site specific meteorological data records. In addition, Weatherzone alerts were trialled during the reporting period but were found to be unreliable. The current method is to access Bureau of Meteorology forecasts on a daily basis to allow preparedness for elevated wind and potential air quality control requirements.

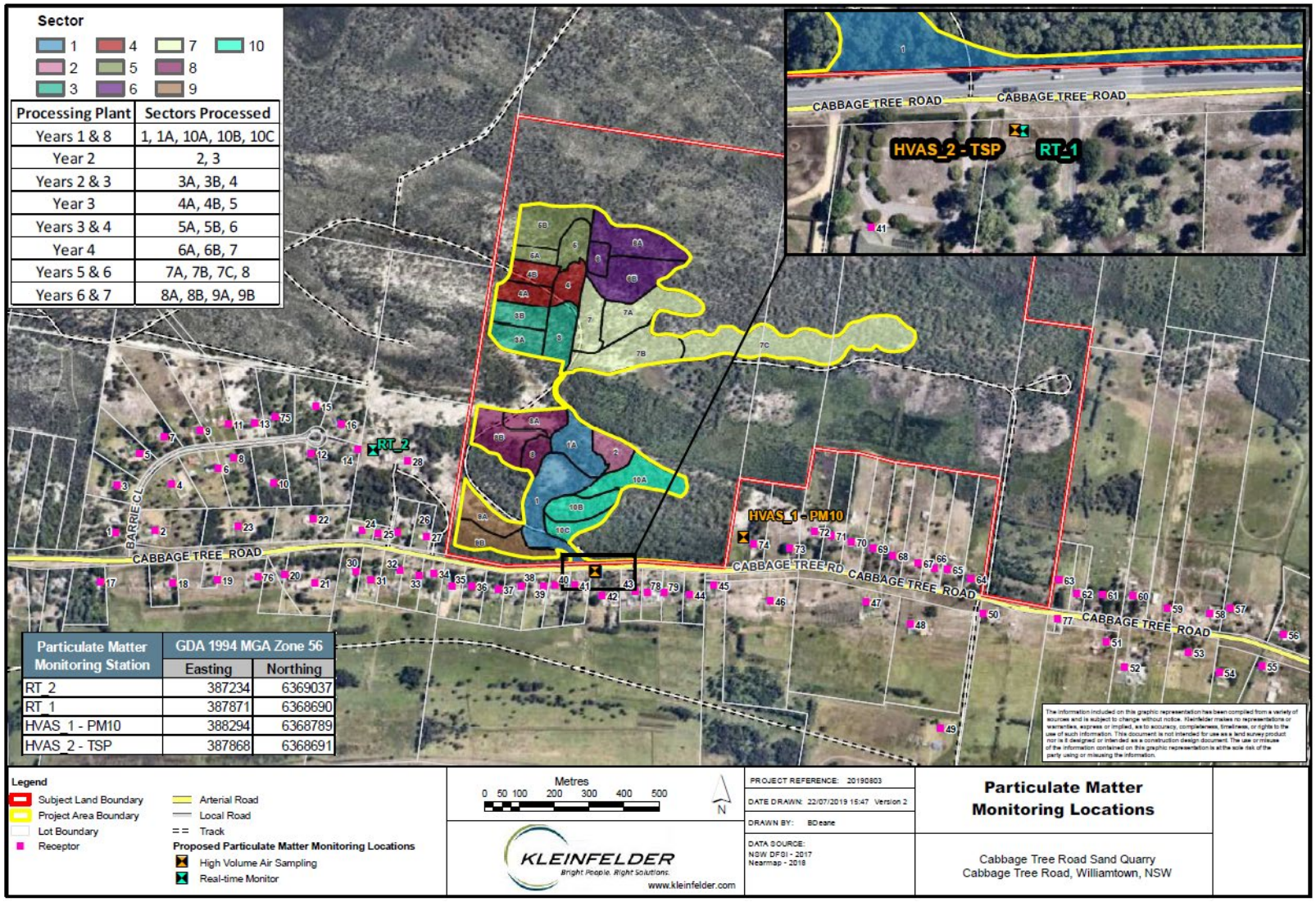

Figure 19: **Air Quality Monitoring Network Locations**

5.1.3 Air Quality Criteria

Newcastle Sand *"must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the development do not cause exceedances of the criteria"* in **Table 7** at any residence on privately-owned land..

Table 7: Air Quality Criteria

Pollutant	Averaging Period	Criteria*
Particulate matter < 10 µm (PM_{10})	Annual	[a c] 25 µg/m^3
Particulate matter < 10 µm (PM_{10})	24-hour	[b] 50 µg/m^3
Total suspended particulates (TSP)	Annual	[a c] 90 µg/m^3

Where:

a – Cumulative impact (i.e. increase in concentrations due to the project plus background concentrations due to all other sources)

b – Incremental impact (i.e. increase in concentrations alone, with zero allowable exceedances of the criteria over the life of the project)

c – Excludes extraordinary events such as bushfire, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by DPIE.

* Based on standard air quality assessment criteria in the *Approved Methods for Modelling and Assessment of Air Pollutants in NSW 2007*

5.1.4 Review of Air Quality Results

Data represented below summarises the air quality monitoring results at each of the monitoring sites for the reporting period.

From late October through to the end of the period air quality was impacted significantly regional bushfire smoke.

5.1.4.1 High Volume Air Samplers (HVAS)

Figure 19 and **Figure 20** show the monitoring results for PM_{10} and TSP in µg/m^3. Measured over 24 hours every 6 days for each of the monitoring locations during the reporting period.

Over the 4-month period the average PM10 reached 20.0 µg/m^3 inclusive of bushfire related events, against the limit of 25 µg/m^3. Therefore there has been no exceedance of annual average PM10 levels. Over the same period the average at the Beresfield DPIE monitoring station, located 13 km west (and upwind) of the site and HVAS monitors, was 31.02 µg/m^3.

On two occasions (22 and 28 November) results from the PM10 showed the measured levels of 75.6 µg/m^3 and 53.4 µg/m^3 respectively. Given, the criteria of 50 µg/m^3 for the project is based on an incremental impact, and the events occurred during the height of bushfire events, these levels do not constitute an exceedance of criteria. An effective upwind sampling site is the Beresfield DPIE monitoring station which showed daily average levels of 72.2 µg/m^3 and 63.9 µg/m^3 respectively for the same days, demonstrating the regional nature of the bushfire

effects on air quality, and the negligible potential for contributions from the site alone exceeding 50 µg/m³.

For TSP, over the 4-month period, the average reached 39.0 µg/m³ inclusive of bushfire related events, against the limit of 90 µg/m³. Therefore there has been no exceedance of criteria for annual average TSP levels during this period. On two occasions (22 and 28 November) the measured TSP was above 90 µg/m³. This corresponds with regionally high air quality levels as shown within the Beresfield PM10 data.

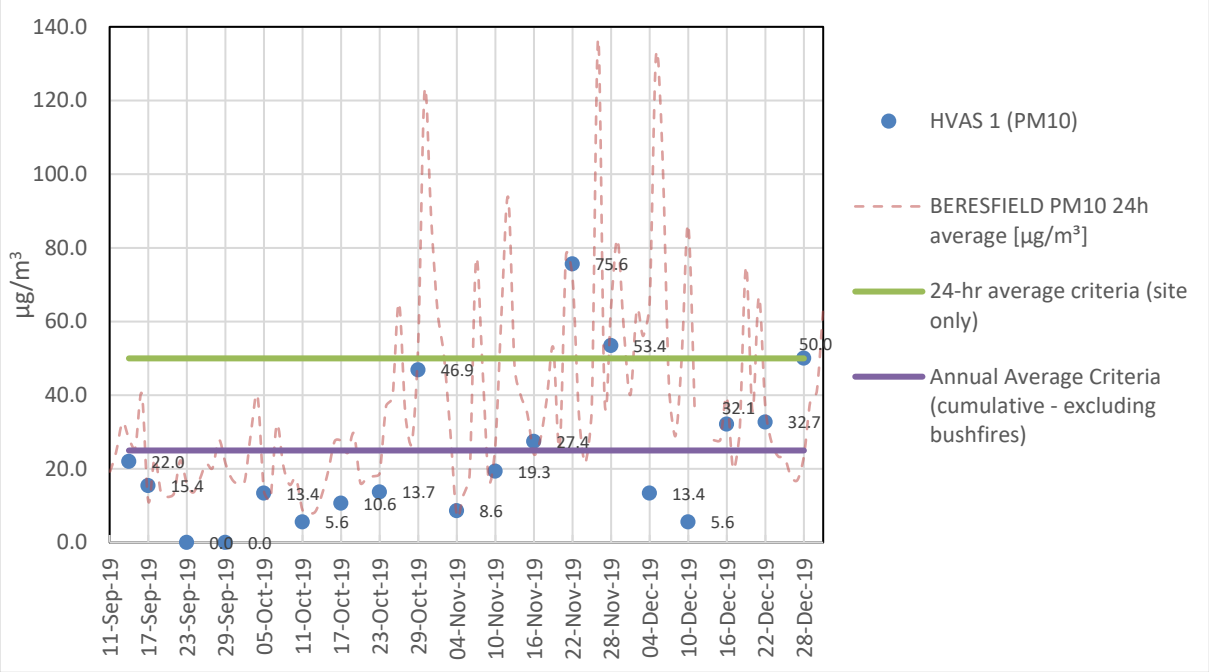

Figure 20: HVAS (PM10) sample results from 14 September to 31 December 2019, shows DPIE Beresfield site for context on regional conditions

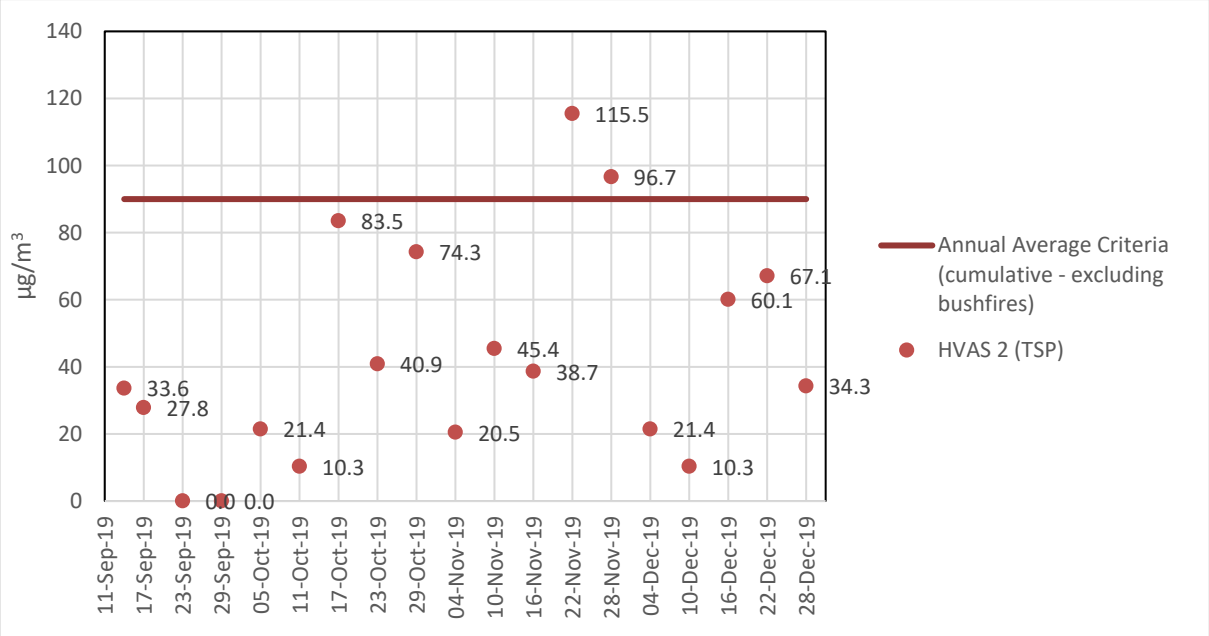

Figure 21: HVAS (TSP) sample results from 14 September to 31 December 2019

5.1.4.2 BAM Monitoring

Two real-time monitors, which measure PM_{10} on a real-time continuous basis, have been installed as a management tool for quarry operations to guide proactive and reactive mitigation measures. The air quality management framework is based on a series of staged reactive measures taking into consideration the prevailing winds and measured PM10 levels, that enable the quarry operators to make proactive decisions on what changes may be required to site operations to maintain air quality levels below the relevant criteria.

RT1 is located to the west of the quarry, while RT2 is to the south. RT1 enables the determination of reasonable background conditions during a north-westerly wind such that the contribution of the quarry to the dust measured at RT2 can be determined, and vice-versa during a south-easterly wind.

Over the period the strongest and most persistent winds occurred from the north west direction, and are considered to be the weather conditions onsite likely to have the greatest potential for air quality impacts at receptors south of the quarry.

Monitoring results for the reporting period are shown in **Figure 21** and below in **Table 6**. The BAM results are generally consistent with those measured by the HVAS units. The 4-month average results from the BAM units show RT2 (south of the quarry), has on average been higher showing the quarry has contributed to an increase in air quality levels. Adjusting the data to take into account the extraordinary bushfire events from late October through to the end of the period shows the quarry has not exceeded the annual average criteria. In addition as the quarry moves further north away from receptors air quality impacts would be expected to decrease.

Table 8: BAM monitoring results from 15 July to 31 December 2019

BAM Monitoring Station	**4-Month Average (µg/m^3)** (inclusive of bushfire events)	**Annual average criteria (µg/m^3)**
RT1 (north of Cabbage Tree Road)	23.8	25 #
RT1 Adjusted (excluding data from October 30 to 23 December accounting for bushfire related impacts)	16.3	
RT2 (south of Cabbage Tree Road)	26.1	
RT2 Adjusted (excluding data from October 30 to 23 December accounting for bushfire related impacts)	18.5	
# – Excludes extraordinary events such as bushfire, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by DPIE.		

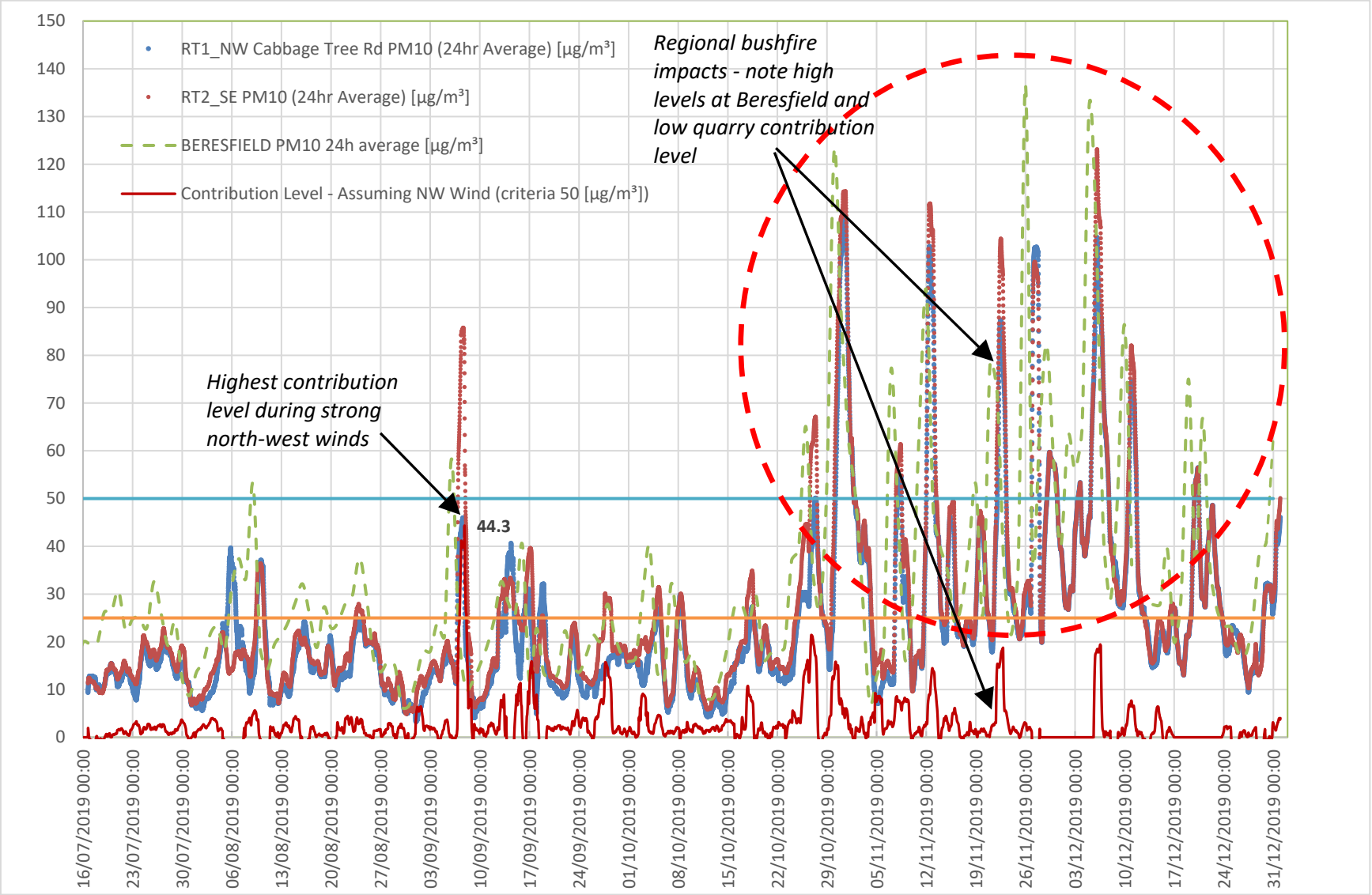

Figure 22: Analysis of Real-Time Air quality data during the period, includes DPIE Beresfield station for context.

5.1.5 Monitoring Performance for the Period

Over the period there has been isolated occurrences where various components of the monitoring system that have not performed as expected. On each occasion the matter was addressed in the following manner:

- Observation of problem.
- Local technician or quarry manager inspect the unit and where possible resolves issue.
- Where local technician or quarry manager is unable to resolve matter seek assistance of installer via phone (Thomson Environmental Services – TES - installed and supported operations).
- If matter can not be resolved over the phone, arrange for TES technician to attend site and resolve issue.
- Where TES technician can not resolve issue, a substitute monitor is installed while the monitor is fixed.

Table 9 provides notes with respect to the performance of the BAM units and notable local issues that may have affected air quality during the period.

Table 9: BAM operational performance notes

Month	Comments
August	- Construction commenced 26 August - Machine error at RT1 - insects - Machine error at RT2 - air conditioning not working
September	- Regional dust storm event on weekend
October	- BAM service visit and calibration 2/10/19
November	- Regional bushfire smoke impacts on air quality - BAM units cleaned 21/11/19 - Machine error on RT2, average corrected with RT1 data
December	- Regional bushfire smoke impacted on air quality - Machine error on RT2, average corrected with RT1 data, service technician booked

5.1.6 Air Quality Complaints

One complaint was received regarding air quality on 12 September 2019. This complaint was closed out as detailed in **Table 10**.

6. SCHEDULE 2 CLAUSE 48 – REVIEW OF PFAS EXPOSURE PATHWAYS

WSS engaged suitably qualified and experienced independent expert, approved by the Secretary, to perform as review of PFAS exposure pathways as required by Schedule 2 Clause 48 of the Development Consent.

The report concluded that:

- Base-sourced PFAS is, and has historically been unlikely to be transported to the Site via wind, surface water or groundwater – the Site does not appear to have received PFAS from the Base and does not appear to be acting as a local tertiary PFAS source because:
  - PFAS have not been reported within Site media (shallow and deep soil, surface water and groundwater) which is consistent with the results from the investigation undertaken by the DoD.
- Quarrying has not been performed and has not increased the potential for contaminated groundwater to flow toward the Site's local area. The most probable effect of quarrying will be the formation of a temporary groundwater mound due to increased rainwater infiltration and decreased evapotranspiration, with the local groundwater flow regime unlikely to be influenced for an extended time-period. The influence of quarrying on the groundwater flow regime is expected to decrease the risk of Base derived PFAS.

Please refer to Appendix 12 for the full report.

7. ENVIRONMENTAL PERFORMANCE

7.1 AREA CLEARED

Clearing was undertaken on in accordance with the CEMP, divided into several smaller campaigns, separating the internal and external intersection work areas. Areas were mulched initially to improve visibility prior to inspection by RAPs and Radiation Survey Specialist. The areas were inspected for hollows prior to clearing and an ecologist was present for the removal of all hollow bearing trees.

An area of 31,369 m^2 was cleared during the reporting period, entirely within the Stage 1 initial clearing area as shown on . Prior to clearing the Boundary was clearly pegged and marked by a registered surveyor.

A further 3,582 m^2 of clearing occurred associated with construction of the intersection within the area shown in .

Clearing was performed in compliance with the procedures detailed in the approved Aboriginal Cultural Heritage Management Plan (see Section 7.12.1).

Clearing occurred under the supervision of an ecologist. Habitat trees were clearly marked prior to clearing using flagging or spray paint (see **Plate 3** and **Plate 4**). No fauna injuries were reported (see Section 7.10). A copy of the hollow bearing tree inspection

Plate 3: **Habitat tree clearly marked with spray paint prior to clearing under supervision by an ecologist.**

Plate 4: **Habitat tree clearly marked with flagging tape prior to clearing under supervision by an ecologist.**

7.1.1 Habitat Trees

Works during the period were under construction and accordingly completed consistent with the CEMP. Hollow bearing trees were removed on 3 September 2019 and 14 October 2019. Six small hollows (from the four trees removed) were removed during the period and are planned for reinstatement in the surrounding vegetation in the following period.

Three hollow bearing trees were marked in the next stage and will have nest boxes erected in the following period. The type of hollows are specified in the attached letter (**Appendix 9**), the location and detailed specifications for each hollow erected will be recorded during installation in the following period.

As the project progresses, the sequencing of clearing and hollow placement will enable the survey and erection of hollows for the next 12 month period.

7.2 FAUNA EXCLUSION FENCING

Frog exclusion fencing was installed along the lower edges of the disturbance area prior to and following clearing activities. The exclusion fencing is specified for the purpose of minimising the movement of frogs from wetter areas outside the disturbance area into the disturbance

footprint. This movement would be expected to occur in mid- late Autumn, with frogs moving in the opposite direction (i.e. from areas potentially within the disturbance area to wetter areas outside it) in Spring.

Koala exclusion fencing was not erected during the period. The fencing design was amended in consultation with DPIE and koala specialists to be barrier fencing that would slow the movement of koalas, but not preclude koala movement, aiming to minimising koala travel along and around fencing. The fencing has crossing fixtures at 200 m intervals.

With the exception of perimeter checks by operational staff, no specific monitoring was undertaken during the period, based on the BRMP, this would be scheduled for Autumn 2020 pending suitable weather conditions.

7.3 OFFSETTING

Newcastle Sand must prior to commencing quarrying operations identify the source and within 12 months of quarrying operations retire these credits (i.e. within 12 months from the first sale of sand from the site). At the conclusion of the period, Newcastle Sand had undertaken the following in relation to satisfying the offsets required under SSD_6125:

- The onsite offsets are already identified, Kleinfelder has been in communication with the BCD to determine requirements to establish the offset site given the complexities associated with the changing to newer Biodiversity Assessment Methodology.
- Review of available credits already established and for sale.
- Engaged Kleinfelder to investigate land holdings within the local area to determine feasibility of securing sufficient land or agreement over land for the establishment of sufficient offsite. No land holdings of adequate size could be found for identification of offset sites.
- On the basis of the limited availability of land available for offsetting, a request was made to the Secretary to enable the payment into the Biodiversity Conservation Trust (BCT) in lieu of finding specific offsets. On this basis, in the event that credits cannot be found prior to the expiry of 12 months from the commencement of operations, a payment can be made.

7.4 WEEDS AND PESTS

7.4.1 Pest Surveys

Given the site was under construction during the period, no pest surveys were completed. No pests were observed directly by staff during the period, however, footprints of dogs have been observed in the quarry. Fauna surveillance cameras will be deployed in the coming period to

determine the nature of these animals and suitably trained professionals engaged where needed to trap and manage pests. Under the lease with Port Stephens Council, trapping and return of domestic dogs to owners or management otherwise is required.

7.4.2 Weed Survey and Control

As the project only commenced in August 2019 and is in the construction phase, weed control has not yet been required in the initial disturbance areas. However, WSS have proactively engaged environmental consultant Kleinfelder to perform a survey of weed species that may be present on site and produce a Weed Identification Booklet to so that weed control can be managed effectively in the future.

7.5 REHABILITATION

7.5.1 Rehabilitation Bond

Under Schedule 3, Condition 38 of the consent a rehabilitation bond is to be calculated and verified by a suitably qualified quantity surveyor or expert to determine the bond necessary to cover the costs of the implementation of the Biodiversity and Rehabilitation Management Plan (BRMP) for the first three years of quarrying operations at the quarry. The bond is to be in place within 6 months of the approval of the BRMP approval.

The Biodiversity and Rehabilitation Management Plan was approved on the 16 April 2019, therefore requiring the submission of a bond by 15 October 2019. Due to an administrative error, no bond was submitted within the required timeframe. Subsequent correspondence with DPIE resulted in the approval of the bond on 29 January 2020, for a total of $259,278 (exclusive of GST), with payment of the bond on 5 February 2020. A warning for a breach of Section 4.2 of the EP&A Act was issued on 2 March 2020.

7.5.2 Batter Stabilization

Construction activities resulted in the retention of more sand than anticipated onsite due to operational amendments in the detailed design for truck turning paths and equipment footprints and the minimisation of sand trucked from site during construction. This resulted in greater stockpiling and in some areas the need for short term areas of steeper batters while the operational areas are expanded. The following measures have been evaluated and adopted:

- All batters and exposed soils are part of a sprinkler system installed to enable rapid response to potential dust concerns and help vegetation establishment.
- The use of polymer sprays to seal the sand surface was evaluated, these products, while potentially effective, come at very high costs and are damaged easily within a

sandy environment. There is opportunity for use of this product in small area, however wide spread use is unlikely to be economically feasible.

- For steep batters the use of pinned geotextile is likely to be the most effective method, sections have been evaluated for the use of this material.
- Long term and medium term batters that can be constructed to suitable slopes have been selected for placement of topsoil and timber, these areas are irrigated with a sprinkler system. Where feasible this is considered the most effective measure.
- The topsoil / subsoil stockpile from the road and workshop area, has some vegetation regrowth on batters and is scheduled for further topsoil/ timber placement to improve stability. Dust control is currently maintained with a sprinkler system. This stockpile avoided the offsite haulage of more than 250 trucks prior to an established intersection.

7.5.3 Areas of Topsoil Application and Depth

Of the area cleared, an area of 3,460 m^2 has had topsoil re-applied at a minimum depth of 100 mm. demonstrates the areas were topsoil has been re-applied within the Stage 1 initial clearing area.

7.6 RADIATION SURVEY

A radiation survey was completed by Bartolo Safety Management Service on 20 August 2019. No significant radioactive anomalies were identified. A copy of the report is enclosed in **Appendix 8**.

Excavation activities during the period did not uncover any evidence of a buried monazite material (i.e. the reason for radiation surveys to be conducted).

7.7 WASTE MANAGEMENT AND MINIMISATION

During construction waste has been minimised by using surplus concrete for counterweight for conveyor bases. This has resulted in no surplus concrete waste.

120 kg of waste steel from construction during the reporting period was been sent for recycling. No further waste steel was produced.

During the reporting period other waste from site consisted of 3 x 3m² general building waste skip bins which were collected by Violia waste services and removed from site to be disposed of appropriately.

Cleared vegetation has been used for batter stabilisation (**Plate 3**) or stockpiled for future use as required. As such no waste has occurred from clearing activities.

During excavation no foreign materials were uncovered.

During the reporting period no permanent effluent system was constructed with temporary ablutions in place only. Waste was removed from these and transported off site by a licenced contractor.

7.8 WATER USE

During the reporting period the volume of water drawn from the HWC network for all activities was 3,087 KL. This was used over a 139 day period since commencement of operations on 14 August and as such equates to an equivalent rate of 8.1 ML per year which is under the estimate of 9.7 ML per year provided in the approved Soil and Water Management Plan.

Since the reporting period an irrigation system has been commissioned on the batters to allow for more efficient use of water in response to managing dust and providing irrigation to facilitate efficient rehabilitation. It has also been noted that the topsoil encountered during construction is more susceptible to becoming airborne than the larger grained sand beneath. As the Project proceeds into *'Quarrying Operations'* less exposure of non-stabilised topsoil immediately after clearing is anticipated potentially resulting in a reduction in the water required for suppression (notwithstanding other environmental factors).

Water transfer from site was limited to 5, 400 L pumped from temporary ablutions by a licenced contractor.

7.9 PEST MANAGEMENT

No pests were observed during the reporting period and no pest control requirements were identified.

7.10 FAUNA INCIDENTS

No fauna incidents occurred during the reporting period. As a result, no changes to current controls in place regarding fauna interactions have been implemented or are proposed as the results suggest they are adequate. They will continue to be monitored and revised if necessary.

7.11 ENERGY EFFICIENCY

7.11.1 Diesel and Electricity Use

Total fuel usage for the reporting period was 72,293 litres. Electricity usage only commenced on 1 November 2019 when the electricity connection was completed. Electricity use for the

year quarter up to 4 February 2020 was 352.917 kW resulting in approximately 117 kWh being used during the reporting period.

No estimate was made of diesel usage for the construction stage in the EIS, as such it is difficult to determine if the estimate of 100-150,000L per annum within the EIS is typical of an operational year at the quarry.

7.11.2 Review of Opportunities to Improve Energy Efficiency

During construction the majority of fuel use is by third party contractors as such there are limited opportunities for review at this stage of the project.

A sprinkler system has been commissioned to reduce the time that fuel carts are required to be running which reduces the fuel burn.

7.12 HERITAGE MANAGEMENT

7.12.1 Aboriginal Heritage

During construction no item or object of Aboriginal heritage significance was identified on site.

Consultation with the RAP was undertaken to notify of the commencement of the construction activity and appropriately qualified RAP representatives were engaged to inspect the Stage 1 cleared areas prior to topsoil stripping on 23 August 2019 (See Appendix 7 for RAP inspection records).

7.12.2 Historic Heritage

During construction no historic heritage items were identified on site. AHIMS site #38-4-1381 has not been disturbed, and no unknown sites were identified.

7.13 INDEPENDANT ENVIRONMENTAL AUDIT

As per Schedule 5 Clause 12 of the project approval, the first Independent Environmental Audit is required within a year of commencing quarrying operations. Quarrying operations have not yet commenced, with the construction phase commencing on 14 August 2019.

8. COMMUNITY

8.1 COMMUNITY CONSULTATIVE COMMITTEE

One Community Consultative Committee (CCC) meeting was held within the reporting period on 11 October 2019. A copy of the meeting minutes is provided in Appendix 3. Agenda items consisted of discussion around the complaints received which are presented, along with close out actions in **Table 10**.

8.2 NEWSLETTERS

Community information newsletters are produced to provide the community with updates regarding:

- Project progress.
- Operating hours, contact information and details of how to provide feedback.
- Ways in which further information can be sought.
- Summary of project issues affecting community and the response and corrective actions to resolve those issues.

Three newsletters were published with this information during the reporting period in July, August and November 2019. The newsletters are provided in Appendix 4.

8.3 COMPLAINTS RECORDS

Six complaints were received by WSS during the reporting period as detailed in **Table 10**. All complaints were resolved as described by the 'Response and Action' column presented in **Table 10.** Complaints received by WSS are available on the public website. DPIE also received eight complaints during the reporting period as presented in **Table 11**. WSS closed all of these out in consultation with DPIE, as detailed by **Appendix 9**.

Table 10: Complaints Received by WSS during the reporting period

Name	Incident ID	Date	Time	Method of Complaint Communication	Key site activities occurring at time of complaint and where? (e.g. clearing and extraction in Sector 2)	Key Complaint Issue (e.g. noise, dust, traffic)	Details	Response and Action	Date of Closure
Keiron Rochester	CTR_INC1	10.9.2019	12:30pm	Phone	Clearing and set up	1. Work starting times. 2. Site egress.	1. Query on the starting time of the earthworks crew. 2. Also people working on site on Sunday. 3. Right turn out of site by staff.	1. Site manager confirmed and days sheets confirm no work commenced prior to 7.00am staff did arrive on site prior to 7.00am. 2. Sunday there was a water cart on site to mange dust control only. 3. Right turn out for trucks is prohibited and is now sign posted, right turn out for passenger vehicles etc is permissible. Darren called back and advised there where no non-compliances	11.09.2019
Steve Kewins	CTR_INC2	12.09.2019	9.15am	Phone	No activities on site over the weekend (except for a water cart for dust control)	Dust	1. Enquiring about dust monitors working, as he noticed dust blowing from the site of an evening over the weekend with high winds.	He was advised the monitors are operating, and we knew we had dust over the weekend that we tried to control. We would be providing notices to residents soon.	12.09.2019
Shirley Davis	CTR_INC3	11.10.2019	12.30pm	Phone	Internal roadworks adjacent to weighbridge area	Traffic	1. Raised concern regarding trucks turning right entering and exiting the site	During civil work vehicles are permitted to enter the site by turning right. Notwithstanding the Quarry Manager contacted the civil works contractor and has directed all contractor heavy vehicles and trucks to enter and exit the site by left turn only. Quarry Manager returned call to complainant and left voice message of actions taken.	11.10.2019
Kay Rochester	CTR_INC4	11.10.2019	1.01pm	Phone	Internal roadworks adjacent to weighbridge area	Traffic	1. Raised concern regarding trucks turning right entering and exiting the site 2. Concerned about traffic passing on the inside of turning trucks with potential for accident.	During civil works, vehicles are permitted to enter the site by turning right. Newcastle Sand has no control over the driving practises of the general public in regards to overtaking. Notwithstanding the Quarry Manager contacted the civil works contractor and has directed all contractor heavy vehicles and trucks to enter and exit the site by left turn only. Quarry Manager returned call to complainant and left voice message of actions taken	11.10.2019
Barry Davis	CTR_INC5	24.10.2019	11.46am	Phone	After Hours	Noise	1. Raised concern regarding a person cutting logs onsite at 8-8.30 pm on 23.10.2019.	Quarry manager investigated and found that another neighbour had cut logs on site for firewood in front of entry gate between 6.00 and 7.00pm. Neighbour has been informed that he is not authorised to cut timber inside property adjacent to roadway. Called complainant back to advise of findings and discussed with son and wife Shirley.	24.10.2019
Kay Rochester	CTR_INC6	24.10.2019	2.50pm	Phone	Internal roadworks	Traffic	1. Kay raised concern that a truck passed her car on the inside to turn left into the mine site, whilst she was stationary awaiting to turn into her driveway. A car travelling behind the truck then nearly hit Kay 's car.	Quarry manager immediately contacted the civil construction foreman who questioned the truck driver to get more details. "Truck driver had indicated to turn left and slowed down to enter site and a member of the public has sped past him. Truck driver had sufficient room to safely pass on the inside and the car following was at fault."	24.10.2019

Table 11: Complaints received by DPIE the reporting period, and the Newcastle Sand response

Complaint Received	Response	Works descriptions for that date	Attachments		Comments	Corrective Action
Tuesday 27th August - 5.40 am arrival	Staff arrived onsite at 8.30am as supported by attached documentation. It is also noted, staff are allowed to arrive onsite prior to 7am as long as no noise is made that can be heard by nearby residences, however operations can not commence until after 7am.	Works included clearing of native vegetation. Onsite works were within approved operations hours as outlined in the CEMP	Work Logs Sign in / Out sheets Truck Logs Inspection Logs Toolbox talk sheet other	Yes Yes n/a n/a n/a n/a	Complete Vegetation Control, daily job sheet is attached, clearly outlining staff onsite, operating hours and tasks completed on that day	none required
Saturday 7th September - 3.30pm departure	As the site was under construction, and automated dust suppression systems had not been put in place yet, watercart hire was required on days that had the potential to create dust issues. Hence Newcastle Sand had dust suppression activities occurring on this day to reduce risk of nearby residence being affected.	watercart spraying site for dust suppression purposes	Work Logs Sign in / Out sheets Truck Logs Inspection Logs Toolbox talk sheet other	Yes Yes n/a Yes n/a n/a	A1 Haulage and Water Cartage plant hire docket is attached, clearly outline tasks for the day, arrival and departure time. The choice to undertake dust suppression activities on the weekends, on high risk days, was to ensure Newcastle Sand, remained a good neighbour and environmental steward. These activities would eb classed as maintenance activities and therefore permissible.	none required
Sunday 8th September- 9.30am arrival and 12 pm departure	As the site was under construction, and automated dust suppression systems had not been put in place yet, watercart hire was required on days that had the potential to create dust issues. Hence Newcastle Sand had dust suppression activities occurring on this day to reduce risk of nearby residence being affected.	watercart spraying site for dust suppression purposes	Work Logs Sign in / Out sheets Truck Logs Inspection Logs Toolbox talk sheet other	Yes Yes n/a Yes n/a n/a	A1 Haulage and Water Cartage plant hire docket is attached, clearly outline tasks for the day, arrival and departure time. The choice to undertake dust suppression activities on the weekends, on high risk days, was to ensure Newcastle Sand, remained a good neighbour and environmental steward. These activities would eb classed as maintenance activities and therefore permissible.	none required
Friday 27th September - 5.40 arrival	Subcontractor arrived at site prior to 7am and floated 13 ton excavator. This was a breach of conditions	Machinery picked up and floated offsite	Work Logs Sign in / Out sheets Truck Logs Inspection Logs Toolbox talk sheet other	Yes Yes an/ n/a Yes n/a	The subcontractor was spoken to, regarding approved operation hours and all staff were spoken too via a toolbox talk, to reinforce the approved operation hours of the site.	Staff spoken too on the daily of the incident
Sunday 20th October - working all day departure 5pm	As the site was under construction, and automated dust suppression systems had not been put in place yet, watercart hire was required on days that had the potential to create dust issues. Hence Newcastle Sand had dust suppression activities occurring on this day to reduce risk of nearby residence being affected.	watercart spraying site for dust suppression purposes	Work Logs Sign in / Out sheets Truck Logs Inspection Logs Toolbox talk sheet other	Yes Yes n/a Yes n/a n/a	P & O Cunningham Pty Ltd. hire docket is attached, clearly outline tasks for the day, arrival and departure time. The choice to undertake dust suppression activities on the weekends, on high risk days, was to ensure Newcastle Sand, remained a good neighbour and environmental steward. These activities would be classed as maintenance activities and therefore permissible.	none required

Table 11 continued…

Complaint Received	Response	Works descriptions for that date	Attachments		Comments	Corrective Action
Saturday 26th October - 6.15am arrival and 5.30pm departure	As the site was under construction, and automated dust suppression systems had not been put in place yet, watercart hire was required on days that had the potential to create dust issues. Hence Newcastle Sand had dust suppression activities occurring on this day to reduce risk of nearby residence being affected.	watercart spraying site for dust suppression purposes	Work Logs	Yes	P & O Cunningham Pty Ltd. hire docket is attached, clearly outline tasks for the day, arrival and departure time. The choice to undertake dust suppression activities on the weekends, on high risk days, was to ensure Newcastle Sand, remained a good neighbour and environmental steward. These activities would be classed as maintenance activities and therefore permissible.	none required
			Sign in / Out sheets	Yes		
			Truck Logs	n/a		
			Inspection Logs	Yes		
			Toolbox talk sheet	n/a		
			other	n/a		
Sunday 10th November - working all morning	No works were carried out by sub-contractors on this day.	no works	Work Logs	n/a	none	none required
			Sign in / Out sheets	n/a		
			Truck Logs	n/a		
			Inspection Logs	n/a		
			Toolbox talk sheet	n/a		
			other	n/a		
Sunday 17th October - working all morning	As the site was under construction, and automated dust suppression systems had not been put in place yet, watercart hire was required on days that had the potential to create dust issues. Hence Newcastle Sand had dust suppression activities occurring on this day to reduce risk of nearby residence being affected.	watercart spraying site for dust suppression purposes	Work Logs	Yes	P & O Cunningham Pty Ltd. hire docket is attached, clearly outline tasks for the day, arrival and departure time. The choice to undertake dust suppression activities on the weekends, on high risk days, was to ensure Newcastle Sand, remained a good neighbour and environmental steward. These activities would be classed as maintenance activities and therefore permissible.	none required
			Sign in / Out sheets	Yes		
			Truck Logs	n/a		
			Inspection Logs	Yes		
			Toolbox talk sheet	n/a		
			other	n/a		

Notable Conditions of Consent	
Approved construction hours - 7am to 5pm Monday - Friday and 8am to 1pm Saturday (CEMP)	
Maintenance can be undertaken at anytime, as long as it is not audible	

9. NON-COMPLIANCES

The rehabilitation bond was required to be lodged by 14 October 2019 to be in compliance with Schedule 3 Clause 38 of the Development Consent. Administrative error saw a delay in this process with DPIE requesting it be submitted by 31 January 2020. The bond was subsequently lodged on 31 January 2020.

No further non-compliances occurred during the 2019 reporting period.

10. DEVELOPMENT IMPACT PREDICTION DISCREPANCIES

As Quarrying Operations have not yet commenced and the Project was in the construction phase throughout the reporting period, there have been no development impact discrepancies identified to date, other than the timeframe of construction extending beyond the predicted 12-week construction period.

Construction duration variance from the CEMP has been caused by:

- Road Works
  - Utility relocation construction period being much longer than expected by both water and Telstra.
  - The sheet piling installation being required for the construction methodology of the retaining wall to retain the batter.
  - Delays with material procurement road pavement material availability
- Internal Works
  - Additional time required to move internal bulk earthworks (retaining sand for future sale), opposed to exporting off site.

WSS are committed to completing construction as efficiently as possible while maintaining a safe and compliant operation. Construction is anticipated to be completed in April 2020.

11. IMPROVEMENT

Throughout the remainder of the construction phase and once Quarrying Operations commence, WSS will implement the necessary actions to meet the performance objectives described by the EMP and conditions of consent and review implementation performance to identify opportunities for improvement.

11.1 REVISION OF STRATEGIES, PLANS & PROGRAMS

As per Schedule 5 Clause 4 of the Project approval, within 3 months of the submission of this AEMR WSS will review the strategies, plans and programs under the Development Consent and notify DPIE in writing of any such review being undertaken. Where this review leads to revisions in any such document, then within 6 weeks of the review the revised document will be submitted for approval by DPIE.

APPENDIX 1. PROJECT APPROVAL

Development Consent

Section 4.38 of the *Environmental Planning and Assessment Act 1979*

The Independent Planning Commission, as the declared consent authority under clause 8A of the *State Environmental Planning Policy* (State and Regional Development) 2011 and section 4.5(a) of *the Environmental Planning and Assessment Act 1979*, approves the development 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 development.

Dianne Leeson (Chair)
Member of the Commission

Peter Cochrane
Member of the Commission

Peter Duncan AM
Member of the Commission

Sydney 9 May 2018

SCHEDULE 1

Application Number	SSD-6125
Applicant	Williamtown Sand Syndicate
Consent Authority:	The Independent Planning Commission NSW
Site:	Lot 1012 DP 814078 Lot 11 DP 629503 Lot 121 DP 556403 Lot 1 DP 224587
Development	Cabbage Tree Road Sand Quarry

APPENDIX 2. EPL

Environment Protection Licence

Licence - 21264

Licence Details	
Number:	21264
Anniversary Date:	31-July

Licensee

WILLIAMTOWN SAND SYNDICATE PTY LIMITED

PO BOX 186

WARATAH NSW 2298

Premises

CABBAGE TREE ROAD SAND QUARRY

298 CABBAGE TREE ROAD

WILLIAMTOWN NSW 2318

Scheduled Activity

Crushing, grinding or separating

Extractive activities

Fee Based Activity	Scale
Crushing, grinding or separating	> 100000-500000 T annual processing capacity
Extractive activities	> 100000-500000 T annual capacity to extract or process

Region

North - Hunter

Ground Floor, NSW Govt Offices, 117 Bull Street
NEWCASTLE WEST NSW 2302

Phone: (02) 4908 6800

Fax: (02) 4908 6810

PO Box 488G

NEWCASTLE NSW 2300

Environment Protection Licence

Licence - 21264

Environment Protection Licence

Licence - 21264

Environment Protection Licence

Licence - 21264

Information about this licence

Dictionary

A definition of terms used in the licence can be found in the dictionary at the end of this licence.

Responsibilities of licensee

Separate to the requirements of this licence, general obligations of licensees are set out in the Protection of the Environment Operations Act 1997 ("the Act") and the Regulations made under the Act. These include obligations to:

- ensure persons associated with you comply with this licence, as set out in section 64 of the Act;
- control the pollution of waters and the pollution of air (see for example sections 120 - 132 of the Act);
- report incidents causing or threatening material environmental harm to the environment, as set out in Part 5.7 of the Act.

Variation of licence conditions

The licence holder can apply to vary the conditions of this licence. An application form for this purpose is available from the EPA.

The EPA may also vary the conditions of the licence at any time by written notice without an application being made.

Where a licence has been granted in relation to development which was assessed under the Environmental Planning and Assessment Act 1979 in accordance with the procedures applying to integrated development, the EPA may not impose conditions which are inconsistent with the development consent conditions until the licence is first reviewed under Part 3.6 of the Act.

Duration of licence

This licence will remain in force until the licence is surrendered by the licence holder or until it is suspended or revoked by the EPA or the Minister. A licence may only be surrendered with the written approval of the EPA.

Licence review

The Act requires that the EPA review your licence at least every 5 years after the issue of the licence, as set out in Part 3.6 and Schedule 5 of the Act. You will receive advance notice of the licence review.

Fees and annual return to be sent to the EPA

For each licence fee period you must pay:

- an administrative fee; and
- a load-based fee (if applicable).

Environment Protection Licence

Licence - 21264

The EPA publication “A Guide to Licensing” contains information about how to calculate your licence fees. The licence requires that an Annual Return, comprising a Statement of Compliance and a summary of any monitoring required by the licence (including the recording of complaints), be submitted to the EPA. The Annual Return must be submitted within 60 days after the end of each reporting period. See condition R1 regarding the Annual Return reporting requirements.

Usually the licence fee period is the same as the reporting period.

Transfer of licence

The licence holder can apply to transfer the licence to another person. An application form for this purpose is available from the EPA.

Public register and access to monitoring data

Part 9.5 of the Act requires the EPA to keep a public register of details and decisions of the EPA in relation to, for example:

- licence applications;
- licence conditions and variations;
- statements of compliance;
- load based licensing information; and
- load reduction agreements.

Under s320 of the Act application can be made to the EPA for access to monitoring data which has been submitted to the EPA by licensees.

This licence is issued to:

WILLIAMTOWN SAND SYNDICATE PTY LIMITED
PO BOX 186
WARATAH NSW 2298

subject to the conditions which follow.

Environment Protection Licence

Licence - 21264

1 Administrative Conditions

A1 What the licence authorises and regulates

A1.1 This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation.

Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.

Scheduled Activity	Fee Based Activity	Scale
Crushing, grinding or separating	Crushing, grinding or separating	> 100000 - 500000 T annual processing capacity
Extractive activities	Extractive activities	> 100000 - 500000 T annual capacity to extract or process

A2 Premises or plant to which this licence applies

A2.1 The licence applies to the following premises:

Premises Details
CABBAGE TREE ROAD SAND QUARRY
298 CABBAGE TREE ROAD
WILLIAMTOWN
NSW 2318
AS SHOWN ON PLAN TITLED "QUARRY OPERATIONS PLAN - FIGURE 1" **WITHIN ALLOTMENTS:** **LOT 1012 DP 814078** **LOT 11 DP 629503** **LOT 121 DP 556403** **LOT 1 DP 224587** **THIS PLAN HAS BEEN FILED AS EPA DOCUMENT DOC19/442133.**

A3 Information supplied to the EPA

A3.1 Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence.

In this condition the reference to "the licence application" includes a reference to:
a) the applications for any licences (including former pollution control approvals) which this licence

replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and
b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.

2 Discharges to Air and Water and Applications to Land

P1 Location of monitoring/discharge points and areas

P1.1 The following points referred to in the table below are identified in this licence for the purposes of monitoring and/or the setting of limits for the emission of pollutants to the air from the point.

Air

EPA identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description
13	Ambient Air Monitoring		PM10 real time particulate monitoring station as described as "RT1" in the document titled "Particulate Matter Monitoring Locations , Figure 5," dated 22 July 2019, EPA file Doc19/629648.
14	Ambient Air Monitoring		PM10 real time particulate monitoring station as described as "RT2" in the document titled " Particulate Matter Monitoring Locations, Figure 5," dated 22 July 2019, EPA file Doc19/629648.
15	Ambient Air Monitoring		PM10 particulate monitoring station as described as "HVAS-1 PM10" in the document titled "Particulate Matter Monitoring Locations, Figure 5," dated 22 July 2019, EPA file DOC19/629648.
16	Ambient Air Monitoring		TSP particulate monitoring station as described as "HVAS-2 TSP" in the document titled "Particulate Matter Monitoring Locations, Figure 5," dated 22 July 2019, EPA file DOC19/629648.

P1.2 The following utilisation areas referred to in the table below are identified in this licence for the purposes of the monitoring and/or the setting of limits for any application of solids or liquids to the utilisation area.

P1.3 The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point.

Water and land

EPA Identification no.	Type of Monitoring Point	Type of Discharge Point	Location Description

1	Groundwater Monitoring	Groundwater Monitoring Bore "BH2" as shown in Figure 7, in document titled "Cabbage Tree Road Sand Quarry" - EPL Supporting Documentation dated 19 March 2019, EPA Doc19/382742.
2	Groundwater Monitoring	Groundwater Monitoring Bore "BH4" as shown in Figure 7, in document titled "Cabbage Tree Road Sand Quarry - EPL Supporting Documentation" dated 19 March 2019, EPA Doc19/382742.
3	Groundwater Monitoring	Groundwater Monitoring Bore "BH6" as shown in Figure 7, in document titled "Cabbage Tree Road Sand Quarry - EPL Supporting Documentation" dated 19 March 2019, EPA Doc19/382742.
4	Groundwater Monitoring	Groundwater Monitoring Bore "BH7" as shown in Figure 7, in document titled "Cabbage Tree Road Sand Quarry - EPL Supporting Documentation: dated 19 March 2019, EPA Doc19/382742.
5	Groundwater Monitoring	Groundwater Monitoring Bore "BH9" as shown in Figure 7, in document titled "Cabbage Tree Road Sand Quarry - EPL Supporting Documentation" dated 19 March 2019, EPA Doc19/382742.
6	Groundwater Monitoring	Groundwater Monitoring Bore "BH11" as shown in Figure 7, in document titled "Cabbage Tree Road Sand Quarry - EPL Supporting Documentation" dated 19 March 2019, EPA Doc19/382742.
7	Groundwater Monitoring	Groundwater Monitoring Bore "MW239S"" as shown in Figure 7, in document titled "Cabbage Tree Road Sand Quarry - EPL Supporting Documentation" dated 19 March 2019, EPA Doc19/382742.

P1.4 The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.

Noise/Weather

EPA identification no.	Type of monitoring point	Location description
17	Meteorological Station	Williamtown Bureau of Meteorology Station

3 Limit Conditions

L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

L2 Waste

L2.1 The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.

L3 Noise limits

L3.1 Noise Limits

Receiver	Day LAeq(15 Min)	Shoulder LAeq(15 Min)	Shoulder LA Max(1 Min)
Any residential reciever	43	39	45

L3.2 Operational noise generated at the premises must not exceed the noise limits shown in the table above.

Note: The noise limits detailed above do not apply at a particular residence if the licensee has a written agreement with that particular residence to exceed those limits.

Note: This condition does not apply to construction activities of the intersection of the quarry access road and Cabbage Tree Road or vegetation clearing in the Southern Resource Area.

L3.3 The following noise limits apply to vegetation clearing in the Southern Resource Area.

The licensee must only undertake vegetation clearing activities in the Southern Resource Area in the following circumstances:

a)noise generated by the development does not exceed 47dB(A)LAeq (15min);

b)bulldozer(s) or equipment with sound power levels greater than 104 dB(A) are not permitted to be used

in sectors 9B, 10A, 10B, and 10C as shown in Figure 2 of Appendix 1 of Project Approval SSD-6125;

c)clearing operations are limited to:

- the day period, Monday to Friday only;
- campaigns not exceeding 5 consecutive working days; and
- no more that 4 campaigns in a calendar year.

L3.4 For the purpose of the Noise limits above:

Day is the period from 7am to 6pm Monday to Friday and 7am to 4pm Saturdays.
The morning shoulder period is from 6am to 7am Monday to Friday.

L3.5 The noise limits set out in this licence apply under all meteorological conditions except for the following:

a) Wind Speeds greater than 3 metres/second at 10 metres above ground level; or
b) Stability category F temperature inversion conditions and wind speeds greater than 2 metres/second at 10 metres above ground level; or
c) Stability class G temperature inversions.

L3.6 For the purpose of the condition above:
a) Data recorded by the meteorological station identified as EPA monitoring point 17 must be used to determine meteorological conditions; and
b) Temperature inversion conditions (stability category) are to be determined by the sigma theta method referred to in the NSW Noise Policy for Industry.

L3.7 **Determining Compliance**

To determine compliance:
a) with the Leq (15 minute) noise limits in the Noise Limits table, the noise measurement equipment must be located:
i) approximately on the property boundary, where any dwelling is situated 30 metres or less from the property boundary closest to the premises; or
ii) within 30 metres of a dwelling façade, but not closer than 3m, where any dwelling on the property is situated more than 30 metres from the property boundary closest to the premises; or, where applicable
iii) within approximately 50 metres of the boundary of a National Park or a Nature Reserve.
b) with the LA1(1 minute) noise limits in the Noise Limits table, the noise measurement equipment must be located within 1 metre of a dwelling façade.
c) with the noise limits in the Noise Limits table, the noise measurement equipment must be located:
i) at the most affected point at a location where there is no dwelling at the location; or
ii) at the most affected point within an area at a location prescribed by part (a) or part (b) of this condition.

Note: A non-compliance of the Noise Limits table will still occur where noise generated from the premises in excess of the appropriate limit is measured:
i) at a location other than an area prescribed in part (a) and part (b); and/or
ii) at a point other than the most affected point at a location.

L3.8 For the purposes of determining the noise generated at the premises the modification factors in Fact Sheet C of the NSW Noise Policy for Industry must be applied, as appropriate, to the noise levels measured by the noise monitoring equipment.

L4 Hours of operation

L4.1 Quarrying operations

7am to 5pm Monday to Friday
7am to 4pm Saturday
At no time on Sundays or public holidays.

Loading and dispatch of laden trucks

6am to 6pm Monday to Friday
7am to 4pm Saturday
At no time on Sundays or Public holidays.

Note: The licensee may undertake maintenance activities outside these hours provided it is not audible at any residential receiver.

L5 Potentially offensive odour

L5.1 The licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises.

L6 Other limit conditions

Extraction and Rehabilitation Depth Limits

L6.1 The Licensee must not undertake any sand extraction within 0.7 metres of the predicted maximum groundwater level at the premises at any time.

L6.2 The Licensee must ensure that rehabilitation final landform levels remain 1 metre above the maximum predicted groundwater height.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

O1.1 Licensed activities must be carried out in a competent manner.
This includes:
a) the processing, handling, movement and storage of materials and substances used to carry out the

activity; and
b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O2 Maintenance of plant and equipment

O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
a) must be maintained in a proper and efficient condition; and
b) must be operated in a proper and efficient manner.

O3 Dust

O3.1 All areas in or on the premises must be maintained in a condition that prevents or minimises the emission of dust to the air.

O3.2 Any activity carried out in or on the premises must be carries out by such practical means as to prevent dust or minimise the emission of dust to the air.

O3.3 Any plant operated in or on the premises must be operated by such practical means to prevent or minimise dust or other air pollutants.

O3.4 All trafficable areas and vehicle manoeuvring areas in or on the premises must be maintained, at all times, in a condition that will minimise the emission of dust to the air, or emission from the premises of wind-blown or traffic generated dust.

O3.5 Trucks entering and leaving the premises that are carrying loads of dust generating materials must have their loads covered at all times, except during loading and unloading.

O3.6 The licensee must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of operations to match its available water supply for dust suppression purposes.

O3.7 The licensee must review operations and ensure that water dust suppression is active on haul roads and stockpile areas during the following conditions:

a) Where wind conditions are directed towards surrounding residences, that is, the weather station indicates winds are blowing from the quadrants west (270 degrees) through North (0 degrees) to East (90 degrees).

b) When the continuous PM10 monitor shows the rolling PM10 24 hr average exceeds the background average concentration of 22 micrograms per cubic metre.

O3.8 The Licensee must cease all topsoil stripping and dozer operations when the following occurs:

a) Wind is directed towards surrounding residences, and
b) Rolling PM10 24 hr average exceeds 35 micrograms per cubic metre.

O3.9 The Licensee must suspend all sand processing activities when:

a) Wind is directed towards surrounding residences, and
b) Rolling PM10 24 hr average exceeds 40 micrograms per cubic metre.

O3.10 The Licensee must suspend all sand extraction from the face when dust levels increase after two hours when:

a) Wind is directed towards surrounding residences, and
b) Rolling PM10 24 hr average exceeds 42.2 micrograms per cubic metre.

O3.11 If dust levels continue to increase after two hours, the Licensee must cease loading and shut down all machinery at the premises when:

a) Wind is directed towards surrounding residences, and
b) Rolling PM10 24 hr average exceeds 45 micrograms per cubic metre.

O3.12 The Licensee must progressively rehabilitate mined/quarried areas as each section is completed.

O4 Emergency response

Note: The licensee must maintain, and implement as necessary, a current Pollution Incident Response Management Plan (PIRMP) for the premises. The licensee must keep the incident response plan on the premises at all times. The incident response plan must document systems and procedures to deal with all types of incidents (e.g. spills, explosions or fire) that may occur at the premises or that may be associated with activities that occur at the premises and which are likely to cause harm to the environment.

The PIRMP must be tested at least annually or following a pollution incident.

The licensee must develop the Pollution Incident Response Management Plan in accordance with the requirements in Part 5.7A of the Protection of the Environment Operations (POEO) Act 1997 and POEO regulations.

O5 Processes and management

Preventing Pollution from Fuels and Chemicals

O5.1 All above ground tanks containing material that is likely to cause environmental harm must be bunded or have an alternative spill containment system in place.

O5.2 Bunds must:
a) have walls and floors constructed of impervious materials;
b) be of sufficient capacity to contain 110% of the volume of the tank (or 110% volume of the largest tank where a group of tanks are installed);
c) have floors graded to a collection sump; and
d) not have a drain valve incorporated in the bund structure,

or be constructed and operated in a manner that achieves the same environmental outcome.

O5.3 All fuel storage and refuelling areas at the premises must be constructed to comply with the relevant Australian Standards.

O5.4 Except as detailed in the condition below, refuelling and all storage of fuels and chemicals must be within an appropriately roofed and concrete bunded area within the workshop compound, located outside of the Tomago Sandbeds Special Area.

O5.5 Tracked plant may be refuelled on a fully bunded and lined hardstand located within the Tomago Sandbeds Special Area. This bunded and lined area must be capable of holding both the tracked equipment and the fuel tank.

O5.6 No fuel storage or refuelling activities may occur at the premises outside of the areas constructed to the relevant Australian Standards.

O5.7 The Licensee must ensure that, outside of the operating hours during which quarrying operations are permitted, all fuel powered equipment is removed from the "Tomago Sandbeds Special Area" to a secure storage, except for equipment being used in vegetation clearing operations, which may be stored within a fully bunded and lined hardstand area outside of operating hours.

Preventing Pollution from Trucks

O5.8 The Licensee must;
a)ensure that all laden trucks entering or exiting the site have their loads covered;
b)ensure that all laden trucks exiting the site are cleaned before leaving the site of material that may fall from vehicles; and
c) use its best endeavours to ensure that appropriate signage is displayed on all trucks used to transport product from the development so that they can be easily identified by road users.

Waste Classification

O5.9 The licensee must ensure that any liquid and/or non liquid waste generated and/or stored at the premises is assessed and classified in accordance with the DECC Waste Classification Guidelines as in force from time to time.

O6 Other operating conditions

Minimising Noise

O6.1 All dozers operating within the Southern Resource Area must be restricted to operating in first gear in reverse to minimise associated track noise.

O6.2 All mobile equipment used onsite must be fitted with a BBS-Tec "back alarm" broadband reversing alarm or similar such device.

Managing Contamination from Past Activities

O6.3 No groundwater on the premises is to be extracted or used on the premises without the prior approval of the EPA.

O6.4 Within the premises boundary the Licensee must accurately determine the location of areas impacted by the former mineral sand extraction operations including the settling ponds, sand tailings disposal areas, monazite trenches and the "equipment graveyard" areas and prior to works commencing on site install suitable fencing to prohibit any activities in these areas.

Stormwater Management

O6.5 The drainage from all areas at the premises which will liberate suspended solids when stormwater runs over these areas must be diverted to adequately sizes sediment basins.

O6.6 The sediment basins must be maintained to ensure that their design capacity is available for the storage of all runoff from cleared areas.

O6.7 Stormwater management measures must be prepared and implemented to mitigate the impacts of stormwater run-off from and within the premises in a manner that is consistent with the Stormwater Management Plan for the catchment. Where a Stormwater Management Plan has not yet been prepared the measures should be consistent with the guidance contained in Managing Urban Stormwater: Soils and Construction: Volume 2C Unsealed Roads and Volume 2E Mines and Quarries (DECCW 2008).

Sewage Management

O6.8 The Licensee must establish and use an on-site sewage pump out system, incorporating an adequately sized holding tank located outside of the "Tomago Sandbeds Special Area".

5 Monitoring and Recording Conditions

M1 Monitoring records

M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.

M1.2 All records required to be kept by this licence must be:
a) in a legible form, or in a form that can readily be reduced to a legible form;
b) kept for at least 4 years after the monitoring or event to which they relate took place; and
c) produced in a legible form to any authorised officer of the EPA who asks to see them.

M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
a) the date(s) on which the sample was taken;
b) the time(s) at which the sample was collected;
c) the point at which the sample was taken; and
d) the name of the person who collected the sample.

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M2 Requirement to monitor concentration of pollutants discharged

M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:

M2.2 Air Monitoring Requirements

POINT 13,14

Pollutant	Units of measure	Frequency	Sampling Method
PM10	micrograms per cubic metre	Continuous	Australian Standard 3580.9.8 - 2001

POINT 15

Pollutant	Units of measure	Frequency	Sampling Method
PM10	micrograms per cubic metre	Every 6 days	AM-18

POINT 16

Pollutant	Units of measure	Frequency	Sampling Method
Total suspended particles	micrograms per cubic metre	Every 6 days	AM-15

M2.3 Water and/ or Land Monitoring Requirements

POINT 1,2,3,4,5,6,7

Pollutant	Units of measure	Frequency	Sampling Method
Arsenic	micrograms per litre	Monthly	Grab sample
Conductivity	microsiemens per centimetre	Monthly	Grab sample
Depth	metres	Monthly	Probe
Iron	milligrams per litre	Monthly	Grab sample
Manganese	milligrams per litre	Monthly	Grab sample
pH	pH	Monthly	Grab sample
Turbidity	nephelometric turbidity units	Monthly	Grab sample

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M3 Testing methods - concentration limits

M3.1 Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with:
a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or
b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or
c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place.

Note: The *Protection of the Environment Operations (Clean Air) Regulation 2010* requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".

M3.2 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.

M4 Weather monitoring

M4.1 At the point(s) identified below, the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1 of the table below, using the corresponding sampling method, units of measure, averaging period and sampling frequency, specified opposite in the Columns 2, 3, 4 and 5 respectively.

POINT 17

Parameter	Sampling method	Units of measure	Averaging period	Frequency
Temperature at 2 metres	AM-4	degrees Celsius	1 hour	Continuous
Wind Direction at 10 metres	AM-2 & AM-4	Degrees	15 minutes	Continuous
Wind Speed at 10 metres	AM-2 & AM-4	metres per second	15 minutes	Continuous
Sigma Theta	AM-2 & AM-4	Degrees	15 minutes	Continuous
Rainfall	AM-4	millimetres	15 minutes	Continuous
Relative humidity	AM-4	percent	1 hour	Continuous

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M5 Recording of pollution complaints

M5.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.

M5.2 The record must include details of the following:
a) the date and time of the complaint;
b) the method by which the complaint was made;
c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
d) the nature of the complaint;
e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
f) if no action was taken by the licensee, the reasons why no action was taken.

M5.3 The record of a complaint must be kept for at least 4 years after the complaint was made.

M5.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M6 Telephone complaints line

M6.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.

M6.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.

M6.3 The preceding two conditions do not apply until 60 days after the date of the issue of this licence.

M7 Other monitoring and recording conditions

Extraction Height Survey

M7.1 The licensee must ensure quarry operators are aware excavation RL heights to allow continual compliance with extraction depth limits. Such provisions may include GPS capability on quarry machinery, relevant network of survey pegs and frequent surveys of operations.

M8 Noise monitoring

M8.1 To assess compliance with the noise limits section of this licence, attended noise monitoring must be undertaken in accordance with the noise conditions and:

a) at a location representative of the most affected residences in the noise limit conditions and;

b) occur quarterly in a reporting period;

c) occur each day and shoulder period as defined in the NSW Industrial Noise Policy for a minimum of:

- 1.5 hours during the day; and
- 30 minutes during the shoulder period.

d) occur for three consecutive operating days.
Note: It is the intention of the EPA to review the noise monitoring results required under this condition after a period of (3) years to assess the suitability of the required monitoring.

6 Reporting Conditions

R1 Annual return documents

R1.1 The licensee must complete and supply to the EPA an Annual Return in the approved form comprising:

1. a Statement of Compliance,
2. a Monitoring and Complaints Summary,
3. a Statement of Compliance - Licence Conditions,
4. a Statement of Compliance - Load based Fee,
5. a Statement of Compliance - Requirement to Prepare Pollution Incident Response Management Plan,
6. a Statement of Compliance - Requirement to Publish Pollution Monitoring Data; and
7. a Statement of Compliance - Environmental Management Systems and Practices.

At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

R1.2 An Annual Return must be prepared in respect of each reporting period, except as provided below.

Note: The term "reporting period" is defined in the dictionary at the end of this licence. Do not complete the Annual Return until after the end of the reporting period.

R1.3 Where this licence is transferred from the licensee to a new licensee:
a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and
b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.

Note: An application to transfer a licence must be made in the approved form for this purpose.

R1.4 Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on:
a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is

given; or
b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.

R1.5 The Annual Return for the reporting period must be supplied to the EPA via eConnect *EPA* or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').

R1.6 The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.

R1.7 Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and Complaints Summary must be signed by:
a) the licence holder; or
b) by a person approved in writing by the EPA to sign on behalf of the licence holder.

Groundwater Monitoring Report

R1.8 The licensee must supply with each Annual Return a monitoring report that includes:

a) all groundwater monitoring results obtained over the reporting period;
b) a graphical presentation of all groundwater monitoring results (one parameter per graph) extending back to when monitoring began; and
c) a commentary on results that have been obtained, highlighting any changes or trends observed over time and make recommendations where adverse effects are identified.

Annual Extraction Height Survey

R1.9 The licensee must submit to the EPA with each Annual Return an annual independent survey report to demonstrate compliance with the extraction depth limit on this licence. The report must show all RL's of quarry operations and compare these against the RL's for the maximum predicted groundwater levels.

R2 Notification of environmental harm

R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

R3 Written report

R3.1 Where an authorised officer of the EPA suspects on reasonable grounds that:
a) where this licence applies to premises, an event has occurred at the premises; or
b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the

carrying out of the activities authorised by this licence,
and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.

R3.2 The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.

R3.3 The request may require a report which includes any or all of the following information:
a) the cause, time and duration of the event;
b) the type, volume and concentration of every pollutant discharged as a result of the event;
c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
g) any other relevant matters.

R3.4 The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.

R4 Other reporting conditions

Noise Monitoring Report

R4.1 A noise compliance assessment report must be submitted to the EPA within 30 days of the completion of the quarterly monitoring. The assessment must be prepared by a suitably qualified and experienced acoustical consultant and include:

a) an assessment of compliance with the noise limits as detailed in this licence; and

b) an outline of any management actions taken within the monitoring period to address any exceedances of the limits detailed in this licence.

7 General Conditions

G1 Copy of licence kept at the premises or plant

G1.1 A copy of this licence must be kept at the premises to which the licence applies.

G1.2 The licence must be produced to any authorised officer of the EPA who asks to see it.

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G1.3 The licence must be available for inspection by any employee or agent of the licensee working at the premises.

G1.4 The Licensee must nominate to the EPA a representative of the proponent that is available at all times and is capable of providing immediate assistance or response during emergencies or any other incidents at the premises. The name of the nominated representative and their contact details, including their telephone number, must be current at all times. The nomination and contact details must be provided to the EPA's Director - Hunter at PO BOX 488G, Newcastle NSW 2300.

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Dictionary

General Dictionary

3DGM [in relation to a concentration limit]	Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples
Act	Means the Protection of the Environment Operations Act 1997
activity	Means a scheduled or non-scheduled activity within the meaning of the Protection of the Environment Operations Act 1997
actual load	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
AM	Together with a number, means an ambient air monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
AMG	Australian Map Grid
anniversary date	The anniversary date is the anniversary each year of the date of issue of the licence. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
annual return	Is defined in R1.1
Approved Methods Publication	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
assessable pollutants	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
BOD	Means biochemical oxygen demand
CEM	Together with a number, means a continuous emission monitoring method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.
COD	Means chemical oxygen demand
composite sample	Unless otherwise specifically approved in writing by the EPA, a sample consisting of 24 individual samples collected at hourly intervals and each having an equivalent volume.
cond.	Means conductivity
environment	Has the same meaning as in the Protection of the Environment Operations Act 1997
environment protection legislation	Has the same meaning as in the Protection of the Environment Administration Act 1991
EPA	Means Environment Protection Authority of New South Wales.
fee-based activity classification	Means the numbered short descriptions in Schedule 1 of the Protection of the Environment Operations (General) Regulation 2009.
general solid waste (non-putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997

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flow weighted composite sample	Means a sample whose composites are sized in proportion to the flow at each composites time of collection.
general solid waste (putrescible)	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environmen t Operations Act 1997
grab sample	Means a single sample taken at a point at a single time
hazardous waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
licensee	Means the licence holder described at the front of this licence
load calculation protocol	Has the same meaning as in the Protection of the Environment Operations (General) Regulation 2009
local authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
material harm	Has the same meaning as in section 147 Protection of the Environment Operations Act 1997
MBAS	Means methylene blue active substances
Minister	Means the Minister administering the Protection of the Environment Operations Act 1997
mobile plant	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
motor vehicle	Has the same meaning as in the Protection of the Environment Operations Act 1997
O&G	Means oil and grease
percentile [in relation to a concentration limit of a sample]	Means that percentage [eg.50%] of the number of samples taken that must meet the concentration limit specified in the licence for that pollutant over a specified period of time. In this licence, the specified period of time is the Reporting Period unless otherwise stated in this licence.
plant	Includes all plant within the meaning of the Protection of the Environment Operations Act 1997 as well as motor vehicles.
pollution of waters [or water pollution]	Has the same meaning as in the Protection of the Environment Operations Act 1997
premises	Means the premises described in condition A2.1
public authority	Has the same meaning as in the Protection of the Environment Operations Act 1997
regional office	Means the relevant EPA office referred to in the Contacting the EPA document accompanying this licence
reporting period	For the purposes of this licence, the reporting period means the period of 12 months after the issue of the licence, and each subsequent period of 12 mo nths. In the case of a licence continued in force by the Protection of the Environment Operations Act 1997, the date of issue of the licence is the first anniversary of the date of issue or last renewal of the licence following the commencement of the Act.
restricted solid waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
scheduled activity	Means an activity listed in Schedule 1 of the Protection of the Environment Operations Act 1997
special waste	Has the same meaning as in Part 3 of Schedule 1 of the Protection of the Environment Operations Act 1997
TM	Together with a number, means a test method of that number prescribed by the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*.

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TSP	Means total suspended particles
TSS	Means total suspended solids
Type 1 substance	Means the elements antimony, arsenic, cadmium, lead or mercury or any compound containing one or more of those elements
Type 2 substance	Means the elements beryllium, chromium, cobalt, manganese, nickel, selenium, tin or vanadium or any compound containing one or more of those elements
utilisation area	Means any area shown as a utilisation area on a map submitted with the application for this licence
waste	Has the same meaning as in the Protection of the Environment Operations Act 1997
waste type	Means liquid, restricted solid waste, general solid waste (putrescible), general solid waste (non-putrescible), special waste or hazardous waste

Mr Peter Jamieson

Environment Protection Authority

(By Delegation)

Date of this edition: 31-July-2019

End Notes

APPENDIX 3. COMMUNITY CONSULTATIVE COMMITTEE MINUTES

Williamtown Sand Syndicate (WSS)
Cabbage Tree Road Sand Quarry
Community Consultative Committee Meeting

11 October 2019
9:00-11:00
Mercure Hotel, Williamtown

Meeting Number:	1st Meeting	**Type of meeting:**	General
Chairperson:	John Turner	**Note taker:**	Jonathan Berry

Attendees:
Wayne Sampson (Resident) – WS
Janet Meyn (Port Stephens Council) – JM
Jonathan Berry (Kleinfelder) – JB
Barry Davis (Resident) – BD
Shirley Davis (Resident) – SD
Darren Williams (WSS) – DW
Paul Bourne (WSS / Newcastle Sand) – PB

Apologies:
Kieron Rochester
John Simpson (Hunter Water Representative)

Observers: Kay Rochester (Resident) - KR

Meeting Open: 9:00am

Minutes

Agenda item: 1 **Apologies** **Presenter:** John Turner

Discussion:

Kieron Rochester.

Agenda item: 2 **Declaration of Pecuniary Interest** **Presenter:** NA

Discussion:

John Turner (Chairperson) – Paid for service by WSS.
Wayne Sampson (Resident) – Deed with WSS.
Janet Meyer (Port Stephens Council) – Owner of land, receives royalty for sand.
Jonathan Berry (Kleinfelder) – Consultant employed by WSS.
Barry Davis (Resident) – Nil.
Shirley Davis (Resident) – Nil.
Kay Rochester (Resident) – Nil.
Darren Williams (WSS) – Quarry owner.
Paul Bourne (WSS / Newcastle Sand) – Quarry employee.

Agenda item: 3	**Correspondence**	**Presenter:**	John Turner

Discussion:

Nil.

Agenda item: 4	**Proponents Reports and Overview**	**Presenter:**	Jonathan Berry
	* progress of the project * monitoring and environmental performance * community complaints and response to these complaints * information provided to the community and any feedback		

Discussion:

JB provided run through of Powerpoint presentation projected on television screen (attached), questions and comments raised periodically.

- KR. PFOS measured at bore at front of yard.
- BD. Westerly winds would be expected to be a problem for dust given experience on another sand site.
- JB. Several enquiries made, website to be updated with latest spreadsheet.
- JB. Newsletter to be delivered pre-intersection construction.
- WS. How are we going to manage trucks turning up early?
- JB. DW. Inductions, Code of Conduct compliance, gate inset from road and/or combination lock to ensure trucks are not stuck at the gate and can stop inside site away from houses.
- KR. BD. Has been an issue with an early start where third-party collected an excavator from the road reserve prior to 6am. BD. Spoke with the float operator at time of collection about the noise at that time of morning.
- KR. SD. Concern about trucks turning into site from right lanes, White Towers truck seen doing turn regularly.
- JB. Better education of drivers may be required.
- SD. What has been onsite in the last few days? Any rollers?
- DW. Yes roller has been onsite as of Thursday 10/10/19.
- SD. Has noticed vibrating cabinet due to something.
- DW. SD to contact PB next time it happens and he will come and inspect.
- BD. Can put rubber under cabinet should not be a problem.
- WS. Will the 60km/h speed limit for the intersection and over Christmas period be 24 hours?
- DW. Yes, given the jersey kerb is on the shoulder it would be expected to remain in place 24 hours per day.
- DW. Unclear when the Christmas shutdown period would be, RMS typically mandates from just before Christmas to after the new year in early January.
- Presentation included discussion on noise level observations, comment made to check these at different locations as the bitumen surface heavily influences noise levels from passing vehicles.
- DW. Expect internal works to be completed by Christmas and road works to be underway, with completion in late January, early February 2020.
- SD noted reversing beepers had been causing her concern.
- PB/ DW / JB. Noted a couple of third party pieces of plant did have beepers, most of these have been removed from site. Trying to ensure new plant only has broadband reversing alarms. All operational plant will have a broadband reversing alarm.

Conclusions:

Key actions from the above discussions summarized below:

Action items	**Person responsible**	**Deadline**
✓ Update complaints spreadsheet on website.	DW	18 October 2019
✓ Newsletter to be delivered prior to construction of intersection. Newsletter to include note on no unauthorized access.	PB	TBA

Action items	Person responsible	Deadline
✓ Followup with contractors with discussion on how to best access the site and educate on best practice in line with the Traffic Control Plan in place.	PB	18/10/2019
✓ SD to contact PB next time vibration occurs to inspect the rattling cabinet.	SD / PB	As needed
✓ Check noise levels near different road surfaces.	JB	Before next meeting.

Agenda item: 5 Other Agenda Items **Presenter:** John Turner

Discussion:

Questions raised by Kieron Rochester addressed, noted in the powerpoint presentation and discussed. See Item 4.

Agenda item: 6 General Business **Presenter:** John Turner

Discussion:

No general business from BD, SD, KD, JB, JM, DW, WS.

PB. Contractors onsite have raised the matter of unauthorized entry into the site of bikes and people. Request that the CCC help spread the fact that the site is a construction site and access, if needed should be arranged with PB prior to coming onto site.

JT. Does anyone have any additional requests or comments for future agendas? The current agenda is one adopted from DPIE guidelines.

All. No changes requested to current agenda.

Action items	Person responsible	Deadline
✓ Community to advise where possible about dangers of construction site and not accessing the site without contacting PB.	CCC	Where possible.
✓ Agreed no change to meeting agenda.	JT to maintain existing agenda	NA
✓ Include note in newsletter about not accessing site during construction.	JB / PB	In next newsletter.

Agenda item: 7 Next Meeting **Presenter:** John Turner

Discussion:

JT. Typical to have four meetings per year as suggested by DPIE.

All. Agreed by all CCC members present on four meetings per year.

JT. Next meeting would be good to have a site inspection if feasible given stage of works.

JT. A meeting in late January 2020 would be next appropriate time.

Action items	Person responsible	Deadline
✓ Agreed four meetings appropriate.	JT to arrange meetings	Next meeting late January 2020
✓ Site inspection agreed next visit, subject to operational restrictions if applicable.	PB	Immediately before next meeting.

Other Information

- **Minutes to be provided as draft in the next week.**
- **Committee members have one week to provide feedback on the minutes to the Chairperson.**
- **Within two weeks of receiving feedback the minutes will be finalized and distributed to members and placed on the website.**
- **SD and KR requested hard copy and the electronic copy. Hard copy to be dropped off in mail box.**

Meeting Close:

10:08 am

Newcastle Sand

Community Consultative Committee Update

11 October 2019

Key Activities Completed for Construction

- Completed management plans and gained EPL.
- Established www.newcastlesand.com.au
- Established air monitors.
- Collecting surface water and groundwater on monthly basis.
- Surveyed construction footprint.
- Surveyed and markout of habitat trees.
- Collected seed from cleared vegetation.
- Mulched understorey vegetation.

Key Activities Completed for Construction

- Cleared trees.
- Removed dumped waste and cars.
- Installed security cameras.
- Removed and stockpiled topsoil.
- Excavated sand to quarry floor to enable construction of access road, construction compound, weighbridge, office and workshop area.
- Excavated sand is stockpiled for future processing.
- Commenced laying road base for access road.
- Spread topsoil on batters for revegetation.

Key Construction Activities Remaining

- Install demountable office and workshop buildings.
- Install weighbridge.
- Install power and water.
- Construct intersection.
- Commission processing plant.
- Commence processing and sale of sand products.

Environmental Monitoring - Water

- Continuous logging of groundwater depth data at several wells across site.
- Gauge depth and sample 8 groundwater wells and 4 surface water sites across the site monthly – reports on the website.
- Groundwater levels have been very low.
- PFAS has been analysed in all bores.
- PFOS detected at low levels in drain at eastern boundary of property.
- PFDS detected in bore once at the limit of reporting near road (1.5m below quarry floor), followup sampling did not detect it again.
- Low level of hydrocarbon detected at BH4 near road in April and September following rainfall. May suggest past vehicle accident?
- PFAS levels consistent with Defence plume mapping, only occurred following rainfall.

Environmental Monitoring - Air

- Network includes two Beta Attenuation Monitors (BAMs) that measure real-time particulate matter smaller than 10 micron (PM_{10}).
  - Have a 6 stage alarm configured to help manage dust levels.
  - Have had some teething problems (sporadic data peaks without likely dust, insects, theft of fence, potential localised surface dust).
  - Have had first quarterly calibration at start of October.
- Two High Volume Air Sampler (HVAS) one measuring PM10 and one measuring total suspended particulates (TSP), these run for 24 hours every six days.

Environmental Monitoring - Air

- Quarry must implement all reasonable and feasible avoidance and mitigation measures so particulate emissions from quarry do not cause exceedance of:
  - PM10 annual average 25 µg/m^3 cumulative.
  - Quarry PM10 contribution over 24 hour average 50 µg/m^3.
- BAM at 393 Cabbage Tree Road = 19.1 µg/m^3 average since install.
- BAM at 458 Cabbage Tree Road = 17.5 µg/m^3 average since install.
- Air quality model in assessment used an assumed annual average background of 19.4µg/m^3.
- Measured 24 hour average went above 50 µg/m^3 over a weekend at the time of a regional dust storm. Water cart was used onsite to help reduce dust levels, no other work was occurring onsite.

Questions

Q. Operating days during construction & operations – can these be confirmed including any specific exceptions for certain tasks.

R. See Schedule 1, Condition 1 of consent. Construction is 7am to 6pm Monday to Friday and 8am to 1pm on Saturday. Quarrying operations will start when weighbridge and intersection completed.

Hours of Operation

1. The Applicant must comply with the operating hours set out in Table 1.

Table 1: Operating Hours

Activity	*Permissible Hours*
Quarrying operations	• 7 am to 5 pm Monday to Friday • 7 am to 4 pm Saturday • At no time on Sundays or public holidays
Loading and dispatch of laden trucks	• 6 am to 6 pm Monday to Friday • 7 am to 4 pm Saturday • At no time on Sundays or public holidays
Maintenance	• May be conducted at any time, provided that these activities are not audible at any privately-owned residence

Questions

Q. Traffic management during construction – can the left turn only operations rule be implemented for all vehicles to increase safety?

R. At this stage, before the intersection works, light vehicles are considered OK to turn right consistent with all residential properties.

Q. Approved works during construction – what trucks if any should be leaving the site loaded ?

R. Essentially any trucks would be permitted to leave site loaded providing that material is part of construction and is not sold.

Q. Start times during construction / operations – definition of start – please confirm no vehicles or machines arrive/depart, start up or shutdown unless within approved times.

R. The assessment noted that light vehicles will arrive before start times to conduct tool-box talks and inspect machines. This applies to construction and operations. It is noted in the consent that maintenance can be conducted at any time providing it is not audible at private residences.

Questions

Q. Reversing beepers – should the broadband beepers be used for construction activities as well ?

R. Where possible machinery with broadband beepers have been selected, unfortunately this is not always feasible with short term contracts during construction. Operational plant will all be fitted with broad band beepers.

Q. Would like some clarity on these issues for the community as there have been instances where all above have been seen.

R. If there are concerns, we encourage residents to record in a journal, or call the information line at the time of the observation.

Q. With regards to the timing for the next CCC, given construction will now be continuing over the busy Christmas period I would suggest a meeting before the RMS compulsory closure period if that is possible.

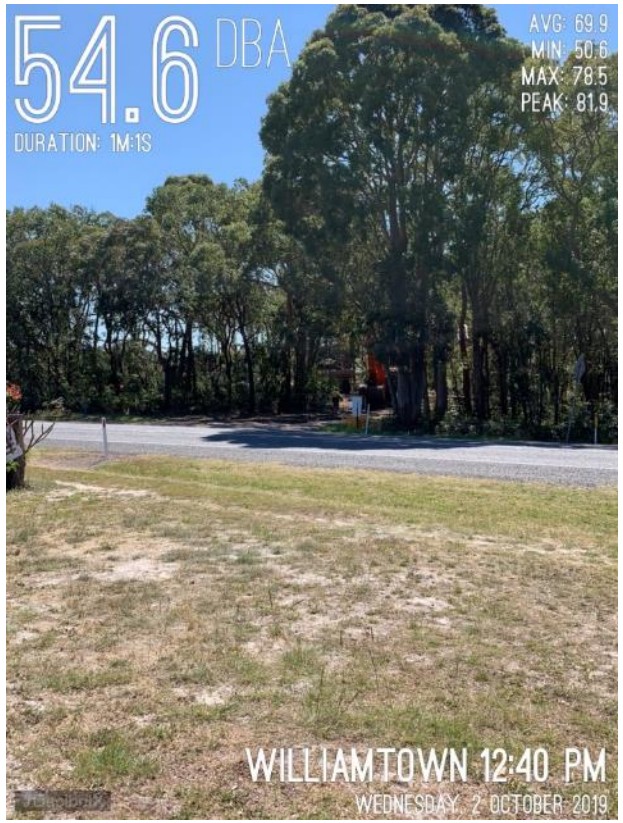
R. Up to the CCC.

More Information

- www.newcastlesand.com.au
- Quarry Manager – Paul Bourne - 0402 648 079

Noise evaluation (not formal monitoring)

Noise from site around 55 dBA versus traffic on CBT Road at 75 dBA



Testing polymers to reduce dust

Air monitors
(HVAS – PM10 not shown)

The site on 11 October 2019

The site on 11 October 2019

APPENDIX 4. NEWSLETTERS

Cabbage Tree Road Sand Quarry

Welcome to **Edition 4** of the Cabbage Tree Road Sand Quarry Newsletter. The purpose of the newsletter is to provide the community with updates on how the project is progressing.

Since the last newsletter in October 2016, the proposed sand quarry received approval from the Joint Regional Planning Panel (JRPP). The JRPP approved the quarry on 9 May 2018 subject to a comprehensive set of Consent Conditions.

Williamtown Sand Syndicate (WSS) has been developing management plans in consultation with government agencies and to the satisfaction of the Secretary of New South Wales (NSW) Department of Planning Industry and Environment (DPIE). WSS has also been working with the NSW Roads and Maritime Service (RMS) to develop detailed plans for the construction of the intersection on Cabbage Tree Road.

START OF CONSTRUCTION

Construction of the intersection, workshop and office area is anticipated to start in August, pending final approval of the intersection design details by the RMS. Construction is expected to take approximately 12 weeks. On this basis quarrying and processing of sand is expected to begin in November 2019. Construction of the intersection and roads will be undertaken by a major earth moving contractor, supported by WSS.

Construction will include building the following:

- A left-in and left-out intersection onto Cabbage Tree Road.
- A bitumen sealed access road.
- The erection of a koala exclusion fence along the boundary of 282B Cabbage Tree Road.
- A workshop, office, and weighbridges.

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

Under the Project's Conditions of Development Consent, WSS must consult with the landowners adjacent to the proposed intersection to minimise the effects of its construction on residents. A Road Construction Management Plan must be developed to consider noise, vibration, dust, and property access impacts of the construction impacts and set out ways to avoid, minimise or offset impacts or provide respite for affected residents from extended periods of construction. WSS have developed a Construction Environmental Management Plan (CEMP) to document these controls. A copy of the CEMP is available to any interested resident for review (see contacts below), and to provide input into controls. A summary of the key controls are provided below. This newsletter is intended to form the basis for plan consultation and encourage input to its refinement.

Vibration

Given the setback of properties from Cabbage Tree Road, no vibration impacts to structures are considered likely to occur. Notwithstanding, landowners within 300 m of the intersection are entitled to make a written request for WSS to engage an independent qualified person to undertake a baseline condition assessment of the structures on their property. In the event of damage, expected by the landowner to be caused by quarry construction activities, the landowner may request further assessment of any damage and if caused by the quarry agree for WSS to repair that damage. The properties within 300 m of the intersection works include numbers; 447, 444, 441, 435, 431, 425, 415, 409, 407, 397, 393, 383, 379, 375, 373, 365, 363, 350, 343, 340 and 336 Cabbage Tree Road, Williamtown.

Noise

Construction will be undertaken during the standard industry construction hours of 7 am to 6 pm Monday to Friday, 8 am to 1 pm on Saturdays with no works occurring on Sunday or a Public Holiday. The noise assessment anticipates that some properties may be noise affected (background plus 10 dB) for some portion of the works, but no

dwelling would be highly noise affected (75 dB(A) or higher). Noise monitoring will be undertaken during construction to assess noise levels.

Dust

Standard dust controls will be applied during construction (e.g. minimise disturbance area, water cart, stabilise bare sand areas as soon as feasible). An air quality monitoring network has been established for the project and includes an air monitor directly opposite the intersection. This air monitor will provide the quarry operators a real-time measurement of air quality and the ability to proactively respond to increasing dust levels from construction to minimise impacts on nearby residents.

Property Access and Traffic

The construction of the intersection will require the implementation of a traffic management plan to the satisfaction the RMS. The traffic management plan will be developed with the successful earth moving contractor, but is considered likely to include; closure of the east-bound road shoulder in the area of the intersection, reduced speed limits and construction warning signage. Despite these controls, during the works, it will be important for residents and visitors of properties opposite the works area to take care accessing the property and preferably access them from the west bound lane as there will be no shoulder available for vehicles to overtake turning traffic.

Input and Feedback

Should residents have any questions, suggestions or concerns in relation to the management plan and proposed construction works, please contact Jonathan on the details below. Prior to the commencement of construction, additional details of the construction manager will be provided.

COMMUNITY CONSULTATIVE COMMITTEE

The DPIE appointed John Turner as the Independent Chair Person for the Cabbage Tree Road Quarry Community Consultative Committee (CCC). Public notices calling for CCC members has been made and the CCC is in the process of being formed. If you are interested in being a member or finding out more about the CCC please contact John at ctrsqccc@gmail.com.

CONTACT US

If you have any comments or would like more information, or have any questions or feedback relating to the Cabbage Tree Road Project, please contact:

Jonathan Berry (Kleinfelder Australia Pty Ltd)
P: 02 4949 5200 (business hours)
M: 0421 440 139
E: jberry@kleinfelder.com

ABOUT WILLIAMTOWN SAND

Williamtown Sand Syndicate Pty Ltd is a Newcastle based privately funded investment business utilising local employees, contractors, consultants, resources and suppliers of services to undertake this project.

Cabbage Tree Road Sand Quarry

Welcome to **Edition 5** of the Cabbage Tree Road Sand Quarry Newsletter. The purpose of this newsletter is to provide the community with updates on how the project is progressing, and to notify of the forthcoming commencement of construction.

The previous newsletter in July 2019 informed that the proposed sand quarry received approval from the Joint Regional Planning Panel (JRPP). This should have stated that approval was received from the Independent Planning Commission on 9 May 2018.

Since the last newsletter in July 2019, Williamtown Sand Syndicate (WSS) has been finalising management plans in consultation with government agencies and to the satisfaction of the Secretary of New South Wales (NSW) Department of Planning Industry and Environment (DPIE). WSS has also been working with the NSW Roads and Maritime Service (RMS) to finalise detailed plans for the construction of the intersection on Cabbage Tree Road.

START OF CONSTRUCTION

Internal construction works will commence on 26 August 2019.

Construction of the intersection is expected to commence in mid-September 2019 pending final approval of the intersection design details by the RMS. Construction is expected to take approximately 12 weeks. Construction of the intersection and roads will be undertaken by an experienced earth moving contractor, supported by WSS.

On this basis quarrying and processing of sand is expected to begin in December 2019 / January 2020.

PHASES OF CONSTRUCTION

Phases of construction are anticipated to be as follows:

1. Marking of boundaries.
2. Vegetation Clearing.
3. Internal earthworks to establish work compounds and internal road and office areas.
4. Construction of intersection with traffic controls (as detailed below)
5. Relocation of services including installation of two live power poles and installation of two permanent streetlights. It is not anticipated that this will result in the requirement for power outages. Likewise, water or telecommunications will not be interrupted during construction.
6. As intersection construction nears completion, short term (approx. 1 day) temporary lane closure may be required, managed by traffic controllers.

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

Under the Project's Conditions of Development Consent, WSS must consult with landowners adjacent to the proposed intersection to minimise the effects of its construction on residents. The previous newsletter in July 2019 informed of a copy of the CEMP is available to any interested resident for review (see contacts below), and to provide input into controls. Feedback has been received from stakeholders including DPIE and captured in the CEMP where applicable. WSS encourage ongoing feedback to ensure construction activities are completed with minimal disruption to the surrounding community.

KEY CONSTRUCTION CONTROLS

Vibration

Given the setback of properties from Cabbage Tree Road, vibration impacts to structures are considered unlikely. Regardless, landowners within 300 m of the intersection are entitled to make a written request for WSS to engage an independent qualified person to undertake a baseline condition assessment of the structures on their property. In the event of damage, suspected by the landowner to be caused by quarry construction activities, the landowner may request further assessment of any

damage and if caused by the quarry agree for WSS to repair that damage. The properties within 300 m of the intersection and quarry include numbers; 464, 458, 457, 452, 451, 447, 444, 441, 435, 431, 425, 415, 409, 407, 397, 393, 383, 379, 375, 373, 365, 363, 350, 343, 340 and 336 Cabbage Tree Road, Williamtown. If you would like to have your property inspected, please contact Jonathan on the details below. For those that have requested a survey, an appointment will be arranged directly with you in the coming fortnight to undertake the inspection.

Noise

Construction will be undertaken during standard industry construction hours of 7 am to 6 pm Monday to Friday, 8 am to 1 pm on Saturdays with no works occurring on Sunday or a Public Holiday. The noise assessment anticipates that some properties may be noise affected (background plus 10 dB) for some portion of the works, and that the worst case construction noise impact is predicted to be 62 dB(A), but no dwelling is predicted be highly noise affected (75 dB(A) or higher). Noise monitoring will be undertaken during construction to assess noise levels.

Dust

Standard dust controls will be applied during construction (e.g. minimise disturbance area, water cart, stabilise bare sand areas as soon as feasible). Further, an air quality monitoring network has been installed to provide a real-time measurement of air quality and the ability to proactively respond to any increasing dust levels from construction to minimise impacts on nearby residents.

Property Access and Traffic

The construction of the quarry intersection will require the implementation of a traffic management plan to the satisfaction the RMS. Traffic controls applied for the construction of the intersection will include:

- Reduction in speed to 60km/h approximately 100 m before and after the intersection.
- Closure of the east-bound road shoulder in the area of the intersection.
- Lane separation using concrete barriers.
- Construction warning signage.
- As intersection construction nears completion, short term (approx. 1 day) temporary east-bound lane closure will be required to cut-in the intersection. This would be managed by traffic controllers, using a contra-flow on the west bound lane.

Despite these controls, during the works, it will be important for residents and visitors of properties opposite the works area to preferably access them from the west bound lane as there will be no shoulder available for vehicles to overtake turning traffic.

COMMUNITY CONSULTATIVE COMMITTEE

The DPIE appointed John Turner as the Independent Chair Person for the Cabbage Tree Road Quarry Community Consultative Committee (CCC). The members of the CCC have now been selected based on registrations of interest. For more about the CCC please contact John at ctrsqccc@gmail.com.

CONTACT US

If you have any comments or would like more information, or have any questions or feedback relating to the Cabbage Tree Road Project, please contact:

Jonathan Berry (Kleinfelder Australia Pty Ltd)
P: 02 4949 5200 (business hours)
M: 0421 440 139
E: jberry@kleinfelder.com

To make a complaint or find out more about the construction activities occurring onsite contact the Quarry Manager on 0402 648 079. This number is the dedicated quarry complaints and information number.

ABOUT WILLIAMTOWN SAND

Williamtown Sand Syndicate Pty Ltd is a Newcastle based privately funded investment business utilising local employees, contractors, consultants, resources and suppliers of services to undertake this project.

Cabbage Tree Road Sand Quarry

Welcome to **Edition 6** of the Cabbage Tree Road Sand Quarry Newsletter. The purpose of this newsletter is to provide the community with updates on how the project is progressing. As you may have noticed, internal construction works have been progressing and we appreciate your patience and understanding during this period.

Williamtown Sand Syndicate (WSS) have now finalised design approval with the Roads and Maritime Service (RMS) for the intersection on Cabbage Tree Road.

Internal construction works are nearing completion with the majority of the bulk earthworks and road building activities anticipated to be completed by the end of November 2019. Facility establishment including the weighbridge, office installation, storage shed, and services will continue at a lesser scale from the 2nd December 2019 until the opening of the quarry.

INTERSECTION CONSTRUCTION & PROPERTY ACCESS

Intersection construction works are anticipated to commence from Monday 2nd December 2019. WSS has appointed Robson Civil as the contractor to construct the intersection. Robson has extensive experience in constructing similar projects throughout the Hunter and Central Coast regions.

The construction of the intersection will occur as per the RMS approved management plans, traffic control and design specifications with periodic RMS Surveillance Office inspections.

The approved traffic control plan will be enforced for the duration of the project (RMS - Road Occupancy Licence), a copy of the traffic control plan is attached to this newsletter for your information, the main controls of this plan are;

- Reduced speed from 90kph to 60kph in both directions for the extent of the work-zone for the duration of the project;
- Lane separation using concrete barriers.
- Concrete barriers located on the east-bound existing shoulder for the extent of the work-zone; and
- Interim (as required) stop go traffic control for both east and west-bound travel lanes.
- Closure of the east-bound road shoulder in the area of the intersection.
- Construction warning signage
- As intersection construction nears completion, short term (approx. 1 day) temporary east-bound lane closure will be required to cut-in the intersection. This would be managed by traffic controllers, using a contra-flow on the west bound lane.

Despite these controls, during the works, it will be important for residents and visitors of properties opposite the works to preferably access theses from the west bound lane as there will be no shoulder available for vehicles to overtake turning traffic (Note traffic will be slowed to 60kph).

It is anticipated the intersection construction will be completed by late February 2020.

CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

Under the Project's Conditions of Development Consent, WSS must consult with landowners adjacent to the proposed intersection to minimise the effects of its construction on residents. The previous newsletter in August 2019 informed of a copy of the CEMP is available to any interested resident for review (see contacts below), and to provide input into controls. Feedback has been received from stakeholders including DPIE and captured in the CEMP where applicable. WSS encourage ongoing feedback to ensure construction activities are completed with minimal disruption to the surrounding community.

KEY CONSTRUCTION CONTROLS

Vibration

Given the setback of properties from Cabbage Tree Road, vibration impacts causing structural damage is considered unlikely. Regardless, landowners within 300 m of the intersection (and quarrying area) are entitled to make a written request for WSS to

engage an independent qualified person to undertake a baseline condition assessment of the structures on their property. In the event of damage, suspected by the landowner to be caused by quarry construction activities, the landowner may request further assessment of any damage and if caused by the quarry agree for WSS to repair that damage. The properties within 300 m of the intersection and quarry include numbers; 464, 458, 457, 452, 451, 447, 444, 441, 435, 431, 425, 415, 409, 407, 397, 393, 383, 379, 375, 373, 365, 363, 350, 343, 340 and 336 Cabbage Tree Road, Williamtown. If you would like to have your property inspected, please contact Jonathan on the details below. For those that have requested a survey, an appointment will be arranged directly with you in the coming fortnight to undertake the inspection.

Noise

Construction will be undertaken during standard industry construction hours of 7 am to 6 pm Monday to Friday, 8 am to 1 pm on Saturdays with no works occurring on Sunday or a Public Holiday. The noise assessment anticipates that some properties may be noise affected (background plus 10 dB) for some portion of the works, and that the worst case construction noise impact is predicted to be 62 dB(A), but no dwelling is predicted be highly noise affected (75 dB(A) or higher). Noise monitoring will be undertaken during construction to assess noise levels.

Dust

Standard dust controls will be applied during construction (e.g. minimise disturbance area, water cart, stabilise bare sand areas as soon as feasible). Further, an air quality monitoring network has been installed to provide a real-time measurement of air quality and the ability to proactively respond to any increasing dust levels from construction to minimise impacts on nearby residents.

ACCESSING THE SITE AND YOUR SAFETY

WSS would like to remind the community that the property on which the quarrying is occurring is both a construction site and operating quarry. For your safety, **no unauthorised access is permitted on the land**. If you would like to access the site, please contact the quarry manager, who will, where possible, assist with your request.

COMMUNITY CONSULTATIVE COMMITTEE

The DPIE appointed John Turner as the Independent Chair Person for the Cabbage Tree Road Quarry Community Consultative Committee (CCC). The members of the CCC have now been selected based on registrations of interest. For more about the CCC please contact John at harcourt2204@hotmail.com.

QUARRY MANAGER

Paul Bourne has been appointed the role of Quarry Manager at WSS. Paul brings with him many years of sand quarrying experience within the local area.

To make a complaint or find out more about the construction activities occurring onsite contact Paul on 0402 648 079. This number is the dedicated quarry complaints and information number.

CONTACT US

If you have any comments or would like more information, or have any questions or feedback relating to the Cabbage Tree Road Project, please contact:

Jonathan Berry (Kleinfelder Australia Pty Ltd)
P: 02 4949 5200 (business hours)
M: 0421 440 139
E: jberry@kleinfelder.com

ROBSON CIVIL SITE CONTACT

Phil Badior – Site Manager
P: 02 4949 1300
M: 0439 609 339

ABOUT WILLIAMTOWN SAND

Williamtown Sand Syndicate Pty Ltd is a Newcastle based privately funded investment business utilising local employees, contractors, consultants, resources and suppliers of services to undertake this project.

Client: ROBSON CIVIL PROJECTS
Contact: Brent Matthews
PH: 0477 027 660

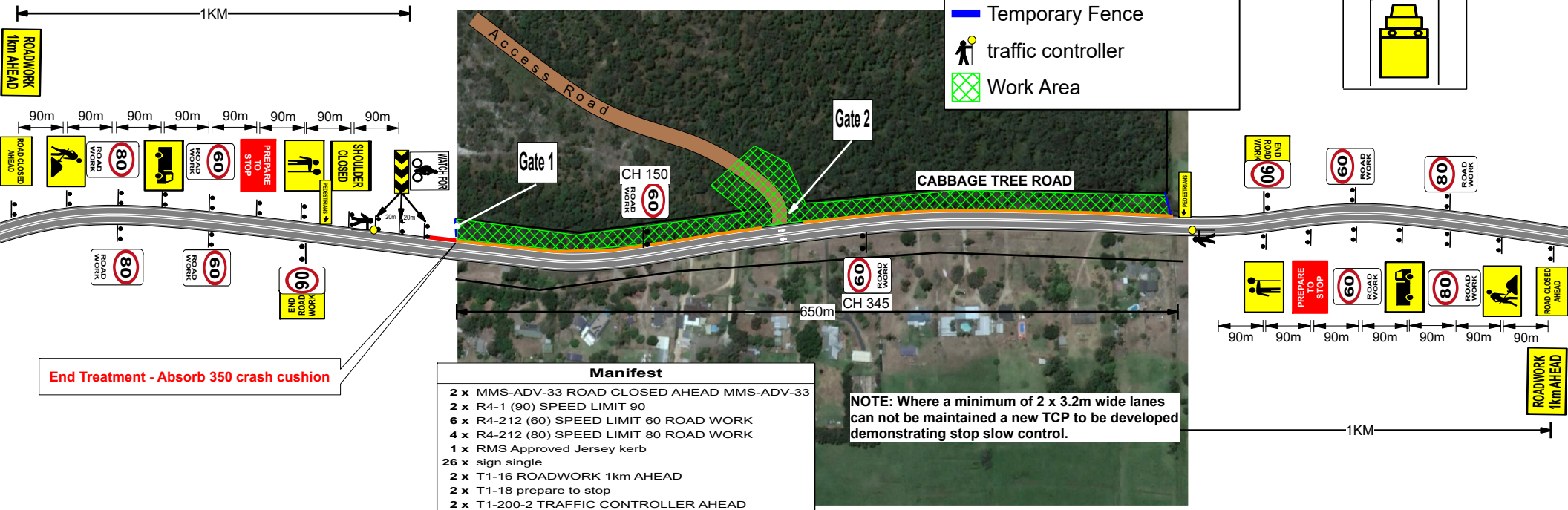
DAY WORKS - SHOULDER CLOSED WITH BRIEF STOPS AS REQUIRED

Coast Traffic Solutions
Traffic Control
coasttrafficsolutions@gmail.com 0412 444 156

Legend

- Property Boundry
- RMS Approved Jersey kerb
- Temporary Fence
- traffic controller
- Work Area

Minimum travel lanes = 3.2m

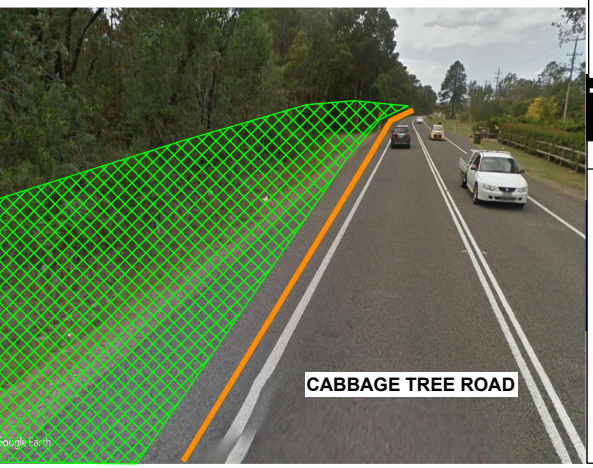


End Treatment - Absorb 350 crash cushion

Manifest

2 x	MMS-ADV-33 ROAD CLOSED AHEAD MMS-ADV-33
2 x	R4-1 (90) SPEED LIMIT 90
6 x	R4-212 (60) SPEED LIMIT 60 ROAD WORK
4 x	R4-212 (80) SPEED LIMIT 80 ROAD WORK
1 x	RMS Approved Jersey kerb
26 x	sign single
2 x	T1-16 ROADWORK 1km AHEAD
2 x	T1-18 prepare to stop
2 x	T1-200-2 TRAFFIC CONTROLLER AHEAD
2 x	T1-5-2 WORKERS AHEAD NSW
2 x	T2-17A end road work
2 x	T2-25 TRUCKS
1 x	T5-4 HAZARD WARNING MARKER
1 x	T8-2L pedestrians (L)
1 x	T8-2R pedestrians (R)
2 x	traffic controller
1 x	Watch for Cyclist

NOTE: Where a minimum of 2 x 3.2m wide lanes can not be maintained a new TCP to be developed demonstrating stop slow control.



TCP 1 - Cabbage Tree Rd - Williamtown - Shoulder Closed - Long Term

Date: 18/11/2019 **Scale:** NOT TO SCALE **Revision:** 0

Comments:

1. SCOPE OF WORKS: Traffic management during Long term road construction & associated works.
2. Day Works: All appropriate PPE to be warn.
3. PEDESTRIANS: Ensure pedestrian signage is clearly posted and surface on temporary walk way smooth and with out obstacles.
4. CERTIFIED TRAFFIC CONTROLLERS: All signage & equipment as per this TCP are to be positioned by holder of a current traffic controller Yellow Card.
5. TCP No 1: Based on TCP 42 from the TCWS manual.
6. SCHEDULE OF WORKS: TBA by Robson Projects.
7. NOTE: When workers are not on site the worker symbolic signs will be removed or covered

GENERAL NOTES: This plan is to be read in conjunction with:

* TRAFFIC CONTROL AT WORKS SITES MANUAL 27-07-2018 - VERSION No 5
* None applicable existing signs to be covered.

Modified by:
Red Card No:
Date: Sign:

Certified by:
Red Card No:
Date: / /201 Sign:

Plan drawn by
Nigel Bolton

Phone
0412 444 156

Transport Roads & Maritime Services
Prepare a Work Zone Traffic Management Plan
Card No. 0049082211
This qualification enables you to prepare Traffic Management Plans and conduct inspections on Traffic Management Plans.
NIGEL BOLTON
Expiry Date: 12/01/2021
Card No: 0049082211
This card is not a proof of identity.

Client: ROBSON CIVIL PROJECTS
Contact: Brent Matthews
PH: 0477 027 660

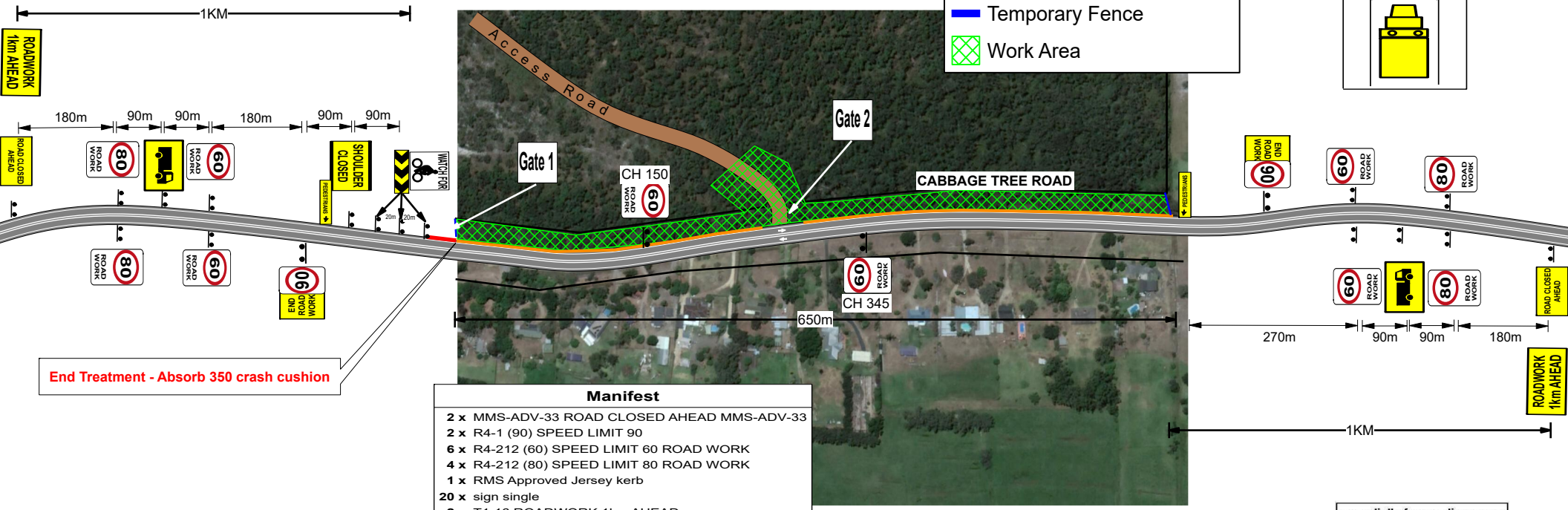
OUT OF HOURS - SHOULDER CLOSED

Coast Traffic Solutions
Traffic Control
coasttrafficsolutions@gmail.com 0412 444 156

Legend

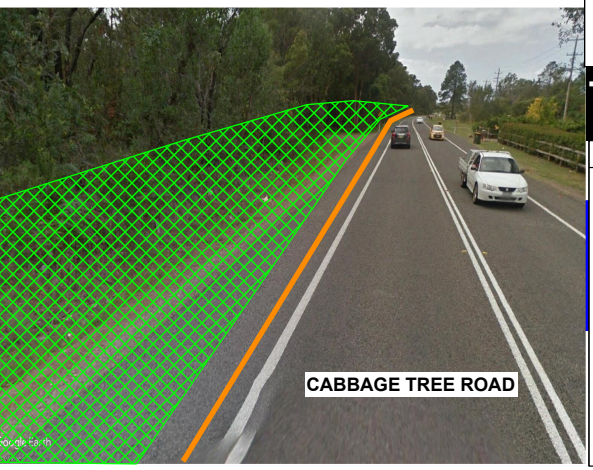
- Property Boundry
- RMS Approved Jersey kerb
- Temporary Fence
- Work Area

Minimum travel lanes = 3.2m



Manifest

2 x	MMS-ADV-33 ROAD CLOSED AHEAD MMS-ADV-33
2 x	R4-1 (90) SPEED LIMIT 90
6 x	R4-212 (60) SPEED LIMIT 60 ROAD WORK
4 x	R4-212 (80) SPEED LIMIT 80 ROAD WORK
1 x	RMS Approved Jersey kerb
20 x	sign single
2 x	T1-16 ROADWORK 1km AHEAD
2 x	T2-17A end road work
2 x	T2-25 TRUCKS
1 x	T5-4 HAZARD WARNING MARKER
1 x	T8-2L pedestrians (L)
1 x	T8-2R pedestrians (R)
1 x	Watch for Cyclist



TCP 2 - Cabbage Tree Rd - Williamtown - Shoulder Closed - OUT OF HOURS

Date: 20/11/2019 **Scale:** NOT TO SCALE **Revision:** 0

Comments:

1. SCOPE OF WORKS: Traffic management OUT OF HOURS Long term road construction & associated works.
2. Day Works: All appropriate PPE to be warn.
3. PEDESTRIANS: Ensure pedestrian signage is clearly posted and surface on temporary walk way smooth and with out obstacles.
4. CERTIFIED TRAFFIC CONTROLLERS: All signage & equipment as per this TCP are to be positioned by holder of a current traffic controller Yellow Card.
5. TCP No 2: Based on TCP 42 from the TCWS manual.
6. SCHEDULE OF WORKS: TBA by Robson Projects.
7. NOTE: When workers are not on site the worker symbolic signs will be removed or covered

GENERAL NOTES: This plan is to be read in conjunction with:
* TRAFFIC CONTROL AT WORKS SITES MANUAL 27-07-2018 - VERSION No 5
* None applicable existing signs to be covered.

Modified by:
Red Card No:
Date: Sign:

Certified by:
Red Card No:
Date: / /201 Sign:

Plan drawn by
Nigel Bolton
Phone
0412 444 156

Client: ROBSON CIVIL PROJECTS
Contact: Brent Matthews
PH: 0477 027 660

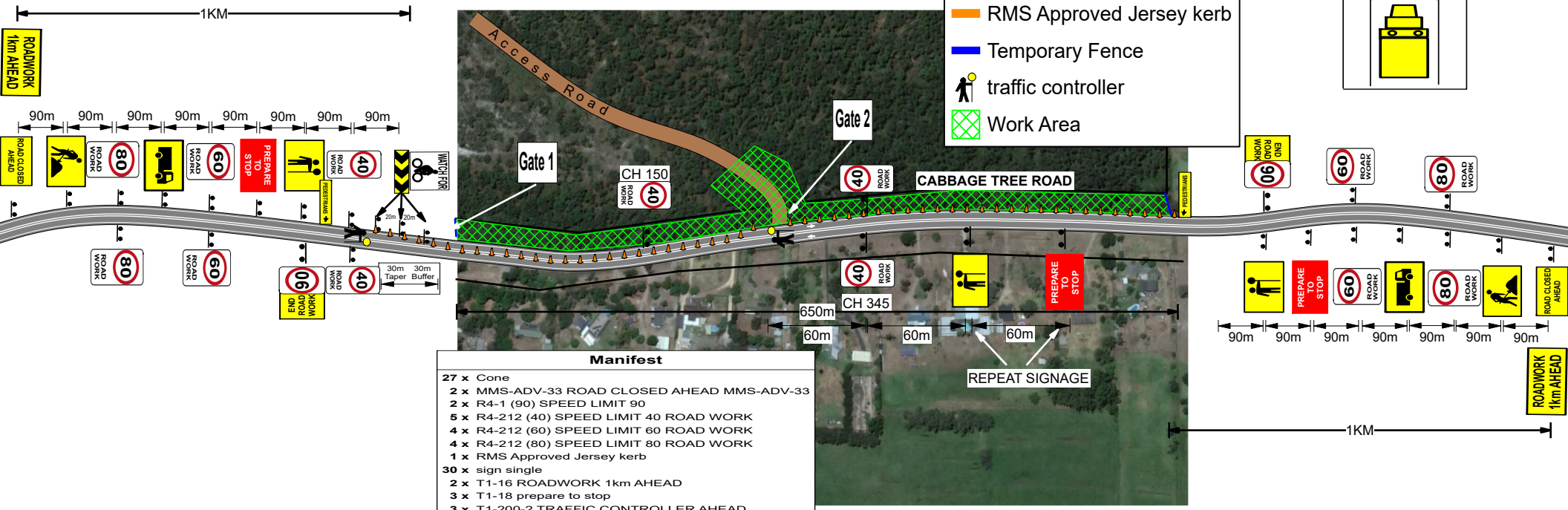
DAY WORKS - Stop Slow Control - Western end of works

Coast Traffic Solutions
Traffic Control
coasttrafficsolutions@gmail.com 0412 444 156

Legend

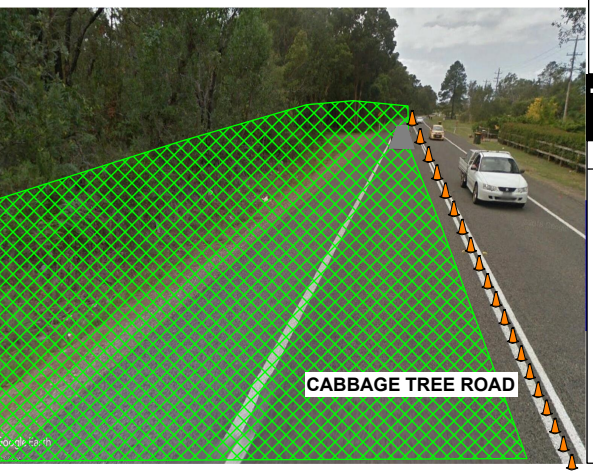
- Cone
- Property Boundry
- RMS Approved Jersey kerb
- Temporary Fence
- traffic controller
- Work Area

Minimum travel lanes = 3.2m



Manifest

27 x	Cone
2 x	MMS-ADV-33 ROAD CLOSED AHEAD MMS-ADV-33
2 x	R4-1 (90) SPEED LIMIT 90
5 x	R4-212 (40) SPEED LIMIT 40 ROAD WORK
4 x	R4-212 (60) SPEED LIMIT 60 ROAD WORK
4 x	R4-212 (80) SPEED LIMIT 80 ROAD WORK
1 x	RMS Approved Jersey kerb
30 x	sign single
2 x	T1-16 ROADWORK 1km AHEAD
3 x	T1-18 prepare to stop
3 x	T1-200-2 TRAFFIC CONTROLLER AHEAD
2 x	T1-5-2 WORKERS AHEAD NSW
2 x	T2-17A end road work
2 x	T2-25 TRUCKS
1 x	T5-4 HAZARD WARNING MARKER
1 x	T8-2L pedestrians (L)
1 x	T8-2R pedestrians (R)
2 x	traffic controller
1 x	Watch for Cyclist



TCP 3 - Cabbage Tree Rd - Williamtown - Stop Slow Control

Date: 20/11/2019 **Scale:** NOT TO SCALE **Revision:** 0

Comments:

1. SCOPE OF WORKS: Traffic management during Long term road construction & associated works.
2. Day Works: All appropriate PPE to be warn.
3. PEDESTRIANS: Ensure pedestrian signage is clearly posted and surface on temporary walk way smooth and with out obstacles.
4. CERTIFIED TRAFFIC CONTROLLERS: All signage & equipment as per this TCP are to be positioned by holder of a current traffic controller Yellow Card.
5. TCP No 3: Based on TCP 83 from the TCWS manual.
6. SCHEDULE OF WORKS: TBA by Robson Projects.
7. NOTE: When workers are not on site the worker symbolic signs will be removed or covered

GENERAL NOTES: This plan is to be read in conjunction with:
* TRAFFIC CONTROL AT WORKS SITES MANUAL 27-07-2018 - VERSION No 5
* None applicable existing signs to be covered.

Modified by:
Red Card No:
Date: Sign:

Certified by:
Red Card No:
Date: / /201 Sign:

Plan drawn by
Nigel Bolton

Phone
0412 444 156

Transport Roads & Maritime Services
Prepare a Work Zone Traffic Management Plan
Card No. 0049082211
This qualification enables you to prepare Traffic Management Plans and conduct inspections on Traffic Management Plans.
NIGEL BOLTON
Expiry Date: 12/01/2021
Card No: 0049082211
This card is not a proof of identity.

Client: ROBSON CIVIL PROJECTS
Contact: Brent Matthews
PH: 0477 027 660

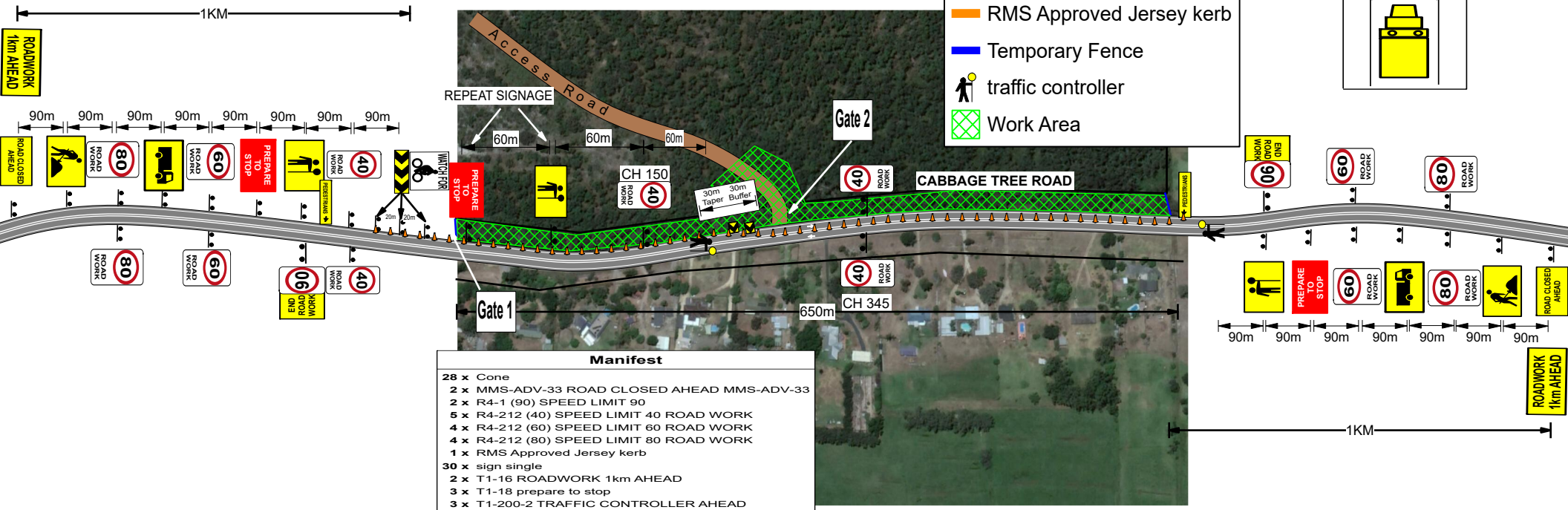
DAY WORKS - Stop Slow Control - Eastern end of works

Coast Traffic Solutions
Traffic Control
coasttrafficsolutions@gmail.com 0412 444 156

Legend

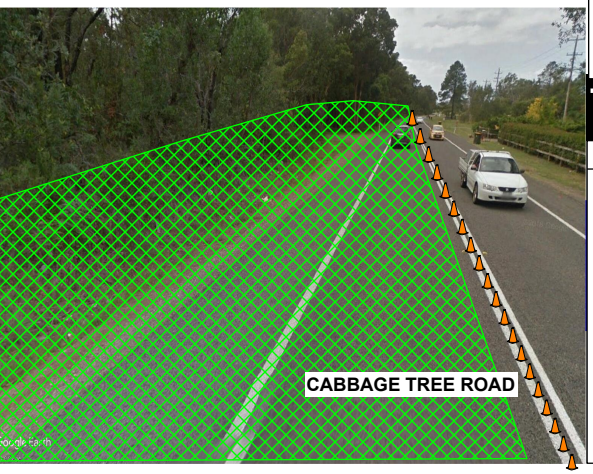
- Cone
- Property Boundry
- RMS Approved Jersey kerb
- Temporary Fence
- traffic controller
- Work Area

Minimum travel lanes = 3.2m



Manifest

28 x	Cone
2 x	MMS-ADV-33 ROAD CLOSED AHEAD MMS-ADV-33
2 x	R4-1 (90) SPEED LIMIT 90
5 x	R4-212 (40) SPEED LIMIT 40 ROAD WORK
4 x	R4-212 (60) SPEED LIMIT 60 ROAD WORK
4 x	R4-212 (80) SPEED LIMIT 80 ROAD WORK
1 x	RMS Approved Jersey kerb
30 x	sign single
2 x	T1-16 ROADWORK 1km AHEAD
3 x	T1-18 prepare to stop
3 x	T1-200-2 TRAFFIC CONTROLLER AHEAD
2 x	T1-5-2 WORKERS AHEAD NSW
2 x	T2-17A end road work
2 x	T2-25 TRUCKS
1 x	T5-4 HAZARD WARNING MARKER
2 x	T5-5 T5-5 single chevron
1 x	T8-2L pedestrians (L)
1 x	T8-2R pedestrians (R)
2 x	traffic controller
1 x	Watch for Cyclist



TCP 4 - Cabbage Tree Rd - Williamtown - Stop Slow Control

Date: 20/11/2019 **Scale:** NOT TO SCALE **Revision:** 0

Comments:

1. SCOPE OF WORKS: Traffic management during Long term road construction & associated works.
2. Day Works: All appropriate PPE to be warn.
3. PEDESTRIANS: Ensure pedestrian signage is clearly posted and surface on temporary walk way smooth and with out obstacles.
4. CERTIFIED TRAFFIC CONTROLLERS: All signage & equipment as per this TCP are to be positioned by holder of a current traffic controller Yellow Card.
5. TCP No 4: Based on TCP 83 from the TCWS manual.
6. SCHEDULE OF WORKS: TBA by Robson Projects.
7. NOTE: When workers are not on site the worker symbolic signs will be removed or covered

GENERAL NOTES: This plan is to be read in conjunction with:
* TRAFFIC CONTROL AT WORKS SITES MANUAL 27-07-2018 - VERSION No 5
* None applicable existing signs to be covered.

Modified by:
Red Card No:
Date: Sign:

Certified by:
Red Card No:
Date: / /201 Sign:

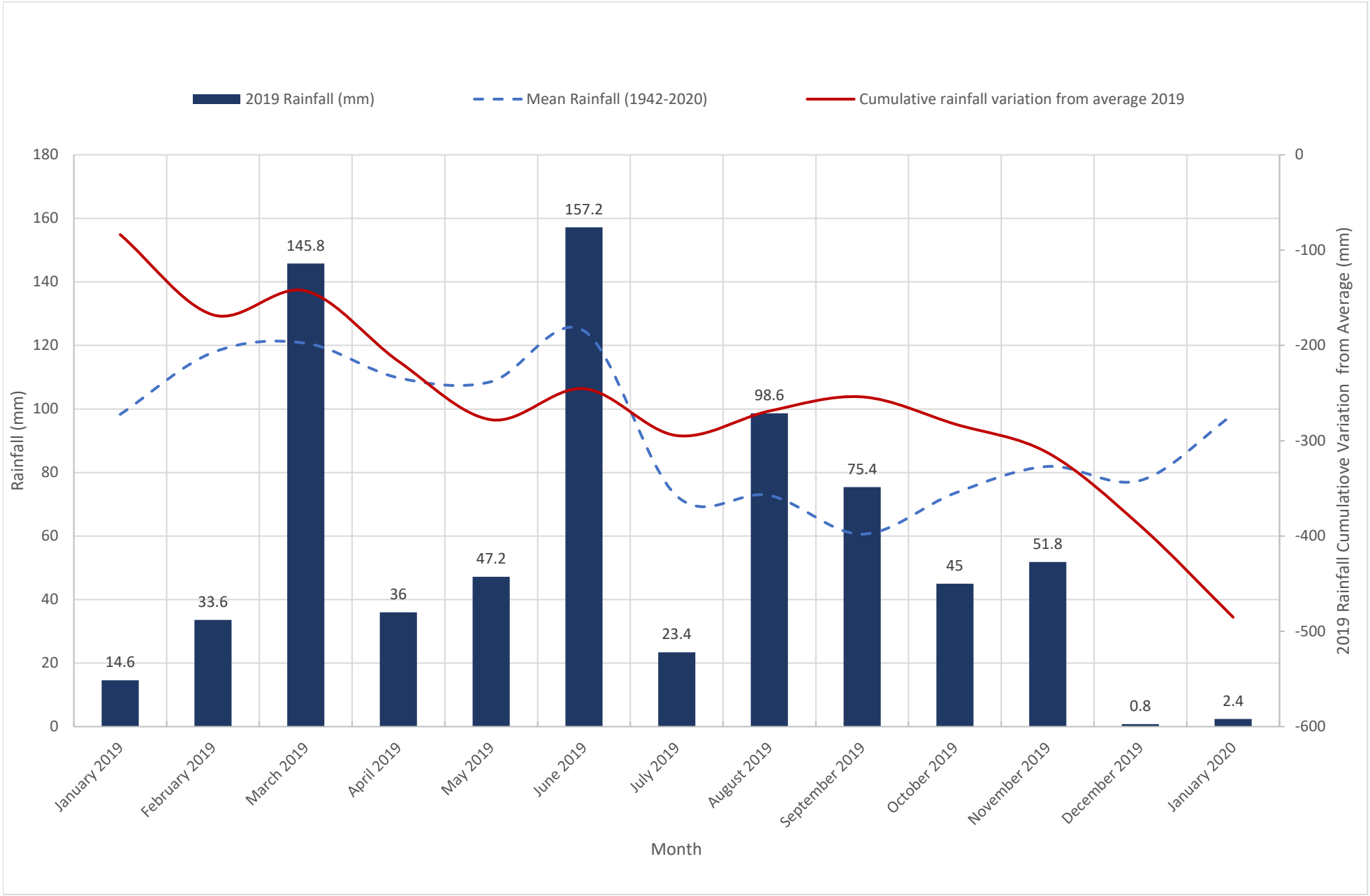
Plan drawn by
Nigel Bolton

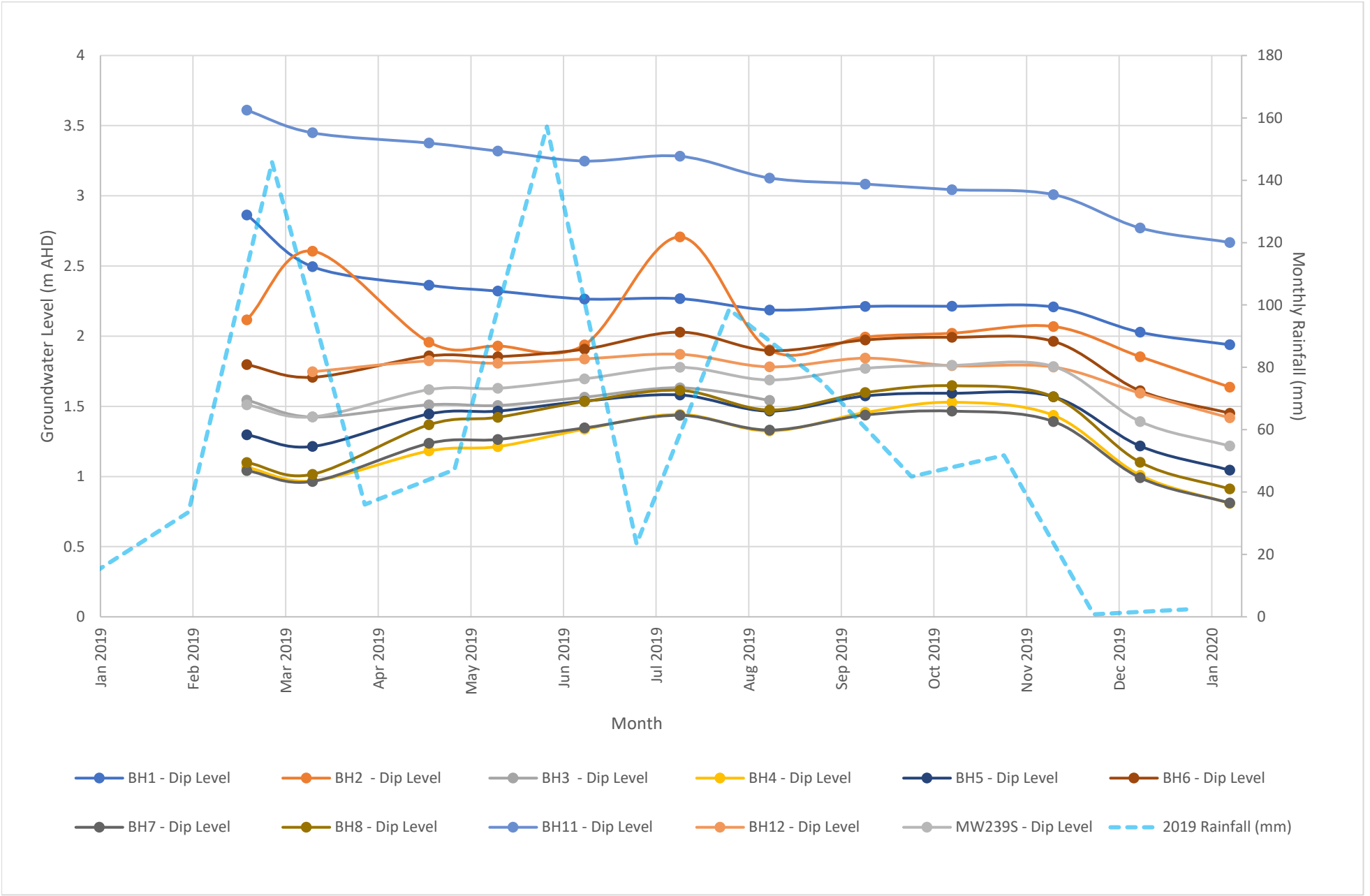
Phone
0412 444 156

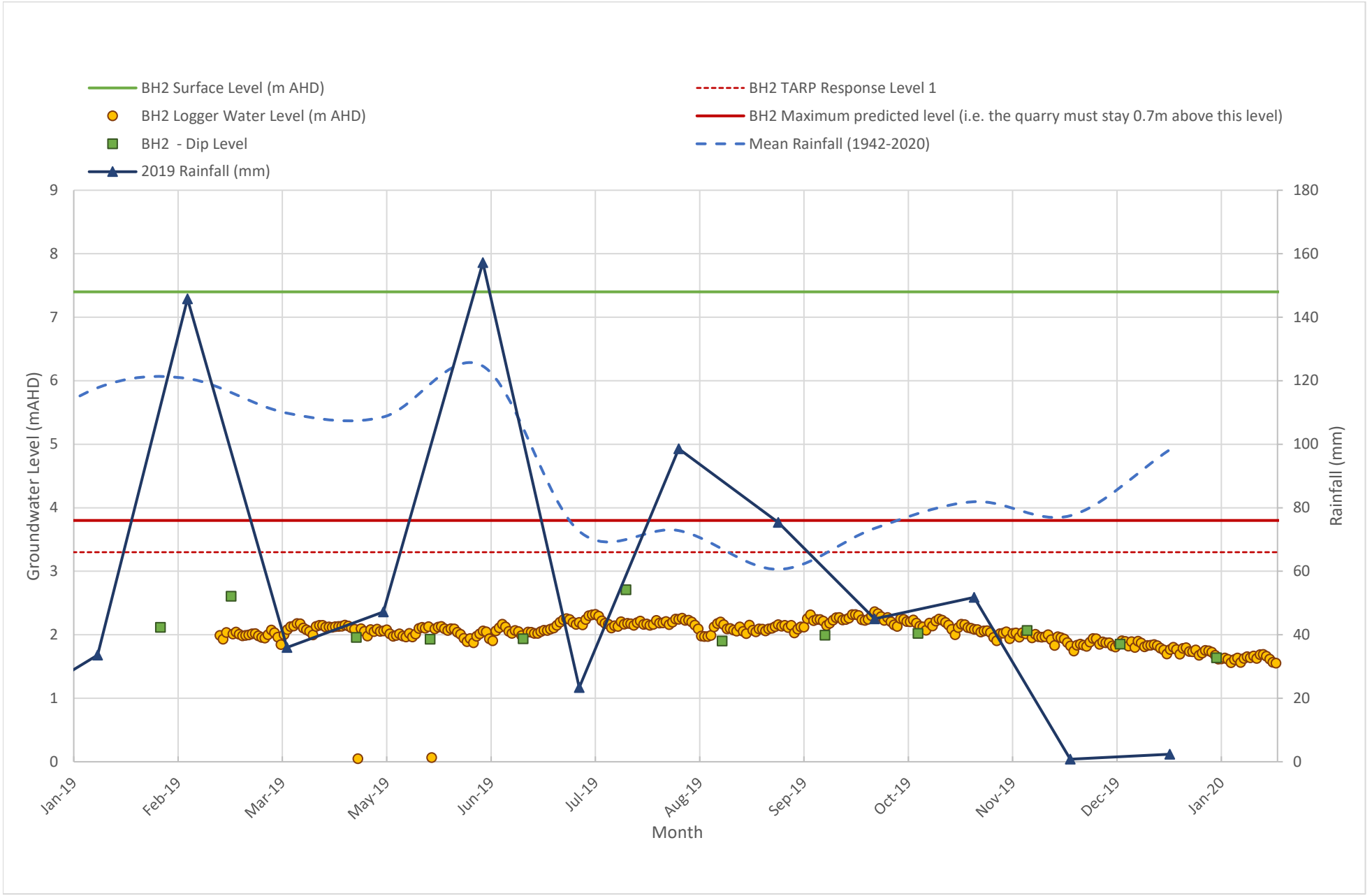
Transport Roads & Maritime Services
Prepare a Work Zone Traffic Management Plan
Card No. 0049082211
This qualification enables you to prepare Traffic Management Plans and conduct inspections on Traffic Management Plans.
NIGEL BOLTON
Expiry Date: 12/01/2021
Card No: 0049082211
This card is not a proof of identity.

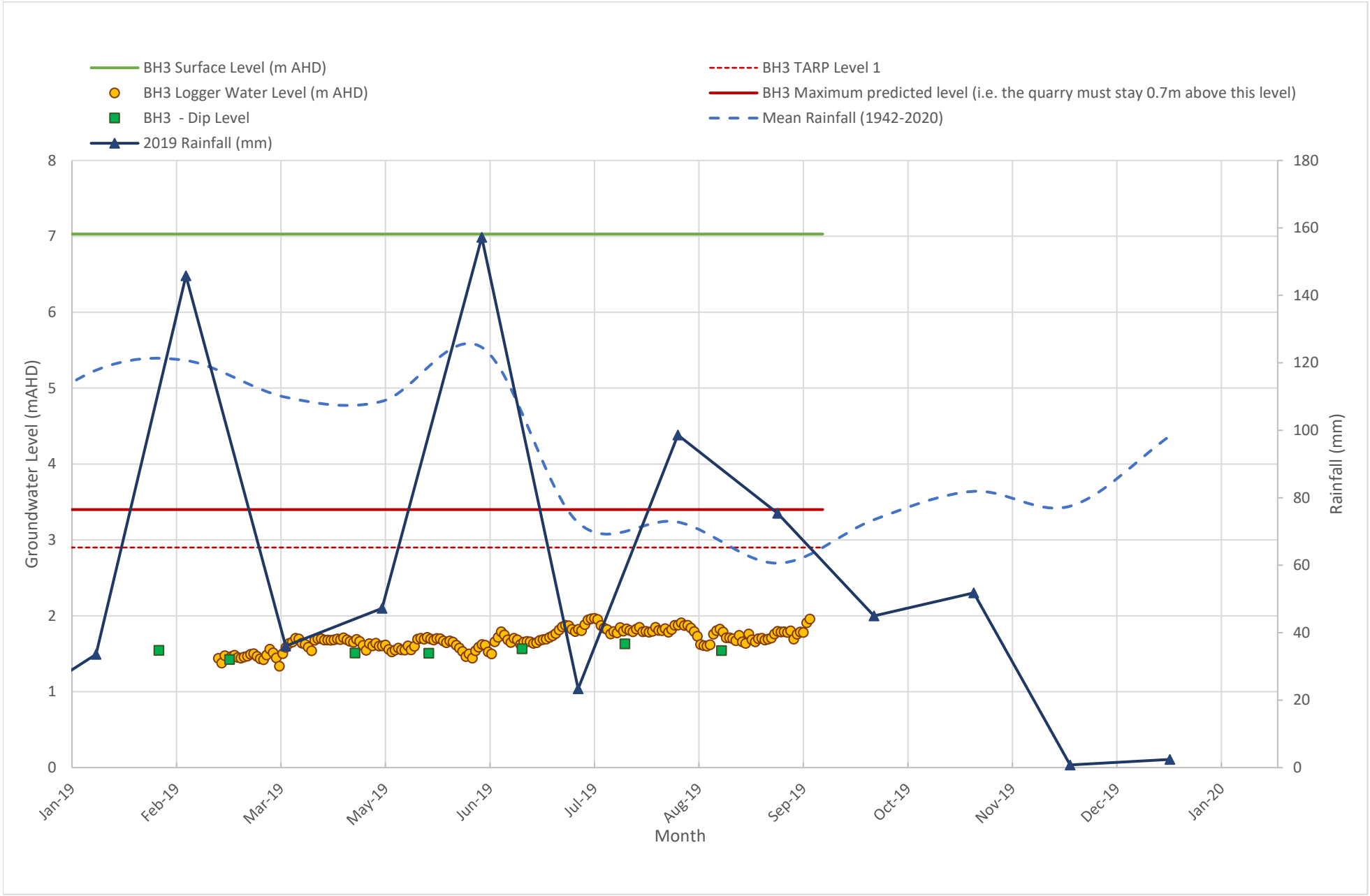
APPENDIX 5. WATER SUMMARY REPORT

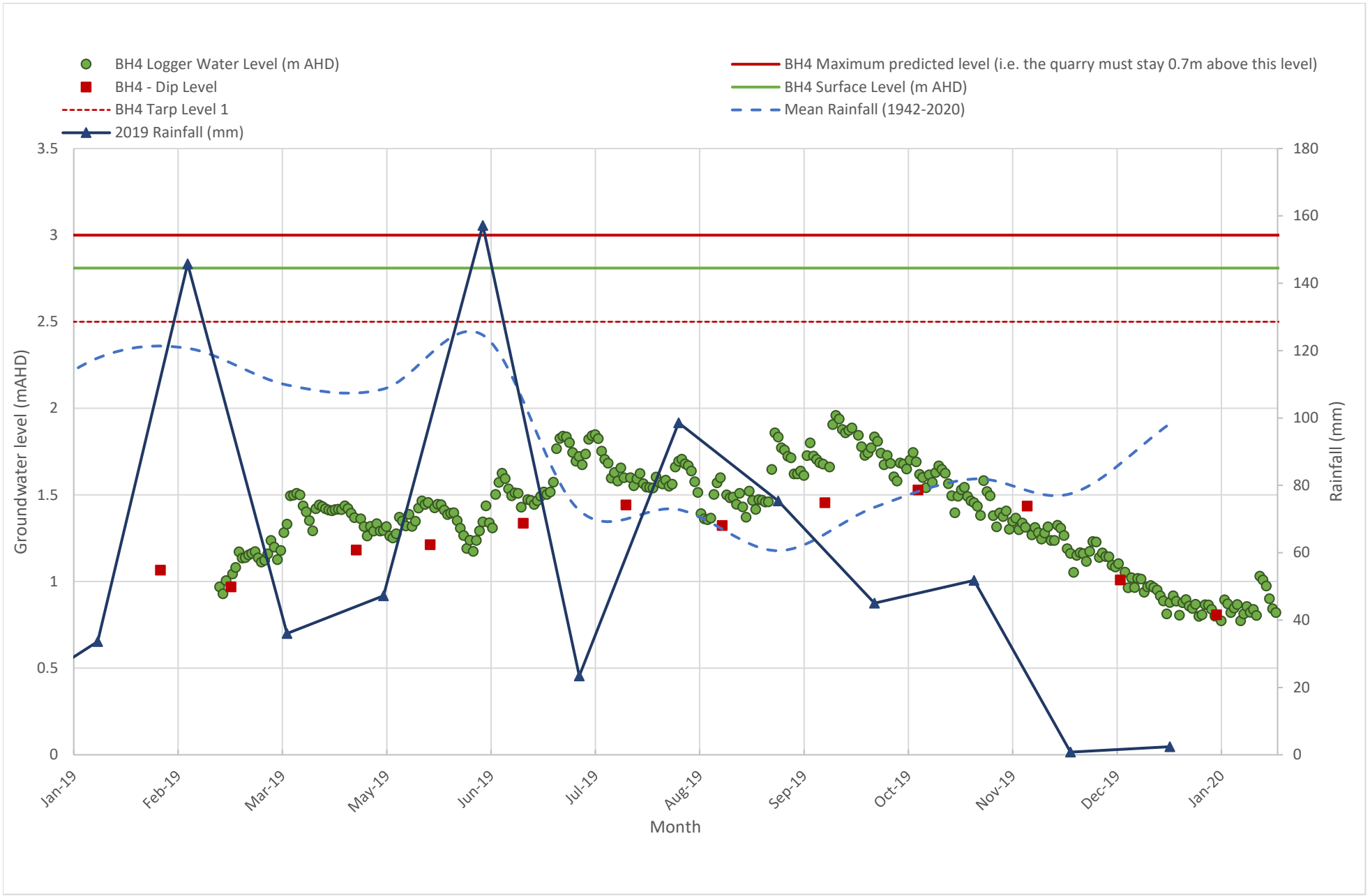
APPENDIX 6. GROUNDWATER LEVEL REVIEW

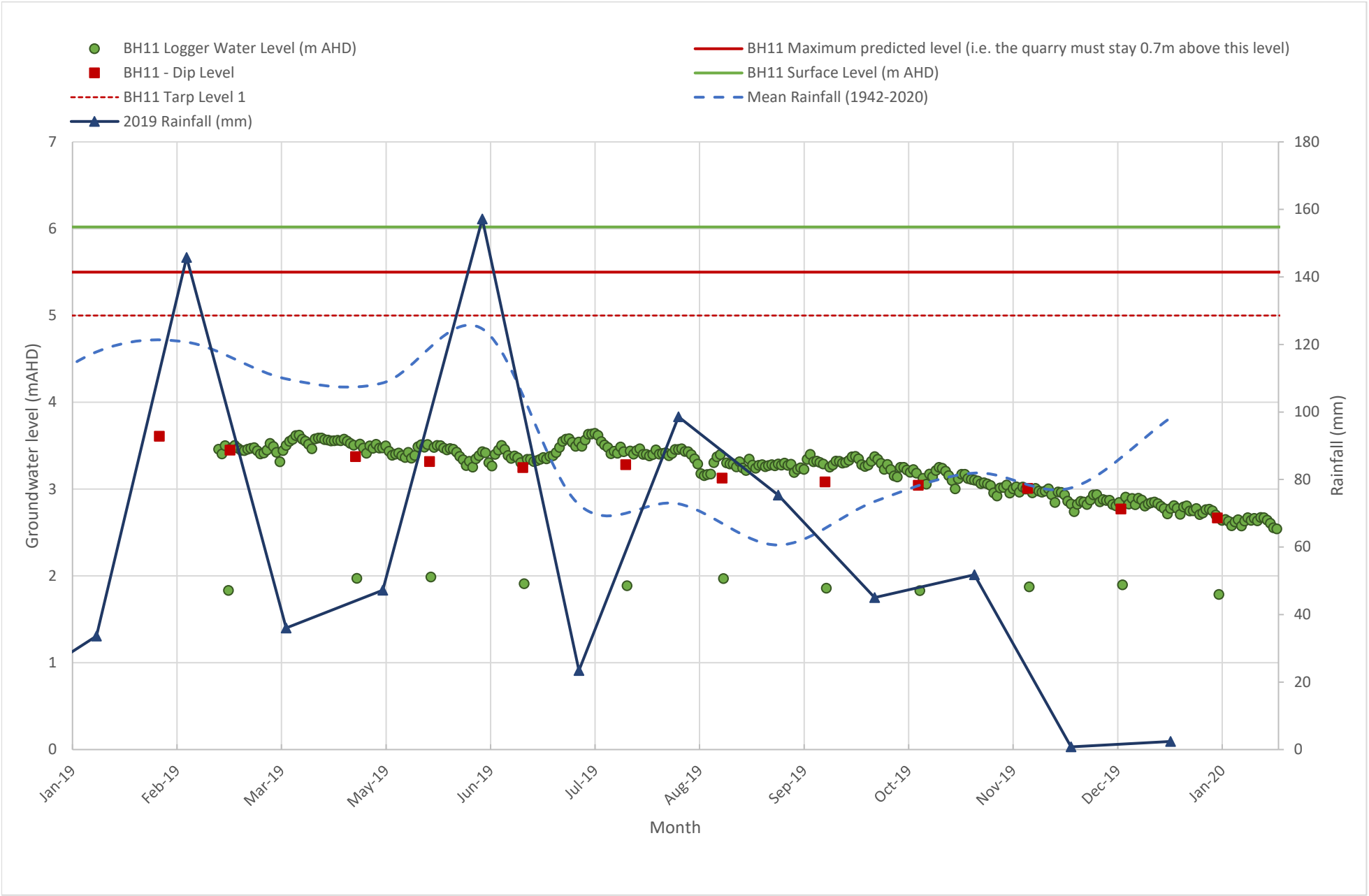

2019 Rainfall (mm)
Mean Rainfall (1942-2020)
Cumulative rainfall variation from average 2019
Rainfall (mm)
2019 Rainfall Cumulatiove Variation from Average (mm)
Month
180
160
140
120
100
80
60
40
20
0
0
-100
-200
-300
-400
-500
-600
14.6
33.6
145.8
36
47.2
157.2
23.4
98.6
75.4
45
51.8
0.8
2.4
January 2019
February 2019
March 2019
April 2019
May 2019
June 2019
July 2019
August 2019
September 2019
October 2019
November 2019
December 2019
January 2020

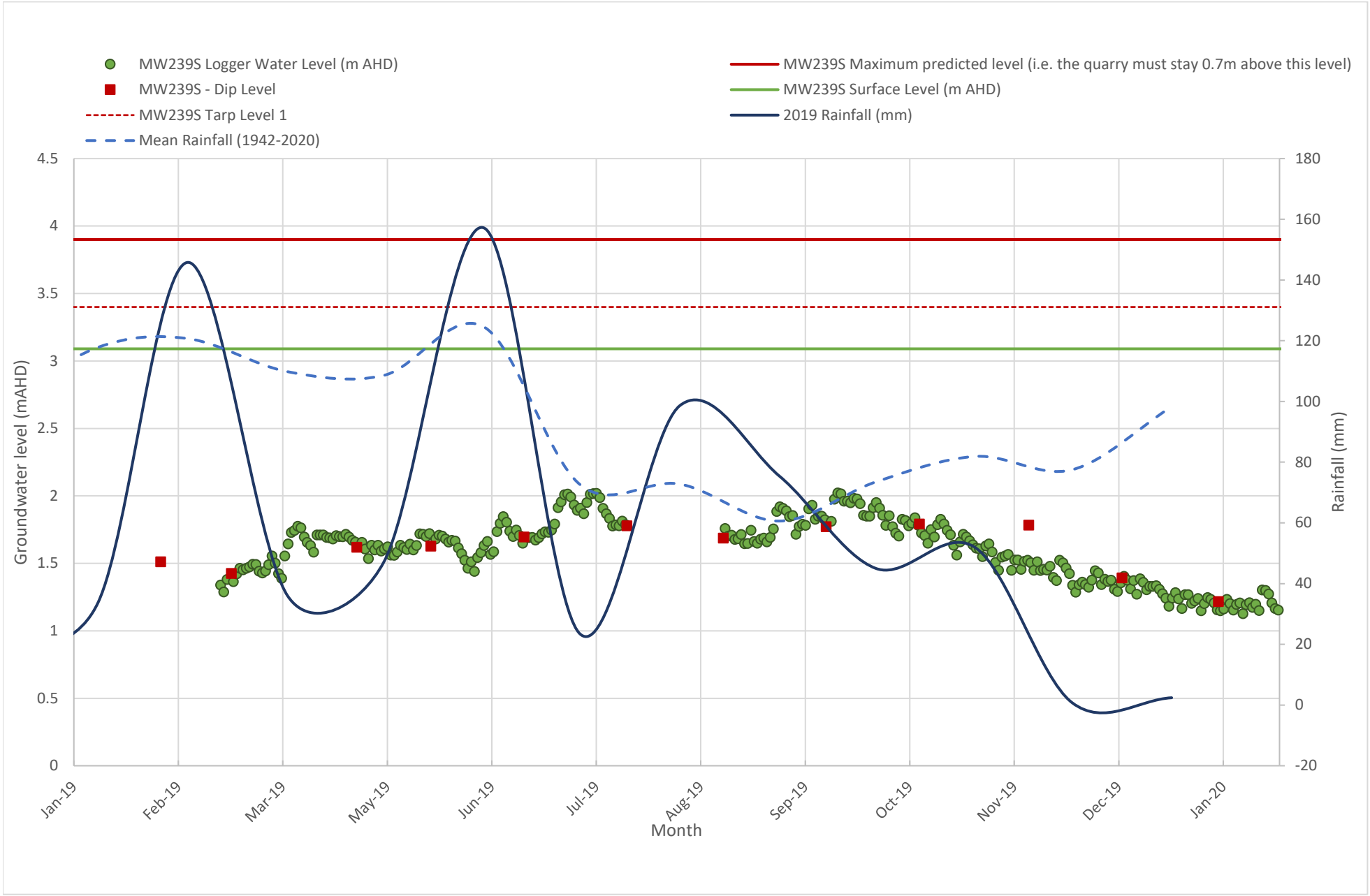

Groundwater Level (m AHD)
Monthly Rainfall (mm)
Month
4
3.5
3
2.5
2
1.5
1
0.5
0
180
160
140
120
100
80
60
40
20
0
Jan 2019
Feb 2019
Mar 2019
Apr 2019
May 2019
Jun 2019
Jul 2019
Aug 2019
Sep 2019
Oct 2019
Nov 2019
Dec 2019
Jan 2020
BH1 - Dip Level
BH2 - Dip Level
BH3 - Dip Level
BH4 - Dip Level
BH5 - Dip Level
BH6 - Dip Level
BH7 - Dip Level
BH8 - Dip Level
BH11 - Dip Level
BH12 - Dip Level
MW239S - Dip Level
2019 Rainfall (mm)


BH2 Surface Level (m AHD)
BH2 Logger Water Level (m AHD)
BH2 - Dip Level
2019 Rainfall (mm)
BH2 TARP Response Level 1
BH2 Maximum predicted level (i.e. the quarry must stay 0.7m above this level)
Mean Rainfall (1942-2020)
Groundwater Level (mAHD)
Rainfall (mm)
Month
0
1
2
3
4
5
6
7
8
9
0
20
40
60
80
100
120
140
160
180
Jan-19
Feb-19
Mar-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20


BH3 Surface Level (m AHD)
BH3 Logger Water Level (m AHD)
BH3 - Dip Level
2019 Rainfall (mm)
BH3 TARP Level 1
BH3 Maximum predicted level (i.e. the quarry must stay 0.7m above this level)
Mean Rainfall (1942-2020)
Groundwater Level (mAHD)
Rainfall (mm)
Month
0
1
2
3
4
5
6
7
8
0
20
40
60
80
100
120
140
160
180
Jan-19
Feb-19
Mar-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20


BH4 Logger Water Level (m AHD)
BH4 - Dip Level
BH4 Tarp Level 1
2019 Rainfall (mm)
BH4 Maximum predicted level (i.e. the quarry must stay 0.7m above this level)
BH4 Surface Level (m AHD)
Mean Rainfall (1942-2020)
Groundwater level (mAHD)
Rainfall (mm)
Month
3.5
3
2.5
2
1.5
1
0.5
0
180
160
140
120
100
80
60
40
20
0
Jan-19
Feb-19
Mar-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20


BH11 Logger Water Level (m AHD)
BH11 - Dip Level
BH11 Tarp Level 1
2019 Rainfall (mm)
BH11 Maximum predicted level (i.e. the quarry must stay 0.7m above this level)
BH11 Surface Level (m AHD)
Mean Rainfall (1942-2020)
Groundwater level (mAHD)
Rainfall (mm)
Month
0
1
2
3
4
5
6
7
0
20
40
60
80
100
120
140
160
180
Jan-19
Feb-19
Mar-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20


MW239S Logger Water Level (m AHD)
MW239S - Dip Level
MW239S Tarp Level 1
Mean Rainfall (1942-2020)
MW239S Maximum predicted level (i.e. the quarry must stay 0.7m above this level)
MW239S Surface Level (m AHD)
2019 Rainfall (mm)
Groundwater level (mAHD)
Rainfall (mm)
Month
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
180
160
140
120
100
80
60
40
20
0
-20
Jan-19
Feb-19
Mar-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Oct-19
Nov-19
Dec-19
Jan-20

APPENDIX 7. RAP INSPECTION RECORDS

RAP Site Inspection Sign Off

This letter provides for the acknowledgement by the Registered Aboriginal Parties (RAPs) that the ground surface as indicated by markup in the plan below has been inspected for the presence of previously unidentified cultural heritage objects.

Table 1: RAP inspection sign on/ off register

RAP	Name	Date Inspected	Time Onsite	Signature
Murrooma	Rebecca Young	23-8-19	Arrive: 8:00 am Leave: 10.30 am	R.Young
Worimi	Jamie Merrick	23/08/19	Arrive: 8:00 Leave: 10:30	
Nurungee	Len Anderson	23/08/19	Arrive: 8 Leave: 1030	
			Arrive: Leave:	

Construction Works Area – August / September 2019

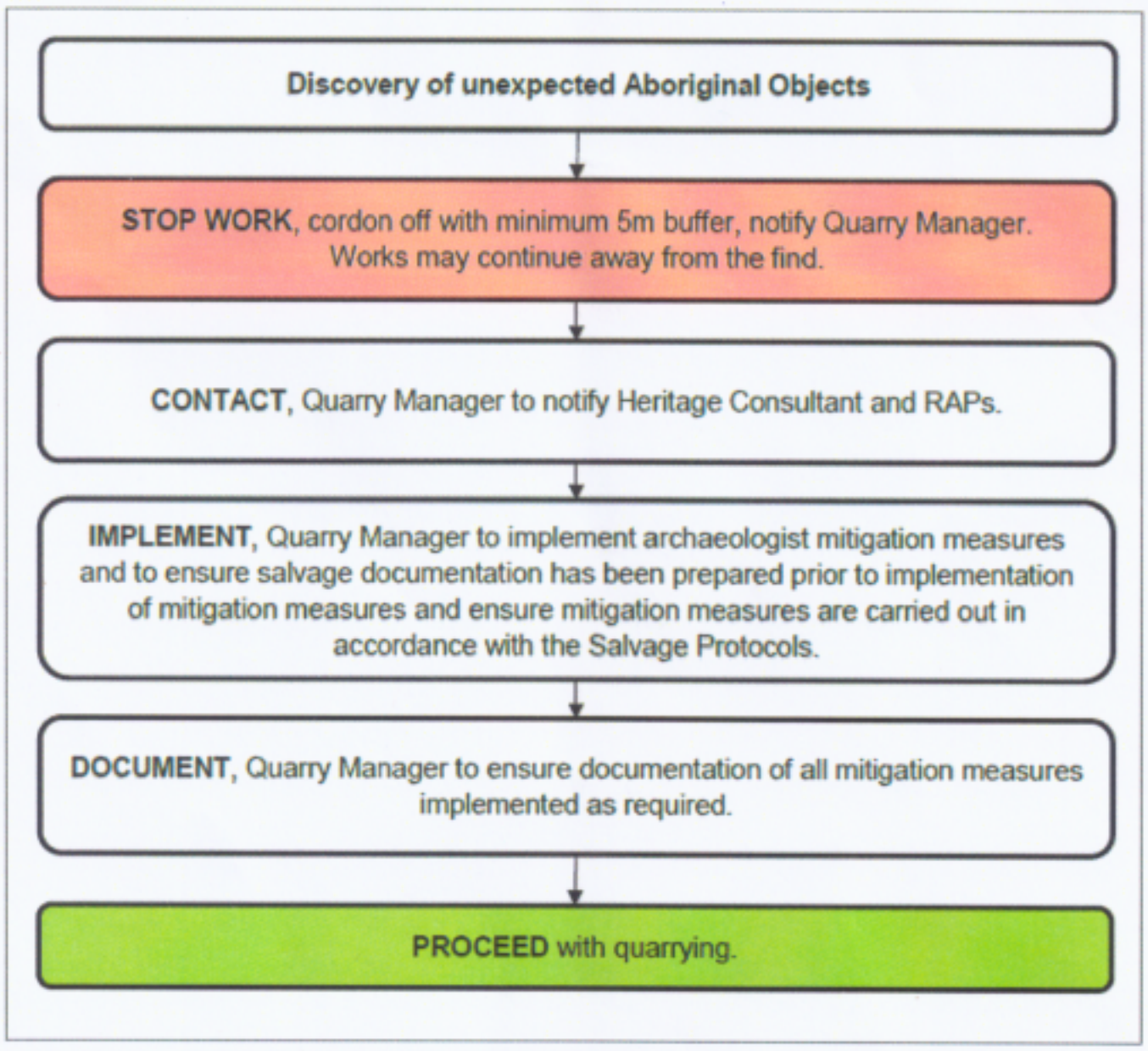
Using a texter or pen please mark on the above plan the areas that were inspected. If identified, please identify the approximate location of any object found, and include a description in the Table 3 below. Please notify the Quarry Manager, who will implement the procedure under the Heritage Management Plan (see next page). As a State Significant Project, artefacts will require recording on the Aboriginal Site Impact Recording Form (ASIRF) and registration in the AHIMS.

Table 2: RAP record of observations

Area Inspected	Objects Found	
	Yes (complete Table 3)	No (area cleared to progress)
All highlighted green area searched - Stage 1		✓ Dy

Table 3: RAP record of observations N/A @ this stage

Location Description	Site Coordinates *(if available)*		Description	Preferred Management *Please initial*
	Easting	Northing		
			As per CHMP → monitoring must be completed for top soil remaval	please contact RAP's

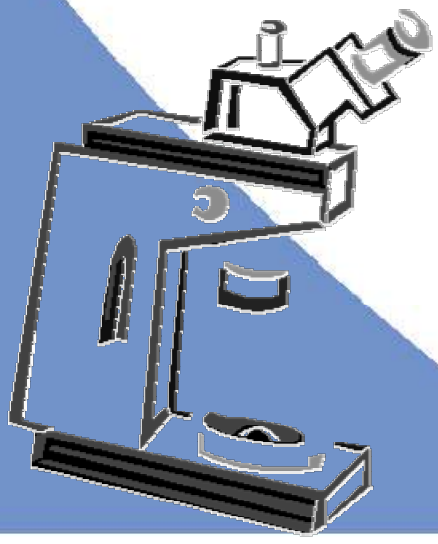


APPENDIX 8. BORTOLO RADIATION SURVEY

NEWCASTLE SAND

Surface Gamma Radiation Survey of Site 1 of the Sand Quarry Site, Cabbage Tree Road, Williamtown, NSW

25 August 2019



Bartolo Safety Management Service

Laboratory, Radiation and
Dangerous Goods Consultant

Surface Gamma Radiation Survey of Site 1 of the Sand Quarry Site, Cabbage Tree Road, Williamtown, NSW

August 2019

by
Bartolo Safety Management Service
PO Box 264
Jannali NSW 2226
Phone/fax: 02 9528 7676
Mobile: 0427 287 630
Email: bartolo-safety@hotkey.net.au

This report has been prepared in accordance within the scope of services described, in consultation between the Douglas Partners Pty Ltd and Bartolo Safety Management Service. The report may rely on information, data, surveys and results provided by the client and the client shall assume responsibility for the accuracy of the supplied information.

Author: **William C F Bartolo, *B.Sc., M.Sc., M.A.R.P.S***

Signed: ….. 

Date: …26th Augus, 2019.

Reviewer: ……..……..

Signed: ……

Date: ……

Contents

1.0 Introduction

Glossary

ARPANSA – Australian Radiation Protection Nuclear Science Agency

Becquerel – the SI unit for radioactive activity is defined as the number of disintegrations per second

EPA – Environmental Protection Agency

Gray – is the SI unit of absorbed dose**).** It is defined as an energy deposition of one joule per kilogram.

NORM – Naturally Occurring Radioactive Material

Sievert – is the SI unit of equivalent dose. Dose equivalent remains, by definition, the absorbed dose multiplied by the quality factor, Q.

TENORM – Technically Enhanced Naturally Occurring Radioactive Material

1.1 Site Description

The site (see Appendix 1), Cabbage Tree Road site Williamtown, has been partly sand mined and is generally an undulating site with some low lying areas that have creeks and ponds.

The area Under consideration is deemed as section 1 and is being developed as the sand quarry with processing and weigh bridge facilities. The majority of the vegetation (undergrowth) has been removed prior to the survey.

The site has a total area of approx. 2ha and the survey measurements were taken on 20th August 2019.

Additionally, there has been some import in the past of crushed ironstone, crushed feldspar and ironstone river pebble to form the access roads, etc.

1.2 Purpose

The purpose of this project is to determine if there is any remaining deposits of heavy mineral sands and their associated radioactivity, either left as not being mined or due to man's activities such as stock-piling and vehicle wash-downs.

1.3 Scope

The scope of the work being undertaken by Bartolo Safety Management Service is the Geotechnic Surface Gamma Radiation Survey (where the terrain and vegetation permits). Any situations elucidated during the survey will not be part of this work.

Radiological exposure of non-human species was not included within the scope of this assessment, nor was assessment of non-radiological contaminants.

1.4 Information and Reference Material

General

Natural radionuclide content in soil can vary significantly as evidenced by the following ranges of global median values: 16-110 Bq/kg for uranium-238, 11-64 Bq/kg for thorium-232 and 140-850 Bq/kg for potassium-40[3]. Mineral sands can have enhanced concentrations of the naturally occurring radionuclides uranium-238 and thorium-232, as well as their associated decay progeny, which can result in elevated terrestrial air kerma rates. In-situ processing of mineral sands typically separates sands of varying mineralogy by mass, magnetic and electrostatic properties; the main constituents include rutile, ilmenite, zircon, garnet and monazite. A dataset of uranium-238 and thorium-232 concentrations in heavy mineral sands is listed in Table 1.

TABLE 1: Typical specific activity concentrations of uranium and thorium in commercially available South East Queensland mineral sands (adapted from Johnston, 1988)[4].

MINERAL PRODUCT	Uranium-238 (Bq/kg)	Thorium-232 (Bq/kg)
Rutile	560 ± 50	70 ± 15
Ilmenite	50 ± 20	64 ± 20
Zircon	3900 ± 300	620 ± 30
Monazite	21000 ± 2000	147000 ± 1900

(Note: while the radiation dose units in the different State regulations are variously quoted in μSv (microsievert) or μGy (microgray) these units are identical for gamma radiation in this situation)

The results of the radiation survey are compared to the limits as set in the following:

A surface radiation survey, as described in EPA Guideline 12 (see below), was conducted to better define radiation levels over the site. There is no justification under ***Guideline 12*** and ***International Commission on Radiation Protection*** guidelines for further investigation methods such as sub-surface bore and soil measurements. The process of accurate boring and bore radiation measurements is relatively expensive, with only a very few companies/authorities in Australia doing such work.

The International Commission on Radiological Protection (ICRP) recommendations

The ICRP, an independent international body, recommends upper limits on acceptable radiation dose to occupationally exposed workers (20mSv/yr averaged over 5 years) and members of the public (1mSv/yr). These limits are accepted throughout the world and used as the basis of national laws and regulations. The most recent recommendations were published in 1991 (ICRP 1991) and have been reconfirmed in 2007 (ICRP 103).

This publication introduced a new concept that is relevant to this site; the concept of “intervention”. Intervention applies to situations, such as abandoned contaminated sites, where “the sources of exposure and the exposure pathways are already present and the only type of action available is intervention”.

These ICRP recommendations have been adopted by the National Health and Medical Research Council (NHMRC 1995) [now controlled by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)] for use in Australia. ARPANSA has also updated and/or released a number of documents such as RPS 9 *Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste management in Mining and Mineral Processing (2005)*, and RPS 15 *Safety Guide for the Management of Naturally Occurring Radioactive Material (NORM) (2008)*. The relevant Commonwealth and State laws and Codes of Practice in turn adopt the NHMRC/ARPANSA recommendations but not all ARPANSA codes have yet been gazetted/mandated or included in the legislation at this time.

New South Wales

NSW Radiation Control Branch Radiation Safety Information Series No 12**: *Clean-up and Disposal of Radioactive Residues from Commercial Operations Involving Mineral Sands.***

This document is based on the 1984 recommendations of the NHMRC and so does not necessarily reflect current international recommendations or limits/constraints. It is also only aimed at active sand mining sites, not "out of control" situations (out of control meaning that the plant and/or company are no longer operational). The limits set in this document do not correlate with current ICRP and National radiation limits. The Radiation Branch of the NSW EPA, however, has not yet produced a revised version, nor does it include reference to the latest relevant ARPANSA Codes.

Action levels are set:

- For high occupancy areas such as dwellings, schools (including playground), businesses factories etc. where occupancies by the same individuals occur regularly on a day by day basis, the remedial action level should be 0.7 μGy/hr (700 nGy/hr) at 1 m above the ground.
- For intermediate occupancy areas where occupancies are for a few hours per week by the same individuals or by differing individuals and for garden areas, the remedial action level should be 1.0 μGy/hr (1000 nGy/hr)at 1 m above the ground.
- For roads paths, and other areas with intermittent occupancy the remedial action level should be 2.5 μGy/hr (2500 nGy/hr) at 1 m above the ground.

Other States

Queensland

Queensland Health Policy Document: Radiation Dose Levels for Properties where Mineral Sand Residues are Deposited on the Ground

This document is of relevance because it was written in 1995 and incorporates the more recent ICRP concept of "intervention". For some of its recommendations, however, it still refers back to a 1984 NHMRC document.

For practices under control, where technically enhanced radiation sources (TENORM) of mineral sands are deposited on the ground the limits are:

- 0.1 μSv/hr above the natural background level for dwellings, schools, etc. and
- 0.2 μSv/hr above the natural background level for parks etc.

Assuming a background level of 0.1μSv/hr, the action levels for dwellings, schools, etc. would be 0.2 μSv/hr and for parks etc. would be 0.3 μSv/hr. Practices under control refer to situations where the mining company is still operating and has responsibility for the land in question.

For an "out of control" practice (i.e. an intervention situation), where the mining company is not still operating and has no responsibility for the land in question, the action levels including background are:

- for dwellings, schools etc., 0.6 μSv/hr (600 nGy/hr),
- for parks etc., 1.0 μSv/hr (1000 nGy/hr) and
- for roads and footpaths, 2.5 μSv/hr (2500 nGy/hr).

Western Australia

Radiation Health Branch of WA Mines Department Guidelines

The Radiation Health Branch of the West Australian Mines Department set (in 1988) Guidelines for remedial action in areas of enhanced background gamma radiation levels. The action level criteria are:

- for dwellings, 0.46 μGy/hr,
- for schools, 0.57 μGy/hr,

- for other areas, 0.7 μGy/hr, and
- for roads, paths etc, 2.5 μGy/hr.

2.0 Historic Aspects

This land has been sand mined in an unusual pattern, probably following a natural depressions where the heavy mineral sands would accumulate due to transport mechanisms such as water run-off and wind erosion.

The land does not appear to have been developed since the mining, other than a little sand quarrying.

3.0 Instruments and Measurement Technique

3.1 Instruments

- SAIC Exploranium Model No.: GR130 Serial No.: 9940+GM Gamma ray survey (calibration conducted in March 2018 [see attached sheets Appendix 4] and confirmed on the day by use of an educational Thorium Standard and stabilized using a Cs-137 source);
- As a confirmation of any "high" counts a Radiation Alert "Inspector" (Calibrated February 2019 - see Appendix 5), also used with the wipe test plate for the soil analysis ;
- a Magellan eXplorist 110 GPS unit.

The SAIC equipment measures in Counts per Second, and hence measurements need to be converted to dose rate for comparison with the NSW Guidelines and other documents. To do this the following formula, which is based and derived from the data supplied with the calibration certificates, is used:

$$y = 1.0127x - 1E\text{-}11$$

$$R^2 = 1$$

Where:

y – is dose rate in nGy/hr

x – is counts per second

3.2 Measurement Techniques

Surface Measurements

The proposal was to measure each of the lots as discreet areas with each area measured at approximately 10 metre grid transect using the GPS for tracking of the measurement transects and any other deviations and paths. This whole approach was dependent on the conditions (vegetation, radiation activity, topography, obstructions, and structures), Work health and Safety (WHS) Risk Assessment and as such the measurement transect pattern varied slightly taking the Risk Assessment into consideration as the procedure progressed. This modification "on-

the-run" would continually consider the necessity of accurate and reliable data, and the need for sufficient measurements to capture substantial contamination zones.

The transect patterns that were finalized "on-the-run" are displayed in the Appendix (Appendix 2).

The measurement process is to trek the transect line with the instrument above the ground at about the 1 metre level. Measurements were noted when the auditory level of the instrument changed. Any "high" measurements were defined by moving about the area to determine the limit of the contamination and the highest level. The measurements would then be confirmed by using the RadAlert instrument.

The SAIC Exploranium is set up to record the measurements every two seconds in unique data sets as determined by when the measurement activity is terminated. Two second measurement intervals would equate to approximately 3 metres of normal walking over an easy walking surface. Once the work or area under consideration is completed the Exploranium is then attached to a computer and the data downloaded as a CSV file for assessment and manipulation.

NOTE: the measurements as displayed in the relevant appendices **do not** indicate a length of transect but rather in this situation the time and thus difficulty of progress across the terrain.

The information contained in the header of the first column of the results is the following for example:
Using Transect P6-B3 the header is:

3 16:05:25 10:20:28 cps Live time (s) 2.00

- The first number is the data set number (hence this is data set 3 for this site)
- The second set 16:05:25 is the date – 25 May 2016
- The third set 10:20:28 is the time – is 10.20.28 AM
- The fourth set of information is cps indicating that the results are in Counts Per Second
- The last piece of information is Live Time (s) 2.00 which means that the measurement and data record is set at 2 second intervals.

Cosmic Radiation Component

The cosmic radiation component of natural background is latitude, longitude and altitude dependent; and has been calculated using United States Federal Aviation Administration Civil Aerospace Medical Institute software 'CARI-6'. The mean cosmic surface air kerma rate for June 2019 was 41 nGy/h (0.041 μSv/h) at 32 48 S, 151 48 E, elevation of 10 m, using a dose conversion factor of 1Sv/Gy.

This does not however take into account such things as heavy cloud, rain and dense vegetation canapy which acts as shielding.

The results in the relevant Appendices have not been adjusted by the reduction of the measurements by the 0.041 μSv/h factor and this has been incorporated in the data contained in column 3 of the data sets of the relevant appendices.

Work, Health and Safety Risk Assessment

As this work is being conducted in a "remote" location and that there are various risks associated with this type of work (such as slips, trips and falls, snake/spider/tick/insect bites, cuts and abrasions due to vegetation, allergy reactions to plants and other things, and falling limbs and branches) then a risk assessment is required and that this risk assessment is "living" whilst the work is being conducted. The risk assessment is detailed in Appendix 3.

As the risk for some of the hazards are medium and high then the approach BSMS will conduct during the transect measurements will be to change the transects as needed to avoid or minimise such risks.

4.0 Survey Results

4.1 General

All measurements were completed on the 20th August 2019, and the results for the transects that were, showed results that in general were not of concern in terms of radiation.

The areas that had the higher though still insignificant in terms of exposure were all associated with the crushed rock used for the making of the access tracks. The section of the boundary results that were highlighted by the orange colour [ ] was not a big area but the number of results in this region of the table is because Mr Bartolo was standing still taking notes.

As can be seen from the results the dose range was from 0.0 to 0.37 µSv/h, which is still well below the 0.7 µSv/h limit for residential use. Hence there would be no radiological concerns for this area.

5.0 Discussion

On examining the results of the surface gamma radiation survey there are no radioactive concentrations or activities that are of any concern for the proposed use of the land/sand. All locations are below the level of 0.7 µSv/hr set by the NSW Guideline for residential use.

The results, even when compared to the most restrictive of the guidelines/legislation (WA in this instance), indicate that none of the results would reach the level of 0.46 µGy/hr for dwellings (note 0.46 µGy/hr is equivalent to 0.46 µSv/hr in this situation; conversion factor of 1:1). As such there is no need for any remedial action or intervention.

References

ICRP 2007. Recommendations of the International Commission on Radiological Protection. ICRP Publication 103. Elsevier 2007.

NSW Dept of Health. Guidelines for the Clean-up and Disposal of Radioactive Residues from Commercial operations Involving Mineral Sands 1984. Available from NSW DECC (EPA).

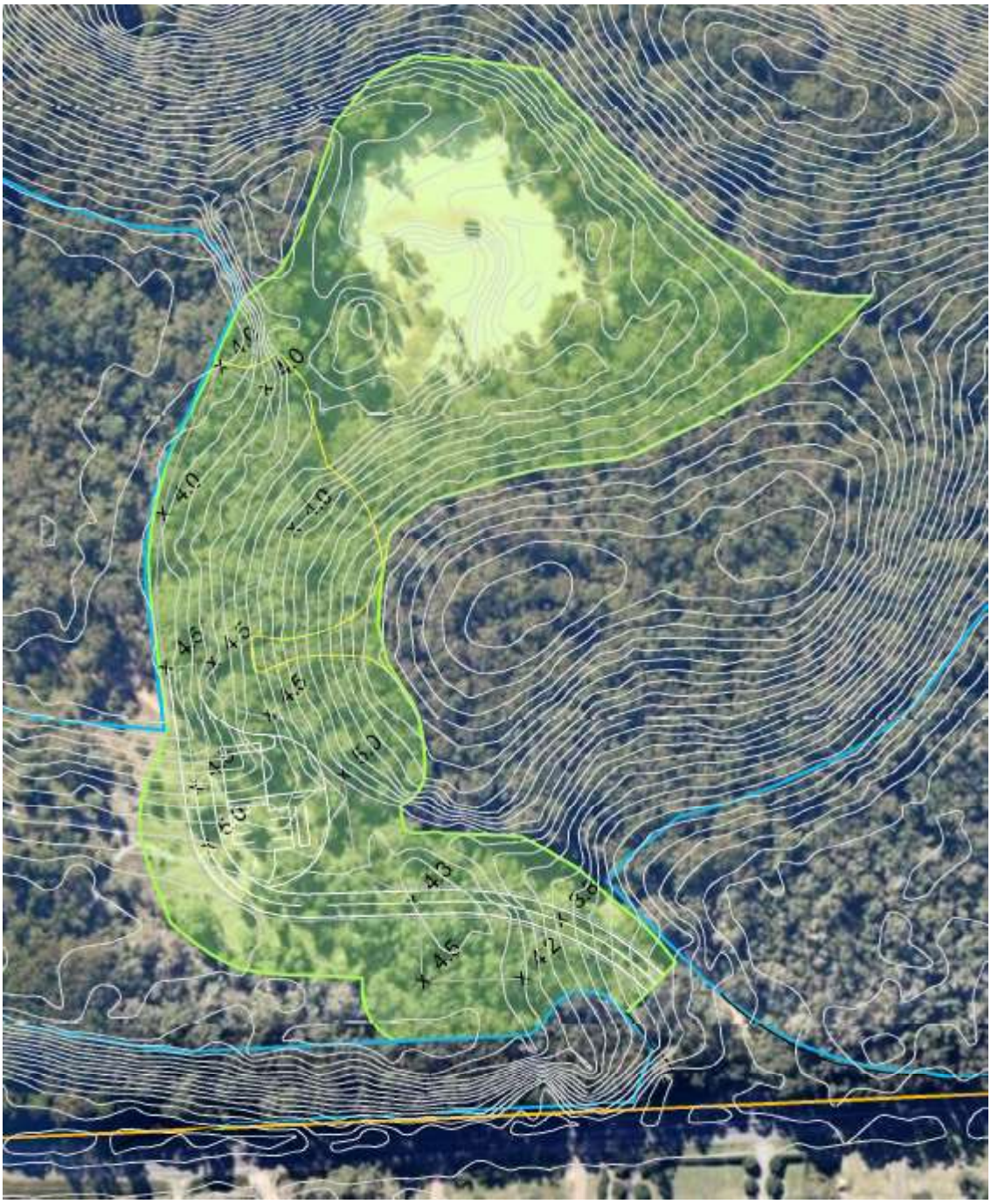
Qld Health Department. Radiation Dose Levels For Properties Where Mineral Sand Residues Are Deposited On The Ground. 1995

ARPANSA RPS 9 *Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste management in Mining and Mineral Processing (2005)*

ARPANSA RPS 15 *Safety Guide for the Management of Naturally Occurring Radioactive Material (NORM) (2008)*.

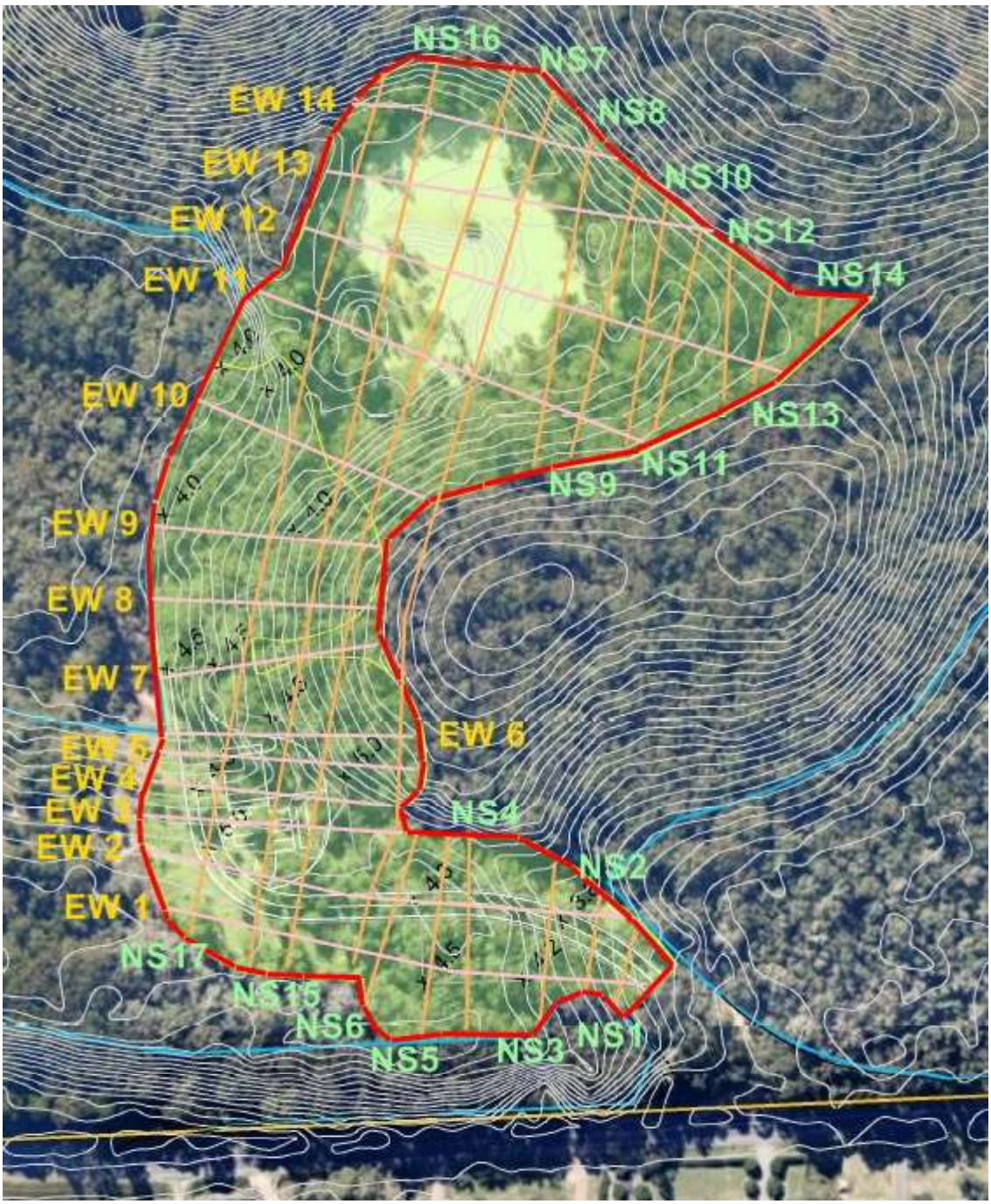
FAA's Civil Aerospace Medical Institute Radiobiology Research Team, *CARI-6*, 2004, United States of America Federal Aviation Administration. p. Computer Freeware.

APPENDIX 1 Cabbage Tree Road Sand Quarry Site – Section 1



APPENDIX 2 Transect Tracks & Surface Gamma radiation Results

Measurement Transects



Transect Measurement Results

(Boundary)

1 19:08:20
10:03:07 cps

Live time (s)	cps to micro Sv/h	solar correction
2.00		
163	0.17	0.12
145	0.15	0.11
142	0.14	0.10
142	0.14	0.10
147	0.15	0.11
138	0.14	0.10
145	0.15	0.11
109	0.11	0.07
101	0.10	0.06
94	0.10	0.05
91	0.09	0.05
67	0.07	0.03
52	0.05	0.01
55	0.06	0.01
44	0.04	0.00
50	0.05	0.01
54	0.05	0.01
50	0.05	0.01
54	0.05	0.01
49	0.05	0.01
52	0.05	0.01
45	0.05	0.00
41	0.04	0.00
39	0.04	0.00
42	0.04	0.00
34	0.03	0.00
41	0.04	0.00
44	0.04	0.00
38	0.04	0.00
52	0.05	0.01
47	0.05	0.01
41	0.04	0.00
41	0.04	0.00
47	0.05	0.01
43	0.04	0.00
43	0.04	0.00
35	0.04	0.00
42	0.04	0.00
25	0.03	0.00
38	0.04	0.00
35	0.04	0.00
32	0.03	0.00
34	0.03	0.00
38	0.04	0.00
39	0.04	0.00
28	0.03	0.00
34	0.03	0.00
39	0.04	0.00
29	0.03	0.00
33	0.03	0.00
30	0.03	0.00
27	0.03	0.00
36	0.04	0.00
39	0.04	0.00
32	0.03	0.00
31	0.03	0.00
35	0.04	0.00
35	0.04	0.00
30	0.03	0.00
30	0.03	0.00
35	0.04	0.00
26	0.03	0.00
27	0.03	0.00
36	0.04	0.00
35	0.04	0.00
34	0.03	0.00
28	0.03	0.00
29	0.03	0.00
33	0.03	0.00
32	0.03	0.00
49	0.05	0.01
47	0.05	0.01
37	0.04	0.00
47	0.05	0.01
37	0.04	0.00
35	0.04	0.00
39	0.04	0.00
42	0.04	0.00
41	0.04	0.00
43	0.04	0.00
43	0.04	0.00
36	0.04	0.00
41	0.04	0.00
38	0.04	0.00
39	0.04	0.00
42	0.04	0.00
38	0.04	0.00
48	0.05	0.01
39	0.04	0.00
45	0.05	0.00
33	0.03	0.00
36	0.04	0.00
38	0.04	0.00

44	0.04	0.00	121	0.12	0.08
32	0.03	0.00	127	0.13	0.09
42	0.04	0.00	135	0.14	0.10
43	0.04	0.00	120	0.12	0.08
37	0.04	0.00	142	0.14	0.10
41	0.04	0.00	117	0.12	0.08
33	0.03	0.00	135	0.14	0.10
32	0.03	0.00	132	0.13	0.09
37	0.04	0.00	135	0.14	0.10
34	0.03	0.00	130	0.13	0.09
42	0.04	0.00	134	0.14	0.09
40	0.04	0.00	84	0.09	0.04
42	0.04	0.00	46	0.05	0.01
38	0.04	0.00	38	0.04	0.00
39	0.04	0.00	41	0.04	0.00
35	0.04	0.00	42	0.04	0.00
29	0.03	0.00	42	0.04	0.00
40	0.04	0.00	43	0.04	0.00
39	0.04	0.00	45	0.05	0.00
46	0.05	0.01	41	0.04	0.00
58	0.06	0.02	47	0.05	0.01
84	0.09	0.04	36	0.04	0.00
118	0.12	0.08	42	0.04	0.00
127	0.13	0.09	40	0.04	0.00
126	0.13	0.09	29	0.03	0.00
122	0.12	0.08	34	0.03	0.00
134	0.14	0.09	27	0.03	0.00
132	0.13	0.09	38	0.04	0.00
133	0.13	0.09	28	0.03	0.00
135	0.14	0.10	31	0.03	0.00
136	0.14	0.10	32	0.03	0.00
124	0.13	0.08	31	0.03	0.00
135	0.14	0.10	31	0.03	0.00
128	0.13	0.09	37	0.04	0.00
132	0.13	0.09	32	0.03	0.00
126	0.13	0.09	41	0.04	0.00
134	0.14	0.09	38	0.04	0.00
106	0.11	0.07	48	0.05	0.01
112	0.11	0.07	35	0.04	0.00
148	0.15	0.11	37	0.04	0.00
100	0.10	0.06	30	0.03	0.00
121	0.12	0.08	36	0.04	0.00
132	0.13	0.09	38	0.04	0.00
121	0.12	0.08	38	0.04	0.00
155	0.16	0.12	35	0.04	0.00
122	0.12	0.08	37	0.04	0.00
135	0.14	0.10	33	0.03	0.00
127	0.13	0.09	39	0.04	0.00
133	0.13	0.09	46	0.05	0.01
133	0.13	0.09	38	0.04	0.00
129	0.13	0.09	37	0.04	0.00
137	0.14	0.10	36	0.04	0.00
130	0.13	0.09	41	0.04	0.00
123	0.12	0.08	33	0.03	0.00
111	0.11	0.07	35	0.04	0.00
124	0.13	0.08	34	0.03	0.00

25	0.03	0.00	23	0.02	0.00
27	0.03	0.00	28	0.03	0.00
29	0.03	0.00	17	0.02	0.00
29	0.03	0.00	27	0.03	0.00
24	0.02	0.00	22	0.02	0.00
27	0.03	0.00	23	0.02	0.00
32	0.03	0.00	28	0.03	0.00
34	0.03	0.00	32	0.03	0.00
31	0.03	0.00	25	0.03	0.00
25	0.03	0.00	28	0.03	0.00
35	0.04	0.00	23	0.02	0.00
30	0.03	0.00	26	0.03	0.00
23	0.02	0.00	25	0.03	0.00
18	0.02	0.00	23	0.02	0.00
29	0.03	0.00	30	0.03	0.00
28	0.03	0.00	27	0.03	0.00
28	0.03	0.00	27	0.03	0.00
28	0.03	0.00	32	0.03	0.00
25	0.03	0.00	24	0.02	0.00
24	0.02	0.00	27	0.03	0.00
27	0.03	0.00	23	0.02	0.00
26	0.03	0.00	22	0.02	0.00
29	0.03	0.00	25	0.03	0.00
27	0.03	0.00	30	0.03	0.00
26	0.03	0.00	31	0.03	0.00
30	0.03	0.00	29	0.03	0.00
32	0.03	0.00	24	0.02	0.00
31	0.03	0.00	25	0.03	0.00
30	0.03	0.00	30	0.03	0.00
29	0.03	0.00	24	0.02	0.00
32	0.03	0.00	21	0.02	0.00
36	0.04	0.00	27	0.03	0.00
26	0.03	0.00	25	0.03	0.00
39	0.04	0.00	31	0.03	0.00
27	0.03	0.00	31	0.03	0.00
32	0.03	0.00	21	0.02	0.00
34	0.03	0.00	38	0.04	0.00
31	0.03	0.00	28	0.03	0.00
30	0.03	0.00	30	0.03	0.00
33	0.03	0.00	30	0.03	0.00
28	0.03	0.00	32	0.03	0.00
39	0.04	0.00	26	0.03	0.00
38	0.04	0.00	32	0.03	0.00
40	0.04	0.00	25	0.03	0.00
36	0.04	0.00	34	0.03	0.00
29	0.03	0.00	21	0.02	0.00
35	0.04	0.00	24	0.02	0.00
23	0.02	0.00	26	0.03	0.00
31	0.03	0.00	33	0.03	0.00
32	0.03	0.00	30	0.03	0.00
21	0.02	0.00	25	0.03	0.00
18	0.02	0.00	26	0.03	0.00
26	0.03	0.00	30	0.03	0.00
26	0.03	0.00	30	0.03	0.00
24	0.02	0.00	35	0.04	0.00
25	0.03	0.00	26	0.03	0.00

32	0.03	0.00	27	0.03	0.00
34	0.03	0.00	29	0.03	0.00
26	0.03	0.00	25	0.03	0.00
33	0.03	0.00	28	0.03	0.00
31	0.03	0.00	33	0.03	0.00
38	0.04	0.00	25	0.03	0.00
28	0.03	0.00	26	0.03	0.00
28	0.03	0.00	24	0.02	0.00
37	0.04	0.00	30	0.03	0.00
35	0.04	0.00	32	0.03	0.00
33	0.03	0.00	35	0.04	0.00
48	0.05	0.01	29	0.03	0.00
45	0.05	0.00	32	0.03	0.00
51	0.05	0.01	29	0.03	0.00
48	0.05	0.01	30	0.03	0.00
57	0.06	0.02	33	0.03	0.00
57	0.06	0.02	32	0.03	0.00
60	0.06	0.02	32	0.03	0.00
66	0.07	0.03	36	0.04	0.00
78	0.08	0.04	33	0.03	0.00
91	0.09	0.05	34	0.03	0.00
103	0.10	0.06	36	0.04	0.00
88	0.09	0.05	37	0.04	0.00
96	0.10	0.06	33	0.03	0.00
78	0.08	0.04	41	0.04	0.00
65	0.07	0.02	34	0.03	0.00
49	0.05	0.01	33	0.03	0.00
43	0.04	0.00	33	0.03	0.00
36	0.04	0.00	33	0.03	0.00
29	0.03	0.00	35	0.04	0.00
35	0.04	0.00	31	0.03	0.00
37	0.04	0.00	32	0.03	0.00
25	0.03	0.00	34	0.03	0.00
32	0.03	0.00	29	0.03	0.00
31	0.03	0.00	32	0.03	0.00
37	0.04	0.00	26	0.03	0.00
41	0.04	0.00	23	0.02	0.00
31	0.03	0.00	19	0.02	0.00
33	0.03	0.00	31	0.03	0.00
42	0.04	0.00	30	0.03	0.00
30	0.03	0.00	27	0.03	0.00
33	0.03	0.00	26	0.03	0.00
25	0.03	0.00	29	0.03	0.00
27	0.03	0.00	33	0.03	0.00
38	0.04	0.00	27	0.03	0.00
38	0.04	0.00	25	0.03	0.00
36	0.04	0.00	33	0.03	0.00
28	0.03	0.00	35	0.04	0.00
27	0.03	0.00	28	0.03	0.00
25	0.03	0.00	32	0.03	0.00
28	0.03	0.00	30	0.03	0.00
26	0.03	0.00	22	0.02	0.00
28	0.03	0.00	27	0.03	0.00
20	0.02	0.00	27	0.03	0.00
23	0.02	0.00	31	0.03	0.00
26	0.03	0.00	34	0.03	0.00

29	0.03	0.00	30	0.03	0.00
27	0.03	0.00	40	0.04	0.00
22	0.02	0.00	36	0.04	0.00
25	0.03	0.00	34	0.03	0.00
28	0.03	0.00	37	0.04	0.00
29	0.03	0.00	28	0.03	0.00
24	0.02	0.00	52	0.05	0.01
24	0.02	0.00	36	0.04	0.00
22	0.02	0.00	44	0.04	0.00
23	0.02	0.00	38	0.04	0.00
20	0.02	0.00	30	0.03	0.00
21	0.02	0.00	31	0.03	0.00
26	0.03	0.00	32	0.03	0.00
24	0.02	0.00	33	0.03	0.00
34	0.03	0.00	22	0.02	0.00
21	0.02	0.00	31	0.03	0.00
23	0.02	0.00	32	0.03	0.00
27	0.03	0.00	47	0.05	0.00
26	0.03	0.00	31	0.03	0.00
24	0.02	0.00	45	0.05	0.00
28	0.03	0.00	62	0.06	0.02
23	0.02	0.00	55	0.06	0.01
23	0.02	0.00	71	0.07	0.03
22	0.02	0.00	64	0.06	0.02
18	0.02	0.00	75	0.08	0.03
21	0.02	0.00	75	0.08	0.03
30	0.03	0.00	89	0.09	0.05
24	0.02	0.00	87	0.09	0.05
26	0.03	0.00	60	0.06	0.02
21	0.02	0.00	43	0.04	0.00
24	0.02	0.00	46	0.05	0.01
20	0.02	0.00	27	0.03	0.00
23	0.02	0.00	40	0.04	0.00
20	0.02	0.00	43	0.04	0.00
24	0.02	0.00	40	0.04	0.00
30	0.03	0.00	29	0.03	0.00
24	0.02	0.00	36	0.04	0.00
22	0.02	0.00	38	0.04	0.00
22	0.02	0.00	39	0.04	0.00
21	0.02	0.00	44	0.04	0.00
25	0.03	0.00	38	0.04	0.00
26	0.03	0.00	47	0.05	0.01
20	0.02	0.00	49	0.05	0.01
21	0.02	0.00	56	0.06	0.02
21	0.02	0.00	59	0.06	0.02
24	0.02	0.00	59	0.06	0.02
25	0.03	0.00	91	0.09	0.05
25	0.03	0.00	116	0.12	0.08
34	0.03	0.00	195	0.20	0.16
28	0.03	0.00	299	0.30	0.26
20	0.02	0.00	361	0.37	0.32
31	0.03	0.00	334	0.34	0.30
27	0.03	0.00	224	0.23	0.19
35	0.04	0.00	214	0.22	0.18
32	0.03	0.00	225	0.23	0.19
28	0.03	0.00	222	0.22	0.18

235	0.24	0.20	235	0.24	0.20
238	0.24	0.20	241	0.24	0.20
199	0.20	0.16	213	0.22	0.17
176	0.18	0.14	258	0.26	0.22
190	0.19	0.15	247	0.25	0.21
200	0.20	0.16	258	0.26	0.22
231	0.23	0.19	260	0.26	0.22
226	0.23	0.19	249	0.25	0.21
207	0.21	0.17	256	0.26	0.22
196	0.20	0.16	251	0.25	0.21
207	0.21	0.17	226	0.23	0.19
220	0.22	0.18	229	0.23	0.19
222	0.22	0.18	241	0.24	0.20
202	0.20	0.16	224	0.23	0.19
209	0.21	0.17	256	0.26	0.22
229	0.23	0.19	250	0.25	0.21
238	0.24	0.20	244	0.25	0.21
223	0.23	0.18	242	0.25	0.20
239	0.24	0.20	251	0.25	0.21
260	0.26	0.22	249	0.25	0.21
266	0.27	0.23	254	0.26	0.22
244	0.25	0.21	241	0.24	0.20
242	0.25	0.20	246	0.25	0.21
217	0.22	0.18	240	0.24	0.20
228	0.23	0.19	237	0.24	0.20
233	0.24	0.19	226	0.23	0.19
239	0.24	0.20	235	0.24	0.20
236	0.24	0.20	240	0.24	0.20
231	0.23	0.19	238	0.24	0.20
254	0.26	0.22	264	0.27	0.23
226	0.23	0.19	223	0.23	0.18
230	0.23	0.19	235	0.24	0.20
242	0.25	0.20	270	0.27	0.23
252	0.26	0.21	233	0.24	0.19
264	0.27	0.23	248	0.25	0.21
262	0.27	0.22	232	0.23	0.19
257	0.26	0.22	240	0.24	0.20
238	0.24	0.20	229	0.23	0.19
251	0.25	0.21	236	0.24	0.20
242	0.25	0.20	256	0.26	0.22
239	0.24	0.20	233	0.24	0.19
243	0.25	0.21	248	0.25	0.21
239	0.24	0.20	230	0.23	0.19
242	0.25	0.20	261	0.26	0.22
244	0.25	0.21	255	0.26	0.22
230	0.23	0.19	241	0.24	0.20
252	0.26	0.21	224	0.23	0.19
255	0.26	0.22	254	0.26	0.22
222	0.22	0.18	250	0.25	0.21
254	0.26	0.22	235	0.24	0.20
244	0.25	0.21	242	0.25	0.20
274	0.28	0.24	226	0.23	0.19
252	0.26	0.21	242	0.25	0.20
245	0.25	0.21	231	0.23	0.19
234	0.24	0.20	254	0.26	0.22
224	0.23	0.19	231	0.23	0.19

248	0.25	0.21
245	0.25	0.21
237	0.24	0.20
255	0.26	0.22
241	0.24	0.20
250	0.25	0.21
229	0.23	0.19
241	0.24	0.20
268	0.27	0.23
255	0.26	0.22
259	0.26	0.22
252	0.26	0.21
232	0.23	0.19
240	0.24	0.20
259	0.26	0.22
230	0.23	0.19
228	0.23	0.19
232	0.23	0.19
231	0.23	0.19
244	0.25	0.21
238	0.24	0.20
245	0.25	0.21
239	0.24	0.20
242	0.25	0.20
239	0.24	0.20
264	0.27	0.23
255	0.26	0.22
250	0.25	0.21
235	0.24	0.20
266	0.27	0.23
241	0.24	0.20
246	0.25	0.21
229	0.23	0.19
225	0.23	0.19
235	0.24	0.20
246	0.25	0.21
238	0.24	0.20
245	0.25	0.21
244	0.25	0.21
230	0.23	0.19
243	0.25	0.21
247	0.25	0.21
263	0.27	0.23
217	0.22	0.18
203	0.21	0.16
175	0.18	0.14
165	0.17	0.13
142	0.14	0.10
158	0.16	0.12
141	0.14	0.10
140	0.14	0.10
132	0.13	0.09
152	0.15	0.11
116	0.12	0.08

NS Transects

1 19:08:20 10:46:06 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS1		
36	0.04	0.00
36	0.04	0.00
40	0.04	0.00
45	0.05	0.00
52	0.05	0.01
96	0.10	0.06
121	0.12	0.08
149	0.15	0.11
127	0.13	0.09
100	0.10	0.06

2 19:08:20 10:47:16 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS2		
96	0.10	0.06
101	0.10	0.06
96	0.10	0.06
105	0.11	0.07
96	0.10	0.06
90	0.09	0.05
127	0.13	0.09
129	0.13	0.09
118	0.12	0.08
94	0.10	0.05
65	0.07	0.02
38	0.04	0.00
37	0.04	0.00
30	0.03	0.00
38	0.04	0.00
32	0.03	0.00
32	0.03	0.00

3 19:08:20 10:48:58 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS3		
32	0.03	0.00
36	0.04	0.00
34	0.03	0.00
40	0.04	0.00
34	0.03	0.00
38	0.04	0.00
41	0.04	0.00
37	0.04	0.00
41	0.04	0.00
40	0.04	0.00
48	0.05	0.01
79	0.08	0.04
122	0.12	0.08
126	0.13	0.09
130	0.13	0.09
102	0.10	0.06
87	0.09	0.05
71	0.07	0.03
65	0.07	0.02
59	0.06	0.02

4 19:08:20 10:50:42 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS4		
45	0.05	0.00
41	0.04	0.00
61	0.06	0.02
74	0.07	0.03
107	0.11	0.07
132	0.13	0.09
145	0.15	0.11
145	0.15	0.11
87	0.09	0.05
47	0.05	0.01
47	0.05	0.01
43	0.04	0.00
32	0.03	0.00
38	0.04	0.00
30	0.03	0.00
37	0.04	0.00
33	0.03	0.00
32	0.03	0.00
32	0.03	0.00
27	0.03	0.00
37	0.04	0.00
33	0.03	0.00
37	0.04	0.00
32	0.03	0.00
42	0.04	0.00
40	0.04	0.00
38	0.04	0.00
47	0.05	0.01
41	0.04	0.00
43	0.04	0.00

5 19:08:20 10:52:26 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS5		
37	0.04	0.00
36	0.04	0.00
36	0.04	0.00
40	0.04	0.00
30	0.03	0.00
33	0.03	0.00
33	0.03	0.00
39	0.04	0.00
37	0.04	0.00
39	0.04	0.00
31	0.03	0.00
30	0.03	0.00
32	0.03	0.00
34	0.03	0.00
35	0.04	0.00
37	0.04	0.00
29	0.03	0.00
32	0.03	0.00
32	0.03	0.00
46	0.05	0.01
34	0.03	0.00
37	0.04	0.00
46	0.05	0.01
38	0.04	0.00
37	0.04	0.00
44	0.04	0.00
42	0.04	0.00
45	0.05	0.00
46	0.05	0.01
43	0.04	0.00
58	0.06	0.02
64	0.06	0.02
81	0.08	0.04
123	0.12	0.08
141	0.14	0.10
118	0.12	0.08
69	0.07	0.03
52	0.05	0.01
47	0.05	0.01

6 19:08:20 10:54:47 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS6		
95	0.10	0.06
96	0.10	0.06
113	0.11	0.07
144	0.15	0.10
138	0.14	0.10
94	0.10	0.05
43	0.04	0.00
40	0.04	0.00
52	0.05	0.01
52	0.05	0.01
50	0.05	0.01
48	0.05	0.01
43	0.04	0.00
46	0.05	0.01
46	0.05	0.01
47	0.05	0.01
32	0.03	0.00
42	0.04	0.00
46	0.05	0.01
40	0.04	0.00
30	0.03	0.00
38	0.04	0.00
35	0.04	0.00
36	0.04	0.00
37	0.04	0.00
33	0.03	0.00
30	0.03	0.00
35	0.04	0.00
33	0.03	0.00
31	0.03	0.00
37	0.04	0.00
39	0.04	0.00
34	0.03	0.00
36	0.04	0.00
41	0.04	0.00
44	0.04	0.00
34	0.03	0.00
34	0.03	0.00
44	0.04	0.00
38	0.04	0.00
39	0.04	0.00
36	0.04	0.00
40	0.04	0.00
37	0.04	0.00
37	0.04	0.00

7 19:08:20 10:57:03 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS7		
39	0.04	0.00
42	0.04	0.00
46	0.05	0.01
33	0.03	0.00
36	0.04	0.00
31	0.03	0.00
43	0.04	0.00
38	0.04	0.00
32	0.03	0.00
33	0.03	0.00
42	0.04	0.00
23	0.02	0.00
32	0.03	0.00
33	0.03	0.00
32	0.03	0.00
30	0.03	0.00
37	0.04	0.00
35	0.04	0.00
27	0.03	0.00
29	0.03	0.00
40	0.04	0.00
29	0.03	0.00
38	0.04	0.00
30	0.03	0.00
31	0.03	0.00
38	0.04	0.00
34	0.03	0.00
31	0.03	0.00
62	0.06	0.02
68	0.07	0.03
86	0.09	0.05
122	0.12	0.08
141	0.14	0.10
119	0.12	0.08
106	0.11	0.07
31	0.03	0.00
32	0.03	0.00
35	0.04	0.00
33	0.03	0.00
33	0.03	0.00
32	0.03	0.00
24	0.02	0.00
27	0.03	0.00
34	0.03	0.00
29	0.03	0.00
38	0.04	0.00
35	0.04	0.00
30	0.03	0.00

33	0.03	0.00	39	0.04	0.00
34	0.03	0.00	38	0.04	0.00
30	0.03	0.00	33	0.03	0.00
31	0.03	0.00	41	0.04	0.00
34	0.03	0.00	38	0.04	0.00
34	0.03	0.00	40	0.04	0.00
30	0.03	0.00	31	0.03	0.00
35	0.04	0.00	33	0.03	0.00
35	0.04	0.00	25	0.03	0.00
38	0.04	0.00	25	0.03	0.00
39	0.04	0.00	45	0.05	0.00
49	0.05	0.01	33	0.03	0.00
51	0.05	0.01	28	0.03	0.00
100	0.10	0.06	31	0.03	0.00
133	0.13	0.09	31	0.03	0.00
130	0.13	0.09	34	0.03	0.00
115	0.12	0.08	31	0.03	0.00
131	0.13	0.09	27	0.03	0.00
117	0.12	0.08	33	0.03	0.00
82	0.08	0.04	34	0.03	0.00
49	0.05	0.01	38	0.04	0.00
54	0.05	0.01	37	0.04	0.00
51	0.05	0.01	31	0.03	0.00
46	0.05	0.01	28	0.03	0.00
52	0.05	0.01	31	0.03	0.00
44	0.04	0.00	31	0.03	0.00
45	0.05	0.00	29	0.03	0.00
42	0.04	0.00	34	0.03	0.00
40	0.04	0.00	29	0.03	0.00
43	0.04	0.00	25	0.03	0.00
39	0.04	0.00	22	0.02	0.00
43	0.04	0.00	30	0.03	0.00
46	0.05	0.01	28	0.03	0.00
42	0.04	0.00	27	0.03	0.00
42	0.04	0.00	29	0.03	0.00
37	0.04	0.00	31	0.03	0.00
42	0.04	0.00	28	0.03	0.00
33	0.03	0.00	27	0.03	0.00
35	0.04	0.00	34	0.03	0.00
38	0.04	0.00	35	0.04	0.00
33	0.03	0.00	26	0.03	0.00
37	0.04	0.00	30	0.03	0.00
29	0.03	0.00	30	0.03	0.00
33	0.03	0.00	31	0.03	0.00
32	0.03	0.00	29	0.03	0.00
34	0.03	0.00	22	0.02	0.00
36	0.04	0.00	31	0.03	0.00
32	0.03	0.00	25	0.03	0.00
34	0.03	0.00	34	0.03	0.00
40	0.04	0.00	24	0.02	0.00
39	0.04	0.00	27	0.03	0.00
35	0.04	0.00	29	0.03	0.00
28	0.03	0.00	28	0.03	0.00
33	0.03	0.00	28	0.03	0.00
32	0.03	0.00	27	0.03	0.00
41	0.04	0.00	30	0.03	0.00

32	0.03	0.00	34	0.03	0.00
31	0.03	0.00	32	0.03	0.00
33	0.03	0.00	29	0.03	0.00
38	0.04	0.00	28	0.03	0.00
27	0.03	0.00	26	0.03	0.00
27	0.03	0.00	22	0.02	0.00
35	0.04	0.00	28	0.03	0.00
33	0.03	0.00	34	0.03	0.00
28	0.03	0.00	31	0.03	0.00
28	0.03	0.00	31	0.03	0.00
23	0.02	0.00	21	0.02	0.00
35	0.04	0.00	28	0.03	0.00
29	0.03	0.00	30	0.03	0.00
22	0.02	0.00	25	0.03	0.00
26	0.03	0.00	30	0.03	0.00
22	0.02	0.00	28	0.03	0.00
29	0.03	0.00			
27	0.03	0.00			
27	0.03	0.00			
31	0.03	0.00	9 19:08:20 11:10:23 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
20	0.02	0.00			
27	0.03	0.00			
26	0.03	0.00			
23	0.02	0.00	NS8		
34	0.03	0.00	25	0.03	0.00
27	0.03	0.00	26	0.03	0.00
26	0.03	0.00	29	0.03	0.00
25	0.03	0.00	30	0.03	0.00
30	0.03	0.00	30	0.03	0.00
29	0.03	0.00	30	0.03	0.00
32	0.03	0.00	22	0.02	0.00
26	0.03	0.00	22	0.02	0.00
31	0.03	0.00	27	0.03	0.00
34	0.03	0.00	32	0.03	0.00
30	0.03	0.00	29	0.03	0.00
29	0.03	0.00	24	0.02	0.00
31	0.03	0.00	27	0.03	0.00
28	0.03	0.00	24	0.02	0.00
24	0.02	0.00	24	0.02	0.00
29	0.03	0.00	27	0.03	0.00
27	0.03	0.00	28	0.03	0.00
23	0.02	0.00	29	0.03	0.00
32	0.03	0.00	31	0.03	0.00
32	0.03	0.00	28	0.03	0.00
32	0.03	0.00	36	0.04	0.00
35	0.04	0.00	31	0.03	0.00
35	0.04	0.00	33	0.03	0.00
34	0.03	0.00	32	0.03	0.00
35	0.04	0.00	32	0.03	0.00
38	0.04	0.00	34	0.03	0.00
36	0.04	0.00	36	0.04	0.00
26	0.03	0.00	28	0.03	0.00
31	0.03	0.00	30	0.03	0.00
30	0.03	0.00	35	0.04	0.00
30	0.03	0.00	32	0.03	0.00
27	0.03	0.00	42	0.04	0.00

33	0.03	0.00
26	0.03	0.00
36	0.04	0.00
28	0.03	0.00
29	0.03	0.00
27	0.03	0.00
31	0.03	0.00
28	0.03	0.00
30	0.03	0.00
31	0.03	0.00
30	0.03	0.00
30	0.03	0.00
29	0.03	0.00
26	0.03	0.00
28	0.03	0.00
26	0.03	0.00
26	0.03	0.00
27	0.03	0.00
38	0.04	0.00
28	0.03	0.00
29	0.03	0.00
25	0.03	0.00
25	0.03	0.00
32	0.03	0.00
26	0.03	0.00
32	0.03	0.00
30	0.03	0.00
37	0.04	0.00
35	0.04	0.00
31	0.03	0.00
36	0.04	0.00
38	0.04	0.00
37	0.04	0.00
39	0.04	0.00
35	0.04	0.00

10 19:08:20 11:13:32 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS9		
26	0.03	0.00
28	0.03	0.00
36	0.04	0.00
36	0.04	0.00
30	0.03	0.00
26	0.03	0.00
22	0.02	0.00
26	0.03	0.00
32	0.03	0.00
28	0.03	0.00
33	0.03	0.00
25	0.03	0.00
19	0.02	0.00

22	0.02	0.00
31	0.03	0.00
20	0.02	0.00
17	0.02	0.00
24	0.02	0.00
31	0.03	0.00
28	0.03	0.00
26	0.03	0.00
24	0.02	0.00
22	0.02	0.00
23	0.02	0.00
21	0.02	0.00
28	0.03	0.00
29	0.03	0.00
28	0.03	0.00
26	0.03	0.00
23	0.02	0.00
20	0.02	0.00
23	0.02	0.00
22	0.02	0.00
38	0.04	0.00
28	0.03	0.00
29	0.03	0.00
27	0.03	0.00
24	0.02	0.00
25	0.03	0.00
27	0.03	0.00
28	0.03	0.00
25	0.03	0.00
27	0.03	0.00
31	0.03	0.00
29	0.03	0.00
30	0.03	0.00
25	0.03	0.00
28	0.03	0.00
32	0.03	0.00
27	0.03	0.00
27	0.03	0.00
32	0.03	0.00
28	0.03	0.00
29	0.03	0.00
26	0.03	0.00
32	0.03	0.00
31	0.03	0.00
36	0.04	0.00
30	0.03	0.00
26	0.03	0.00
40	0.04	0.00
33	0.03	0.00

11 19:08:20 11:16:29 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS10		
28	0.03	0.00
32	0.03	0.00
36	0.04	0.00
34	0.03	0.00
34	0.03	0.00
36	0.04	0.00
35	0.04	0.00
39	0.04	0.00
39	0.04	0.00
38	0.04	0.00
36	0.04	0.00
37	0.04	0.00
34	0.03	0.00
40	0.04	0.00
51	0.05	0.00
44	0.04	0.00
38	0.04	0.00
33	0.03	0.00
33	0.03	0.00
35	0.04	0.00
32	0.03	0.00
34	0.03	0.00
36	0.04	0.00
29	0.03	0.00
36	0.04	0.00
28	0.03	0.00
25	0.03	0.00
23	0.02	0.00
26	0.03	0.00
34	0.03	0.00
27	0.03	0.00
31	0.03	0.00
29	0.03	0.00
34	0.03	0.00
28	0.03	0.00
28	0.03	0.00
23	0.02	0.00
33	0.03	0.00
24	0.02	0.00
28	0.03	0.00
23	0.02	0.00
27	0.03	0.00
25	0.03	0.00
29	0.03	0.00
27	0.03	0.00
21	0.02	0.00
19	0.02	0.00
25	0.03	0.00
23	0.02	0.00
32	0.03	0.00
22	0.02	0.00
31	0.03	0.00
20	0.02	0.00
30	0.03	0.00
23	0.02	0.00
19	0.02	0.00
25	0.03	0.00
22	0.02	0.00
23	0.02	0.00
28	0.03	0.00
21	0.02	0.00
27	0.03	0.00
27	0.03	0.00
21	0.02	0.00
22	0.02	0.00
24	0.02	0.00

12 19:08:20 11:19:26 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS11		
23	0.02	0.00
26	0.03	0.00
26	0.03	0.00
27	0.03	0.00
23	0.02	0.00
20	0.02	0.00
33	0.03	0.00
23	0.02	0.00
26	0.03	0.00
27	0.03	0.00
30	0.03	0.00
25	0.03	0.00
28	0.03	0.00
26	0.03	0.00
31	0.03	0.00
42	0.04	0.00
45	0.05	0.00
50	0.05	0.01
35	0.04	0.00
49	0.05	0.01
79	0.08	0.04
48	0.05	0.01
34	0.03	0.00
37	0.04	0.00
22	0.02	0.00
28	0.03	0.00
27	0.03	0.00
36	0.04	0.00
30	0.03	0.00
51	0.05	0.01

63	0.06	0.02
63	0.06	0.02
34	0.03	0.00
31	0.03	0.00
37	0.04	0.00
32	0.03	0.00
34	0.03	0.00

13 19:08:20 11:21:20 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS12		
39	0.04	0.00
63	0.06	0.02
95	0.10	0.06
66	0.07	0.03
35	0.04	0.00
26	0.03	0.00
30	0.03	0.00
25	0.03	0.00
29	0.03	0.00
27	0.03	0.00
26	0.03	0.00
30	0.03	0.00
25	0.03	0.00
26	0.03	0.00
31	0.03	0.00
30	0.03	0.00
27	0.03	0.00
31	0.03	0.00
25	0.03	0.00
32	0.03	0.00
32	0.03	0.00
23	0.02	0.00
25	0.03	0.00
23	0.02	0.00
25	0.03	0.00
24	0.02	0.00
23	0.02	0.00
23	0.02	0.00

14 19:08:20 11:22:53 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS13		
32	0.03	0.00
22	0.02	0.00
32	0.03	0.00
26	0.03	0.00
30	0.03	0.00
26	0.03	0.00
25	0.03	0.00
31	0.03	0.00
28	0.03	0.00
28	0.03	0.00
29	0.03	0.00
22	0.02	0.00
27	0.03	0.00
31	0.03	0.00
28	0.03	0.00
19	0.02	0.00
34	0.03	0.00
27	0.03	0.00
31	0.03	0.00
23	0.02	0.00
33	0.03	0.00

15 19:08:20 11:24:44 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS14		
29	0.03	0.00
19	0.02	0.00
27	0.03	0.00
34	0.03	0.00
26	0.03	0.00
26	0.03	0.00
27	0.03	0.00
26	0.03	0.00
31	0.03	0.00
30	0.03	0.00
31	0.03	0.00
29	0.03	0.00
32	0.03	0.00
28	0.03	0.00
30	0.03	0.00
28	0.03	0.00
30	0.03	0.00
30	0.03	0.00
34	0.03	0.00
30	0.03	0.00
27	0.03	0.00
29	0.03	0.00
23	0.02	0.00

16 19:08:20 11:28:18 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS15		
32	0.03	0.00

31	0.03	0.00	37	0.04	0.00
32	0.03	0.00	38	0.04	0.00
35	0.04	0.00	46	0.05	0.01
38	0.04	0.00	34	0.03	0.00
34	0.03	0.00	36	0.04	0.00
30	0.03	0.00	25	0.03	0.00
29	0.03	0.00	28	0.03	0.00
25	0.03	0.00	28	0.03	0.00
28	0.03	0.00	31	0.03	0.00
29	0.03	0.00	23	0.02	0.00
28	0.03	0.00	30	0.03	0.00
23	0.02	0.00	24	0.02	0.00
22	0.02	0.00	34	0.03	0.00
25	0.03	0.00	24	0.02	0.00
31	0.03	0.00	26	0.03	0.00
34	0.03	0.00	23	0.02	0.00
36	0.04	0.00	25	0.03	0.00
29	0.03	0.00	26	0.03	0.00
37	0.04	0.00	20	0.02	0.00
27	0.03	0.00	27	0.03	0.00
28	0.03	0.00	29	0.03	0.00
35	0.04	0.00	29	0.03	0.00
27	0.03	0.00	34	0.03	0.00
29	0.03	0.00	34	0.03	0.00
32	0.03	0.00	25	0.03	0.00
29	0.03	0.00	22	0.02	0.00
31	0.03	0.00	34	0.03	0.00
35	0.04	0.00	32	0.03	0.00
24	0.02	0.00	26	0.03	0.00
26	0.03	0.00	28	0.03	0.00
30	0.03	0.00	28	0.03	0.00
22	0.02	0.00	40	0.04	0.00
29	0.03	0.00	31	0.03	0.00
26	0.03	0.00	36	0.04	0.00
27	0.03	0.00	31	0.03	0.00
28	0.03	0.00	41	0.04	0.00
27	0.03	0.00	29	0.03	0.00
26	0.03	0.00	36	0.04	0.00
24	0.02	0.00	38	0.04	0.00
27	0.03	0.00	41	0.04	0.00
24	0.02	0.00	30	0.03	0.00
23	0.02	0.00	37	0.04	0.00
18	0.02	0.00	38	0.04	0.00
27	0.03	0.00	40	0.04	0.00
24	0.02	0.00	38	0.04	0.00
37	0.04	0.00	37	0.04	0.00
73	0.07	0.03	44	0.04	0.00
74	0.07	0.03	41	0.04	0.00
87	0.09	0.05	37	0.04	0.00
70	0.07	0.03	36	0.04	0.00
73	0.07	0.03	48	0.05	0.01
78	0.08	0.04	56	0.06	0.02
75	0.08	0.03	87	0.09	0.05
48	0.05	0.01	152	0.15	0.11
43	0.04	0.00	189	0.19	0.15
43	0.04	0.00	121	0.12	0.08

137	0.14	0.10
153	0.15	0.11
148	0.15	0.11
119	0.12	0.08
100	0.10	0.06
69	0.07	0.03
48	0.05	0.01
41	0.04	0.00
31	0.03	0.00
32	0.03	0.00
38	0.04	0.00
32	0.03	0.00
27	0.03	0.00
39	0.04	0.00
25	0.03	0.00
34	0.03	0.00
31	0.03	0.00
32	0.03	0.00
32	0.03	0.00
37	0.04	0.00
34	0.03	0.00
37	0.04	0.00
33	0.03	0.00
34	0.03	0.00
28	0.03	0.00
32	0.03	0.00
28	0.03	0.00
38	0.04	0.00
30	0.03	0.00
25	0.03	0.00
29	0.03	0.00
29	0.03	0.00
26	0.03	0.00
27	0.03	0.00
27	0.03	0.00

19 19:08:20 11:38:11 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS16		
87	0.09	0.05
99	0.10	0.06
85	0.09	0.05
97	0.10	0.06
105	0.11	0.07
102	0.10	0.06
108	0.11	0.07
102	0.10	0.06
89	0.09	0.05
82	0.08	0.04
71	0.07	0.03
71	0.07	0.03
72	0.07	0.03

84	0.09	0.04
78	0.08	0.04
68	0.07	0.03
53	0.05	0.01
59	0.06	0.02
42	0.04	0.00
27	0.03	0.00
26	0.03	0.00
27	0.03	0.00
23	0.02	0.00
19	0.02	0.00
23	0.02	0.00
28	0.03	0.00
31	0.03	0.00
26	0.03	0.00
27	0.03	0.00
28	0.03	0.00
27	0.03	0.00
27	0.03	0.00
29	0.03	0.00
22	0.02	0.00
31	0.03	0.00
22	0.02	0.00
28	0.03	0.00
27	0.03	0.00
27	0.03	0.00
32	0.03	0.00
33	0.03	0.00
32	0.03	0.00
28	0.03	0.00
32	0.03	0.00
31	0.03	0.00
23	0.02	0.00
31	0.03	0.00
26	0.03	0.00
24	0.02	0.00
25	0.03	0.00
26	0.03	0.00
26	0.03	0.00
26	0.03	0.00
28	0.03	0.00
29	0.03	0.00
34	0.03	0.00
24	0.02	0.00
30	0.03	0.00
28	0.03	0.00
35	0.04	0.00
34	0.03	0.00
32	0.03	0.00
29	0.03	0.00
28	0.03	0.00
34	0.03	0.00
29	0.03	0.00
29	0.03	0.00
31	0.03	0.00
25	0.03	0.00

32	0.03	0.00	74	0.07	0.03
25	0.03	0.00	63	0.06	0.02
34	0.03	0.00	42	0.04	0.00
33	0.03	0.00	39	0.04	0.00
24	0.02	0.00	44	0.04	0.00
27	0.03	0.00	35	0.04	0.00
32	0.03	0.00	33	0.03	0.00
23	0.02	0.00	32	0.03	0.00
32	0.03	0.00	31	0.03	0.00
21	0.02	0.00	28	0.03	0.00
24	0.02	0.00	29	0.03	0.00
20	0.02	0.00	39	0.04	0.00
34	0.03	0.00	36	0.04	0.00
31	0.03	0.00	29	0.03	0.00
27	0.03	0.00	36	0.04	0.00
21	0.02	0.00	35	0.04	0.00
28	0.03	0.00	28	0.03	-0.01
23	0.02	0.00	40	0.04	0.00
24	0.02	0.00	49	0.05	0.01
32	0.03	0.00	37	0.04	0.00
29	0.03	0.00	32	0.03	0.00
30	0.03	0.00	25	0.03	0.00
27	0.03	0.00	26	0.03	0.00
34	0.03	0.00	21	0.02	0.00
26	0.03	0.00	29	0.03	0.00
28	0.03	0.00	24	0.02	0.00
22	0.02	0.00	31	0.03	0.00
35	0.04	0.00	28	0.03	0.00
26	0.03	0.00	25	0.03	0.00
22	0.02	0.00	29	0.03	0.00
23	0.02	0.00	29	0.03	0.00
26	0.03	0.00	28	0.03	0.00
22	0.02	0.00	21	0.02	0.00
30	0.03	0.00	23	0.02	0.00
21	0.02	0.00	25	0.03	0.00
25	0.03	0.00	26	0.03	0.00
35	0.04	0.00	26	0.03	0.00
25	0.03	0.00	23	0.02	0.00
38	0.04	0.00	33	0.03	0.00
28	0.03	0.00	34	0.03	0.00
29	0.03	0.00	32	0.03	0.00
28	0.03	0.00	30	0.03	0.00
32	0.03	0.00	23	0.02	0.00
29	0.03	0.00	38	0.04	0.00
31	0.03	0.00	33	0.03	0.00
29	0.03	0.00	29	0.03	0.00
41	0.04	0.00	33	0.03	0.00
35	0.04	0.00	29	0.03	0.00
63	0.06	0.02	18	0.02	0.00
88	0.09	0.05	22	0.02	0.00
82	0.08	0.04	30	0.03	0.00
89	0.09	0.05	29	0.03	0.00
84	0.09	0.04	25	0.03	0.00
97	0.10	0.06	28	0.03	0.00
88	0.09	0.05	32	0.03	0.00
81	0.08	0.04	35	0.04	0.00

33	0.03	0.00
36	0.04	0.00
33	0.03	0.00
24	0.02	0.00
32	0.03	0.00
34	0.03	0.00
39	0.04	0.00
30	0.03	0.00
39	0.04	0.00
37	0.04	0.00
41	0.04	0.00
41	0.04	0.00
43	0.04	0.00
44	0.04	0.00
54	0.05	0.01
90	0.09	0.05
157	0.16	0.12
150	0.15	0.11
133	0.13	0.09
153	0.15	0.11
141	0.14	0.10
90	0.09	0.05
79	0.08	0.04
72	0.07	0.03
102	0.10	0.06
46	0.05	0.01
45	0.05	0.00
42	0.04	0.00
43	0.04	0.00
49	0.05	0.01
31	0.03	0.00
36	0.04	0.00
36	0.04	0.00
34	0.03	0.00
41	0.04	0.00
34	0.03	0.00
38	0.04	0.00
37	0.04	0.00
29	0.03	0.00
41	0.04	0.00
32	0.03	0.00
28	0.03	0.00

21 19:08:20 11:47:08 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
NS17		
35	0.04	0.00
40	0.04	0.00
38	0.04	0.00
45	0.05	0.00
52	0.05	0.01
54	0.05	0.01

62	0.06	0.02
49	0.05	0.01
41	0.04	0.00
30	0.03	0.00
37	0.04	0.00
43	0.04	0.00
50	0.05	0.01
39	0.04	0.00
46	0.05	0.01
60	0.06	0.02
49	0.05	0.01
62	0.06	0.02
76	0.08	0.04
125	0.13	0.09
171	0.17	0.13
164	0.17	0.13
103	0.10	0.06
67	0.07	0.03
58	0.06	0.02
42	0.04	0.00
38	0.04	0.00
38	0.04	0.00
32	0.03	0.00
31	0.03	0.00
33	0.03	0.00
33	0.03	0.00
44	0.04	0.00
59	0.06	0.02
49	0.05	0.01
35	0.04	0.00
36	0.04	0.00
34	0.03	0.00
30	0.03	0.00
33	0.03	0.00
34	0.03	0.00
47	0.05	0.00
33	0.03	0.00
36	0.04	0.00
35	0.04	0.00
27	0.03	0.00
31	0.03	0.00
32	0.03	0.00
35	0.04	0.00
24	0.02	0.00
32	0.03	0.00
27	0.03	0.00
29	0.03	0.00
25	0.03	0.00
35	0.04	0.00
31	0.03	0.00
28	0.03	0.00
25	0.03	0.00
29	0.03	0.00
24	0.02	0.00
33	0.03	0.00
40	0.04	0.00

55	0.06	0.01	27	0.03	0.00
50	0.05	0.01	25	0.03	0.00
60	0.06	0.02	26	0.03	0.00
68	0.07	0.03	26	0.03	0.00
88	0.09	0.05	29	0.03	0.00
92	0.09	0.05	29	0.03	0.00
97	0.10	0.06	24	0.02	0.00
73	0.07	0.03	27	0.03	0.00
41	0.04	0.00	31	0.03	0.00
34	0.03	0.00	26	0.03	0.00
26	0.03	0.00	27	0.03	0.00
33	0.03	0.00	36	0.04	0.00
32	0.03	0.00	31	0.03	0.00
21	0.02	0.00	33	0.03	0.00
27	0.03	0.00	28	0.03	0.00
28	0.03	0.00	29	0.03	0.00
27	0.03	0.00	91	0.09	0.05
29	0.03	0.00	84	0.09	0.04
26	0.03	0.00	102	0.10	0.06
29	0.03	0.00	95	0.10	0.06
25	0.03	0.00	94	0.10	0.05
31	0.03	0.00	109	0.11	0.07
24	0.02	0.00	102	0.10	0.06
22	0.02	0.00	91	0.09	0.05
21	0.02	0.00	78	0.08	0.04
25	0.03	0.00	77	0.08	0.04
24	0.02	0.00	115	0.12	0.08
32	0.03	0.00	89	0.09	0.05
37	0.04	0.00	80	0.08	0.04
30	0.03	0.00	62	0.06	0.02
28	0.03	0.00	90	0.09	0.05
28	0.03	0.00	75	0.08	0.03
28	0.03	0.00	70	0.07	0.03
21	0.02	0.00	76	0.08	0.04
26	0.03	0.00	63	0.06	0.02
19	0.02	0.00	73	0.07	0.03
21	0.02	0.00	96	0.10	0.06
34	0.03	0.00	81	0.08	0.04
25	0.03	0.00	70	0.07	0.03
31	0.03	0.00	89	0.09	0.05
25	0.03	0.00	97	0.10	0.06
20	0.02	0.00	112	0.11	0.07
25	0.03	0.00	123	0.12	0.08
25	0.03	0.00	145	0.15	0.11
28	0.03	0.00	151	0.15	0.11
31	0.03	0.00	157	0.16	0.12
26	0.03	0.00	154	0.16	0.11
24	0.02	0.00	160	0.16	0.12
20	0.02	0.00	149	0.15	0.11
26	0.03	0.00	158	0.16	0.12
21	0.02	0.00	134	0.14	0.09
25	0.03	0.00	102	0.10	0.06
30	0.03	0.00	87	0.09	0.05
24	0.02	0.00	54	0.05	0.01
24	0.02	0.00	62	0.06	0.02
22	0.02	0.00	59	0.06	0.02

53	0.05	0.01
45	0.05	0.00
46	0.05	0.01

EW Transects

1 19:08:20 12:13:23 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
ew1		
36	0.04	0.00
35	0.04	0.00
36	0.04	0.00
38	0.04	0.00
29	0.03	0.00
41	0.04	0.00
36	0.04	0.00
36	0.04	0.00
35	0.04	0.00
30	0.03	0.00
37	0.04	0.00
37	0.04	0.00
34	0.03	0.00
40	0.04	0.00
27	0.03	0.00
37	0.04	0.00
27	0.03	0.00
36	0.04	0.00
37	0.04	0.00
29	0.03	0.00
35	0.04	0.00
35	0.04	0.00
32	0.03	0.00
29	0.03	0.00
30	0.03	0.00
34	0.03	0.00
27	0.03	0.00
29	0.03	0.00
31	0.03	0.00
37	0.04	0.00
30	0.03	0.00
34	0.03	0.00
36	0.04	0.00
28	0.03	0.00
34	0.03	0.00
28	0.03	0.00
36	0.04	0.00
38	0.04	0.00
37	0.04	0.00
36	0.04	0.00
28	0.03	0.00
33	0.03	0.00
32	0.03	0.00
28	0.03	0.00
27	0.03	0.00
27	0.03	0.00
30	0.03	0.00
29	0.03	0.00
34	0.03	0.00
36	0.04	0.00
37	0.04	0.00
47	0.05	0.01
36	0.04	0.00
37	0.04	0.00
35	0.04	0.00
32	0.03	0.00
29	0.03	0.00
27	0.03	0.00
36	0.04	0.00
37	0.04	0.00
31	0.03	0.00
34	0.03	0.00
30	0.03	0.00
32	0.03	0.00
32	0.03	0.00
35	0.04	0.00
32	0.03	0.00
31	0.03	0.00
33	0.03	0.00
32	0.03	0.00
42	0.04	0.00
32	0.03	0.00
34	0.03	0.00
42	0.04	0.00
37	0.04	0.00
43	0.04	0.00
52	0.05	0.01
69	0.07	0.03
100	0.10	0.06
106	0.11	0.07
115	0.12	0.08

2 19:08:20 12:17:13 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
ew2		
115	0.12	0.08
117	0.12	0.08
132	0.13	0.09
133	0.13	0.09
148	0.15	0.11
144	0.15	0.10
142	0.14	0.10
136	0.14	0.10
132	0.13	0.09
127	0.13	0.09

112	0.11	0.07	40	0.04	0.00
123	0.12	0.08	39	0.04	0.00
102	0.10	0.06	48	0.05	0.01
91	0.09	0.05	36	0.04	0.00
76	0.08	0.04	36	0.04	0.00
80	0.08	0.04	48	0.05	0.01
61	0.06	0.02	48	0.05	0.01
62	0.06	0.02	37	0.04	0.00
48	0.05	0.01	39	0.04	0.00
56	0.06	0.02	38	0.04	0.00
59	0.06	0.02	46	0.05	0.01
51	0.05	0.01	39	0.04	0.00
55	0.06	0.01	48	0.05	0.01
51	0.05	0.01	45	0.05	0.00
47	0.05	0.01	40	0.04	0.00
47	0.05	0.01	43	0.04	0.00
46	0.05	0.01	40	0.04	0.00
51	0.05	0.01	45	0.05	0.00
55	0.06	0.01	50	0.05	0.01
42	0.04	0.00	45	0.05	0.00
51	0.05	0.01	42	0.04	0.00
41	0.04	0.00	42	0.04	0.00
46	0.05	0.01	34	0.03	0.00
51	0.05	0.01	49	0.05	0.01
39	0.04	0.00	39	0.04	0.00
47	0.05	0.01	44	0.04	0.00
42	0.04	0.00	43	0.04	0.00
53	0.05	0.01	41	0.04	0.00
42	0.04	0.00	40	0.04	0.00
47	0.05	0.01			
43	0.04	0.00			
51	0.05	0.01			
42	0.04	0.00	3 19:08:20 12:21:22 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
47	0.05	0.01			
49	0.05	0.01			
47	0.05	0.01			
49	0.05	0.01	ew3		
39	0.04	0.00	60	0.06	0.02
27	0.03	0.00	53	0.05	0.01
42	0.04	0.00	49	0.05	0.01
40	0.04	0.00	72	0.07	0.03
33	0.03	0.00	56	0.06	0.02
36	0.04	0.00	67	0.07	0.03
39	0.04	0.00	70	0.07	0.03
38	0.04	0.00	107	0.11	0.07
30	0.03	0.00	207	0.21	0.17
33	0.03	0.00	131	0.13	0.09
36	0.04	0.00	50	0.05	0.01
30	0.03	0.00	54	0.05	0.01
40	0.04	0.00	53	0.05	0.01
31	0.03	0.00	59	0.06	0.02
35	0.04	0.00	61	0.06	0.02
33	0.03	0.00	70	0.07	0.03
27	0.03	0.00	63	0.06	0.02
36	0.04	0.00	86	0.09	0.05
42	0.04	0.00	85	0.09	0.05

107	0.11	0.07
159	0.16	0.12
177	0.18	0.14
177	0.18	0.14
194	0.20	0.16
184	0.19	0.15
164	0.17	0.13
153	0.15	0.11
146	0.15	0.11
124	0.13	0.08
115	0.12	0.08
107	0.11	0.07
124	0.13	0.08
125	0.13	0.09
133	0.13	0.09
131	0.13	0.09
126	0.13	0.09
133	0.13	0.09
153	0.15	0.11
133	0.13	0.09
135	0.14	0.10
107	0.11	0.07

4 19:08:20 12:23:54 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
ew4		
32	0.03	0.00
36	0.04	0.00
38	0.04	0.00
31	0.03	0.00
40	0.04	0.00
36	0.04	0.00
31	0.03	0.00
35	0.04	0.00
31	0.03	0.00
33	0.03	0.00
34	0.03	0.00
33	0.03	0.00
36	0.04	0.00
35	0.04	0.00
29	0.03	0.00
29	0.03	0.00
32	0.03	0.00
32	0.03	0.00
32	0.03	0.00
45	0.05	0.00
38	0.04	0.00
32	0.03	0.00
38	0.04	0.00
36	0.04	0.00
33	0.03	0.00
42	0.04	0.00
36	0.04	0.00
39	0.04	0.00
38	0.04	0.00
38	0.04	0.00
35	0.04	0.00
36	0.04	0.00
43	0.04	0.00
38	0.04	0.00
33	0.03	0.00
36	0.04	0.00
45	0.05	0.00
38	0.04	0.00
38	0.04	0.00
43	0.04	0.00
40	0.04	0.00
41	0.04	0.00
45	0.05	0.00
48	0.05	0.01
49	0.05	0.01
47	0.05	0.01
70	0.07	0.03
95	0.10	0.06
126	0.13	0.09
145	0.15	0.11
140	0.14	0.10
162	0.16	0.12
162	0.16	0.12
146	0.15	0.11
151	0.15	0.11
127	0.13	0.09

5 19:08:20 12:26:24 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
ew5		
140	0.14	0.10
166	0.17	0.13
170	0.17	0.13
141	0.14	0.10
154	0.16	0.11
125	0.13	0.09
99	0.10	0.06
72	0.07	0.03
47	0.05	0.01
39	0.04	0.00
38	0.04	0.00
42	0.04	0.00
29	0.03	0.00
35	0.04	0.00
39	0.04	0.00
43	0.04	0.00
29	0.03	0.00
35	0.04	0.00

39	0.04	0.00
40	0.04	0.00
30	0.03	0.00
30	0.03	0.00
34	0.03	0.00
38	0.04	0.00
33	0.03	0.00
39	0.04	0.00
29	0.03	0.00
35	0.04	0.00
34	0.03	0.00
30	0.03	0.00
26	0.03	0.00
30	0.03	0.00
31	0.03	0.00
32	0.03	0.00
29	0.03	0.00
35	0.04	0.00
34	0.03	0.00
31	0.03	0.00
31	0.03	0.00
36	0.04	0.00
34	0.03	0.00
34	0.03	0.00
28	0.03	0.00
23	0.02	0.00
32	0.03	0.00
31	0.03	0.00
36	0.04	0.00

6 19:08:20 12:28:57 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
ew6		
35	0.04	0.00
34	0.03	0.00
41	0.04	0.00
48	0.05	0.01
33	0.03	0.00
39	0.04	0.00
42	0.04	0.00
27	0.03	0.00
36	0.04	0.00
34	0.03	0.00
34	0.03	0.00
35	0.04	0.00
32	0.03	0.00
34	0.03	0.00
28	0.03	0.00
35	0.04	0.00
25	0.03	0.00
35	0.04	0.00
36	0.04	0.00

35	0.04	0.00
29	0.03	0.00
38	0.04	0.00
35	0.04	0.00
39	0.04	0.00
30	0.03	0.00
38	0.04	0.00
33	0.03	0.00
26	0.03	0.00
40	0.04	0.00
42	0.04	0.00
44	0.04	0.00
45	0.05	0.00
47	0.05	0.01
35	0.04	0.00
47	0.05	0.01
44	0.04	0.00
78	0.08	0.04
115	0.12	0.08
141	0.14	0.10
182	0.18	0.14
154	0.16	0.11
180	0.18	0.14

7 19:08:20 12:31:14 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
ew7		
195	0.20	0.16
209	0.21	0.17
207	0.21	0.17
213	0.22	0.17
195	0.20	0.16
180	0.18	0.14
202	0.20	0.16
191	0.19	0.15
127	0.13	0.09
57	0.06	0.02
46	0.05	0.01
43	0.04	0.00
35	0.04	0.00
34	0.03	0.00
26	0.03	0.00
43	0.04	0.00
31	0.03	0.00
37	0.04	0.00
31	0.03	0.00
32	0.03	0.00
39	0.04	0.00
33	0.03	0.00
28	0.03	0.00
29	0.03	0.00
33	0.03	0.00

28	0.03	0.00
25	0.03	0.00
33	0.03	0.00
28	0.03	0.00
29	0.03	0.00
26	0.03	0.00
33	0.03	0.00
32	0.03	0.00
25	0.03	0.00
21	0.02	0.00
29	0.03	0.00
26	0.03	0.00
28	0.03	0.00
36	0.04	0.00
32	0.03	0.00
27	0.03	0.00
28	0.03	0.00
28	0.03	0.00
27	0.03	0.00
22	0.02	0.00
19	0.02	0.00
30	0.03	0.00
34	0.03	0.00
32	0.03	0.00

8 19:08:20 12:33:27 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
ew8		
30	0.03	0.00
31	0.03	0.00
28	0.03	0.00
30	0.03	0.00
20	0.02	0.00
24	0.02	0.00
27	0.03	0.00
30	0.03	0.00
27	0.03	0.00
23	0.02	0.00
29	0.03	0.00
23	0.02	0.00
26	0.03	0.00
34	0.03	0.00
25	0.03	0.00
29	0.03	0.00
25	0.03	0.00
25	0.03	0.00
28	0.03	0.00
26	0.03	0.00
28	0.03	0.00
27	0.03	0.00
34	0.03	0.00
31	0.03	0.00

28	0.03	0.00
27	0.03	0.00
34	0.03	0.00
40	0.04	0.00
41	0.04	0.00
45	0.05	0.00
52	0.05	0.01
53	0.05	0.01
111	0.11	0.07
160	0.16	0.12
156	0.16	0.12
134	0.14	0.09
136	0.14	0.10
100	0.10	0.06
163	0.17	0.12

9 19:08:20 12:35:26 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
ew9		
50	0.05	0.01
49	0.05	0.01
44	0.04	0.00
45	0.05	0.00
41	0.04	0.00
45	0.05	0.00
31	0.03	0.00
43	0.04	0.00
55	0.06	0.01
69	0.07	0.03
79	0.08	0.04
87	0.09	0.05
80	0.08	0.04
49	0.05	0.01
47	0.05	0.01
29	0.03	0.00
31	0.03	0.00
28	0.03	0.00
27	0.03	0.00
36	0.04	0.00
32	0.03	0.00
36	0.04	0.00
31	0.03	0.00
30	0.03	0.00
24	0.02	0.00
26	0.03	0.00
29	0.03	0.00
26	0.03	0.00
27	0.03	0.00
26	0.03	0.00
32	0.03	0.00
25	0.03	0.00
26	0.03	0.00

27	0.03	0.00
28	0.03	0.00
32	0.03	0.00
28	0.03	0.00
29	0.03	0.00
31	0.03	0.00
26	0.03	0.00
30	0.03	0.00
31	0.03	0.00
30	0.03	0.00
27	0.03	0.00
25	0.03	0.00
30	0.03	0.00
29	0.03	0.00

10 19:08:20 12:38:00 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
ew10		
23	0.02	0.00
24	0.02	0.00
29	0.03	0.00
32	0.03	0.00
32	0.03	0.00
22	0.02	0.00
28	0.03	0.00
30	0.03	0.00
28	0.03	0.00
21	0.02	0.00
24	0.02	0.00
30	0.03	0.00
29	0.03	0.00
34	0.03	0.00
24	0.02	0.00
22	0.02	0.00
26	0.03	0.00
33	0.03	0.00
28	0.03	0.00
30	0.03	0.00
27	0.03	0.00
34	0.03	0.00
28	0.03	0.00
35	0.04	0.00
39	0.04	0.00
71	0.07	0.03
89	0.09	0.05
100	0.10	0.06
106	0.11	0.07
50	0.05	0.01
38	0.04	0.00
25	0.03	0.00
33	0.03	0.00
30	0.03	0.00

27	0.03	0.00
24	0.02	0.00
39	0.04	0.00
38	0.04	0.00

11 19:08:20 12:40:03 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
ew11		
58	0.06	0.02
52	0.05	0.01
45	0.05	0.00
31	0.03	0.00
35	0.04	0.00
29	0.03	0.00
25	0.03	0.00
25	0.03	0.00
23	0.02	0.00
31	0.03	0.00
28	0.03	0.00
36	0.04	0.00
32	0.03	0.00
28	0.03	0.00
32	0.03	0.00
22	0.02	0.00
26	0.03	0.00
35	0.04	0.00
29	0.03	0.00
29	0.03	0.00
29	0.03	0.00
29	0.03	0.00
27	0.03	0.00
29	0.03	0.00
27	0.03	0.00
32	0.03	0.00
30	0.03	0.00
41	0.04	0.00
38	0.04	0.00
47	0.05	0.01
54	0.05	0.01
79	0.08	0.04
72	0.07	0.03
60	0.06	0.02
67	0.07	0.03
89	0.09	0.05
96	0.10	0.06
101	0.10	0.06
106	0.11	0.07
90	0.09	0.05
67	0.07	0.03
44	0.04	0.00
38	0.04	0.00
40	0.04	0.00

39	0.04	0.00	28	0.03	0.00
33	0.03	0.00	22	0.02	0.00
45	0.05	0.00	27	0.03	0.00
59	0.06	0.02	22	0.02	0.00
41	0.04	0.00	27	0.03	0.00
44	0.04	0.00	23	0.02	0.00
36	0.04	0.00	19	0.02	0.00
37	0.04	0.00	23	0.02	0.00
52	0.05	0.01	26	0.03	0.00
50	0.05	0.01	27	0.03	0.00
48	0.05	0.01	29	0.03	0.00
41	0.04	0.00	33	0.03	0.00
38	0.04	0.00	20	0.02	0.00
36	0.04	0.00	35	0.04	0.00
41	0.04	0.00	26	0.03	0.00
39	0.04	0.00	30	0.03	0.00
37	0.04	0.00	33	0.03	0.00
35	0.04	0.00	27	0.03	0.00
27	0.03	0.00	27	0.03	0.00
27	0.03	0.00	30	0.03	0.00
24	0.02	0.00	29	0.03	0.00
28	0.03	0.00	28	0.03	0.00
24	0.02	0.00	25	0.03	0.00
32	0.03	0.00	29	0.03	0.00
20	0.02	0.00	42	0.04	0.00
29	0.03	0.00	71	0.07	0.03
25	0.03	0.00	97	0.10	0.06
34	0.03	0.00	73	0.07	0.03
22	0.02	0.00	79	0.08	0.04
30	0.03	0.00	91	0.09	0.05
31	0.03	0.00	79	0.08	0.04
34	0.03	0.00	78	0.08	0.04
29	0.03	0.00	76	0.08	0.04
28	0.03	0.00	43	0.04	0.00
31	0.03	0.00	35	0.04	0.00
35	0.04	0.00	31	0.03	0.00
26	0.03	0.00	31	0.03	0.00
31	0.03	0.00	30	0.03	0.00
32	0.03	0.00	29	0.03	0.00
36	0.04	0.00	28	0.03	0.00
32	0.03	0.00	29	0.03	0.00
29	0.03	0.00	25	0.03	0.00
29	0.03	0.00	26	0.03	0.00
31	0.03	0.00	29	0.03	0.00
34	0.03	0.00	23	0.02	0.00
30	0.03	0.00	30	0.03	0.00
30	0.03	0.00			
24	0.02	0.00			
26	0.03	0.00			
22	0.02	0.00	13 19:08:20 12:48:43 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
26	0.03	0.00			
26	0.03	0.00			
19	0.02	0.00			
25	0.03	0.00	ew12		
26	0.03	0.00	31	0.03	0.00
28	0.03	0.00	31	0.03	0.00

29	0.03	0.00
36	0.04	0.00
30	0.03	0.00
30	0.03	0.00
24	0.02	0.00
33	0.03	0.00
22	0.02	0.00
34	0.03	0.00
21	0.02	0.00
20	0.02	0.00
21	0.02	0.00
27	0.03	0.00
26	0.03	0.00
25	0.03	0.00
32	0.03	0.00
21	0.02	0.00
24	0.02	0.00
27	0.03	0.00
24	0.02	0.00
22	0.02	0.00
22	0.02	0.00
19	0.02	0.00
25	0.03	0.00
29	0.03	0.00
24	0.02	0.00
26	0.03	0.00
30	0.03	0.00
26	0.03	0.00
27	0.03	0.00
29	0.03	0.00
26	0.03	0.00
36	0.04	0.00
50	0.05	0.01
67	0.07	0.03
88	0.09	0.05
72	0.07	0.03
67	0.07	0.03
66	0.07	0.03
64	0.06	0.02
44	0.04	0.00
34	0.03	0.00
25	0.03	0.00
25	0.03	0.00
28	0.03	0.00
28	0.03	0.00
36	0.04	0.00
26	0.03	0.00
31	0.03	0.00
25	0.03	0.00
32	0.03	0.00
28	0.03	0.00
28	0.03	0.00
29	0.03	0.00
24	0.02	0.00
24	0.02	0.00
18	0.02	0.00

29	0.03	0.00
24	0.02	0.00
28	0.03	0.00
30	0.03	0.00
24	0.02	0.00
33	0.03	0.00
39	0.04	0.00
35	0.04	0.00
33	0.03	0.00
27	0.03	0.00
23	0.02	0.00
25	0.03	0.00
20	0.02	0.00
23	0.02	0.00
21	0.02	0.00
19	0.02	0.00
23	0.02	0.00
21	0.02	0.00
21	0.02	0.00
25	0.03	0.00
24	0.02	0.00
29	0.03	0.00
23	0.02	0.00
23	0.02	0.00
21	0.02	0.00
21	0.02	0.00
28	0.03	0.00
21	0.02	0.00
18	0.02	0.00
19	0.02	0.00
25	0.03	0.00
28	0.03	0.00
28	0.03	0.00
28	0.03	0.00
27	0.03	0.00
22	0.02	0.00
23	0.02	0.00
23	0.02	0.00
24	0.02	0.00
28	0.03	0.00
24	0.02	0.00
23	0.02	0.00
24	0.02	0.00
21	0.02	0.00
25	0.03	0.00
24	0.02	0.00
27	0.03	0.00
21	0.02	0.00
23	0.02	0.00
31	0.03	0.00
16	0.02	0.00
22	0.02	0.00
30	0.03	0.00
31	0.03	0.00
27	0.03	0.00
34	0.03	0.00

31	0.03	0.00
31	0.03	0.00
37	0.04	0.00
32	0.03	0.00
23	0.02	0.00
25	0.03	0.00
20	0.02	0.00
23	0.02	0.00
18	0.02	0.00
25	0.03	0.00
14	0.01	0.00
21	0.02	0.00
17	0.02	0.00
21	0.02	0.00
24	0.02	0.00
23	0.02	0.00
25	0.03	0.00
29	0.03	0.00
22	0.02	0.00
26	0.03	0.00
31	0.03	0.00
34	0.03	0.00
24	0.02	0.00
31	0.03	0.00
26	0.03	0.00
36	0.04	0.00
34	0.03	0.00
42	0.04	0.00
32	0.03	0.00
29	0.03	0.00
30	0.03	0.00
22	0.02	0.00
28	0.03	0.00
27	0.03	0.00
29	0.03	0.00
29	0.03	0.00
34	0.03	0.00
31	0.03	0.00
29	0.03	0.00
23	0.02	0.00
23	0.02	0.00
28	0.03	0.00
22	0.02	0.00
30	0.03	0.00
29	0.03	0.00
30	0.03	0.00
29	0.03	0.00
37	0.04	0.00
31	0.03	0.00
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15 19:08:20 12:56:18 cps Live time (s) 2.00	cps to micro Sv/h	solar correction
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APPENDIX 3 WHS Risk Assessment

Consequence	Likelihood: Unlikely	Possible	Likely	Almost Certain
Catastrophic *Eg. Kill or Permanently Maim*	MEDIUM	HIGH	EXTREME	EXTREME
Major *Eg. Long term Injury or Illness*	MEDIUM	MEDIUM	HIGH	EXTREME
Moderate *Eg. Medical Attention with several days off work*	LOW	MEDIUM	MEDIUM	HIGH
Minor *Eg. First Aid Needed*	LOW	LOW	MEDIUM	MEDIUM

Summary of Requirements

Personal Protective Equipment	Broad rimmed hat, long sleeve cotton shirt with good sun protection and comfort, comfortable long pants, solid work/walking shoes, sun glasses, insect repellent, sun screen,
Training	Bush craft and field work
Equipment	Clothing, water containers, snacks, pocket knife, communication device(s) [mobile phone with good signal], measurement equipment, camera, first aid kit
Relevant Legislation etc.	NSW Work Health and Safety
Review	During the measurement survey

Hazard Identification		Control		Risk Assessment
What are the steps of the activity / items of equipment	**What are the potential hazards**	**What methods will be used to reduce the likelihood and/or the consequence of an illness or injury from those hazards**	**What hazard remains**	**What is the level of risk remaining based on the Risk Assessment matrix**
Vehicular travel to and from site	Vehicular accident	Trucking Road Safety Protocols	Accident due to other person's misadventure	Medium
Sun exposure	Sun burn, melanoma, heat stroke	Long sleeve shirts, long pants, hat and sun screen	Heat exhaustion and possible sun exposure due to reflection	Low
Slip, trip and fall	broken limbs, vegetative impalement, unconsciousness, lack of rescue	Care in walking, avoiding areas of greatest concern, use of remote communication device(s)	Small possibility of trip	Medium

Snake bite	Severe medical reaction, hospitalisation, death	Not working at a time of greatest snake activity, avoiding areas of greatest vegetative density and risk, appropriate clothing	Small possibility of interacting with a snake	Medium
Insect bite	Itches, medical reaction, allergy, pathogens	Long sleeve shirts, long pants, hat and insect repellent	Small possibility of insect bite	Medium
Tick problems	Pathogens and diseases, discomfort, hospitalisation	Long sleeve shirts, long pants, hat and insect repellent, avoiding dense vegetation areas; continual vigilance and end of day body check	There still remains the possibility of tick infestation	Medium
Vegetation (cuts, scratches and reactions)	Scratches, bleeding, infections, reaction to vegetation materials	Long sleeve shirts, long pants, hat and avoiding dense vegetation areas	Slight possibility of all the problems listed	Medium
Dehydration	Unconsciousness, loss of normal body function(s)	Carrying and drinking sufficient drinking water as is needed	Slight chance of dehydration	Low
Disorientation (geographical misplacement)	All of the above hazards (except vehicle travel)	Use of GPS and ensuring a good supply of batteries.	none	Low
Falling Branches	Injury, unconsciousness, death	Vegetation and tree awareness; avoiding as much as is possible locations of greatest hazard	unlikely	Low

APPENDIX 4 Exploranium Calibration Certificate

Queensland Government

Forensic and Scientific Services

HealthSupport Queensland

CERTIFICATE OF CALIBRATION

CLIENT: Inmed Healthcare Pty. Ltd.
45 Prime Drive
Seven Hills NSW 2147

ATTN: Bronte Hoban

Laboratory Reference:	18030077
Client Order Number:	n/a
Quote Number:	emailed
Date Received:	21/03/2018
Date Commenced:	24/03/2018
Laboratory Number/s:	17PX286

INSTRUMENT DESCRIPTION

	Instrument	Detector
Manufacturer:	SAIC Exploranium	-
Model:	GR130	-
Serial Number:	9940+GM	-
Type :	NaI + GM	-

PRE CALIBRATION CHECKS

Visual Inspection:	Check performed adequately on receipt, during and after the calibration process.
Battery Check:	Check performed adequately on receipt, during and after the calibration process.
High/Low Voltage:	N/A
Self-diagnosis system:	N/A
Desiccant condition:	N/A
Mechanical zero:	No adjustment was necessary.
Check Source Reading:	No check source was supplied.
Background/Leakage:	All calibration measurements were adjusted to take into account the background radiation levels.

CALIBRATION CONDITIONS

Detector Reference Point:	The effective measurement point was taken to be the centre of the detector volume.
Instrument Orientation:	The instrument was orientated so that the radiation beam was normally incident to the detector axis.

ATMOSPHERIC CONDITIONS

Dry Bulb Temperature:	22.6 °C
Relative Humidity:	64 %
Atmospheric Pressure:	1018.7 hPa (764 mm Hg)
Height Above Sea Level:	32.4 m

Enquiries: Principal Health Physicist
Phone (+61) 7 3096 2901
Email ross.kleinschmidt@health.qld.gov.au
39 Kessels Road, Coopers Plains QLD 4108, AUSTRALIA
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Email FSS-RadiationScience@health.qld.gov.au

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CALIBRATION TRACEABILITY

The exposure and air kerma rates from the Australian Radiation Protection and Nuclear Agency (ARPANSA) Gamma Radiation Irradiator, serial number 007, utilising radioactive sources are traceable to the Australian primary standard of exposure. Air kerma rate was converted to tissue equivalent dose using a factor of Sv/Gy = 1.21 for caesium-137 at 0.662Mev (ICRP Publication 74, 1995).

Nuclide	Emission	Serial Number	Nominal Activity (GBq)	Reference Date
Caesium-137	0.662 MeV gamma	1192GN	0.037	01-July-1984
Caesium-137	0.662 MeV gamma	0892GN	0.37	01-July-1984
Caesium-137	0.662 MeV gamma	1194GN	3.7	01-July-1984
Caesium-137	0.662 MeV gamma	1085GN	37	01-July-1984

CALIBRATION RESULTS - RATE MODE

Range	Expected exposure rate (µSv/h)	Average Instrument Reading (µSv/h)	Uncertainty (%)	Variation (%)	Calibration Factor
Background		0.15	5.4%	-	-
auto	0.50	0.52	1.8%	3.7%	0.96
auto	1.00	0.98	0.5%	-2.5%	1.03
auto	2.01	1.94	0.5%	-3.6%	1.04
auto	5.02	4.97	0.8%	-1.0%	1.01
auto	10.05	9.67	0.4%	-3.7%	1.04
auto	30.17	26.37	0.3%	-12.6%	1.14
auto	502.16	519.85	1.4%	3.5%	0.97
auto	1004.50	1061.85	1.0%	5.7%	0.95
auto	2011.01	2025.85	0.7%	0.7%	0.99
auto	4016.59	3859.85	0.6%	-3.9%	1.04

CALIBRATION RESULTS - INTEGRATE MODE

Range	Expected exposure (µSv)	Instrument Reading (µSv)	Integration Time (min)	Variation (%)	Calibration Factor
Background		0.00	6		
auto	0.50	0.51	6	1.3%	0.99
auto	1.00	0.97	6	-3.5%	1.04
auto	50.22	50.00	6	-0.4%	1.00
auto	100.45	100.00	6	-0.4%	1.00
auto	401.66	380.00	6	-5.4%	1.06

Enquiries: Principal Health Physicist 39 Kessels Road PO Box 594 Phone (+61 7) 3096 2900
Phone (+61) 7 3096 2901 Coopers Plains QLD 4108 Archerfield QLD 4108 Fax (+61 7) 3096 2913
Email ross.kleinschmidt@health.qld.gov.au AUSTRALIA AUSTRALIA Email FSS.RadiationScience@health.qld.gov.au

COMMENTS

Over-Range Response:	This instrument continued to indicate full scale under high exposure levels.
Energy Dependence Factors:	The response of the instrument was tested for caesium-137 (0.662 MeV) only. For radiation emissions other than 0.662 Mev energy response correction, factors should be determined from the manufacturer-supplied energy response data.
Accuracy:	For the calibration of an instrument of this type, the accuracy is dependent of the laboratory measurements, the accuracy of the intercomparison transfer standard and the stability of the instrument being calibrated. The result for this calibration can be considered reliable to within 20%.
General:	Higher exposure should be measured by side of detector where GM tube is located.

NEXT CALIBRATION DUE **25 March 2019**

PERFORMED BY

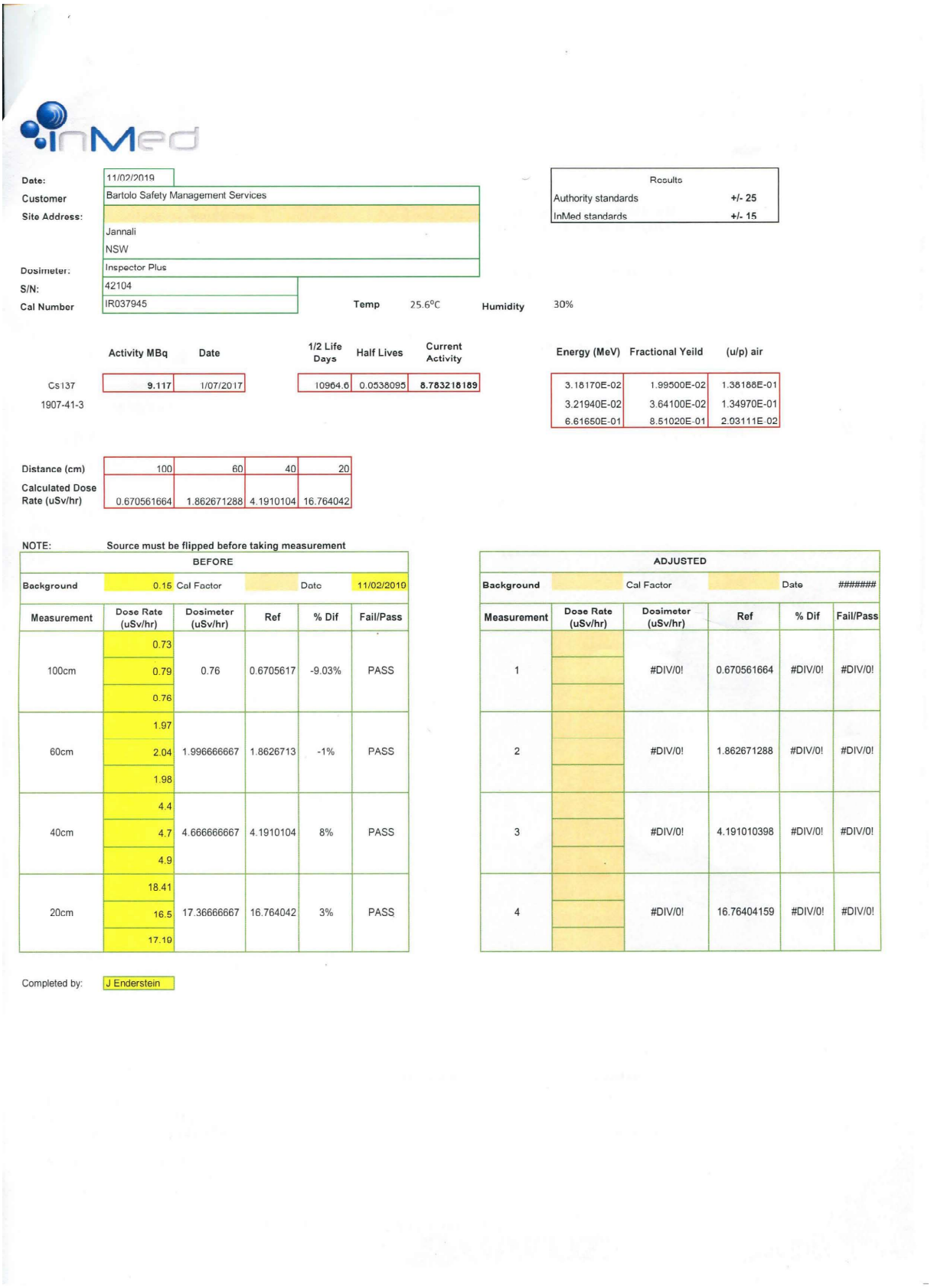
Pushpendra Chauhan
Health Physicist
Radiation & Nuclear Science
26-Mar-18

REVIEWED BY

for Ross Kleinschmidt
Principal Health Physicist
Radiation & Nuclear Science

Enquiries: Principal Health Physicist 39 Kessels Road PO Box 594 Phone (+61 7) 3096 2900
Phone (+61) 7 3096 2901 Coopers Plains QLD 4108 Archerfield QLD 4108 Fax (+61 7) 3096 2913
Email ross.kleinschmidt@health.qld.gov.au AUSTRALIA AUSTRALIA Email FSS-RadiationScience@health.qld.gov.au

APPENDIX 5 SEI RadAlert Calibration Certificate



Date:	11/02/2019
Customer	Bartolo Safety Management Services
Site Address:	Jannali NSW
Dosimeter:	Inspector Plus
S/N:	42104
Cal Number	IR037945

Temp 25.6°C Humidity 30%

Results	
Authority standards	+/- 25
InMed standards	+/- 15

	Activity MBq	Date	1/2 Life Days	Half Lives	Current Activity	Energy (MeV)	Fractional Yeild	(u/p) air
Cs137	9.117	1/07/2017	10964.6	0.0538095	8.783218189	3.18170E-02	1.99500E-02	1.38188E-01
1907-41-3						3.21940E-02	3.64100E-02	1.34970E-01
						6.61650E-01	8.51020E-01	2.03111E-02

Distance (cm)	100	60	40	20
Calculated Dose Rate (uSv/hr)	0.670561664	1.862671288	4.1910104	16.764042

NOTE: Source must be flipped before taking measurement

BEFORE

Background 0.15 Cal Factor Date 11/02/2019

Measurement	Dose Rate (uSv/hr)	Dosimeter (uSv/hr)	Ref	% Dif	Fail/Pass
100cm	0.73	0.76	0.6705617	-9.03%	PASS
	0.79				
	0.76				
60cm	1.97	1.996666667	1.8626713	-1%	PASS
	2.04				
	1.98				
40cm	4.4	4.666666667	4.1910104	8%	PASS
	4.7				
	4.9				
20cm	18.41	17.36666667	16.764042	3%	PASS
	16.5				
	17.19				

ADJUSTED

Background Cal Factor Date ########

Measurement	Dose Rate (uSv/hr)	Dosimeter (uSv/hr)	Ref	% Dif	Fail/Pass
1		#DIV/0!	0.670561664	#DIV/0!	#DIV/0!
2		#DIV/0!	1.862671288	#DIV/0!	#DIV/0!
3		#DIV/0!	4.191010398	#DIV/0!	#DIV/0!
4		#DIV/0!	16.76404159	#DIV/0!	#DIV/0!

Completed by: J Enderstein

APPENDIX 9. HOLLOWS INSPECTION LETTER

Kleinfelder Australia Pty Ltd
95 Mitchell Road
CARDIFF NSW 2285
T| +61 2 4949 5200
www.kleinfelder.com.au
ABN: 23 146 082 500
NEWCASTLE OFFICE

31 October 2019
File Ref: 20190803_CabbageTreeRdQuarry_Sept_Oct2019_HollowRemoval_V1.docx
Document Ref: 20190803_Sept_Oct_2019HollowRemoval

Construction Manager
Newcastle Sand Pty Ltd
282 Cabbage Tree Rd,
Williamtown NSW 2318

Attention: Paul Bourne
Delivered by email: paul@newcastlesand.com.au

Subject: Habitat Tree Removal at the Cabbage Tree Road Sand Quarry

This letter provides a summary of habitat tree removal supervision works undertaken at the Cabbage Tree Road Sand Quarry, located at Lot 1 Deposited Plan (DP), Lot 121 DP 556403 Lot 11 DP 629503, and Lot 1012 DP 814078, 282B Cabbage Tree Road, Williamtown.

Removal of habitat trees were undertaken over a period of two days, 3 September and 14 October 2019. The following sections provide a summary of works undertaken on these dates.

1. 3 SEPTEMBER 2019

Two Kleinfelder ecologists attended the Cabbage Tree Road Sand Quarry on 3 September 2019, with one tasked with supervising the removal of hollow bearing trees within the 'infrastructure construction' area (see **Figure 1**).

Hollow bearing trees slated for removal were inspected prior to felling, with Tree 213 (*Angophora costata*) and Tree 215 (Dead Stag) identified within the clearing area footprint. Tree 238 (*Eucalyptus robusta*) was not initially identified, however it was noted by the supervising ecologist that a bushfire had burnt the survey area in January 2018, occurring after the hollow-bearing tree survey was undertaken (May 2016). In the absence of a *Eucalyptus robusta* containing two large hollows in the area where Tree 238 was marked to occur, a wide burnt out stag stump (height approximately 3 m) was determined to likely constitute Tree 238 (see **Photograph 1**). This stag was outside the clearing footprint and thus not cleared on this date.

Tree 242 was felled prior to ecologist arrival onsite. Tree 242 was previously verified as containing one small hollow.

The removal of Tree 213 and Tree 215 was undertaken under the supervision of the Kleinfelder ecologist. No fauna were present within the two small hollows of Tree 213 or two small hollows of Tree 215.

2. 14 OCTOBER 2019

One Kleinfelder ecologist attended the Cabbage Tree Sand Quarry the remove an additional hollow bearing tree and two non-hollow bearing trees within the remaining extent of the 'infrastructure construction' area as shown on **Figure 1**.

The hollow-bearing tree (Tree 214 on **Figure 1,** see **Photograph 2**) was inspected by the supervising ecologist prior felling, with one hollow within a dead limb identified. A second dead limb with potential to contain a hollow was also identified.

The felling of Tree 214 was undertaken using a 20 tonne excavator. Prior to felling Tree 214 was nudged using the excavator to stir any fauna that may be resting within the hollow(s) within the tree. No fauna were identified and Tree 214 was subsequently felled using the excavator.

On-ground inspection of Tree 214 identified one small hollow with no fauna inside (see **Photograph 3**). No further hollows within Tree 214 were identified during the on-ground inspection (**Photograph 4**).

Nearby non-hollow bearing trees were retained as their position and lean presented too much a risk of falling within retained vegetation areas west of the clearing footprint if felled using an excavator alone. One dead stag containing hollows (Tree 215) was identified on the ground on the edge of the protected area (see **Photograph 5**).

3. COMPENSATORY HABITAT INSTALLATION

In order to offset the removal of Tree 213 (two small hollows), Tree 214 (one small hollow), Tree 215 (two small hollows) and Tree 242 (one small hollow) the following nestboxes will be sourced from Hollow Log Homes for installation as compensatory habitat:

- Three Small Parrot nestboxes.
- Three Sugar / Squirrel Glider front entry nestboxes.

Nest box installation will occur as per Section 6.15 of the Cabbage Tree Road Sand Quarry Biodiversity Management Plan, following the below procedure:

- Nestboxes will be installed within protected vegetation areas onsite.
- Nestboxes will be installed to a minimum three (3) m height above ground.
- Nestboxes will be installed so as to not directly face towards the quarry extraction areas, ideally facing towards the south, shielded from sunlight by the tree trunk. Nest box installation will also account for exposure to night-time light sources and the predominant aspects of severe storms.
- Nestboxes will be installed using the Habisure system (or equivalent), utilising a hose pipe (or similar) to protect host trees from nest box wires.
- The following information will be recorded during the installation of nestboxes:
    - Nest box Number.
    - Nest box Type (i.e. salvaged hollow, artificial).
    - Target species.
    - GPS location.
    - Nest box height and orientation.
    - If installed on existing tree – tree species and diameter at breast height (DBH).

4. CONCLUSION

In summary, vegetation works conducted at the Cabbage Tree Road Sand Quarry required the removal of four hollow-bearing trees (Trees 213, 214, 215 and 242), requiring the offset of six small hollows.

No fauna were injured during hollow bearing tree removal works.

Please do not hesitate to contact me using the contact details provided below if you have any further questions. Please see **Attachment 2** for limitations applying to this letter.

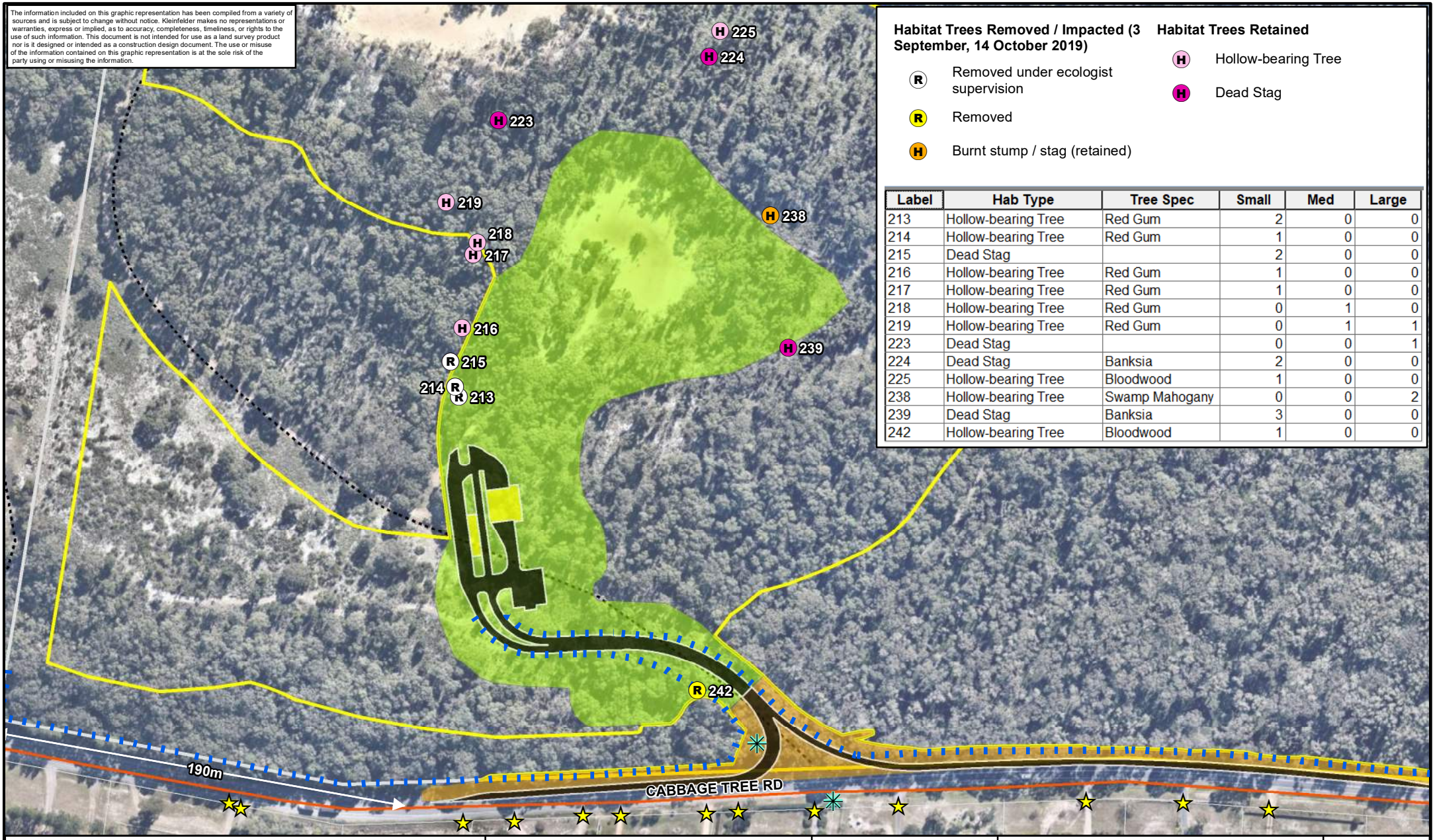
Sincerely,

Kleinfelder Australia Pty Ltd

Brad Deane B.BioCons, M.WldMgt

Environmental Consultant / Ecologist
Environmental Management, Approvals & Compliance
bdeane@kleinfelder.com

Mobile: 0411 293 242



Habitat Trees Removed / Impacted (3 September, 14 October 2019)

- R — Removed under ecologist supervision
- R — Removed
- H — Burnt stump / stag (retained)

Habitat Trees Retained

- H — Hollow-bearing Tree
- H — Dead Stag

Label	Hab Type	Tree Spec	Small	Med	Large
213	Hollow-bearing Tree	Red Gum	2	0	0
214	Hollow-bearing Tree	Red Gum	1	0	0
215	Dead Stag		2	0	0
216	Hollow-bearing Tree	Red Gum	1	0	0
217	Hollow-bearing Tree	Red Gum	1	0	0
218	Hollow-bearing Tree	Red Gum	0	1	0
219	Hollow-bearing Tree	Red Gum	0	1	1
223	Dead Stag		0	0	1
224	Dead Stag	Banksia	2	0	0
225	Hollow-bearing Tree	Bloodwood	1	0	0
238	Hollow-bearing Tree	Swamp Mahogany	0	0	2
239	Dead Stag	Banksia	3	0	0
242	Hollow-bearing Tree	Bloodwood	1	0	0

Legend

- Project Area Boundary
- Infrastructure Construction
- Intersection Construction
- Office and Workshop
- Sealed Road
- Subject Land Boundary
- Lot boundaries
- 1.2m Koala Exclusion Fence
- Arterial Road
- Track
- Street Lighting
- Potential for Change in Traffic Conditions
- Receptor

Metres
0 10 20 40 60 80 100

N

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PROJECT REFERENCE: 20190803
DATE DRAWN: 31/10/2019 12:15 Version 1
DRAWN BY: BDeane
DATA SOURCE:
NSW DFSI - 2018
Nearmap - 2019

Hollow-bearing Tree Removal

Cabbage Tree Road Sand Quarry
Cabbage Tree Road, Williamtown, NSW

FIGURE:
1

L:\GIS FOLDER\00 CLIENT FILES\126863_TrusteeForWSS_UnitTrust\20170448_Williamtown\Mapping\20193526_D20190903_20191014_HollowRemoval.mxd

ATTACHMENT 1: SITE PHOTOGRAPHS

Photograph 1: Burnt out tree determined likely to constitute Tree 238

Photograph 2: Hollow limb within Tree 214

Photograph 3: Small hollow limb being inspected following felling of Tree 214

Photograph 4: Tree 214 on ground following felling

Photograph 5: Dead stag (Tree 215) on ground

ATTACHMENT 2: STATEMENT OF LIMITATIONS

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This work was performed in a manner consistent with that level of care and skill ordinarily exercised by other members of Kleinfelder's profession practicing in the same locality, under similar conditions and at the date the services are provided. Our conclusions, opinions, and recommendations are based on a limited number of observations and data. It is possible that conditions could vary between or beyond the data evaluated. Kleinfelder makes no other representation, guarantee, or warranty, express or implied, regarding the services, communication (oral or written), report, opinion, or instrument of service provided.

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The findings and conclusions contained within this report are relevant to the conditions of the site and the state of legislation currently enacted in the relevant jurisdiction in which the site is located as at the date of this report.

Additionally, the findings and conclusions contained within this report are made following a review of certain information, reports, correspondence and data noted by methods described in this report including information supplied by the client or its assigns. Kleinfelder has designed and managed the program for this report in good faith and in a manner that seeks to confirm the information provided and test its accuracy and completeness. However, Kleinfelder does not provide guarantees or assurances regarding the accuracy, completeness and validity of information and data obtained from these sources and accepts no responsibility for errors or omissions arising from relying on data or conclusions obtained from these sources.

Any representation, statement, opinion or advice expressed or implied in this report is made on the basis that Kleinfelder, its agents and employees are not liable to any other person taking or not taking (as the case may be) action in respect of any representation, statement, opinion or advice referred to above.

APPENDIX 10. DPIE CORRESPONDANCE

Rob Townsend

From: adam blundell <adamtblundell@gmail.com>
Sent: Wednesday, 25 March 2020 5:01 PM
To: Rob Townsend
Subject: Fwd: Cabbage Tree Rd Sand Quarry - complaint - construction hours

External Email.

Sent from my iPhone

Begin forwarded message:

> **From:** Ann Hagerthy <Ann.Hagerthy@planning.nsw.gov.au>
> **Date:** 18 March 2020 at 3:23:33 pm AEDT
> **To:** Darren Williams <darren@arbus.com.au>
> **Cc:** "adamtblundell@gmail.com" <adamtblundell@gmail.com>, Paul Bourne <Paul@newcastlesand.com.au>, Heidi Watters <Heidi.Watters@Planning.nsw.gov.au>
> **Subject: RE: Cabbage Tree Rd Sand Quarry - complaint - construction hours**
>
> Hi Darren,
>
> Thanks for submitting the information. The Department can confirm that no breach has been identified.
>
> Regards,
>
> **Ann Hagerthy**
> **Senior Compliance Officer**
>
> (Mon-Thu)
> Planning & Assessment - Compliance | Department of Planning, Industry and Environment
> **T** 02 6575 3407 | **M** 0428 976 540| **E** ann.hagerthy@planning.nsw.gov.au
> PO Box 3145 | Singleton NSW 2330
>
> *Please direct all email correspondence to compliance@planning.nsw.gov.au*
>
> www.dpie.nsw.gov.au
>
> *The Department of Planning, Industry and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.*

From: Darren Williams <darren@newcastlesand.com.au>
Sent: Monday, 20 January 2020 12:48 PM

To: Ann Hagerthy <Ann.Hagerthy@planning.nsw.gov.au>
Cc: adam blundell <adamtblundell@gmail.com>; Paul Bourne <Paul@newcastlesand.com.au>
Subject: RE: Cabbage Tree Rd Sand Quarry - complaint - construction hours

Ann,

Please see the attached response to your email 9.1.20.

As discussed we treat compliance and impact on our neighbours very serious and get good feed back from the vast majority of neighbours who we engage with since being on site, and prior.

The complaint about the pick up on the 27th August 2019 (5 months ago) was raised and addressed at the last CCC meeting see minutes attached.

We would encourage people to contact us promptly should a matter arises so it can be addressed or responded to equally as promptly. In doing so non-events or perceived issues can be eliminated and not compound.

Regards,

Darren Williams
General Manager

NEWCASTLE SAND

Suite 2i Building 9, 54 Clyde Street, Hamilton North NSW 22923
P.O Box 186, Waratah NSW 2298
M 0429 877 704 **E** darren@newcastlesand.com.au
www.newcastlesand.com.au

From: Ann Hagerthy <Ann.Hagerthy@planning.nsw.gov.au>
Sent: Thursday, 9 January 2020 5:27 PM
To: Darren Williams <darren@arbus.com.au>
Cc: adamtblundell@gmail.com; Heidi Watters <Heidi.Watters@Planning.nsw.gov.au>
Subject: Cabbage Tree Rd Sand Quarry - complaint - construction hours

Hi Darren,

The Department received a complaint in relation to construction activities occurring outside approved construction hours, at Cabbage Tree Road Sand Quarry. Can you please provide the following information and records by 20 January 2020:

- Employee and contractor work logs;

- Sign in/out sheets;
- Truck logs;
- Inspection logs; and
- A description of the works undertaken;

to demonstrate all works that occurred on site during the following days:

- Tuesday 27th Aug 5.40am arrival,
- Saturday 7th Sept 3.30pm departure
- Sunday 8th Sept 9.30am arrival, 12pm departure
- Friday 27th Sept, 5.40am arrival
- Sunday 20th Oct working all day depart 5pm
- Saturday 26th Oct arrival 6.15am depart 5.30pm
- Sunday 10th Nov working all morning
- Sunday 17th Nov working all morning

This is an informal request for information and records. You do not have to provide the information or records requested and, if you do so, they may be used in evidence. The Department has powers to require information and records under the Act and may decide to exercise those powers if you do not provide the information and records as requested.

Regards,

Ann Hagerthy
A/Team Leader

(Mon-Thu)
Planning & Assessment - Compliance | Department of Planning, Industry and Environment
T 02 6575 3407 | **M** 0428 976 540| **E** ann.hagerthy@planning.nsw.gov.au
PO Box 3145 | Singleton NSW 2330

Please direct all email correspondence to compliance@planning.nsw.gov.au

www.dpie.nsw.gov.au

The Department of Planning, Industry and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

NEWCASTLE SAND

APPENDIX 11. CONSTRUCTION NOISE MONITORING REPORT

28 February 2020

Ref: 161267/8876

Williamtown Sand Syndicate Pty Ltd
Cabbage Tree Road Sand Quarry
Cabbage Tree Road
WILLIAMTOWN NSW 2318

RE: CONSTRUCTION NOISE MONITORING RESULTS – NEWCASTLE SANDS

This letter report presents the results of plant noise and operational noise compliance monitoring conducted for the Cabbage Tree Road Sand Quarry (CTSQ) at Cabbage Tree Road Williamtown during the period November 2019 – February 2020.

OPERATIONAL NOISE

Noise Limits

Operational noise limits for the quarry are contained in Condition 3, Schedule 3 of Development Consent SSD-6125 issued on 9 May 2018:

Noise Impact Assessment Criteria
The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 2 at any residence on privately-owned land.

Table 2: Noise criteria dB(A)

Receiver	***Day*** $L_{Aeq\ (15\ minute)}$	***Shoulder*** $L_{Aeq\ (15\ minute)}$	***Shoulder*** $L_{Amax\ (1\ minute)}$
Any residence on privately owned land	43	39	45

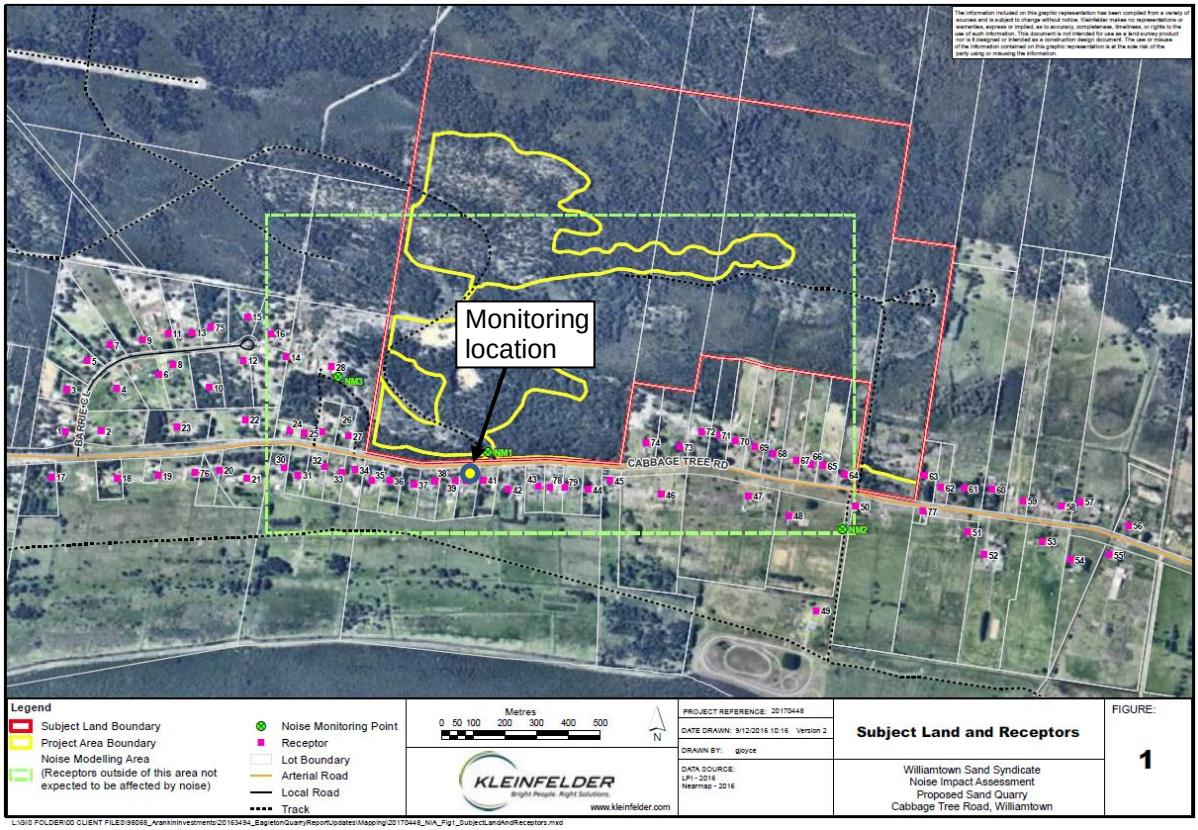
In this condition, 'the development' excludes road construction activities associated with the intersection of the quarry access road and Cabbage Tree Road and vegetation clearing operations within the Southern Resource Area (see condition 4 below).

Noise generated by the development is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NPI. Appendix 5 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

The criteria in Table 2 do not apply if the Applicant has an agreement with relevant landowner/s to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.

Monitoring Locations

Noise monitoring was conducted in the front yard of the residence identified as R40 in **Figure 1**. This location is representative of the potentially worst impacted residences from constructions activities near the site entrance.



Noise Monitoring Procedure

Noise emission levels were measured with a Brüel & Kjær Type 2250 Precision Sound Analyser. This instrument has Type 1 characteristics as defined in AS1259-1982 “Sound Level Meters”. Calibration of the instrument was confirmed with a Brüel & Kjær Type 4231 Sound Level Calibrator prior to and at the completion of measurements. A calibration certificate is attached to this report.

Operating conditions

Operation conditions and site activities during the noise surveys have been provided by the operator as follows:

23/11/2019

- Water cart in use.

18/12/2019

- Placing Signs and Posts on Cabbage Tree Road.
- Placing concrete barriers on Cabbage Tree Road.

22/01/2020

- Box out subgrade CH 630-530.
- Completing water main testing.

12/02/2020

- Place DGB 20 on intersection.
- Box out retaining wall footing.

Measured Noise Levels

Table 1 shows summarises the measured noise levels and contributing noise sources.

Table 1. CTSQ Construction Noise Monitoring Results

Location	Date	Time	dB(A), Leq	CTSQ Contribution dB(A), Leq	Criterion dB(A) Leq	Identified Noise Sources
R40	23/11/19	1:04 pm	59	35	43	Traffic (59), **CTSQ (35)**
R40	18/12/19	12:30 pm	61	25	43	Traffic (61), wind (41), **CTSQ (25)**
R40	22/01/20	1:31 PM	62	30	43	Traffic (62), wind (41), **CTSQ (30)**
R40	12/02/20	10:34 AM	68	<30	43	Traffic (68), **CTSQ (<30)**

Noise emission attributed to CTSQ were due to reverse alarms on mobile plant with some contribution from engine revs. The results in Table 1 demonstrate compliance with the noise emission criterion.

I trust this report fulfils your requirements at this time, however, should you require additional information or assistance please contact the undersigned on 4954 2276.

Yours faithfully,

SPECTRUM ACOUSTICS PTY LIMITED

Neil Pennington

Acoustical Consultant

B.Sc.(Physics), B.Math.(Hons)
Member, Australian Institute of Physics
Member, Australian Acoustical Society
Member, Acoustical Society of America

Brüel & Kjær

Australian Calibration Laboratory
Suite 2, 6-10 Talavera Road, North Ryde NSW 2113, Australia
Accredited for compliance with ISO/IEC 17025 - Calibration. Laboratory No. 1301

NATA
WORLD RECOGNISED ACCREDITATION

CERTIFICATE OF CALIBRATION

Certificate No: CAU1800652 Page 1 of 10

CALIBRATION OF:

Sound Level Meter:	Bruel & Kjaer	2250	No: 2747794
Microphone:	Bruel & Kjaer	4189	No: 2733511
Preamplifier:	Bruel & Kjaer	ZC-0032	No: 15339
Supplied Calibrator:	N/A	N/A	No: N/A
Software version:	BZ7224 Version 4.6	Pattern Approval:	PTB
Instruction manual:	BE1712-22	Identification:	N/A

CUSTOMER:

Spectrum Acoustics Pty Ltd
30 Veronica Street
Cardiff NSW 2285

CALIBRATION CONDITIONS:

Preconditioning:	4 hours at 23 °C
Environment conditions:	*see actual values in **Environmental conditions** sections*

SPECIFICATIONS:

The Sound Level Meter has been calibrated in accordance with the requirements as specified in IEC61672-1:2013 class 1. Procedures from IEC 61672-3:2013 were used to perform the periodic tests.

PROCEDURE:

The measurements have been performed with the assistance of Brüel & Kjær Sound Level Meter Calibration System B&K 3630 with application software type 7763 (version 7.2 - DB: 7.20) and test procedure 2250-4189.

RESULTS:

	Initial calibration		Calibration prior to repair/adjustment
X	Calibration without repair/adjustment		Calibration after repair/adjustment

The reported expanded uncertainty is based on the standard uncertainty multiplied by a coverage factor $k = 2$ providing a level of confidence of approximately 95 %. The uncertainty evaluation has been carried out in accordance with EA-4/02 from elements originating from the standards, calibration method, effect of environmental conditions and any short time contribution from the device under calibration.

Date of Calibration: 25/06/2018

Sajeeb Tharayil
Calibration Technician

Certificate issued: 26/06/2018

Jan Rasmussen
Approved signatory

NEWCASTLE SAND

APPENDIX 12. PFAS EXPOSURE PATHWAYS REVIEW

Kleinfelder Australia Pty Ltd
ABN: 23 146 082 500
Level 1, 95 Coventry Street
South Melbourne VIC 3205
T| 03 9907 6000 **F|** 03 9907 6090
www.kleinfelder.com/australia

09 September 2020

20204045.001/Williamtown Sand Syndicate/MLB109272

Williamtown sand Syndicate
PO Box 898
Newcastle, NSW 2300

Attention: Darren Williams

Email: darren@newcastlesand.com.au

Subject: **Draft Williamtown Sand Syndicate – Review of Per- and Polyfluoroalkyl Substances Exposure Pathways**
298 Cabbage Tree Road, Williamtown, New South Wales, 2318

Williamtown Sand Syndicate (WSS) are required to engage an independent expert to undertake a review of the available data and determine if quarrying activities are increasing the potential per- and polyfluoroalkyl substances (PFAS) exposure to local residents derived from the Department of Defence (DoD) Williamtown Royal Australian Air Force (RAAF) Base (hereafter "the Base") associated with the Williamtown Sand Syndicate quarry. PFAS have been identified in sediment, surface water, groundwater and biota (terrestrial and aquatic) within and surrounding the Base.

The WSS quarry is located at 298 Cabbage Tree Road, Williamtown (hereafter "the Site") and is situated partially within the New South Wales Environment Protection Authority (EPA) defined Williamtown Management Area (WMA). The Site is located within the WMA *broader management zone* where PFAS may be identified in the future.

This report forms the requirement of Schedule 3 Condition 48 in Development Consent SSD-6125 which requires an assessment of whether or not quarrying operations are increasing the risk of PFAS exposure for local residents and/or the environment.

Since 2007 the DoD have been investigating the PFAS presence in various media at and surrounding the Base. The investigations have included multiple rounds of soil, sediment, surface water and groundwater sampling within the EPA defined Williamtown Management Area.

Additional off-Base PFAS surface water and groundwater fate and transport models and human and ecological health risk assessments have also been conducted. The human health risk assessment[1] identified four "risk zones" designated as Zones A through D and corresponding with a risk hierarchy such that Zone A is the highest risk and Zone D is the lowest. Part of the Site is situated within the low risk zone C, with the northeastern Site area located outside the defined risk zones.

A review of the available information that includes the Site setting, PFAS sampling and analysis undertaken at the Site and investigations conducted by the DoD at the base and surrounding area leads to the following conclusions:

- PFAS are not present in Site soil, surface water or groundwater.
- PFAS migration from primary or secondary Base sources are unlikely to result in PFAS migrating to the Site.
- The proposed quarry minimum extraction elevations are sufficiently above the maximum observed local water table and comply with conditions set out in the quarry's licence.

The DoD-commissioned human health risk assessment determined that the Site is within risk zone C for PFAS impacts originating from the Base. The risk assessment review compared the upper exposure scenario (i.e., highest concentration) for risk zone C with potential exposures from the quarry and concluded:

- Quarrying operations will not increase the PFAS risk to residents because:
    - PFAS have not been identified in the tested Site media and are unlikely to impact nearby residents at unacceptable levels.
    - The Base PFAS groundwater plumes will not intersect the eastern Site boundary prior to 2050.
    - Quarrying operations may result in the establishment of a groundwater mound; however this is unlikely to change the current groundwater flow regime.

Historical prevailing wind directions and dust mitigation measures undertaken by the quarry will not result in additional PFAS impacts to nearby residents.

[1] AECOM, 2017. Off-site Human Health Risk Assessment. RAAF Base Williamtown, Stage 2B Environmental Investigation

1 INTRODUCTION

As per Schedule 3 Clause 48 of the consent, WSS commissioned a suitably qualified and experienced Independent Expert to undertake a review of DoD and the NSW EPA information regarding PFAS contamination that originated from the Williamtown Royal Australian Air Force (RAAF) Base ("the Base").

Currently in the construction phase, WSS are preparing to extract sand from the "Site", which is within the NSW EPA declared WMA. The WMA was established by the NSW EPA following DoD commissioned testing of sediment, soil, groundwater, surface water and aquatic and terrestrial biota which identified a large area affected by PFAS contamination originally sourced from the Base (Figure 1). The management area is comprised of three zones:

- Primary – high PFAS concentrations have been observed.
- Secondary – low PFAS concentrations have been identified.
- Broader – topography and hydrology are used to suggest that PFAS could be identified in the future.

The Site is within the broader management area where the Site's eastern boundary is 1.4 km from the Base's western boundary.

In accordance with Schedule 3 Condition 48 of the Consent an annual review of the current available PFAS information relating to PFAS exposure pathways for contamination originating from the Base is required to be conducted. The review is to assess if the quarrying activities have resulted in an increased PFAS exposure for local residents. Condition 48 states the following:

> *"In conjunction with preparation of each Annual Review, unless otherwise agreed with the Secretary, the Applicant shall engage a suitably qualified and experienced independent expert, approved by the Secretary, to review the currently available information on exposure pathways for PFAS contamination originating from the Williamtown RAAF Base, as may be applicable to local residents and the development. This report must assess whether or not quarrying operations are increasing the risk of PFAS exposure for local residents and/or the environment, to the satisfaction of the Secretary. The Applicant must ensure that the Review of PFAS Exposure Pathways reports are placed on its website and are available to the CCC and any interested person on request*."

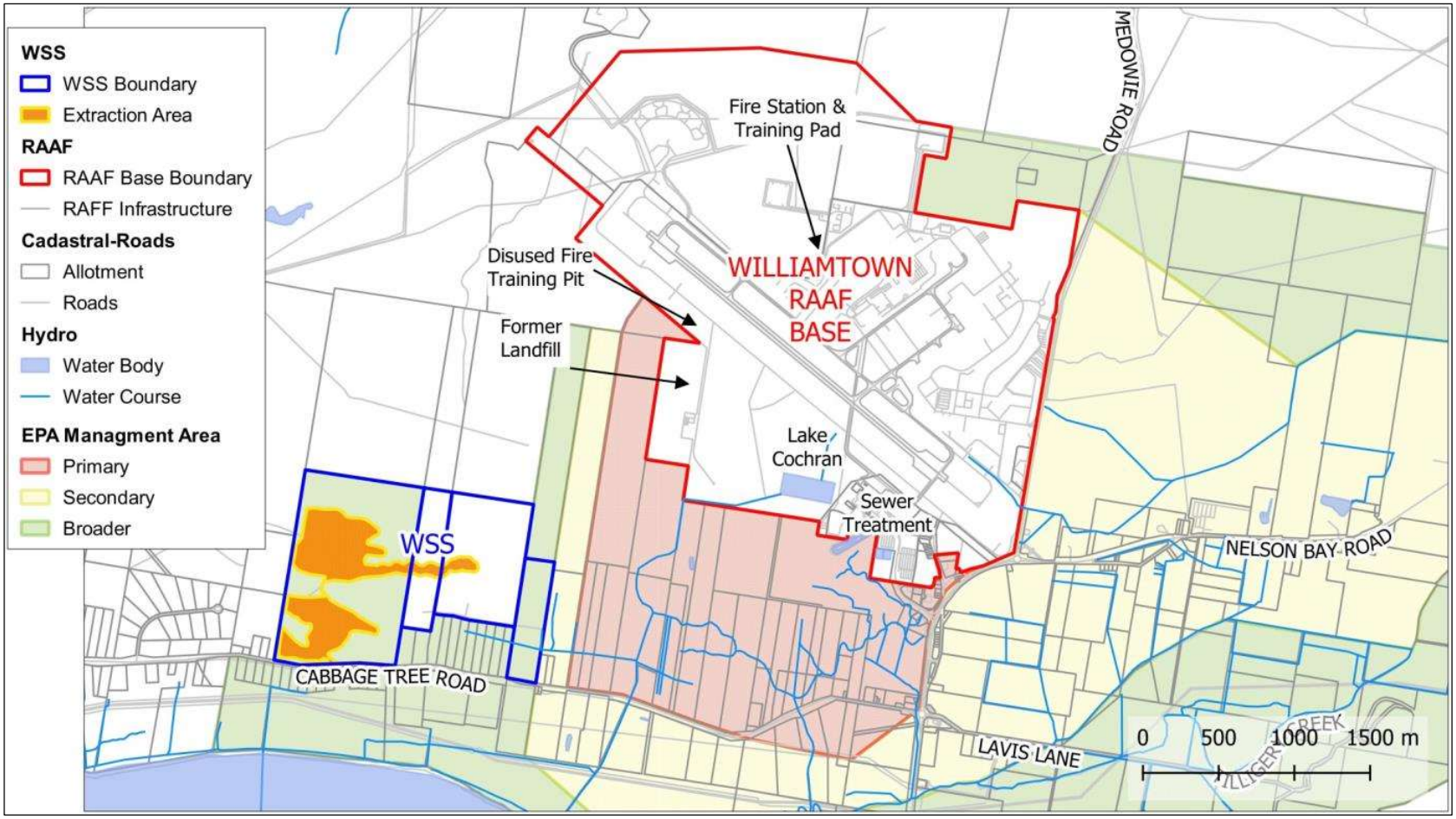


Figure 1. Site regional context

2 OBJECTIVE

The objective of this review is to assess if the quarrying activities during the 2019 calendar year have resulted in an increased PFAS exposure for local residents.

3 SITE SETTING

The site is located approximately 1.4 km to the southwest of the Base's western boundary. The general land use in the vicinity of the Site is large-lot residential and farming. Residential properties are located to the Site's west and south with larger allotments located along the eastern and northern boundaries. The Tilligerry Habitat Reserve forms part of the western and northern Site boundaries.

The Williamtown area receives a mean annual rainfall of 1,100 mm, with the highest rainfall months typically between January and June, where the mean rainfall typically exceeds 100 mm. Mean monthly temperatures range between 17°C and 28°C, indicating the climate is warm temperate. The prevailing 9 AM wind directions at the Base[2] are northwesterly (25%) and westerly (22%), i.e., away from the Site. Calm is the third most common observation (15%). Wind directions toward the Site are northeasterly (6%) and easterly (5%). Predominant 3 PM wind directions are southeasterly (24%) and southerly (16%). Afternoon wind directions toward the Site are easterly (14%) and northeasterly (8%).

Geologically the Site is located within the Tomago Sandbeds, a linear series of shallow sand dunes that cover approximately 200 km^2 between Newcastle and Lemon Tree Passage, that have a mean thickness of 20 metres. The beds were deposited from the Hunter and Karuah rivers during a period of high sea level and overlie relatively impermeable clays and rocks. The hydraulic gradient indicates a potential southerly groundwater flow direction (**Figure 2**) and in some low lying areas the water table is at the surface.

The Tomago Sandbed is an aquifer which forms an important potable water resource in the area. The potable groundwater combined with relatively shallow water table depth (mean depth 1.5 m below ground level) in the area have, historically resulted in the extensive use of the resource as a stock watering, irrigation and drinking water supply.

[2] Bureau of Meteorology wind speed and direction data for site number 061078 (Williamtown RAAF). Data are for 9 AM with 26,178 observations and 3 PM with 26,153 observation.

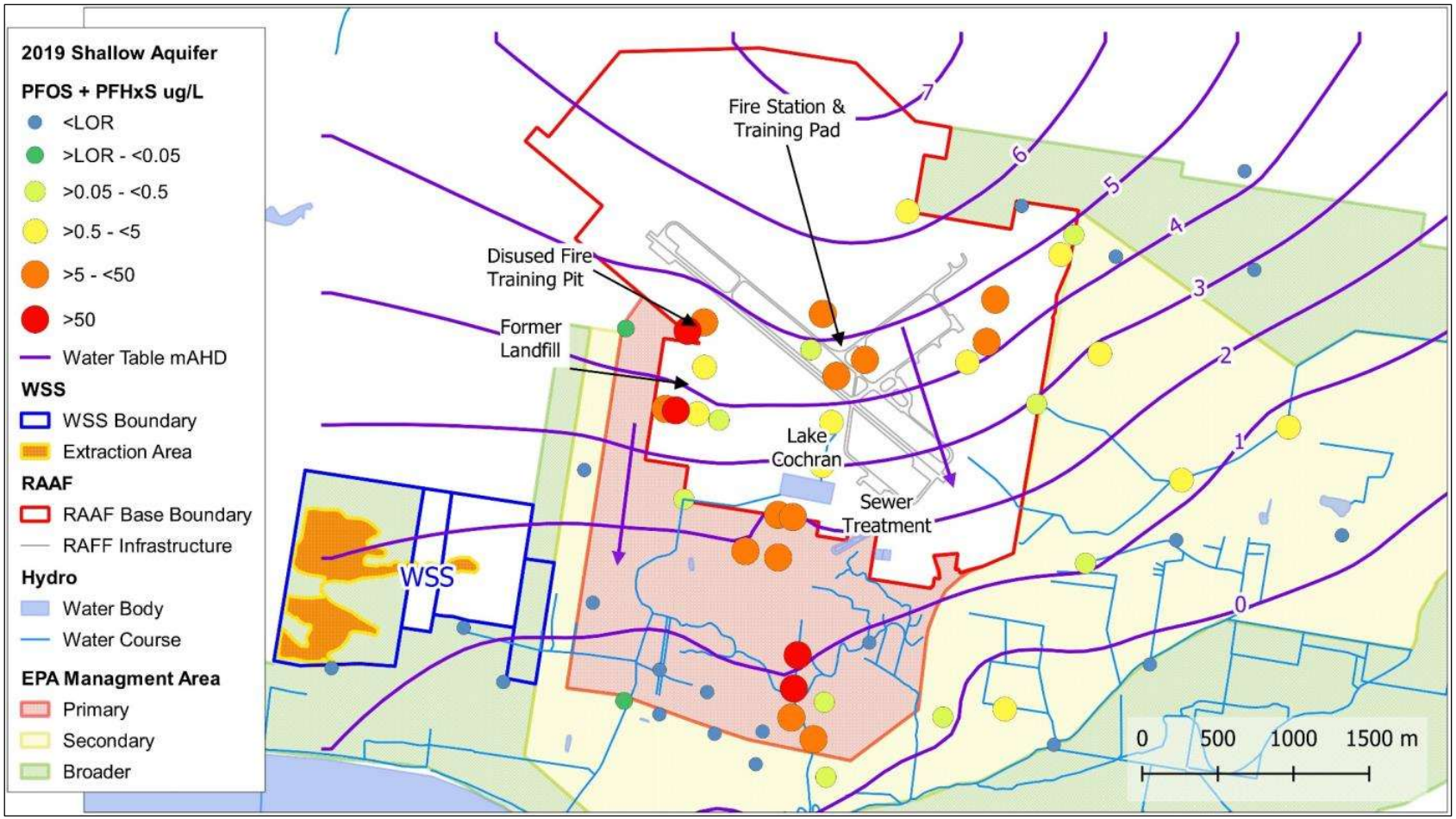


Figure 2. May 2019 water table elevations, potential groundwater flow direction and shallow groundwater sample PFOS + PFHxS concentrations

There is a well-developed man-made surface waterway network within the Williamtown area. Site surface water runoff may discharge to two unnamed surface water channels; one channel discharges directly to Fullerton Cove and the other joins Dawsons Drain, approximately 650 metres from the Site's eastern boundary. Within the Base Lake Cochran acts as a stormwater collection point which also discharges to the off-Base Dawsons Drain And ultimately Fullerton Cove.

4 2019 QUARRYING ACTIVITIES SUMMARY

During the reporting period the activity was in the construction phase, with no sand being processed or transported from site. Excavation of sand occurred for construction purposes only, with some temporary stockpiling of excavated material for future re-use. Construction commenced on 14 August 2019.

The quarry occupies four land titles and has an area of 175 hectares (ha), with the extractable sand resource occupying 43 ha. Approximately 3.25 megatonnes of sand will be quarried from elevated areas over a period of 15 years. Sand will be excavated from an elevation of 24 mAHD to an elevation no less than 0.7 metres above the highest estimated water table elevation. The anticipated minimum excavation elevations are 3.8 mAHD in the north and 3.4 mAHD in the south.

Groundwater is not being extracted by the site operators for quarrying operations, which rely on water sourced from Hunter Water. WSS have commenced a comprehensive groundwater and surface water monitoring program to assist with potential migration of PFAS from the Site and to ensure that sand is not extracted from an elevation less than 0.7 metres above the maximum water table elevation.

Works that occurred during 2019 at the Site include:

- Construction of onsite facilities and the intersection with Cabbage Tree Road
- Minor vegetation removal and temporary stockpiling of excavated material associated with the construction of the intersection and site facilities.
- No sand was processed or exported from the Site.

5 SUMMARY OF PFAS INVESTIGATIONS IN THE WMA

5.1 On- and Off-Base PFAS Investigations

PFAS contamination of surface water, groundwater, sediment and aquatic and terrestrial biota within and surrounding the Base has been reported by both the NSW EPA and DoD. A list of reports is available at www.defence.gov.au/environment/pfas/Williamtown/publications.asp.

The contamination is understood to have been the result of the use of aqueous film-forming foam utilised in firefighting and emergency response training activities. The known PFAS contamination sources at the Base are:

- Primary sources – Fire station, two landfills and a disused fire training pit.
- Secondary sources – Lake Cochran, the trade waste treatment plant (eastern Base area) and sewage treatment plant.
    - The trade waste treatment plant is not considered a possible source for PFAS contamination at the Site.

The surface soil samples collected outside the Base boundaries[3] have been predominantly collected across the southern boundary, south of Lack Cochran and the sewerage treatment area. The sum of PFOS and PFHxS[4], which generally make up approximately 90% of the PFAS identified in the Williamtown Management Area, in the off-Base surface soil samples PFOS and PFHxS range between the laboratory limit of reporting (LOR) of 0.2 micrograms per kilogram (µg/kg) and 375 µg/kg. Two soil samples were collected between the Site and the Base's western boundary. The PFOS + PFHxS concentrations in soil were 0.5 and 0.7 µg/kg, with the closest sample to the Site 350 metres northeast (1.3 km from the disused fire training pit (i.e., a primary PFAS source) and 1.1 km from a former landfill (i.e., a secondary PFAS source).

PFOS + PFHxS concentrations above the laboratory LOR (>0.2 to <10 µg/L) have been observed in all surface water samples collected from channels that receive discharge from the Base. Based on the local drainage network, surface water is not considered a likely pathway for PFAS from the Base to the Site.

[3] AECOM, 2017. Environmental Site Assessment. RAAF Base Williamtown, Stage 2B Environmental Investigation.
[4] PFOS – perfluorooctane sulfonic acid; PFHxS – perfluorohexane sulfonic acid

On- and off-Base PFAS groundwater investigations have focussed on the Tomago Sandbed aquifer with shallow and deep groundwater samples collected and analysed. This review focusses on PFAS concentrations in the shallow aquifer, which is the aquifer section that could be intersected during quarrying.

The 2019 groundwater PFAS monitoring results of the Base are summarised in **Figure 2**. PFOS + PFHxS concentrations above the laboratory LOR were detected to the south of Lake Cochran, beneath the disused fire training pit, former landfill and current fire station and training pad. From the data reviewed it is evident that there is a groundwater mound to the south of Lake Cochran, suggesting the lake is providing groundwater recharge and consistent with high PFOS + PFHxS concentrations observed down-gradient from the Lake.

The Site is not directly down-hydraulic gradient from any known primary or secondary PFAS source.

With regards to the Base a groundwater fate and transport model four "unidentified" PFAS sources (surface water, soil and or groundwater) located to the Site's south were identified. It is likely that one of these sources, located near the Cabbage Tree Road Dawsons Drain bridge is associated with the Lake Cochran discharge. The three other low PFAS concentration occurrences are located to the Base's south and cannot be directly linked to the source at the Base. The three locations are:

- One Base groundwater monitoring well and three residential monitoring bores located on Cabbage Tree Road, directly south of the Site.
- Groundwater from a residential well located 550 metres to the Site's south.
- Groundwater from a residential bore located to the south of lot DP629503. It is noted PFAS were not present above the laboratory LOR in a 2019 groundwater sample (from MW139) located approximately 75 metres up-hydraulic gradient from the residential well.

The PFAS groundwater fate and transport model[5] estimated:

- The Base PFAS groundwater plume areas may expand through PFAS dispersion and diffusion.
- That by 2050:
    - The disused fire training pit and former landfill plumes may merge, although the merged plume should not intersect the Site's eastern boundary.
    - The Lake Cochran PFAS plume should not intersect the Site's eastern boundary.
- The probable Lake Cochran sourced off-Base groundwater "unidentified" PFAS occurrence is beneath the Site's DP814078 parcel (eastern Site area) at concentrations between 0.01 and 0.07 µg/L.

6 SITE PFAS AND WATER TABLE INVESTIGATIONS

PFAS investigations commissioned by WSS at the Site have involved submission of soil, surface water and groundwater samples to a laboratory that has National Association of Testing Authorities (NATA) accreditation to determine PFAS concentrations in the submitted media.

6.1 Soil

Sixteen samples collected from 10 bore holes between 7 and 17 December 2016 were submitted for PFAS analysis. The samples were all collected from elevated Site areas where sand quarrying is proposed to be undertaken. All samples, including two samples collected within the eastern Site area, i.e., closest to the Base were reported to have total PFAS concentrations below the laboratory LOR.

6.2 Surface Water

Eleven surface water samples collected from three locations (SW01, SW03 and SW04; **Figure 3**) between February and November 2019 and submitted for PFAS analysis. SW02 was reported to be dry during each monitoring event.

[5] Hydro Simulations, 2016. RAAF Williamtown groundwater modelling. Appendix L of AECOM, 2016. Stage 2B environmental investigation report. RAAF Base Williamtown. (www.defence.gov.au/Environment/PFAS/docs/Williamtown/Reports/ESAReports)

PFOS concentrations, below the National Medical Research Council (NHMRC) drinking water criteria of 0.07 µg/L were reported in two surface water samples (0.03 and 0.05 µg/L (LOR = 0.01 µg/L)) collected from SW04 in September 2019 (**Figure 3**). SW04 is located at the Site's southeast corner of the eastern-most land parcel (DP814078), above the "unidentified" groundwater PFAS source. PFAS were reported below the laboratory LOR in an earlier sample collected from the same location in May 2019 and a follow up sample collected in November 2019.

The presence of PFAS in the Site surface water is therefore unable to be confirmed but is considered unlikely.

6.3 Groundwater

Twelve groundwater monitoring bores have been installed and sampled at the Site (BH01 to BH12). MW239S, located on Cabbage Tree Road directly to the Site's south and installed during the DoD investigations was reported to have 0.03 µg/L PFOS in March 2017 and was re-sampled during the February 2019 groundwater monitoring event. Two Site bores have been dry since 2017 (BH09 and BH10) and one bore was decommissioned in September 2019 (BH03).

May 2019 water table elevations for on-Site bores are provided on **Figure 3**, where it is evident that there is a close correspondence to the AECOM May 2019 measured water table elevations. At the Site May 2019 water table elevation varied between 1.2 mAHD in the south and 3.3 mAHD in the north, with a south to southeasterly groundwater flow direction and a low hydraulic gradient (MW04 to MW11 = 0.002[6]).

Between February 2019 and January 2020 the depth to groundwater beneath the Site reduced by a mean of 0.7 m (ranging from 0.2 to 1.1 m). The mean water table elevations during the monitoring period at MW01, MW02 and MW04 (2.3, 2.1 and 1.2 mAHD, respectively) were below the proposed quarry base, 3.8 mAHD in the north and 3.4 mAHD in the south.

During the monitoring period the maximum water table elevation was 0.9 m below the proposed quarrying base in the north (BH01 maximum water table elevation = 2.9 mAHD) and 1.9 m below the proposed quarry base in the south (BH04 maximum water table elevation = 1.5 mAHD). These maximum water table elevations are below the specification that requires the quarry base to be 0.7 m above the water table.

[6] Hydraulic gradient units are internally consistent units (m), which cancel during the calculation

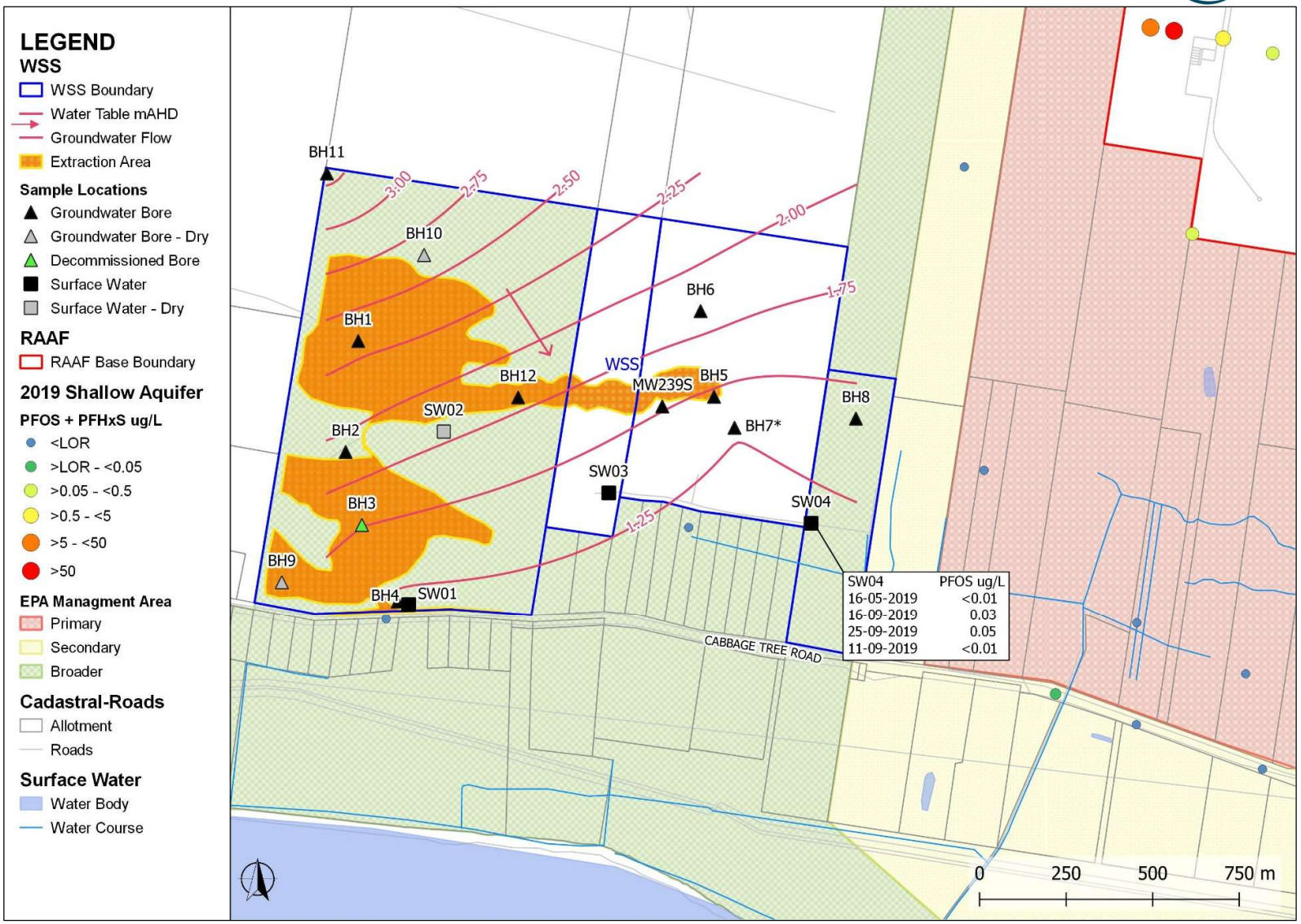


Figure 3. Site water table elevations and surface water and groundwater PHOS + PFHxS concentrations

Groundwater rainfall recharge within the sands is likely to be relatively rapid. The removal of sand above the Site aquifer is likely to produce a groundwater mound, due to increased infiltration and lower evapotranspiration although the mound will likely dissipate in the short-term due to the high effective porosity of the sands. If a groundwater mound does form beneath the quarried areas it would be unlikely to significantly change the groundwater flow direction and is more likely to result in producing a steeper off-Site hydraulic gradient. The likelihood that the quarrying would lead a change in groundwater flow direction and increased groundwater flow from the Base to the Site area is very low.

Seven groundwater samples were analysed for PFAS in 2016 and 2017 with all PFAS reported below the laboratory LOR. Between February 2019 and January 2020 groundwater samples from nine monitoring wells, eight on-Site and one off-Site (total = 54) were submitted to the laboratory for PFAS concentration determination (**Table 1**).

Table 1. PFAS Concentration in Groundwater 2019.

Monitoring Event Date	Monitoring Well ID	Total PFAS	PFAS >LOR, µg/L
21-22 Feb 2019	BH02, BH03, BH04, BH05, BH06, BH07, BH08, BH11 & MW239S	<LOR	-
14-15 Mar 2019	BH04, BH06, BH07, BH08	<LOR	-
23 Apr 2019		<LOR	-
16 May 2019		<LOR	-
14 Jun 2019		<LOR	-
16 Jul 2019		<LOR	-
15 Aug 2019		<LOR	-
16 Sept 2019		<LOR, except BH04	PFDS[7], 0.02
25 Sept 2019	BH04	<LOR	
15 Oct 2019	BH04, BH06, BH07, BH08	<LOR	
18 Nov 2019		<LOR	
17 Dec 2019		<LOR, except BH06	6:2 FTS[8], 0.19
16 Jan 2010		<LOR	-

Concentrations were below LOR with the exception of BH04 in September and December 2019 The groundwater monitoring well BH04 is located in the southern Site area, near the DoD documented occurrence in off-Site residential groundwater wells and down hydraulic gradient from the WSS 2019 works area. BH06 to BH08 are located within the eastern Site area,

[7] PFDS is perfluorodecanesulfonic acid
[8] 6:2 FTS is 6:2 fluorotelomer sulfonic acid

closest to the Base which, although unlikely could in the future be impacted by PFAS migration in groundwater.
The PFAS reported above the laboratory LOR were:

- A PFDS concentration (0.02 µg/L, LOR = 0.02 µg/L) was reported in groundwater from BH04 collected on 16th September 2019, confirmation sampling on the 25 September 2019 for PFAS returned results below the laboratory LOR.

- A 6:2 FTS concentration (0.19 µg/L, LOR = 0.05 µg/L) was reported in groundwater collected from BH06 in December 2019, Confirmation sampling in January 2020 for PFAS returned results below the laboratory LOR.

    - 6:2 FTS was not reported above the laboratory LOR in shallow groundwater samples during the 2019 DoD monitoring.

96% of the Site groundwater PFAS analyses during 2019 and early 2020 were reported below the laboratory LOR. In the two cases where concentrations above the LOR were reported the compound concentrations were close to the LOR and not repeated during confirmation sampling or not observed in the DoD PFAS plumes. In addition, the PFAS concentration reported slightly above the laboratory LOR from the shallow aquifer in the Site area[9] in 2017 was below the laboratory LOR upon resampling in 2019.

7 DOD HUMAN HEALTH RISK ASSESSMENT REVIEW

The DoD engaged AECOM to undertake an off-site human health risk assessment (HHRA) in 2016 which was updated in 2017[10]. A summary of the findings of the updated HHRA and relevance to the Site area are provided below.

The HHRA evaluated the potential health risks in the Williamtown area to residents (including recreational and commercial fishers and beef farmers) and non-residents (commercial fishers, council workers and visitors) from exposure to PFAS under both typical and upper exposure scenarios. The exposure scenarios are:

- Typical exposure scenario – Representative of PFAS concentrations that a general or average receptor is likely to be exposed. Applicable to the majority of the population.

[9] MW236S, AECOM 2017.
[10] AECOM, 2017. Off-site Human Health Risk Assessment. RAAF Base Williamtown, Stage 2B Environmental Investigation.

- Upper exposure scenario – Calculated based on the upper 95th percentile of PFAS concentrations in the relevant media and is applicable for receptors that may be in close proximity to media with elevated concentrations within a localised area, such as a residential groundwater well. The upper exposure scenario is considered sufficient for quarry workers who would be exposed to a generally high risks though ingestion (incidental and through inhalation) or residents near the quarry.

Based on the Stage 2B investigation outcomes the HHRA[11] divided the off-Base areas into *zones* based on the potential risk that PFAS posed. The Site's local area was designated risk zone C (low risk), with the risk zone encompassing the entire eastern Site area and the southern proposed extraction area. For reference the northern extraction area is not within an identified risk zone.

The HHRA determined risks for risk zone C upper exposure scenarios (pathways) are:

- Ingestion and contact with groundwater – acceptable.
- Dermal contact with soil and Ingestion of soil and dust – acceptable.
- Consumption of homegrown eggs – **elevated**.
- Consumption of locally grown fruit and vegetables – acceptable.
- Incidental ingestion of surface water – **elevated**.
- Surface water contact – acceptable.
- Incidental ingestion and contact with sediment – acceptable.
- Consumption of beef and milk – **elevated**.

7.1 Relevance to Potential On- and Off-Site Exposures

The HHRA determined potential exposure pathways listed above are considered suitable for off-Site residents and on-Site quarry personnel. For nearby residents and quarry personnel the comparison of the HHRA upper exposure scenario is considered conservative:

- For dust inhalation/soil ingestion because:

[11] AECOM, 2017. Off-site human health risk assessment. December 2017. RAAF Base Williamtown. Stage 2B environmental investigation. (www.defence.gov.au/Environment/PFAS/docs/Williamtown/Reports)

- The prevailing wind directions in the area are not toward the residential areas.
- PFAS have not been identified in shallow (or deep) soil samples.
- Dust mitigation measures are required during quarrying activities.

- For groundwater exposure because:
  - The quarry base will not extend to a depth closer than 0.7 metres to the highest estimated water table elevation, hence groundwater management will not be required and discharge to surface water will not occur.
  - PFAS have not been identified above the laboratory LOR in Site groundwater, hence PFAS present in nearby residential groundwater wells is unlikely to have been sourced from the Site and may be diluted by Site derived groundwater.
  - The designation of risk zone C in the Site area was partially based on a very low PFOS concentration from one well, a concentration that was not subsequently repeated.
  - Groundwater migration from the Base is unlikely to reach the eastern property before 2050, by which time quarrying operations will have ceased and any complete PFAS migration pathways will be unlikely.
- For surface water because:
  - PFAS were not present above the laboratory LOR in surface water samples that drain from the Site.

The potential increased PFAS exposure to residents from quarrying activities is therefore considered unlikely.

8 CONCLUSIONS

This report has reviewed the currently available information regarding the PFAS contamination originating from the Base and assessed Site derived groundwater data to determine whether quarrying operations will increase the PFAS exposure to nearby residents.

During 2019 activities at the Site were largely restricted to vegetation removal and building and roadway construction. Quarrying operations were not undertaken during 2019.

Considering the information reviewed the following is concluded:

- Base-sourced PFAS is, and has historically been unlikely to be transported to the Site via wind, surface water or groundwater – the Site does not appear to have received PFAS from the Base and does not appear to be acting as a local tertiary PFAS source because:
    - PFAS have not been reported within Site media (shallow and deep soil, surface water and groundwater) which is consistent with the results from the investigation undertaken by the DoD.
- Quarrying has not been performed and has not increased the potential for contaminated groundwater to flow toward the Site's local area. The most probable effect of quarrying will be the formation of a temporary groundwater mound due to increased rainwater infiltration and decreased evapotranspiration, with the local groundwater flow regime unlikely to be influenced for an extended time-period. The influence of quarrying on the groundwater flow regime is expected to decrease the risk of Base derived PFAS.

9 RECOMMENDATION

Developing a numerical groundwater flow model that allows for the effects of increased infiltration in the sand extraction areas to be quantitatively assessed should be considered.

If you require additional information or clarification, please contact the undersigned at (03) 9907 6000.

This report should be read in conjunction with the Kleinfelder Statement of Limitations (attached).

Sincerely,

Kleinfelder Australia Pty Ltd

Stuart Graham (PhD – Geochemistry)

Associate Hydrogeologist

Attachment 1: Kleinfelder Statement of Limitations

ATTACHMENT 1: KLEINFELDER STATEMENT OF LIMITATIONS

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The findings and conclusions contained within this report are relevant to the conditions of the site and the state of legislation currently enacted in the relevant jurisdiction in which the site is located as at the date of this report.

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