Meander Valley Council
Working Together

PLANNING NOTICE

An application has been received for a Permit under s.57 of the Land Use Planning Approvals Act 1993:

APPLICANT:	**C Everard – PA\25\0102**
PROPERTY ADDRESS:	**Reiffers Road MEANDER (CT: 211176/45)**
DEVELOPMENT:	**Level 2 Activity - Extractive Industry (Quarry) Intensification - discretionary use, karst management area**

The above application has been referred to the Board of the Environment Protection Authority (the Board) for assessment under the Environmental Management and Pollution Control Act 1994 (EMPCA). An Environmental Effects Report (EER) has been lodged in support of the application.

A copy of the full development application is available for public inspection during the notification period at:

- Meander Valley Council, 26 Lyall Street, Westbury

Alternatively, the full development application can be viewed at:

- www.meander.tas.gov.au

The EER can also be viewed at: https://epa.tas.gov.au/consultations

For assistance in accessing a copy of the EER, please contact Ryan Burrows on Ph 1300 746 466 or email rburrows@pinionadvisory.com

Any person may make a representation (public submission) relating to the application from **Saturday 01 November 2025** to **Tuesday 18 November 2025** by writing to the General Manager, Meander Valley Council, PO Box 102, Westbury TAS 7303 or by email to planning@mvc.tas.gov.au.

A guide for preparing a public submission can be found at:

- https://epa.tas.gov.au/public-submission-guide

Please note that any representations lodged will be available for public viewing.

Dated at Westbury on 20 September 2025.

Jonathan Harmey

GENERAL MANAGER

APPLICATION FORM

PLANNING PERMIT

Land Use Planning and Approvals Act 1993

- Application form & details MUST be completed **IN FULL**.
- Incomplete forms will not be accepted and may delay processing and issue of any Permits.

Meander Valley Council
Working Together

OFFICE USE ONLY

Property No: | | | | | | **Assessment No:** | | - | | | | | - | | | |

DA | | **PA** | | **PC** | |

- Is your application the result of an illegal building work? ☐ Yes ✓ No
- Have you already received a Planning Review for this proposal? ☐ Yes ✓ No
- Is a new vehicle access or crossover required? ☐ Yes ✓ No

Indicate by ✓ box

PROPERTY DETAILS:

Address: RIEFFERS ROAD

Certificate of Title: 211176

Suburb: MEANDER 7304

Lot No: 45

Land area: 50.65 m^2 / ***ha***

Present use of land/building: QUARRY AND GRAZING *(vacant, residential, rural, industrial, commercial or forestry)*

- Does the application involve Crown Land or Private access via a Crown Access Licence: ☐ Yes ✓ No
- Heritage Listed Property: ☐ Yes ✓ No

DETAILS OF USE OR DEVELOPMENT:

Indicate by ✓ box

☐ Building work ☐ Change of use ☐ Subdivision ☐ Demolition
☐ Forestry ✓ Other

QUARRY EXPANSION

Total cost of development *(inclusive of GST):* $50,000 *Includes total cost of building work, landscaping, road works and infrastructure*

Description of work: SHALE QUARRY EXPANSION CONDUCTED WITHIN EXISTING MINING LEASE (1107P/M)

Use of building: N/A (main use of proposed building – dwelling, garage, farm building, factory, office, shop)

New floor area: m^2 New building height: m

Materials: External walls: Colour:

Roof cladding: Colour:

RESULT OF SEARCH

RECORDER OF TITLES

Issued Pursuant to the Land Titles Act 1980

SEARCH OF TORRENS TITLE

VOLUME	FOLIO
211176	45
EDITION	DATE OF ISSUE
5	11-Nov-2019

SEARCH DATE : 29-Oct-2025
SEARCH TIME : 01.01 PM

DESCRIPTION OF LAND

Parish of ARCHER, Land District of WESTMORLAND
Lot 45 on Plan 211176
Derivation : The whole of Lot 45 - 125 acres 1 rood 18 perches - Gtd. to N.F.Whiteley.
Prior CT 2497/3

SCHEDULE 1

B117015 ASSENT to GRANT RICKY WHITELEY

SCHEDULE 2

Reservations and conditions in the Crown Grant if any
M787195 MORTGAGE to Bendigo and Adelaide Bank Limited
Registered 11-Nov-2019 at 12.01 PM

UNREGISTERED DEALINGS AND NOTATIONS

No unregistered dealings or other notations

ORIGINAL – NOT TO BE REMOVED FROM TITLES OFFICE

R.P. 1469
TASMANIA
REAL PROPERTY ACT, 1862, as amended

NOTE—REGISTERED FOR OFFICE CONVENIENCE TO REPLACE

CERTIFICATE OF TITLE

Register Book
Vol. 2497 Fol. 3

Purchase Grant Vol.228 Fol.54.

I certify that the person described in the First Schedule is the registered proprietor of an estate in fee simple in the land within described together with such interests and subject to such encumbrances and interests as are shown in the Second Schedule. In witness whereof I have hereunto signed my name and affixed my seal.

Recorder of Titles.

DESCRIPTION OF LAND

PARISH OF ARCHER LAND DISTRICT OF WESTMORLAND
ONE HUNDRED AND TWENTY FIVE ACRES ONE ROOD EIGHTEEN PERCHES on the Plan hereon

FIRST SCHEDULE (continued overleaf)

NORMAN FREDRICK WHITELEY of Meander, Farmer

SECOND SCHEDULE (continued overleaf)

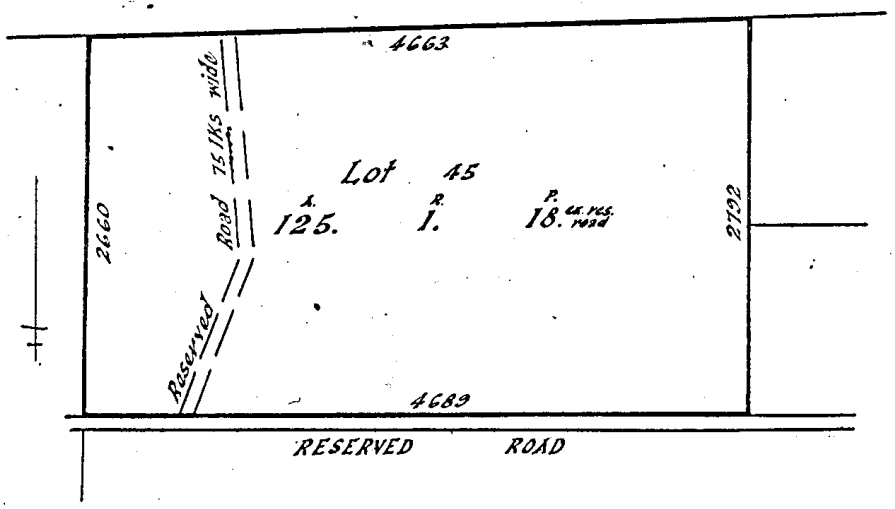
NIL.

CANCELLED
- 5 JAN 1995
RECORDER OF TITLES
NEW TITLE ISSUED

NOTE.—ENTRIES CANCELLED UNDER SIGNATURE OF THE RECORDER OF TITLES ARE NO LONGER SUBSISTING.

REGISTERED NUMBER 211176

Lot 45 of this plan consists of all the land comprised in the above-mentioned cancelled folio of the Register.



The whole of Lot 45 - 125 acres 1 rood 18 perches - Gtd. to N.F. Whiteley. Meas. in Links.

FIRST Edition. Registered 16 JUL 1969

Derived from P.G.Vol.228 Fol.54.

ENVIRONMENTAL EFFECTS REPORT

GR and AM Whiteley

Meander Shale Quarry Intensification

OCTOBER 2025

pinion
ADVISORY

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Report authors:	Ryan Burrows BAppSci(EnvSci), Pinion Advisory
An appropriate citation for this report is:	Pinion Advisory (2025). Meander Shale Quarry Intensification - Environmental Effects Report. Prepared for GR & AM Whiteley.
Document status:	Version 5.0 – 29/10/2025

Date	Issue number	Reason	Reviewed by	Authorised by
19/05/2025	V1.0	Supply to client for review	C.Everard	R.Burrows
15/07/2025	V1.1	EPA review	EPA	R.Burrows
29/07/2025	V2.0	Review of EPA feedback	R.Burrows	R.Burrows
20/08/2025	V3.0	Submission to EPA	R.Burrows	R.Burrows
03/09/2025	V4.0	Submission to council	MVC	R.Burrows
29/10/2025	V5.0	Council updates	R.Burrows	R.Burrows

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Executive summary

Introduction

The Meander Shale Quarry is located at Reiffers Road, Meander, approximately two kilometres (km) west of Meander in northern Tasmania.

The proponent (GR & AM Whiteley) is seeking to increase the current maximum shale production from 20,000m^3/year (~32,000 tonnes/year) to 30,000 m^3/year (~48,000 tonnes/year).

The quarry has operated as a level 2 activity (extractive industry)[1] since 2016. Meander Valley Council (MVC) determined that the proposed expansion is a substantial modification to site operations, and therefore a new planning permit (and level 2 activity approval) is required

This Environmental Effects Report (EER) has been prepared in accordance with the EPA's Extractive Industry Environmental Effects Report Guidelines GR & AM Whiteley Meander Shale Quarry Expansion, Meander (February 2025).

Environmental impact assessment studies were conducted within the quarry area as part of the site's 2015 and 2022 EERs and have been reviewed as a part of this assessment.

To inform the current assessment, an updated natural values atlas (NVA) database search was completed for the area in February 2025. A site inspection was conducted on 12 March 2025 (by Pinion Advisory) to assess the existing operational footprint, current onsite environmental management procedures and the proposed future expansion area.

Potential environmental impacts and management

Due to the small-scale nature of the proposed intensification, potential environmental impacts (from dust, noise, acid rock drainage, weeds and surface water runoff) can be managed with existing management procedures. It should be highlighted that no complaints or issues have been raised by neighbours or the wider community regarding operations at the quarry.

The assessment found that no impacts to natural values are expected as a result of the project.

Current (2024) baseline data on truck movements to and from the quarry include:

- 4190 truck movements to and from the quarry (one load is two movements).
- Maximum/peak movements are 3 trucks x 16 movements (8 loads) per day.

The proponent will continue to consult with the immediate neighbours, Meander community and EPA throughout the life of the project.

While no significant impacts to natural values, surface water, groundwater or soils have been identified during current operations, nor are anticipated with the proposed production increase,

[1] Meander Valley Council planning permit PA/16/0066 (permit condition environmental no. 9105, in accordance with section 57 of the *Land Use Planning and Approvals Act 1993* (LUPA Act).

relevant management measures will be implemented. A summary of the proposed management measures for the project is presented in section 4 (Table 11).

List of abbreviations

EER	Environmental effects report
EMPC Act	*Environmental Management and Pollution Control Act 1994*
EPA	Environment Protection Authority, Tasmania
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
LUPA Act	*Land Use Planning Approvals Act 1993*
MVC	Meander Valley Council
NVA	Natural values atlas
t	Tonnes

1 Part A: Proponent information

Table 1. Proponent information.

Name of proponent (entity name for permit)	GR & AM Whiteley
Name of proponent (trading name)	GR & AM Whiteley
Registered address	156 Main Road, Meander Tas 7304
Postal address of proponent	156 Main Road, Meander Tas 7304
ABN	69 766 599 417
CAN	NA
Contact persons for the operation	Name: Grant and Angela Whiteley Phone: 0418 137 084 / 0408 695 221 Email: leeswood156@gmail.com
Consultant contact details	Company Name: Pinion Advisory Consultant: Ryan Burrows Email: rburrows@pinionadvisory.com

2 Part B: Proposal description

2.1 Description of proposed activity

2.1.1 Background

The Meander Shale Quarry (the quarry) is located at Reiffers Road, Meander, approximately two kilometres (km) west of Meander in northern Tasmania (Figures 1 and 2).

An Environmental Effects Report (EER) was previously submitted to the Tasmanian Environment Protection Authority (EPA) in April 2015[2] to obtain approval as a Level 2 activity under the *Environmental Management and Pollution Control Act 1994* (EMPC Act).

Since 2016, the quarry has operated as a level 2 activity (extractive industry) under Meander Valley Council (MVC) planning permit PA\16\0066 (Permit Condition Environmental No. 9105), in accordance with section 57 of the *Land Use Planning and Approvals Act 1993* (LUPA Act).

Another EER[3] was prepared in May 2022 to support the increase in maximum shale production from 15,000m^3/year (~24,000 tonnes/year) to 20,000m^3/year (~32,000 tonnes/year).

The project was approved by the EPA on 7 October 2022 (Permit Conditions – Environmental (PCE) No. 11068). Planning approval was granted by the Meander Valley Council (MVC) on 20 December 2022 (corrected permit, PA\22\0253).

To meet the increase in local demand for shale product (for dairy lanes and road projects), GR & AM Whiteley (the proponent) is seeking to increase the annual production volume at the quarry from the current permitted volume of **20,000m^3/year (32,000 tonnes/year) to 30,000m^3/year (48,000 tonnes/year)** (the project).

Discussions with the MVC planning department (L. Rabjohns, Town Planner, 10 November 2023) found that the proposed intensification is considered a substantial modification to the existing operation, and therefore a new planning permit application is required.

A new planning permit application and updated traffic impact assessment report was submitted to the MVC on 6 December 2024 for the proposed increase. The project was subsequently referred by the MVC to the EPA for assessment.

The EPA determined the project a Class 2A (EER) assessment under sections 27A and 27C of the EMPC Act. The determination was based on the small-scale nature of the proposal and on the potential environmental impacts being relatively minor in scale, local in extent and readily avoided or mitigated through appropriate management

[2] Macquarie Franklin (2015). Environmental Effects Report. Prepared for GR & AM Whiteley. April 2015.

[3] Pinion Advisory (2022). Meander Shale Quarry Expansion - Environmental Effects Report. Prepared for GR & AM Whiteley. Dowsing Point, TAS.

This EER has been prepared in accordance with the EPA's Extractive Industry Environmental Effects Report Guidelines GR & AM Whiteley Meander Shale Quarry Expansion, Meander (February 2025). The EER provides a detailed description of the project operations and management measures and commitments to mitigate potential environmental impacts.

A natural values atlas (NVA) database search and site inspection was conducted on 12 March 2025 by Pinion Advisory to assess the existing operational footprint, current onsite environmental management procedures and the proposed future expansion area. The findings from the database search and inspection were included in the May 2022 EER.

An updated natural values atlas (NVA) database search was completed for the area on 25 February 2025. A site inspection was also conducted on 12 February 2025 by Pinion Advisory to assess the project site. Findings from these assessments are presented in Section 3.4 of this EER.

MVC determined that the proposed intensification forms a substantial modification to the existing activity and therefore a new planning permit in accordance with LUPA Act is required. An application was lodged with the MVC (in accordance with section 57 of the LUPA Act) on the 6 December 2024.

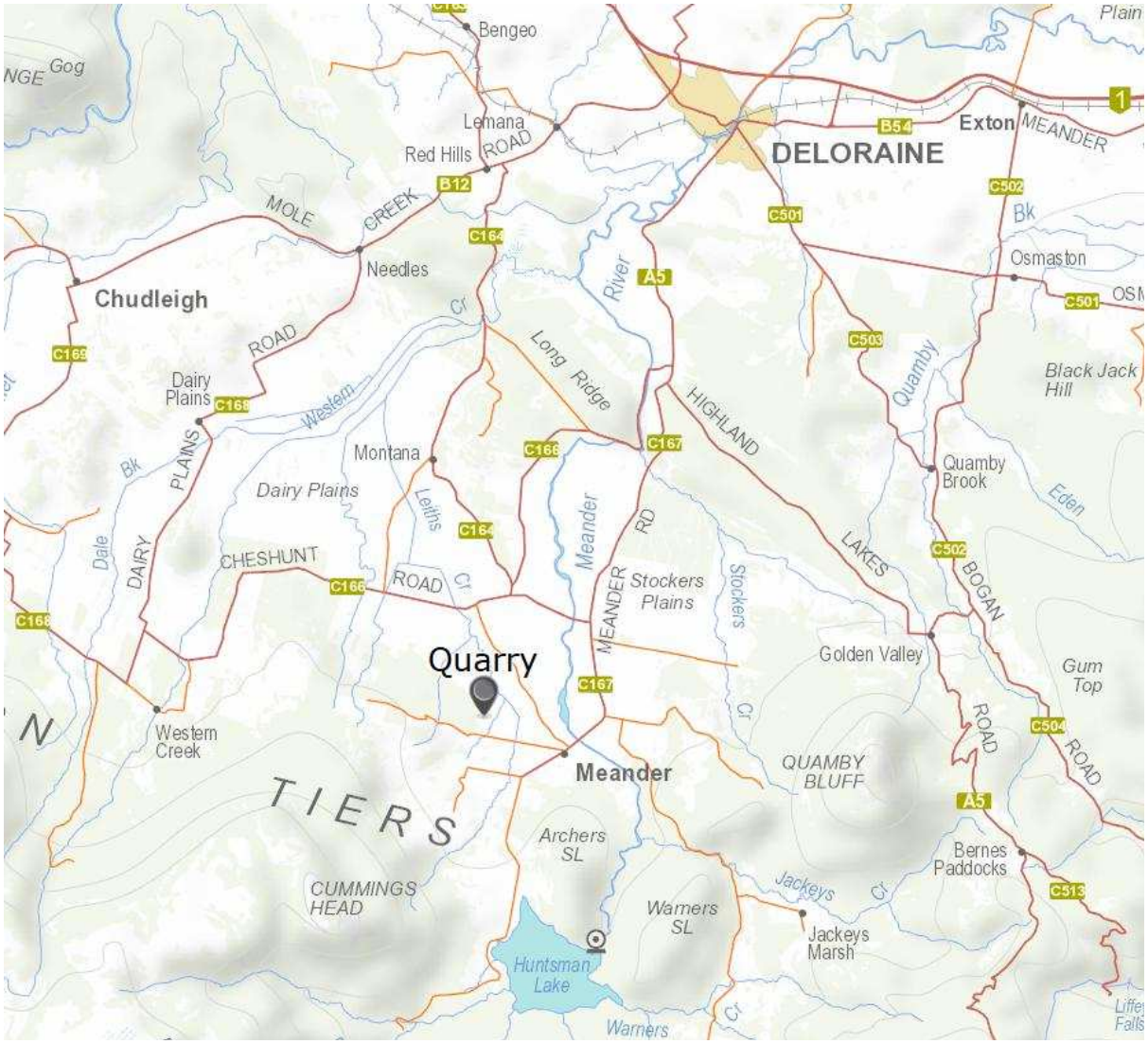

Figure 1. General location map and existing quarry site (pink shaded box) (Source: ListMap).

Figure 2. Property details and location of mining lease 1107P/M (Source: ListMap).

2.2 Key project characteristic

Key characteristics of the project are summarised in Table 2. Proposed operations at the quarry are not expected to alter significantly from those currently in place.

In summary, the following key project changes are proposed:

- Truck types – change from majority single truck usage, to majority truck and trailer combinations for approximately 75% of the transport, resulting in a 10.7% increase in truck movements from 4190 annual movements (2095 loads of shale product) to 4690 annual movements (2345 loads of shale product). The minor increase in truck movements is due to the extra carrying capacity of trucks with trailers compared to trucks alone, even though shale production will increase by 34%.
- Crusher time – increase from 265 hours per year to 400 hours per year (increase of 135 hours per year, or 2.6 hours per week).
- Production increase from 20,000m3 /year (32,000 tonnes/year) to 30,000m3 /year (48,000 tonnes/year).

All other project components will remain the same, including:

- Development will continue within the previously approved mining area as approved in the previous EER.
- Blasting schedule
- Stockpile sizes and locations

- Onsite infrastructure and equipment
- Site layout (e.g. locations of access roads, stockpiles, surface water management, etc)
- Operating hours
- Number of personnel
- Proposed rehabilitation areas
- Mining lease (1107P/M) boundaries
- Land zoning
- Site environmental management and monitoring measures.

Table 2. Key project characteristics (project changes bolded).

Activity	The existing activity includes drilling, blasting, crushing, loading and transporting shale rock from the quarry site. In the period November 2023 to October 2024 30,005.44t (18,753.4m^3) of shale product was transported from the quarry. The proposed activity (intensification) will require a revision of the permit with changed conditions and include: SCHEDULE 2: CONDITIONS Q1 Regulatory limits • **Request increase from 20,000m^3 to 30,000m^3 rocks, ores or minerals processed** • **Request increase from 20,000m^3 to 30,000m^3 rocks, ores or minerals extracted.**
Existing activity	Intensification of existing activity.
Material to be extracted	No change. Open pit mining of shale rock. Based on the available resource at the site, the quarry will continue for at least 15-25 years depending on market conditions.
Proposed maximum extraction quantity	**30,000m^3 per annum (or 48,000 tonnes per annum).**
Proposed maximum processing quantity	**30,000m^3 per annum (equivalent to 48,000 tonnes per annum) will be processed (includes crushing).**

Material extraction and processing activities	• Blasting – No change. Once per year (by a licenced contractor), with sufficient material raised during this to maintain the quarrying activities for 12 months. • **Crushing - mobile crusher will increase from approximately 265 hours per year (2023, 19,875m^3) to 400 hours per year, an increase of approximately 135 hours per year, or 2.6 hours per week. Based on a rate of 75m3/hr and increase to 30,000m^3.** • Stockpiling crushed shale material – no change. • **Loading shale material with wheel loader into tri axle rigid trucks will change to loading truck and trailer combinations to minimise truck movements and increase operational efficiency.** Proposed operations at the quarry are not expected to alter significantly from those currently in place.
Transport	Current truck data (Nov 2023 – Oct 2024) are as follows: • 55.56% truck usage, 44.44% truck & trailer usage. • 4190 annual movements carting 2095 loads of shale product (2 movements per load). **Proposed future truck movements (based on 25% truck/75% truck & trailer):** • **4690 annual movements carting 2345 loads of shale product.** • **No change to light vehicle movements.** • **10.7% increase in truck movements.** Access is via Reiffers Road (a sealed local rural road) and a gravel access road to the quarry site (400m north of Reiffers Road). The access route remains unchanged. Based on vehicle size and movements the current road network is sufficient to accommodate the proposed intensification.
Stockpiling	No change. Stockpiled material includes: • Run of mine material (uncrushed) • Crushed product (0 - 100mm rock)
Proposed area of disturbance	No change. Maximum area of disturbance (un-rehabilitated) at any one time will be three hectares. Total area to be cleared over the life of the project is four hectares.
Major equipment	No change. Major equipment includes: • Mobile crusher (Metrotrac Jaw Crusher 900/600) • Excavator (Komatsu 20t – 6) • Wheel loader (Komatsu WA400) • A dozer is also contracted to the site when required • Light vehicles from site personnel No new equipment or machinery will be required for the proposed activity.
Infrastructure	No change. Site infrastructure: • Internal gravel access road • Stockpile area • Sediment settling pond (refer to Figure 4) No buildings are present on the site. All locations and dimensions of existing access roads and boundaries will remain. No new buildings will be constructed as a part of the intensification.
Operating hours	No change. Standard operating hours are:

	Quarry, processing and truck movements: • 7:00am to 6:00pm Monday to Friday • 8:00am to 4:00pm on Saturday No quarry or processing operations are conducted on Sundays or gazetted public holidays. Operating hours will not change from those currently in place.
Personnel	No change. Existing personnel/contractors: • Site: two personnel • Contractors: trucking contractors as required, and one bulldozer operator as required. No additional site personnel are required for the intensification.
Proposal timeline	The quarry intensification will only commence once regulatory approval from EPA and MVC are granted. Intensification will also be dependent on increased demand for shale.

Table 3. Location and planning context.

Location	Single title located north of Reiffers Road, Meander (PID 6278839, property title 211176/45) and road reserve (refer to Figure 2).
Land zoning and tenure	Agriculture Zone under the *Tasmanian Planning Scheme – Meander Valley Scheme*. Tenure: Private Freehold. Rezoning is not required.
Use class and permissibility	Extractive use category under the *Tasmanian Planning Scheme – Meander Valley Scheme*. Extractive activities are a Discretionary use class (Table 21.2).
Mining lease (ML)	Mining lease 1107P/M, first issued on 5 October 1984. Mining lease renewed May 2025. All project works will be contained within the current mining lease footprint.
Lease area	Mining lease area is approximately four (4) ha.
Electricity infrastructure	No electricity transmission lines occur near the mining lease. An electricity transmission corridor (electricity transmission infrastructure protection code overlay) occurs to the north of the mining lease but will not be impacted by the project.
Carparking	No designated carparking areas are required.

Table 4. Description of existing site and surrounds.

Land Use	Agriculture and livestock grazing in conjunction with shale extraction. The site is surrounded by agricultural land, a forestry plantation borders the western boundary. No changes to the livestock grazing practises surrounding the site are proposed. All neighbouring residences are greater than 1,000m from the quarry. The site is not located within or adjacent to an existing reserved area (e.g. National Park, State Reserve, Regional Reserve, Nature Reserve, Forest Reserve or Conservation Area).
Topography	Gently undulating farmland. The site has an easterly aspect.
Climate	Mean annual rainfall: 943.4mm. 90th percentile annual rainfall: 1198.2mm (Meander River BoM Weather Station No. 91267). Winds are from a predominately North westerly direction.
Geology	The geology of the quarry is defined as mudstone. A detailed geological assessment conducted in 2015 found that the likelihood of Acid Rock Drainage (ARD) was low[4]. The site is located within the Meander Valley Council defined karst water catchment, but within an area identified as having underlying Low Sensitivity Karst. No features indicating karst processes have been observed or identified at the quarry or immediate area. No signs of acid generating material have been identified by the operators throughout the history of the operation.
Soils	The site is not located in an area known for Acid Sulphate Soils and none have been identified during the history of the operation.

[4] Geoton (2015). Geology and geomorphology appraisal for the Meander Quarry, Reiffers Road, Meander. Prepared for Macquarie Franklin. January 2015.

Hydrology	Chittys Creek, a named minor stream is located 100m east of the site. Chittys Creek flows in a northerly direction year-round and is a tributary of Leiths Creek.
Natural values	A natural values atlas (NVA) database search is provided in Appendix 1. The quarry is located on cleared agricultural land (FAG, as classified by TASVEG 4.0). No mature trees or remnant native vegetation are present within the expansion area or mining lease (1107P/M). The site is surrounded by mostly agricultural land, except for a small area of native vegetation identified as *Eucalyptus obliqua* wet forest (WOU), located along the north western boundary of the site (Figure 3). No impacts to this vegetation community are expected. Surrounding agricultural land is predominantly used for grazing (dairy, sheep and beef) with some cropping and has been effectively unchanged for the last 30 years. No listed threatened fauna, flora or vegetation communities including potential habitat for any such species are present within the expansion area or mining lease. No threatened vegetation communities will be impacted as a result of the project. No threatened fauna species were recorded within 500m of the site, although several listed species have the potential to occur in the area based on range boundaries (refer to section 3.4.3). One declared weed species (Ragwort *Senecio jacobaea*) listed under the Tasmanian *Weed Management Act 1999* was identified from the NVA search but was not found during the site visit on 12 February 2025. Scotch thistle (a non-declared weed species) is present at the site and is currently monitored and actively managed by the proponent several times per year.

2.3 Map and site plans

The quarry site is located approximately two km west of the Meander township, off Reiffers Road (coordinates 465732E, 5389533N) (Figure 1).

The 52ha property consists of a single title located north of Reiffers Road, Meander (PID 6278839, property title 211176/45) as illustrated in Figure 2.

Table 5. Mining lease boundary coordinates.

Boundary point	Coordinates (GDA94 Easting Northing)
Northwest	465760E, 5389733N
Northeast	465959E, 5389705N
Southwest	465732E, 5389535N
Southeast	465930E, 5389508N

Table 6. Property boundary coordinates.

Boundary point	Coordinates (GDA94 Easting Northing)
Northwest	465731E, 5389755N
Northeast	466559E, 5389065N
Southwest	465642E, 5389225N
Southeast	466572E, 5389064N

The existing shale pit is located on Mining Lease 1107P/M which covers approximately four hectares of gently undulating farmland (Figure 2). The mining Lease is situated within the 52ha property. The land upon which the activity is conducted is owned and operated by the proponent.

All neighbouring residences are greater than 1,000m from the quarry (distances are presented in Figure 3). Land situated to the northwest of the quarry is dominated by agricultural land, forestry plantations and native vegetation.

The active quarry area will progress west of the existing quarry pit to the extent identified in Figure 4. This area is already approved under the 2022 EER. Note, these figures are based on an aerial imagery from 2019 and are therefore not reflective of the current site status. Quarry bench heights will be maintained at 15 metres or less. Photographs of the proposed expansion area are provided in Figure 9 and Figure 10.

All equipment is mobile and therefore is located around the pit as required for processing. There are no structures on the site.

All project works will be contained within the area shown in Figure 4, remaining within the current mining lease footprint.

Areas in the southern part of the mining lease that were previously stripped for shale extraction, have been successfully rehabilitated using the in-situ over burden to re-establish grazing land, in accordance with the principles set out in Quarry Code of Practice.[5] The rehabilitated area is shown in Figure 4.

The subject land is categorised as Agriculture Zone under the *Tasmanian Planning Scheme – Meander Valley Scheme* and situated within a low sensitivity karst management area. The land was zoned Rural Resource under the previous *Meander Valley Interim Planning Scheme 2013*, replaced on 19 April 2021. The project fits into the extractive activities category of the planning scheme. Extractive activities are a discretionary use class within the Agriculture Zone.

[5] Environment Protection Authority (2017). Quarry Code of Practice 3rd Edition, EPA Tasmania, Hobart, Tasmania.

Figure 3. Location of the property boundary (blue line) and sensitive receptors within 1.5km of the mining lease boundary. All sensitive receptors within 1.5km are residences.

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Figure 4. Site layout plan showing active quarry face in red, approved expansion area in blue and rehabilitated areas in yellow.
Aerial image source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo and the GIS User Community (2025).

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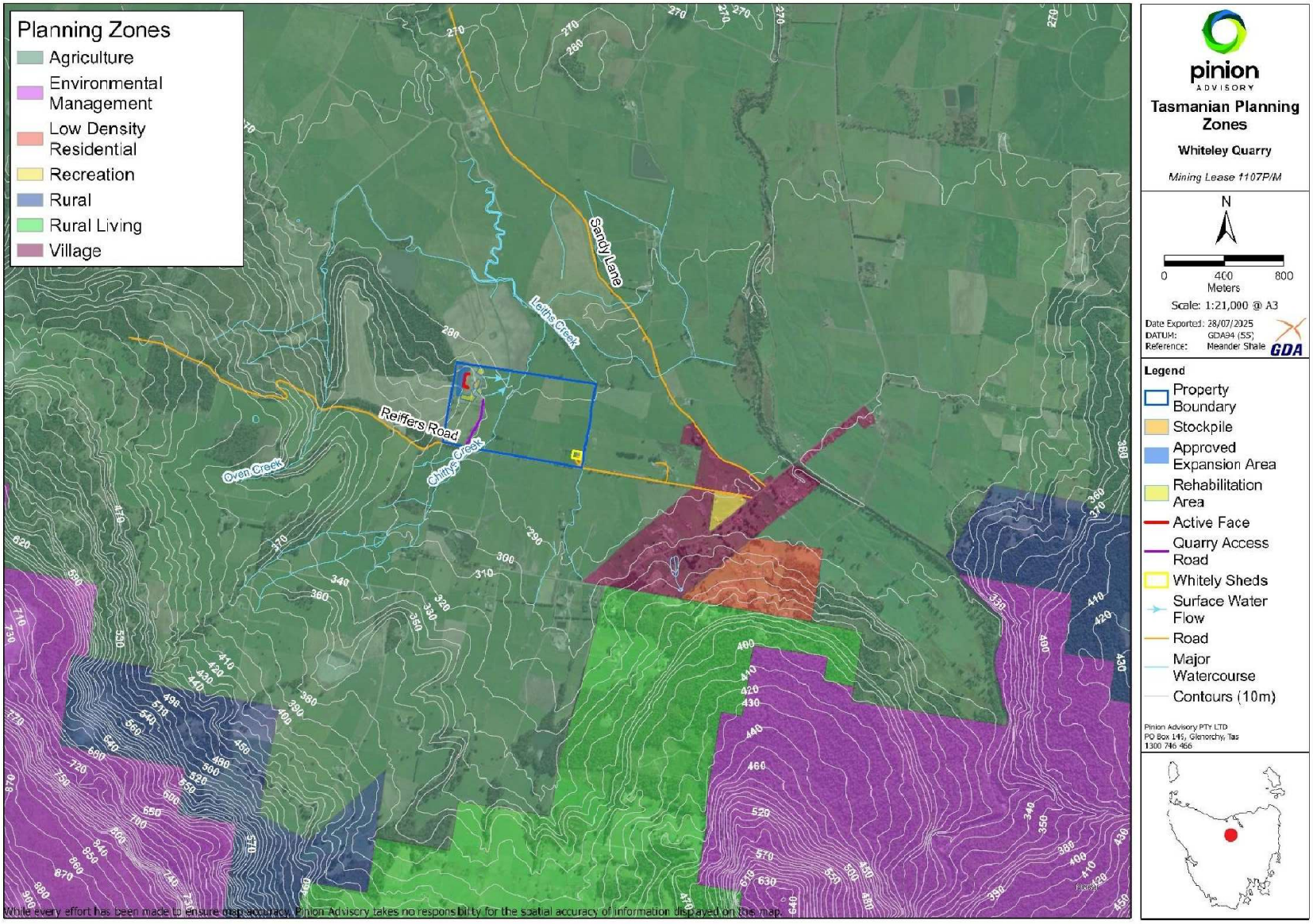

Figure 5. Tasmanian planning zones surrounding the quarry.

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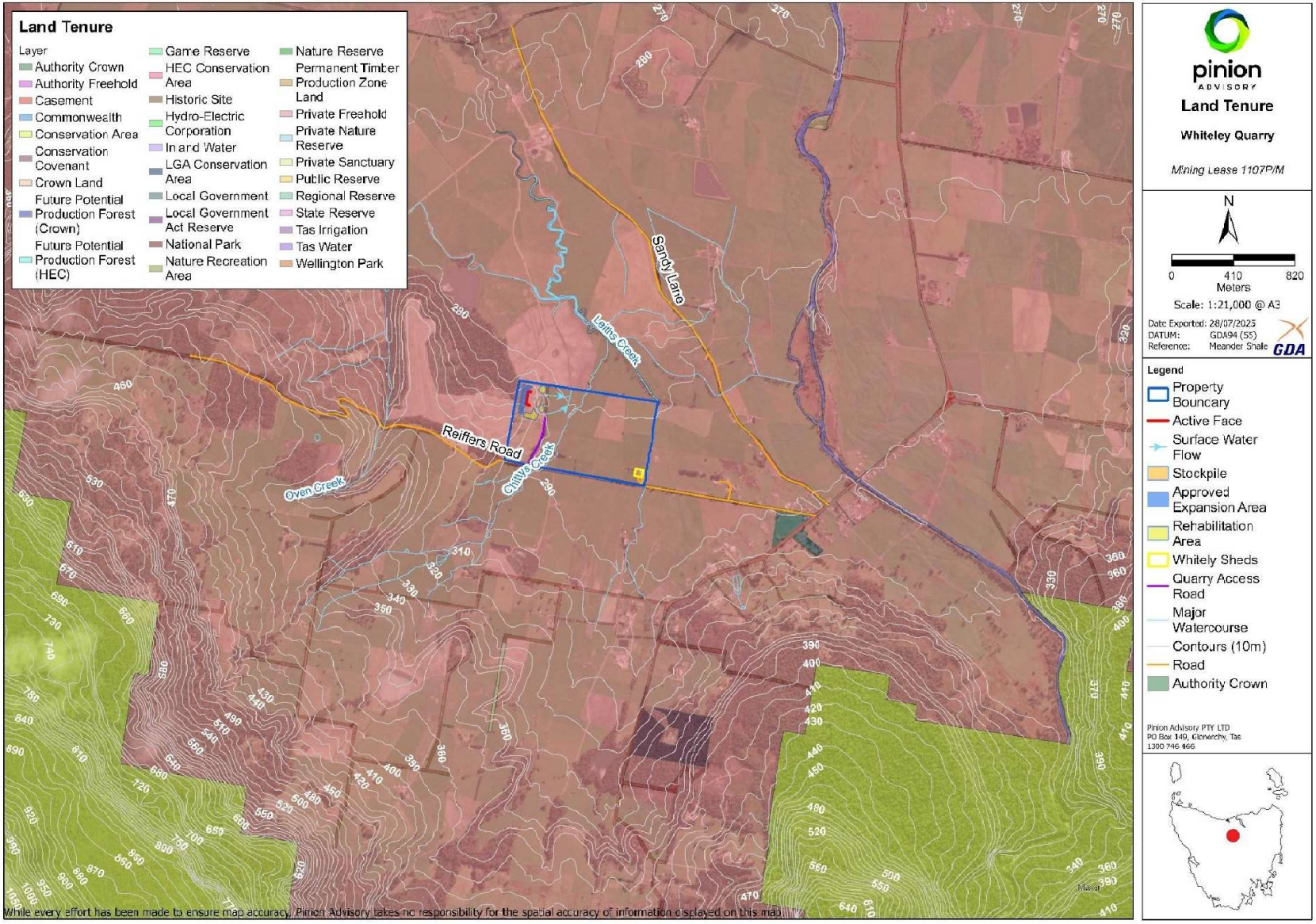

Figure 6. Land tenure surrounding the quarry. The majority of titles are private freehold.

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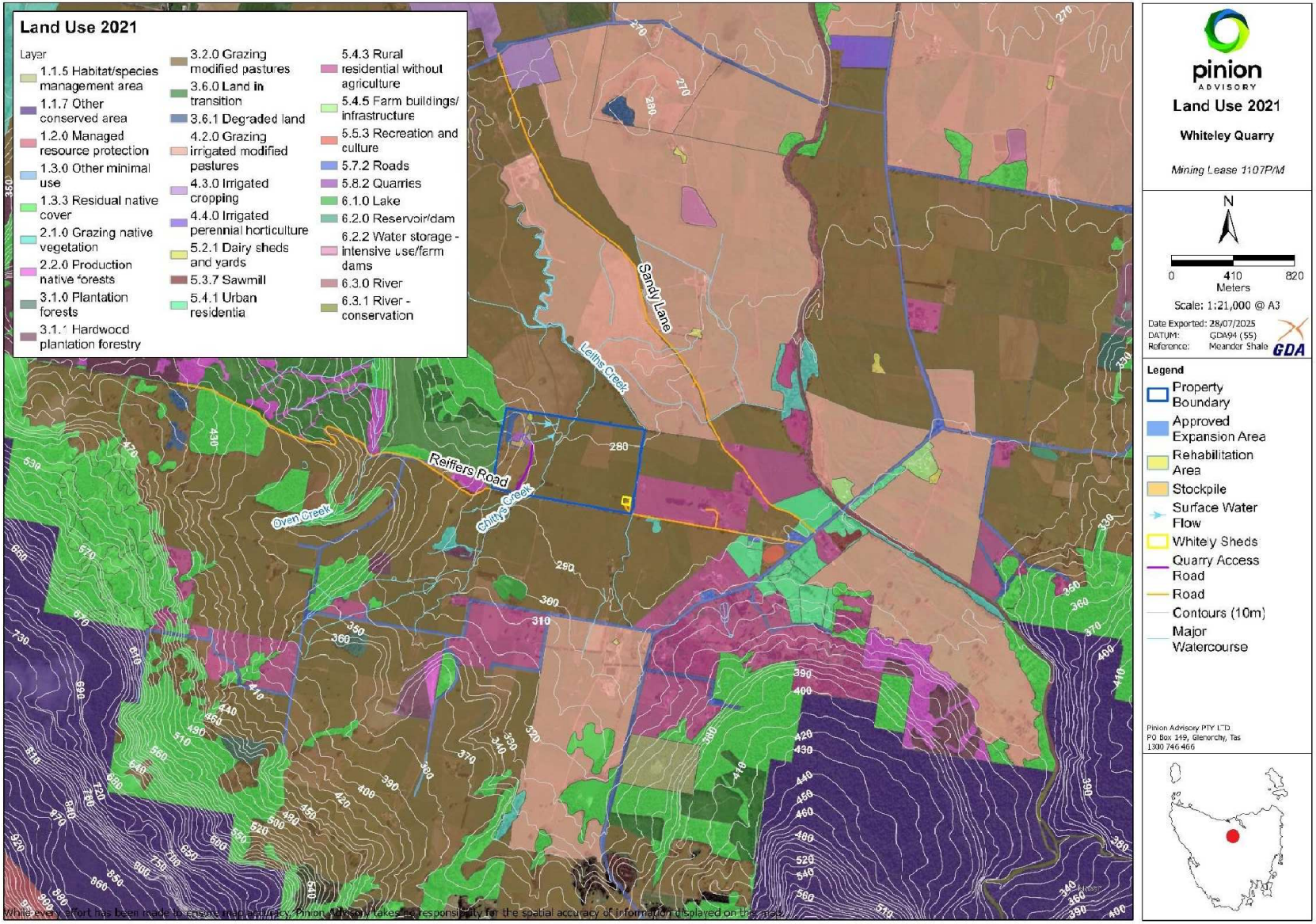


Figure 7. Land use classifications in the region.

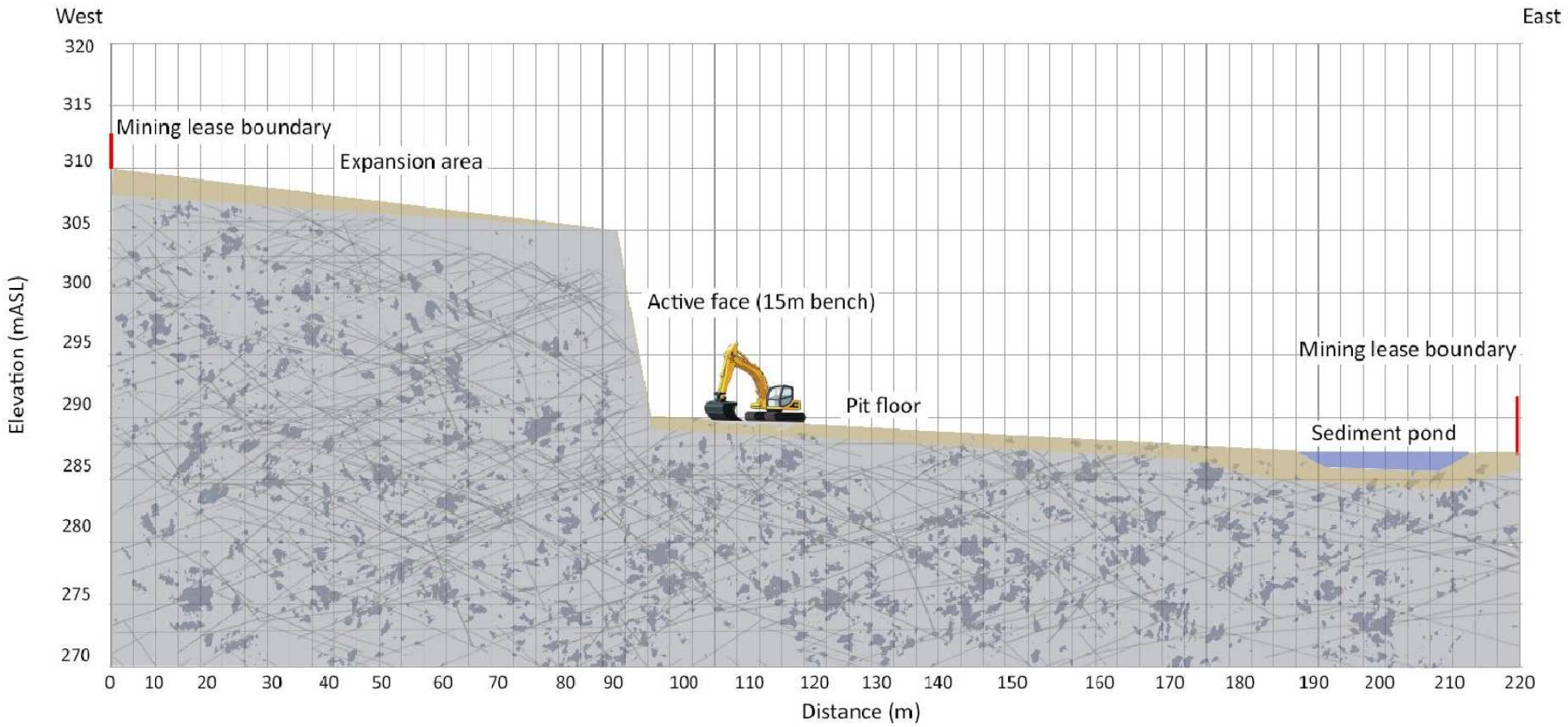


Figure 8. Approximate pit cross section in March 2025.

Figure 9. Approved expansion area (facing north), quarry to progress from right (active quarry area) to left.

Figure 10. Approved expansion area (facing south), quarry to progress from left (active quarry area) to right.

2.4 Project background, rationale, alternatives and existing activity

The land is privately owned by the proponent and is primarily used for livestock grazing, with an intermittent cropping programme.

Mining Lease No. 1107P/M was first issued on 5 October 1984 to Associated Pulp and Paper Mills Limited. The shale pit was originally opened for supporting the local forestry industry building forestry access and timber haulage roads. In later years the shale has become a recognised and sought after product for the local dairy industry for building dairy lanes, due to the friable nature of the product reducing cow lameness cause by stone injuries to their feet.

In 2006, the mining lease was transferred to the proponent and landowners, Grant and Angela Whiteley. The site has operated continually for 37 years. During this time, the site has been successfully rehabilitated behind the extraction areas. The mining lease was renewed in May 2025 for a further ten years. An Environmental Effects Report (EER) was previously submitted to the Tasmanian Environment Protection Authority (EPA) in April 2015[6] to obtain approval as a Level 2 activity under the *Environmental Management and Pollution Control Act 1994* (EMPC Act).

Since 2016, the quarry has operated as a level 2 activity (extractive industry) under Meander Valley Council (MVC) planning permit PA\16\0066 (Permit Condition Environmental No. 9105), in accordance with section 57 of the *Land Use Planning and Approvals Act 1993* (LUPA Act).

Another EER[7] was prepared in May 2022 to support the increase in maximum shale production from 15,000m^3/year (~24,000 tonnes/year) to 20,000m^3/year (~32,000 tonnes/year).

The project was approved by the EPA on 7 October 2022 (Permit Conditions – Environmental (PCE) No. 11068). Planning approval was granted by the Meander Valley Council (MVC) on 20 December 2022 (corrected permit, PA\22\0253).

To meet the increase in local demand for shale product (for dairy lanes and road projects), GR & AM Whiteley (the proponent) is seeking to increase the annual production volume at the quarry from the current permitted volume of **20,000m^3/year (32,000 tonnes/year) to 30,000m^3/year (48,000 tonnes/year)** (the project).

The growth in demand for the shale by the local dairy industry for laneway material has seen average sales volumes continue to increase annually. It is this growing local demand for product that has triggered the necessity for the proponent to expand operations.

The customer base is primarily local dairy farms in the Meander and greater Deloraine region. The local Meander Valley Council also purchase shale from the pit as a source of building material for local road projects. Forestry Tasmania have also used the pit in recent years as a source of road material for local plantation maintenance.

No viable mining alternatives are available for the proponent.

[6] Macquarie Franklin (2015). Environmental Effects Report. Prepared for GR & AM Whiteley. April 2015.

[7] Pinion Advisory (2022). Meander Shale Quarry Expansion - Environmental Effects Report. Prepared for GR & AM Whiteley. Dowsing Point, TAS.

No known non-compliances or exceedances of conditions have occurred during the operational of the quarry to date. There have been no observed impacts to natural, cultural, social and economic values in the region as a result of the operation.

3 Part C: Potential environmental impacts and management

3.1 Air quality

Quarry operations result in minor dust emissions during times of crushing but off-site impacts are low. The quarry is located on an easterly aspect slope it is naturally protected by predominant westerly winds minimising carriage of dust and noise from the site. The native vegetation located to the Northwest of the site further increases the wind buffer. The combination of topography and vegetation around the site creates a naturally protected site.

The proposed intensification does not require a significant change in any equipment or extraction/processing methodology from that previously approved in the May 2022 EER. An increase in the volume of exhaust gas emissions to the atmosphere from mobile plant and cartage equipment and on-site dust produced due to a minor increase in operating hours are the only changes.

Furthermore, the nature of the blue shale mined and crushed onsite produces very little dust and therefore, the need for dust mitigation strategies to be implemented is uncommon.

All neighbouring residences are greater than 1,000m from the quarry (refer to Figure 3). No complaints or issues have been raised by the community, EPA or the Meander Valley Council regarding dust emissions from the site.

In 2021, a shelter belt of blue gum (*Eucalyptus globulus*) and blackwood (*Acacia melanoxylon)* was planted by the proponent along northern and eastern boundaries of the quarry (Figure 11). As the trees mature, the shelter belt will further reduce the risk of dust emissions from the site.

Potential dust emission sources onsite include the permanent access road and mobile plant, stockpiles and blasting which vary in location around the activity area depending on operational requirements:

- Permanent gravel access road to the south of the mining lease from Reiffer's Road, particularly when traversed by trucks in dry conditions.
- Mobile jaw crusher.
- Wheel loader tramming material for stockpiling and truck loading.
- Drill Rig (annual)
- Blasting (annual)
- Bulldozer
- Excavator
- Stockpile in high wind conditions.

Figure 11. Shelter belt of blue gum and blackwood planted in 2021, located along the northern and eastern boundaries of the quarry

3.1.1 Dust Management

Extraction and processing of the shale material does not create significant amounts of dust compared to the processing of other common aggregate materials. Dust emissions will be managed through several strategies which will be implemented in dry conditions as required;

- Blasting dust emissions will be minimised through properly engineered shot design by the blasting company. Note blasting only occurs once annually.
- Stockpile dust will be managed using sprinklers to water the entire stockpile and spray bars on the crusher to increase the moisture content of the crushed material.
- Excessive dust generated by mobile plant will be supressed using water carts or sprinklers in high traffic areas such as wheel loading tramming from crusher to stockpile.
- Loading of Run of Mine (ROM) material into the crusher does not typically generate significant dust.
- Dust from periodic crushing operations will be supressed utilising water spray bars on the crushers.
- Trucks will be tarped if dust is generated from loaded trucks on the roads.
- Shelterbelts planted in recent years have grown to the stage where they are starting to become an effective barrier to dust that may migrate offsite.

- Visual inspections will be conducted daily in drier periods during normal operating conditions (crusher operating, truck movements on and off site, truck loading, stockpiling) to ensure dust is not leaving site. Dust suppression measures will be implemented as per above if an issue is identified.

3.1.2 Sustainability of Water Usage for Dust Suppression

- Evaporation exceeds rainfall in Meander for three months of the year. Therefore, dust suppression may be required for maximum 90 days per year in the December-February period.
- Combined water usage for crusher spray bars and a ¾' nozzle portable lateral sprinkler is estimated at maximum 1.0L/sec. Dust suppression theoretically could be required for a maximum of 90 days per year but is more likely to be a maximum of 30 days per year, in line with current operations. If dust suppression is required for 10 hours per day over 90 days, water usage is 3.24ML at absolute maximum.

  Daily water usage calculations:
  Spray bars and sprinkler usage=1.0L/sec
  Evaporation hours=10 hours
  Maximum days dust suppression required=90

  Daily water usage (L) = usage L/sec x 60sec/min x 60min/hr x 10hrs
  = 1.0x60x60x10
  =36,000L

  Yearly water usage (ML)= (daily usage (L) x 90 days) / 1,000,000L/ML
  =(36,000 x 90)/1,000,000
  =3.24ML

- Water is supplied to the quarry by the reticulated stock water system that provides water to the proponent's livestock operation surrounding the quarry. Water is sourced from Oven's creek.

Using the Water Assessment Tool (NRE) seasonal 50% flow for the Oven's creek offtake location is 981ML. See Table 1 for modelled streamflow for Oven's creek at the take location. Daily water use for dust suppression is maximum 36,000L. Given that the daily minimum of reliable 50% streamflow for Oven's creek in February is 1,339,416L, there is ample water available for dust suppression now and into the future, even if streamflow reduces significantly due to a predicted drier climate.

Table 7. Streamflow for Oven's Creek

	December	January	February
Monthly portion of mean annual rainfall (%)	6.56	6.46	4.65
Monthly streamflow (ML)=(Portion rainfall x annual 50% flow)	64.31	63.45	45.59
Daily streamflow (ML)=(Monthly streamflow/days in month)	2.07	2.05	1.34
Daily streamflow (L)	2074399	2046819	1339416

3.2 Water quality

3.2.1 Surface water

There are no permanent water bodies located on the quarry site.

The catchment area above the site is limited to a 250m low ridge which borders the western boundary. As a result, the runoff catchment area is small, relative to the site. Earthen bunding around the top of the pit intercepts surface water and diverts it to pasture paddock.

All surface water from the active quarry area is channelled by site topography into two small sediment settling ponds (approximately 10m x 10m x 0.6m at the deepest point) (Figure 12). The settling ponds are a simple design, with outflows distributed across a broad and gentle 3 – 5% slope cropping area, for approximately 250m before it enters a drain (Figure 4). The drain then flows into Leith's Creek (located to the north), rather than into Chittys Creek (the closest waterway located to the east of the site).

A limestone barrier wall is installed on the downslope side of the settling ponds to slow down potential high flow events and provide some buffering capacity prior to discharge across the paddock (Figure 12). The settling ponds were inspected during the site visit in March 2025 and were functioning appropriately. The proponent stated that the settling ponds typically only contain water for approximately six months of the year.

The adjacent paddock/infiltration area contains perennial pasture that acts as an additional filter for any turbidity. During the winter period, stocking rates are reduced to minimise risk of soil pugging.

This drainage management system through the proponent's land ensures that peak flows and winter surface flows minimise any erosion and sediment flow outside of the site.

The settling ponds are cleaned out on a regular basis (when conditions are dry), to maintain their capacity to settle sediment and ensure maximum retention volume.

Water captured in the settling ponds is monitored biannually (when water is present in the pond) by the proponent with test results sent to the EPA. Further details of the water quality monitoring program are provided in section 3.13.

Acceptable criteria for water quality have been established based on managing acid rock drainage indicators and international best practice. The International Erosion Control Association handbook states that a maximum concentration of 50mg/L Total Suspended Solids should not be exceeded from sediment basin discharge[8]. pH of the sediment basin discharge should not be less than 6.5 as an indicator or acid rock drainage[9]. Monitoring of the sedimentation ponds has not identified exceedances in any of these parameters.

It is noted that the intensification does not propose changes to the current operational footprint and expansion area as previously approved in the 2022 EER. The operational footprint will not change and

[8] International Erosion Control Association- Best Practice Sediment and Erosion Control- Book 1 V7, Section 1.4
[9] Geoton Geology and Geomorphology Appraisal, 2015.

therefore the catchment area contributing surface water to the sedimentation pond will not be increased. Progressive rehabilitation of disturbed areas will continue to occur. Surface water from rehabilitated areas will be directed away from the sedimentation pond catchment. Water quality parameters of pH, electrical conductivity and TSS have not been exceeded in any sampling events from the sedimentation discharge monitoring point. Given the proposed intensification will not involve changes from previously approved operational footprint and expansion area, as well as the absence of exceedances in key water quality parameters in water discharged from the site, the current surface water collection and treatment system is considered adequate.

Figure 12. Sediment settling pond with limestone barrier and discharge across pasture paddock in background (March 2025).

Figure 13. Water distribution area after settling ponds. (March 2025).

The project will occur within 200m of a creek, however, as noted above no negative impacts are expected because of the production increase. The project will not result in the filling, excavating or impoundment of a river, creek, wetland or estuary, nor will the project result in clearing of vegetation within 200m of a river, creek, wetland or estuary.

Existing operations at the quarry have not resulted in any adverse impacts on Chitty's Creek. On this basis, and with current management and monitoring procedures in place, no adverse impacts are anticipated with the proposed project.

The Meander River catchment at the receiving stream is subject to the protected environmental value (PEV) description of:

"….water quality management strategies should provide water of a physical and chemical nature to support a modified, but healthy aquatic ecosystem from which edible fish may be harvested; which will allow people to safely engage in recreation activities such as swimming, kayaking, paddling or fishing in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Trevallyn Power Scheme."[10]

[10] Department of Primary Industries, Water and Environment, Tasmania. 2004. Environmental Management Goals for Tasmanian Surface Waters- Meander River Catchment.

Addressing the PEV's:

- Protection of aquatic ecosystems-
  - The water should not adversely affect aquatic species as pH, TSS and electrical conductivity is within acceptable generic trigger ranges[11]
  - pH is within the DGV for the Meander Catchment for a slightly to moderately disturbed stream[12].
  - Environmentally adverse water pollutants and water quality parameters are not expected if operational protocols are followed. During rainfall events that cause discharge of the sedimentation pond, further dilution of the discharge by diverted onsite surface water downstream from the sedimentation pond sampling point is expected to significantly reduce the electrical conductivity of the site surface water.
  - TSS of discharged surface water is within the IECA[13] and Quarry Code of Practice[14] limits of 50mg/L and 30mg/L respectively.
- Recreational water quality and aesthetics-
  - The discharge pH is within acceptable ranges for swimming and turbidity is visually acceptable.
- Industrial water supply (for Hydro-electric power generation)-
  - The water does not contain pollutants or debris that may affect hydroelectric generation capacity or infrastructure.

Given the lack of past impact on the Meander River catchment streams from the operation, no proposed change to site operational area and therefore the low likelihood of any future impact, the intensification poses an low risk to the PEVs in the Meander River catchment.

3.2.2 Groundwater

A search of the Groundwater Information Access Portal[15] identified no groundwater bores on or adjacent to the site. The closest groundwater bore was identified approximately 950m south of the quarry (Bore 31157: GDA 94, 465883E, 5388605N, accuracy 200m). The bore was installed in April 2002 to a depth of 97.5m through clay, shingle and mudstone. Depth to water at the time of installation was 5.0m. No water quality data was included in the search results.

Minor groundwater seepage has been observed periodically from the western face of the quarry.

Water use at the quarry is limited to dust suppression and is not routinely required. Water for this purpose is sourced from the reticulated stock water system that passes through the site.

[11] Department of Primary Industries and Water. 2008. Site-specific trigger values for physico-chemical indicators monitored under the DPIW Baseline Water Quality Monitoring Program.

[12] Default Guideline Values (DGVs) for Aquatic Ecosystems of the Meander Catchment

[13] International Erosion Control Association- Best Practice Sediment and Erosion Control- Book 1 V7, Section 1.4

[14] Environment Protection Authority. 2017. Quarry Code of Practice 3rd Edition.

[15] Department of Natural Resources and Environment Tasmania. Groundwater Information Access Portal. Accessed 16/02/2025 at: https://wrt.tas.gov.au/groundwater-info/

No impacts to groundwater values are expected as a result of the proposed intensification.

3.3 Noise emissions

Location of the quarry is consistent with distances from sensitive receptors recommended in the Quarry Code of Practice section 7[16], which states that separation distances from a sensitive use should be a minimum 1000 metres. The closest sensitive receptor (residential dwelling) is 1050 metres from quarry.

Addressing the Environment Protection Policy (Noise 2009)[17], the proposed intensification will not increase the intensity of noise. There will be a minor increase in operating hours for the crusher. The most significant noise source is blasting which has been reduced in frequency from a biannual event to an annual event in recent years. No sensitive environmental values have been identified within 1000m that will be impacted by operational noise. The Meander community is a rural community that is accustomed to general noise from agriculture, quarrying and forestry operations at all hours of the day. The quarry is also a vital source of laneway and roading surfacing material for most of the agricultural properties in the community. No community complaints have been received in the lifetime of the operation. The proposed intensification will implement best practice mitigation measures including sensitive hours of operation, minimising blast frequency, existing appropriate site location and vegetation screening.

[16] Environment Protection Authority Tasmania. 2017. Quarry Code of Practice 3rd Edition.

[17] Environment Protection Authority Tasmania. 2009. Environment Protection Policy (Noise). Part 5- Commercial and Industrial Activities.

Figure 14. Potential noise receptors within 3km highlighted in yellow. The 3km radius is shown with a dotted red line and includes the entirety of the Meander township, where no noise complaints have been received in the operational lifetime of the quarry.

pinion ADVISORY

Quarry operations include mobile equipment and activities that emits noise, including blasting, crushing and cartage. Mobile equipment and the noise emissions are listed below:

Table 8. Noise emissions from mobile equipment utilised onsite.

Equipment	Model	Noise emissions at machine dB(A)
Excavator	Komatsu 20t	75-90
Jaw crusher	Metrotrac 900/600	110-120
Bulldozer	Caterpillar D5	80-100
Wheel Loader	Komatsu WA400	103
Mobile drill rig	Various	120
Road cartage: 10-yard truck and trailer (pig or dog trailer)	Various	70

3.3.1 Blasting

Blasting is required to fracture the material to allow its removal and processing. The blasting schedule will remain the same (once a year), with sufficient material raised during this to maintain the quarrying activities for the following 12 months.

Blast design, management and evaluation is contracted and currently completed by experienced contractor, Orica Mining Services. The size of the last blast conducted on 5 March 2025, was approximately 13,450m^3 (solid cubic metres), equivalent to 20,175m^3 (loose cubic metres). Blasting activities at the site only occur during 10:00am and 4:00pm (Monday to Friday) in accordance with Condition B1 (Permit No. 9105).

Direct communication is made prior to blasting to neighbouring residences (A, B and C; Figure 3). All neighbouring residences are greater than 1,000m from quarry. Communication is also extended to the wider Meander community on when blasting will occur, usually via the local Meander shop and resulting 'word of mouth'.

No complaints are known to the proponent in relation to blasting activities. The proponent will continue to notify immediate neighbouring residences and the Meander community when blasting is planned to occur.

No noise or vibration monitoring has occurred by the blasting contractor due to blasting occurring only once annually and that there have been no community complaints throughout the entire operational history. Blast monitoring is not considered necessary in the Quarry Code of Practice when there is a separation distance of more than 1000 metres from a sensitive receptor.

3.3.2 Crushing

A mobile Metrotrac Jaw Crusher 900/600 is used as required. A 20t excavator is used to feed the crusher and a wheel loader is used to bog out from the crusher and stockpile the crushed material

ready for sale. No screening or stacking equipment is utilised. The crusher is located on the quarry floor and operates within normal working hours (8.00am to 4.30pm), and only during fine weather (all activities at the quarry cease during rainfall events). Therefore, crushing activity usually occurs most frequently during the months of November to April.

As a result of the intensification, the mobile crusher will increase from approximately 265 hours per year (2023, 19,875m^3 and 2024, 18,753m^3) to 400 hours per year, an increase of approximately 135 hours per year, or 2.6 hours per week. Based on a rate of 75m^3/hr and increase to 30,000m^3.

No complaints are known to the proponent in relation to crushing activities at the quarry.

3.3.3 Cartage (loading and truck movements)

A Komatsu WA400 Wheel Loader is currently used for loading shale at the quarry. Loading of shale and truck movements will occur during standard operating times and include:

- 7:00am to 6:00pm Monday to Friday
- 8:00am to 4:00pm on Saturday

No quarry or processing operations are conducted on Sundays or gazetted public holidays.

Current truck data (Nov 2023 – Oct 2024) are as follows:

- 55.56% truck usage, 44.44% truck & trailer usage.
- 4190 annual movements carting 2095 loads of shale product (2 movements per load).

Proposed future truck movements (based on 25% truck/75% truck & trailer):

- **4690 annual movements carting 2345 loads of shale product.**
- **No change to light vehicle movements.**

See the Traffic Impact Assessment for further information in Appendix 4.

This increase represents a 10.7% increase in truck movements for a 34% increase in production.

In response to the sporadic demand for shale (for local dairies and other road projects), peak truck movements can increase temporarily at times to the maximum allowable of 48 per day (3 trucks x 8 loads each).

No complaints are known to the proponent in relation to loading or transporting shale.

Noise emissions will not be above those that are currently approved at the site. The quarry is situated in a sheltered position (refer to section 3.1) which assists in reducing the acoustic transmission of noise to neighbouring residences. The gravel access track to the quarry will be well maintained (without corrugations) to reduce noise emissions from truck movements.

In 2021, a shelter belt of blue gum (*Eucalyptus globulus*) and blackwood (*Acacia melanoxylon)* was planted by the proponent along northern and eastern boundaries of the quarry (Figure 11). As the trees mature, the shelter belt will further reduce the risk of noise emissions from the site.

No noise impacts are anticipated as a result of the proposed project expansion.

3.4 Natural values

The Meander area has a long history of agricultural production, including grazing and cropping. Due to clearing for agriculture there is no native vegetation on the site. As a result, the natural values are very low.

Land surrounding the property (to the north, east and south) has also been cleared for agriculture, except for a small remnant patch of native vegetation located adjacent to the north western boundary (refer to Figure 3 and Figure 4).

The site is not located within or adjacent to an existing reserved area (e.g. National Park, State Reserve, Regional Reserve, Nature Reserve, Forest Reserve or Conservation Area). No native vegetation or potential habitat for native fauna will be cleared or disturbed as part of the proposed intensification.

A search of the natural values atlas (NVA) database was undertaken on 25 February 2025 to determine if any listed threatened species or ecological communities occur in or near the site (Appendix 1). A review of the aerial photography (ListMap) was also conducted to determine the ecological value of the site in the context of the surrounding landscape and historical land uses. Ecological values and the likelihood of listed species or communities being present at the site were also assessed during the site visit, conducted on 12 March 2025.

3.4.1 Vegetation

A single TASVEG 4.0 vegetation community was identified within the site boundary, classified as Agricultural Land (FAG). No mature trees or remnant vegetation are present within the site.

Seven TASVEG 4.0 vegetation communities were identified within one km of the site and include:

1. DOV - *Eucalyptus ovata* forest and woodland
2. FAG - Agricultural land
3. FPH - Plantations for silviculture - hardwood
4. FPU - Unverified plantations for silviculture (now harvested)
5. FWU – Weed infestation
6. OAQ - Water
7. WOU - *Eucalyptus obliqua* wet forest (undifferentiated)

No threatened native vegetation communities are present within the quarry site or proposed expansion area (Figure 4). One threatened community was identified within one kilometre of the site. The NVA noted some small and isolated patches of the threatened community *Eucalyptus ovata* forest and woodland (DOV), situated approximately 150m – 300m south of the active quarry area (Appendix 1). These were visited during the site visit and found to be isolated trees dominated by other *Eucalyptus* species. The proposed project will not impact these isolated vegetation communities. The NVA also identified some remnant patches of DOV dispersed throughout the landscape (as shown in Appendix 1). These isolated vegetation communities will not be impacted by the project.

3.4.2 Flora

Six threatened flora species listed under the *Threatened Species Protection Act 1995* (TSP Act) were identified within 5km of the site, no records were identified at or near the site.

3.4.3 Fauna

The NVA search identified the following threatened fauna species (based on range boundaries) within 5km of the site:

- Green and gold frog *Litoria raniformis*
- Swift parrot *Lathamus discolor*
- Spotted-tail quoll *Dasyurus maculatus subsp. maculatus*
- Tussock skink *Pseudemoia pagenstecheri*
- Swan galaxias *Galaxias fontanus*
- Masked owl (Tasmanian) *Tyto novaehollandiae subsp. Castanops*
- White-bellied sea-eagle *Haliaeetus leucogaster*
- Grey goshawk *Accipiter novaehollandiae*
- Tasmanian devil *Sarcophilus harrisii*
- Eastern barred bandicoot *Perameles gunnii*
- Tasmanian wedge-tailed eagle *Aquila audax subsp. fleayi*
- Eastern quoll *Dasyurus viverrinus*

No threatened fauna species were recorded within 500m of the site, although several listed species have the potential to occur in the area.

No evidence of threatened fauna activity was identified during the site visit, such as scats, tracks, calls, diggings or sightings.

The Tasmanian devil and other crepuscular mammals (e.g. spotted-tail quoll, eastern quoll and eastern barred bandicoot) are susceptible to roadkill. Whilst there will only be a small and sporadic increase in traffic movements to and from the site (section 3.10) the majority of movements, such as trucks transporting shale, will occur during daylight hours. In the winter months, there may be some movements to the facility at dawn, but this will coincide with a time of low dispersal for male devils and imps. As a result, the species is unlikely to be impacted by the project.

While impacts to fauna from roadkill are likely to be negligible to low, the proponent will implement the following management measures to reduce any potential mortality:

- Provide ongoing awareness to site personnel (truck drivers) and contractors during inductions and toolbox meetings.
- Driving at reduced speeds during dawn and dusk.
- Identify high-risk roadkill areas and reduced speeds in these areas and provide signage where relevant.
- Move roadkill away from the road corridor, where practical and safe to do so.
- Report injured animals and roadkill.

No raptor nests or sightings were recorded within 500m of the site. Four wedge-tailed eagle nests have been recorded within 5km of the site, but significantly more than 1km from the site to the southeast.

Other listed avifauna species (e.g. swift parrot, grey goshawk and masked owl) are unlikely to be impacted from the project due to the lack of suitable breeding and foraging habitat at the site. Impacts from noise and light emissions on avifauna species are unlikely, given the nature of the operations.

The project is unlikely to significantly impact any matters of national environmental significance protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). As a result, the project will not be referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water for approval under the EPBC Act.

3.4.4 Geoconservation

The NVA search identified one geoconservation site (Mole Creek Karst) within one km of the quarry. A detailed Geology and Geomorphology survey and report was conducted in 2015 by Geoton (Appendix 2)[18]. The findings of this study are summarised below.

The quarry is located within the Meander Valley Council defined karst water catchment, but within an area identified as having underlying Low Sensitivity Karst. No features indicating karst processes were observed or identified at the quarry or surrounding area. No outcropping limestone was observed within the quarry, the bed of Chittys Creek or emergent from the Quaternary sediments of the floodplain to the north and east of the site. The floodplain has no evidence of sinkholes, springs or features indicative of active karst processes between the surface and at depth. There are no known limestone caves within the Meander township district, and no known outcrops of Ordivician limestone identified on the surface geology maps.

No biosecurity risks or active landslides are located with one km of the site.

In summary, no impacts to natural values are expected from the proposed intensification. Furthermore, current surface water management measures (e.g. sediment settling pond and biannual monitoring) will ensure that downstream aquatic values and/or species will not be impacted. Based on the above findings, The Department of Natural Resources and Environment Tasmania, Conservation Assessments Section (CAS), supports the conclusion that the risk of impacts to Karst systems is low.

If in the future the quarry is proposed to be developed below the current pit floor level, a geological survey may be required to determine the extent of the underlying geology and to assess the likelihood of karstified limestone occurring below the quarry.

3.5 Weeds, pests and pathogens

The NVA database search identified one declared weed species (Ragwort *Senecio jacobaea*) listed under the Tasmanian *Weed Management Act 1999* and no priority weeds within 500m of the site

[18] Geoton (2015). Geology and geomorphology appraisal for the Meander Quarry, Reiffers Road, Meander. Prepared for Macquarie Franklin. January 2015.

(Appendix 1). Ragwort records from the NVA were identified south of the quarry area, near Reiffers Road. Ragwort was not identified in the project area during the site visit.

A further nine species (listed under the *Weed Management Act 1999*) were identified from the NVA within five km of the site (Appendix 1). None of the nine weed species were recorded in the project area.

Scotch Thistle (or Spear Thistle) *Cirsium vulgare* (a non-declared weed species) is present at the site and is currently monitored and actively managed (sprayed) by the proponent. A tractor mounted chemical spray unit is used to spray weed species as they are identified in the quarry area.

No gorse or blackberry (both listed as declared weed species) and only isolated dock plants (non-declared species) were identified during the site visit. Some common pasture weeds are present, mostly as flat weeds.

In 2012, topsoil was opportunistically brought in from the Meander Valley Council (MVC) and stockpiled on the site, to be used for rehabilitation purposes only. Since that time, topsoil is infrequently delivered to the quarry from the MVC. Since 2022, no topsoil has been imported to the site and this practice is not anticipated to occur in the future.

Weed management procedures will be guided by the Weed and Disease Planning and Hygiene Guidelines[19].

3.5.1 Weed management procedures

The following management procedures are implemented by the proponent to manage weeds at the site (Table 9).

Table 9. Weed management procedures.

Activity	Responsible party	Action
Site monitoring & evaluation	Proponent or nominated 3rd party	• Inspect the access road, quarry floor, stockpiles and land surrounding the mining lease for the presence of weeds. • Conduct weed inspections three (3) times a year; April/May (autumn), September/October (spring) and January/February (summer).
Weed control	Proponent or nominated 3rd party	• Apply the correct herbicide under the correct spray conditions to achieve 100% control of those weeds present. • Seek professional agronomic advice for complete herbicide recommendations as required.

Most heavy equipment that is used onsite does not leave site, except for major maintenance. The exception of this is contracted trucks for transporting product. Trucks are restricted to loading on a

[19] Department of Primary Industries, Parks, Water and Environment (2015). Weed and Disease Planning and Hygiene Guidelines - Preventing the spread of weeds and diseases in Tasmania.

gravel pad that drains into a settling pond. Therefore, the risk of weed seed importation and establishment of weeds is low and can be easily monitored in the small area of the site. Contracted equipment such as drill rigs should be thoroughly inspected for hygiene purposes before unloading onsite. Such equipment should not be accepted onsite in an unhygienic condition. An example of an inspection checklist is shown below.

CLEANING/INSPECTION LIST FOR AN EXCAVATOR				
Date:		**Site:**		
Vehicle:		**Registration/ID:**		
Area	**Contamination point**	**Inspected**	**Cleaned**	**Method**
Engine bay	Engine bay floor			
	Fan shroud and radiator cores			
	Air filters (shake/tap filters to determine if clean)			
	Glacier plate (near radiator)			
Cabin	Footwells			
	Carpets and mats			
	Seats			
	Tool boxes			
	Air vents			
Excavation body	Hollow section chassis channels			
	Channels for hydraulic hoses from driven motor			
	Counterweight void spaces			
	Removable track adjuster guards and lubrication points			
	Turret pivot area			
	Arms/booms - pivot points			
Bucket/Blade	Between teeth of adapters			
	Wear plates			
Rear blade (Stabiliser)	Wear plates			
	Hollow section arms			
	Hollow section blade			
Cleaning method: Mechanical (M), Compressed Air (CA), Vacuum (V), High Pressure Water (HPW), Low Pressure Water (LPW)				
Inspected by:		**Signature:**		
Cleaned by:		**Signature:**		

Figure 15. Mobile plant inspection/cleaning checklist.

Weed seeds in shale supplied off site also has the potential to spread weeds. With the above management procedures in place the potential risk of spreading weeds from the site is low, combined with complete stripping and segregation of topsoil (potentially containing weed seeds) from the processed product.

No known pests or pathogens have been recorded at the site.

3.6 Waste

3.6.1 Acid rock drainage

No acid rock drainage is expected due to previous assessments, absence of signs of potentially acid forming (PAF) material and surface water runoff from the operational area having a pH >6.5. If PAF material is exposed, MRT will be contacted, operational activity in that area will cease and the monitoring of sedimentation basin pH will be conducted to determine if treatment action is necessary.

3.6.2 Solid and liquid waste

The activity will not produce or result in solid wastes, except overburden, which is maintained onsite and utilised for rehabilitation activities. Used machinery oil and general refuse will be taken off-site and recycled or disposed at a registered waste disposal facility.

The activity will not result in discharge of liquids (including to sewer), except surface water which is discussed in section 3.2.1.

3.7 Environmentally hazardous substances

The activity involves the use of industry standard fuels and explosives, however, these materials are not stored onsite.

Diesel fuel for onsite machinery is stored in a mobile tank mounted to a light vehicle, which is not stored onsite. No other environmentally hazardous materials (e.g. oils and lubricants) are stored at the site.

Mitigation measures to avoid potential impacts include appropriate training for the filling of diesel fuel tanks, spill management and personal protective equipment (PPE). Any spill will be cleaned up immediately and recorded in a site register. A spill kit (located in a large plastic yellow wheelie bin, Figure 16) is situated at the entrance to the quarry to manage hydrocarbon type spills. All site personnel are aware of the location and how to correctly use the spill kit.

Figure 16. Hydrocarbon spill kit located at the entrance of the quarry.

3.8 Site contamination

The quarry is located on existing farmland with no known historical contamination issues to soil or groundwater values from dangerous goods or environmentally hazardous materials (e.g. hydrocarbons and pesticides).

3.9 Potentially acid forming material and acid rock drainage

Commonly occurring sulphide minerals, such as pyrite, can generate sulphuric acid when exposed to oxidising conditions and in the presence of certain metallogenic bacteria. The resulting acid drainage can mobilise heavy metals which can seriously affect soils and water quality in the receiving environments[20]. A detailed analytical report conducted by Geoton[21], including site observations and analytical analysis is provided in Appendix 2.

The report concludes that site works to limit oxidation/acidification are not considered necessary at the quarry due to the following reasons:

- The Net Aid Production Potential (NAPP) from samples are below the Acid Rock Drainage (ARD) threshold of 20 kg H_2SO_4/t.
- The quarry rocks are identified as being within the low reactivity zone.
- The site and surrounds consist of sedimentary rocks with no evidence of any significant inclusions of heavy metal mineralisation. Therefore, any acid generation is unlikely to mobilise any heavy metals into the environment.
- The observed geology was fossiliferous with inclusions of acid neutralising calcium carbonate.
- No visual pyrite mineralogy was observed.
- The outflow from the quarry is considered as being minimal as the catchment is very small and only very minor groundwater seepage was encountered.
- Only minor iron staining was evident.
- No odours or discolouring of the water was evident at the time of the investigation, and the vegetation downslope shows no evidence of changes to species composition or rates of growth.
- No precipitation was evident along the drainage channel.
- The rehabilitated area is well vegetated with a thick cover of grass.
- Roads inspected that were constructed using the quarry product did not display any signs of acid generation.

A future assessment was recommended, with further testing conducted, if certain conditions in the quarry change. Such changes are as follows:

- Any change within the geology of the material. In particular, any pyrite (or other acidic mineralogy) visible within the quarried material. A visual assessment should be undertaken on the blast drillhole cuttings, with a further visual assessment after each blast. If pyrite is encountered, consideration should be given to not blasting in that area until testing of the material has been conducted. The geological map indicates that pyritic mudstone is found locally in the area and is not typically fossiliferous and will most likely have a lower acid

[20] Gurung, Dr S (2001/05). Acid drainage from abandoned mines in Tasmania.

[21] Geoton (2015). Geology and geomorphology appraisal for the Meander Quarry, Reiffers Road, Meander. Prepared for Macquarie Franklin. January 2015.

neutralising capacity (ANC) and therefore a higher NAPP. Therefore, any quarried material that is encountered that contains pyritic mudstone is potentially likely to produce some acid along the laneways and roads where it is used.

- A field pH of less than pH 6.5 recorded from the sediment settling pond.
- An increase in iron staining and iron precipitation, visible within the working area of the quarry.
- Any increase in groundwater seepage and subsequent outflow from the quarry.
- Any significant changes in the vegetation along the drainage channel.

The proponent has not observed any signs of the above in the period to 12 March 2025.

3.10 Environmental impacts of traffic

Traffic movements from the site have the potential to create excessive dust and noise emissions causing nuisance to neighbouring residents.

Impacts from dust and noise emissions are discussed in sections 3.1 and 3.3 respectively and briefly summarised below.

3.10.1 Current traffic movements

Reiffers Road is a rural bitumen and gravel road that services local traffic and the quarry site. All trucks from the quarry exit along Reiffers Road to Meander, from where there are three main routes that are taken – Sandy Lane, towards Western Creek, north along Meander Road to Deloraine or south towards Lake Huntsman. Other agricultural machinery and truck traffic including milk tankers and farm machinery also use the local roads on a regular basis. See the Traffic Impact Assessment in Appendix 4.

Current (and future) times for quarrying operations, processing and truck movements are as follows:

- 7:00am to 6:00pm Monday to Friday.
- 8:00am to 4:00pm on Saturday.

No quarry or processing operations are conducted on Sundays or gazetted public holidays.

Current truck data (Nov 2023 – Oct 2024) are as follows:

- 55.56% truck usage, 44.44% truck & trailer usage.
- 4190 annual movements carting 2095 loads of shale product (2 movements per load).

The current traffic schedule will remain for the majority of operations.

3.10.2 Future traffic movements

Activities at the quarry, and therefore future traffic movements are dependent on market demand, with recent increases in demand mainly from local dairy farmers who use the material for internal tracks and laneways.

As noted in section 3.3.3, **Proposed future truck movements (based on 25% truck/75% truck & trailer):**

Proposed future truck movements (based on 25% truck/75% truck & trailer):

- 4690 annual movements carting 2345 loads of shale product.
- No change to light vehicle movements.
- 10.7% increase in truck movements.

See the Traffic Impact Assessment for further information in Appendix 4.

No complaints or issues have been raised by neighbours or EPA regarding noise or dust emissions from the transport of shale. The small and infrequent increase in truck movements associated with the proposed intensification is not likely to adversely impact the amenity of the surrounding area.

3.10.3 Weather limitations

The demand for gravel is very much influenced by weather events, such that during wet rainy weather the dominant end users (being dairy farmers) are unable to lay the gravel and hence truck movements and quarrying operations cease.

3.11 Cultural heritage

As a part of the 2015 EER[22], Aboriginal Heritage Tasmania (AHT) completed a search of the Tasmanian Aboriginal Site Index (TASI) regarding the proposed quarry expansion at mining lease 1107P/M and advised that there were no Aboriginal heritage sites recorded within or close to the property (Appendix 3). Based on a review of previous reports and the area being highly disturbed, it was believed that the area had a low probability of Aboriginal heritage being present.

Accordingly, there was no requirement for an Aboriginal heritage investigation and AHT had no objection to the project proceeding.

Similarly, due the highly disturbed nature of the site it is believed that the area has a low probability of European cultural heritage being present.

The proponent is aware of legislated obligations regarding aboriginal heritage in Tasmania. "Unanticipated Discovery Guidelines" have been obtained and works will cease, and guidelines followed if unanticipated discoveries are found.

3.12 Other off-site impacts

All infrastructure required for the intensification will be contained within the existing site boundary. Expansion of the activity is not expected to impact any off-site infrastructure (e.g. roads, power networks and ports).

Given that the proposed activity is only a slight increase from that currently being conducted (and approved), it is unlikely that the expansion will impact the amenity of residents or other premises.

[22] Macquarie Franklin (2015). Environmental Effects Report. Prepared for GR & AM Whiteley. April 2015.

3.13 Monitoring

3.13.1 Sediment settling ponds

At present there is one surface water monitoring point located at the sediment settling pond (WQMP1). The pond is located in the Southeastern corner of the quarry (Figure 4) and monitored biannually to identify any change in surface water parameters in runoff from the active quarry area. A second sediment settling pond (WQMP2) is now located in the Northeastern corner of the quarry (Figure 4) and will be monitored biannually as per Condition M2, Permit 9105. Any change in pH is important in identifying the presence of potentially acid-forming material.

The following parameters (in accordance with Condition M2, Permit 9105) are to be monitored every six months:

- Field pH
- Electrical conductivity (EC) (µs/cm)
- Total suspended solids (TSS) (mg/L)

Water samples are collected by the proponent and submitted to a National Association of Testing Authority (NATA) accredited laboratory (Analytical Services Tasmania, New Town, Tasmania) for analysis.

Water quality monitoring is to be conducted every six months, however, there are periods throughout the year when the sediment settling ponds are dry and no water samples can be collected. If this occurs, the proponent will collect samples when there is sufficient water in the settling ponds.

A summary of the monitoring results from October 2021 to September 2024 are presented in Table 10. All parameters (pH, EC and TSS) are within acceptable ranges. Results of water quality testing are submitted to the EPA for review. Water quality parameters have been improving over time.

Water samples will be collected by the proponent when there is sufficient water to obtain a sample.

During rainfall events that cause discharge of the sedimentation pond, further dilution of the discharge by diverted onsite surface water downstream from the sedimentation pond sampling point is expected the significantly reduce the electrical conductivity of the site surface water.

Table 10. Sediment settling pond (WQMP1) monitoring results.

Parameter	Units	27 October 2021	11 November 2022	28 July 2023	10 September 2024
pH	pH units	7.4	7.5	7.3	7.3
Electrical conductivity	µs /cm	1990	1310	1460	589
Total suspended solids (TSS)	mg/L	39	24	5	16

If monitoring identifies that field pH readings are less than 6.5, then the EPA will be notified in writing within seven days. The IECA sediment and erosion control handbook states that sediment basin discharge should not exceed 50mg/L TSS.

3.13.2 Record keeping and review

The proponent will ensure that all records such as monitoring data, consultation and complaints are accurately kept.

The settling ponds water quality monitoring program will be reviewed and updated on an as needs basis or as instructed by the EPA. Results and recommendations from the monitoring program will be reported to the EPA as required.

3.14 Decommissioning and rehabilitation

As has been the successful operational strategy for 30 years, rehabilitation will occur at a rate matching expansion of the active quarry area.

3.14.1 Historical rehabilitation

Areas of the site previously stripped for shale extraction have been rehabilitated where practical. In 2020, disturbed land located south of the active quarry area was recontoured and rehabilitated to grazing grassland using the in-situ over burden (refer to Figure 4 and Figure 17). In 2024, several more areas were rehabilitated.

Figure 17. Rehabilitation of previously disturbed area (foreground) and active quarry area (background), facing north.

Figure 18. Rehabilitation area on the southeastern boundary (March 2025).

3.14.2 Proposed rehabilitation

The shale pit is located on Mining Lease 1107P/M which covers approximately 4ha of gently undulating farmland. A survey conducted by Mineral Resources Tasmania (MRT) in September 2021 show that the current area of disturbance of Mining Lease 1107P/M was 2.03ha. To reduce this, previously disturbed areas located in the northern part of the lease will be rehabilitated by the proponent back to grazing land using the in-situ over burden and topsoil stored on the site. Progressive rehabilitation will occur as operations allow.

Proposed rehabilitation plans have been discussed with the EPA regulation branch during routine site audits. Progressive rehabilitation of the site will be conducted in accordance with the principles set out in Quarry Code of Practice.[23]

3.14.3 Decommissioning

In the event that operations cease at the quarry, the proponent will be responsible for the safe and effective decommissioning of the site. If required, this may include the removal of all site infrastructure, recontouring the land to a safe and acceptable profile and re-establishing grazing pastures. Decommissioning activities will comply with all relevant statutory and legal obligations.

[23] Environment Protection Authority (2017). Quarry Code of Practice 3rd Edition, EPA Tasmania, Hobart, Tasmania.

3.15 Greenhouse gas emissions and climate change

The use of mobile plant at the quarry will release greenhouse gases into the atmosphere from the combustion of hydrocarbon derived fuels. The transport of quarry product also contributes to greenhouse gas emissions and climate change impacts.

There are not anticipated to be any significant impacts from climate change on the project, either from warming or other severe weather events. Any potential impact (such as a drying/warming climate) will be addressed with standard site management procedures e.g. increased water use for dust suppression.

The project minimises greenhouse gas emissions through:

- Providing a local source of dairy laneway material to the greater Meander area, minimising emissions from transport for non-locally sourced materials.
- The shale product requires significantly less processing compared to other aggregate materials. (primary crushing only, compared to the standard primary crushing, screening and secondary crushing).
- Fuel efficiency measures will be implemented to reduce diesel consumption and associated emissions. This includes regular maintenance, modern equipment, monitoring fuel consumption and addressing any mechanical issues promptly.
- Transport contractor fuel efficiency will be increased through utilising trailers on trucks to move more tonnes per truck movement.

The project will not significantly change Tasmania's emissions profile but every attempt will be made to minimise emissions from the operation.

4 Part D: Summary of proposed management measures

A summary of the proposed management measures is presented in Table 11.

Table 11. Proposed management measures.

No.	Proposed management measure	Timeframe	Responsibility
1	Aboriginal heritage and Heritage Tasmania sites Continue to monitor for Aboriginal heritage and Heritage Tasmania sites. If unanticipated discoveries made cease works and refer to appropriate "Unanticipated Discovery Guidelines".	Ongoing	Proponent
2	Weed site monitoring and evaluation Inspect the access road, quarry floor, stockpiles and land surrounding the mining lease for the presence of weeds. Conduct weed inspections three (3) times a year; April/May (autumn), September/October (spring) and January/February (summer).	Ongoing	Proponent or nominated sub-contractor
3	Weed control Apply the correct herbicide under the under correct spray conditions to achieve 100% control of those weeds present. As required seek professional agronomic advice for complete herbicide recommendations.	Ongoing	Proponent or nominated sub-contractor
4	Acid rock drainage A future assessment will be undertaken with further testing conducted if conditions in the quarry change, including: - Any change within the geology of the material. - A field pH of less than pH 6.5 recorded from the sediment settling pond. - An increase in iron staining and iron precipitation. - Any increase in groundwater seepage and subsequent outflow from the quarry. - Any significant changes in the vegetation along the drainage channel. Vegetation dieback in paddocks that border laneways where the product has been used.	- 6-monthly water monitoring. - Monthly inspections of vegetation change in surface water discharge. - Weekly inspections of active quarry face for groundwater seepage and geological changes. 6-monthly inspections of 3 laneways where product has been used.	Suitably qualified consultant Proponent responsible for monitoring sediment settling pond.
5	Noise Emissions - Blasting Continue to notify immediate neighbouring residences and the Meander community when blasting is going to occur.	Ongoing – before every blast	Proponent
6	Dust Emissions- Operations Refer to dust management plan.	Daily	Proponent
7	Surface Waters / Runoff To minimise any chance of erosion and sediment flow: - Continue to clean out the sediment trap on a regular basis and after any major rainfall events ensuring maximum holding capacity is available at all times.	Ongoing – monthly and post major rainfall events Ongoing – as quarry expansion occurs	Proponent

	Permanent vegetation cover must be maintained on the 2.8ha of land associated with the quarry over winter months when runoff is likely to occur. Reduce stocking rates during this period to reduce the chance of pugging.	Over winter months – April to October	
8	<u>Rehabilitation</u> Continue to rehabilitate areas where quarrying operations have ceased, back to pasture or native vegetation.	Within six (6) months of cessation of mining and processing activities, in previously disturbed areas	Proponent

5 Part E: Public and stakeholder consultation

Throughout the operation of the project, the proponent has consulted the following key stakeholders:

- EPA Tasmania (assessment and industrial regulation branches)
- Mineral Resources Tasmania (Department of State Growth)
- Meander Valley Council
- Department of Natural Resources and Environment Tasmania (formerly Department of Primary Industry, Parks, Water and Environment)
- Closest residential neighbours
- Meander community (via the local Meander store and Post office)

To date, consultation conducted with the local community has identified no complaints regarding the operation of the quarry. Through community consultation over the 37-year operation of quarry, the proponent has identified overall community support for the project due to its minimal impact and importance as a service to the agricultural community. Notice of the annual blast (the most significant activity onsite) is communicated verbally to the closest residences to the quarry, and to the broader community via written notice at the Meander Store and Post Office.

The proponent holds annual onsite meetings with representatives from the EPA regulation branch and Mineral Resources Tasmania.

The Meander Valley Council has provided planning advice regarding the project. A new planning permit application will be lodged with the Meander Valley Council in due course (in accordance with section 57 of the LUPA Act). The proposed intensification will not require the site to be rezoned.

Appendices

Appendix 1: Natural Values Atlas – database search (February 2025)

Natural Values Atlas Report

Authoritative, comprehensive information on Tasmania's natural values.

Reference: Meander Shale Quarry
Requested For: Pinion Advisory
Report Type: Summary Report
Timestamp: 03:24:14 PM Tuesday 25 February 2025

Threatened Flora: buffers Min: 500m Max: 5000m
Threatened Fauna: buffers Min: 500m Max: 5000m
Raptors: buffers Min: 500m Max: 5000m
Tasmanian Weed Management Act Weeds: buffers Min: 500m Max: 5000m
Priority Weeds: buffers Min: 500m Max: 5000m
Geoconservation: buffer 1000m
Acid Sulfate Soils: buffer 1000m
TASVEG: buffer 1000m
Threatened Communities: buffer 1000m
Fire History: buffer 1000m
Tasmanian Reserve Estate: buffer 1000m
Biosecurity Risks: buffer 1000m

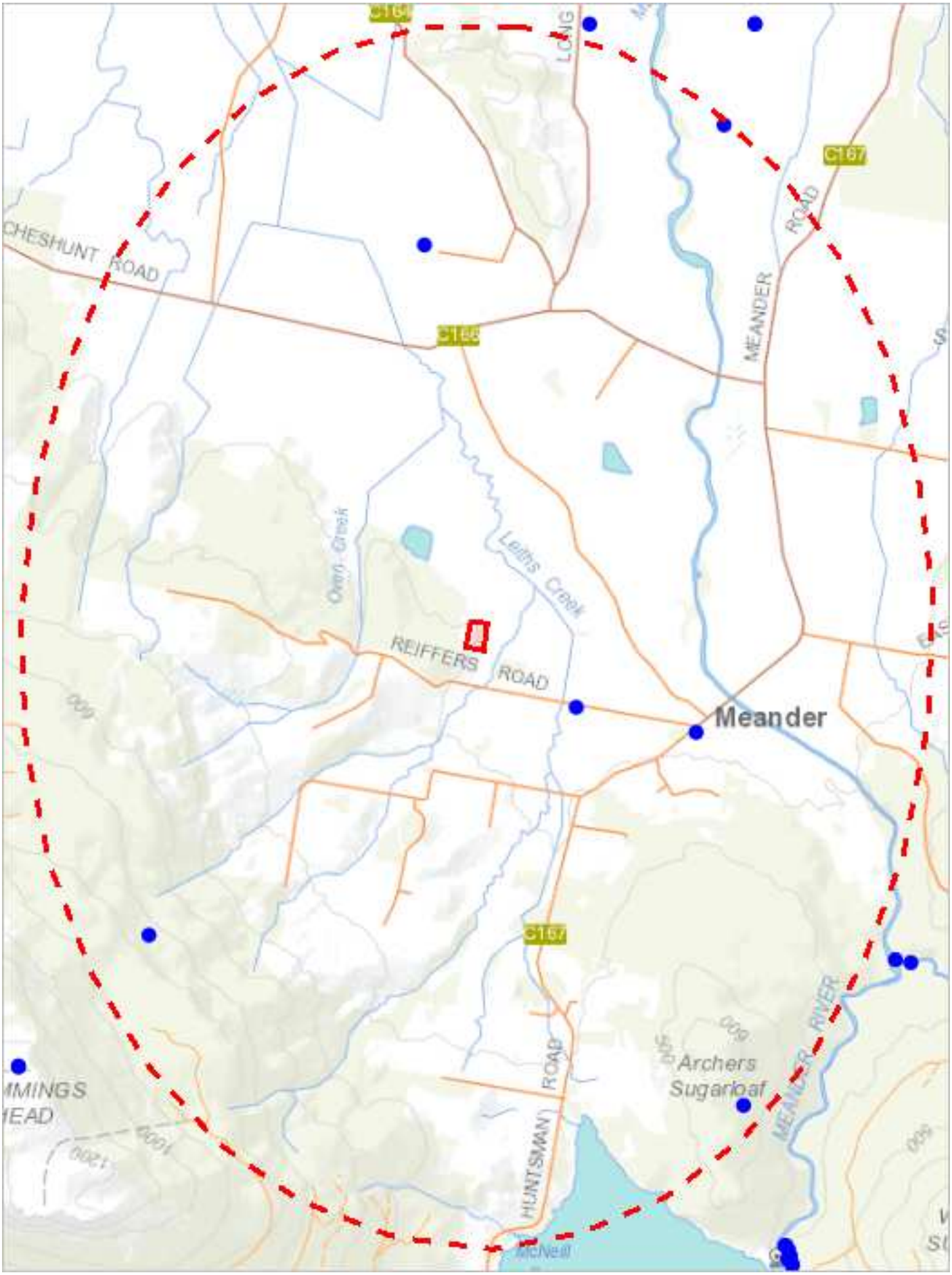
The centroid for this query GDA94: **465852.0, 5389601.0** falls within:

Property: 6278839

***** No threatened flora found within 500 metres *****

Threatened flora within 5000 metres

469851, 5394915



461837, 5384258

Please note that some layers may not display at all requested map scales

Threatened flora within 5000 metres

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Threatened flora within 5000 metres

Verified Records

Species	Common Name	SS	NS	Bio	Observation Count	Last Recorded
Goodenia geniculata	bent native-primrose	e		n	2	13-Jan-1931
Lythrum salicaria	purple loosestrife	v		n	1	04-Mar-1961
Persoonia muelleri subsp. angustifolia	narrowleaf geebung	r		e	1	30-Jun-1986
Pomaderris phylicifolia subsp. phylicifolia	narrowleaf dogwood	r		n	1	07-Nov-1986
Tricoryne elatior	yellow rushlily	v		n	1	01-Jan-1851
Uncinia elegans	handsome hooksedge	r		t	2	24-Feb-1986

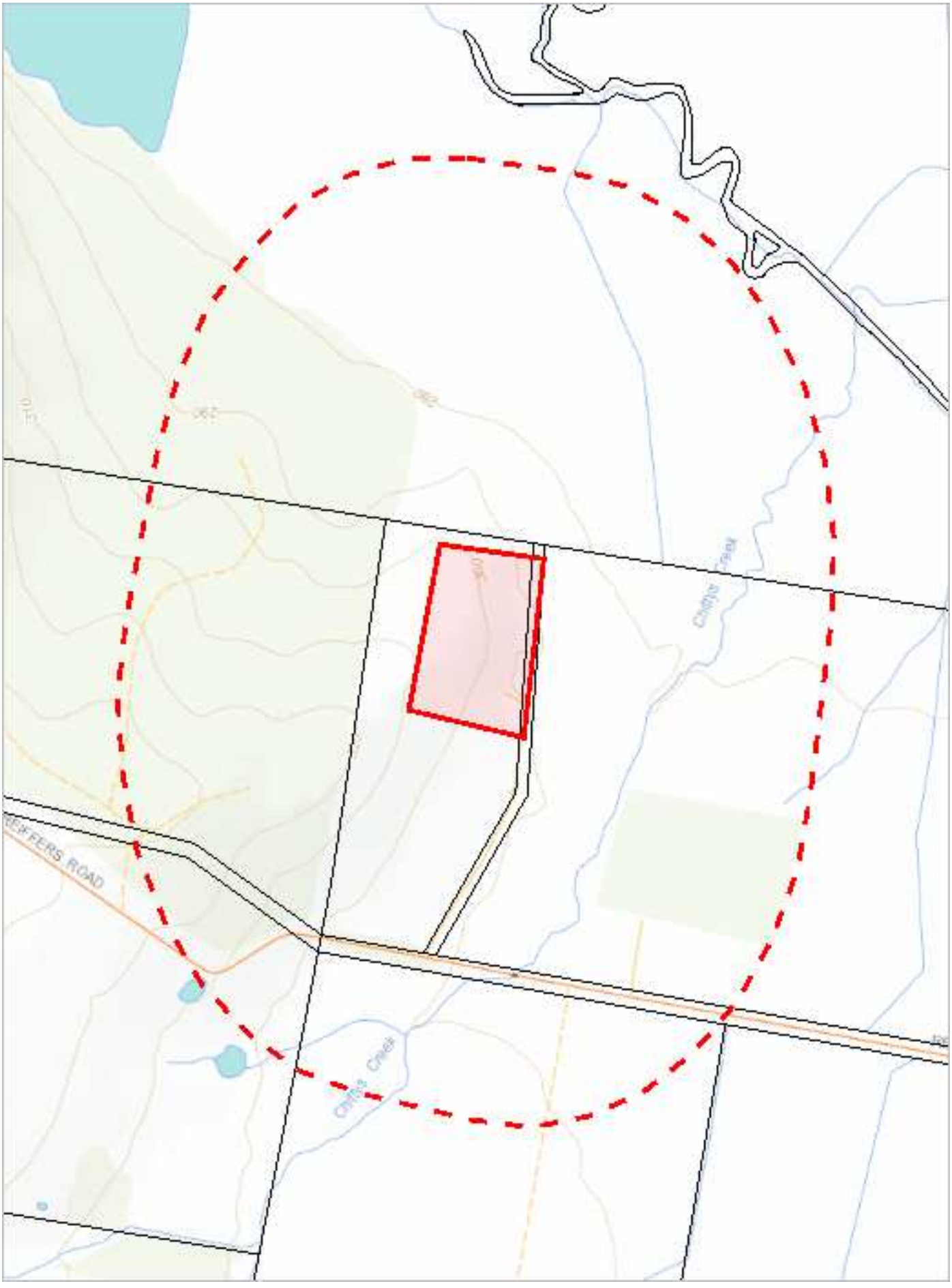
Unverified Records

No unverified records were found!

For more information about threatened species, please contact Threatened Species Enquiries.
Telephone: 1300 368 550
Email: ThreatenedSpecies.Enquiries@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Threatened fauna within 500 metres

466464, 5390423



465233, 5388772

Please note that some layers may not display at all requested map scales

Threatened fauna within 500 metres

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Threatened fauna within 500 metres

(based on Range Boundaries)

Species	Common Name	SS	NS	BO	Potential	Known	Core
Litoria raniformis	green and gold frog	v	VU	n	1	0	0
Pseudemoia pagenstecheri	tussock skink	v		n	1	0	0
Galaxias fontanus	swan galaxias	e	EN	e	1	0	0
Tyto novaehollandiae subsp. castanops	masked owl (Tasmanian)	e	VU	e	1	0	1
Haliaeetus leucogaster	white-bellied sea-eagle	v		n	1	0	0
Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	n	1	0	0
Accipiter novaehollandiae	grey goshawk	e		n	1	0	1
Sarcophilus harrisii	tasmanian devil	e	EN	e	1	0	0
Perameles gunnii	eastern barred bandicoot		VU	n	1	0	0
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	1	0	0
Dasyurus viverrinus	eastern quoll		EN	n	0	0	1

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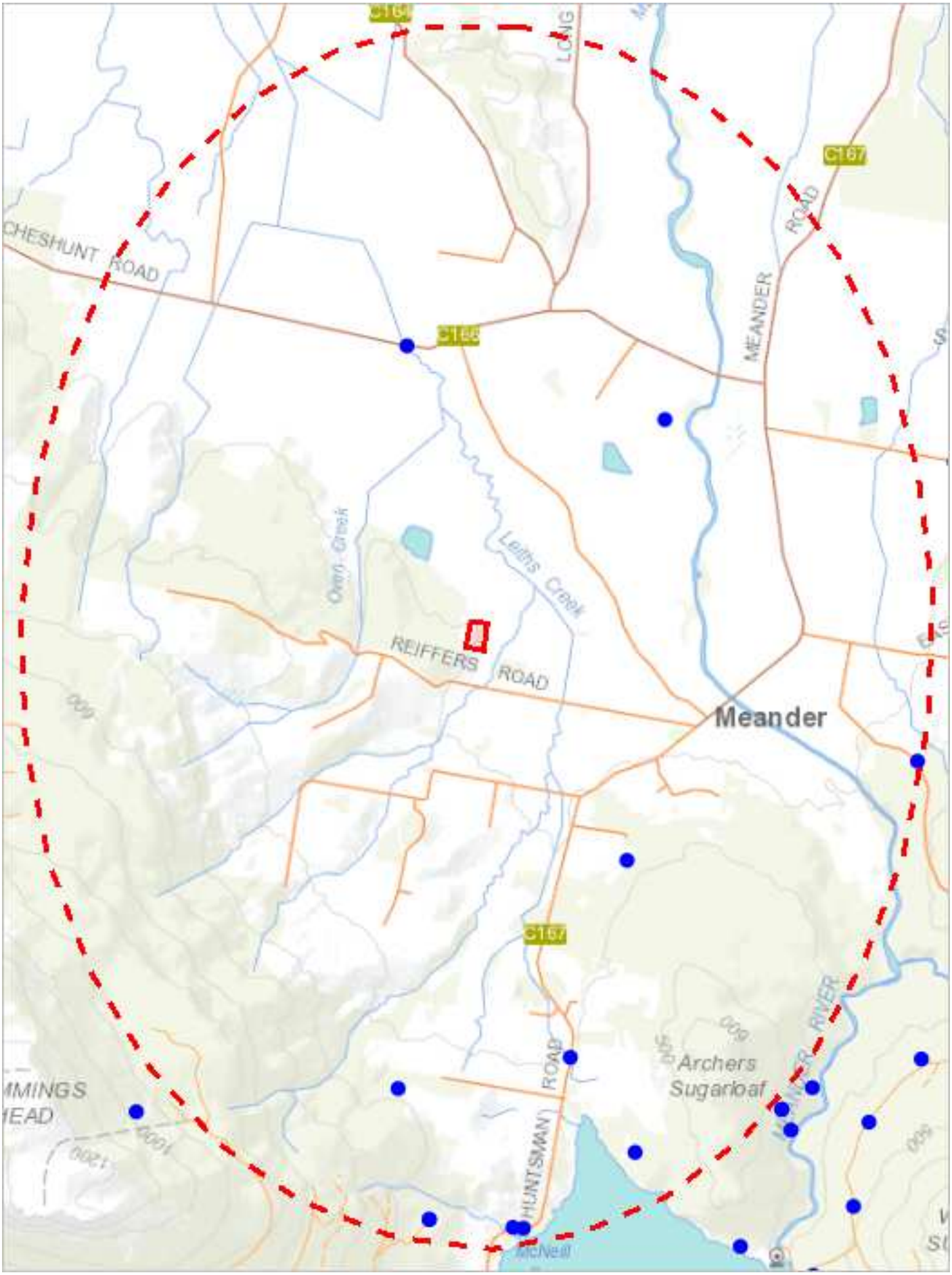
Threatened fauna within 5000 metres

469851, 5394915



461837, 5384258

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Threatened fauna within 5000 metres

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Threatened fauna within 5000 metres

Verified Records

Species	Common Name	SS	NS	Bio	Observation Count	Last Recorded
Accipiter novaehollandiae	grey goshawk	e		n	1	05-Mar-1997
Aquila audax	wedge-tailed eagle	pe	PEN	n	1	01-Mar-2020
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	5	21-Mar-2019
Dasyurus maculatus	spotted-tailed quoll	r	VU	n	4	24-Jul-2019
Dasyurus viverrinus	eastern quoll		EN	n	1	18-Jan-2023
Gallinago hardwickii	lathams snipe		VU	n	1	24-Oct-2021
Neophema chrysostoma	blue-winged parrot		VU	n	1	01-Jan-1900
Sarcophilus harrisii	tasmanian devil	e	EN	e	4	18-Mar-2023

Unverified Records

No unverified records were found!

Threatened fauna within 5000 metres

(based on Range Boundaries)

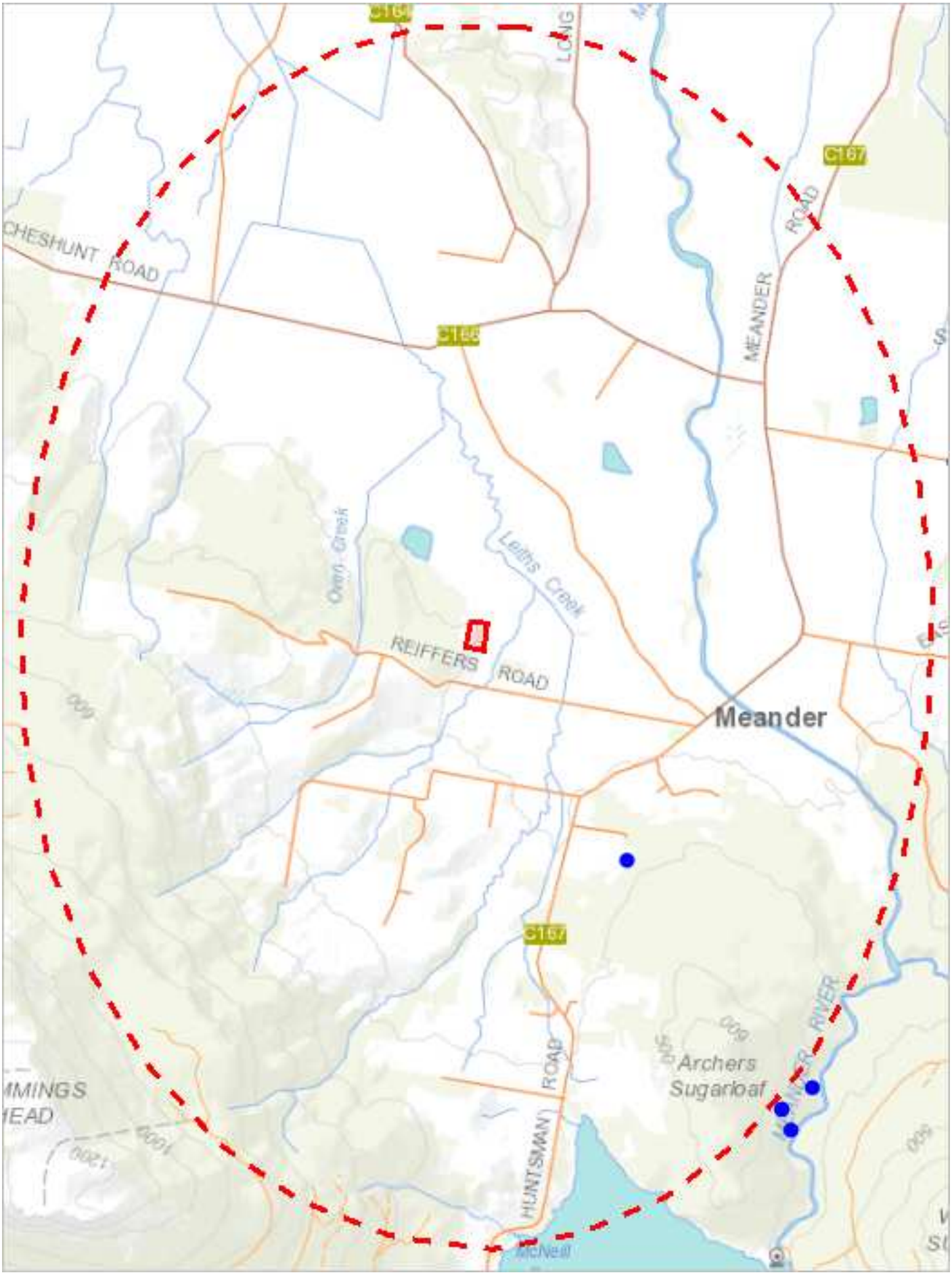
Species	Common Name	SS	NS	BO	Potential	Known	Core
Litoria raniformis	green and gold frog	v	VU	n	1	0	0
Lathamus discolor	swift parrot	e	CR	mbe	1	0	0
Pseudemoia pagenstecheri	tussock skink	v		n	1	0	0
Galaxias fontanus	swan galaxias	e	EN	e	1	0	0
Tyto novaehollandiae subsp. castanops	masked owl (Tasmanian)	e	VU	e	1	0	1
Haliaeetus leucogaster	white-bellied sea-eagle	v		n	1	0	0
Dasyurus maculatus subsp. maculatus	spotted-tailed quoll	r	VU	n	1	0	1
Accipiter novaehollandiae	grey goshawk	e		n	1	0	1
Sarcophilus harrisii	tasmanian devil	e	EN	e	1	0	0
Perameles gunnii	eastern barred bandicoot		VU	n	1	0	0
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	e	1	0	0
Dasyurus viverrinus	eastern quoll		EN	n	0	0	1

For more information about threatened species, please contact Threatened Species Enquiries.
Telephone: 1300 368 550
Email: ThreatenedSpecies.Enquiries@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

***** No Raptor nests or sightings found within 500 metres. *****

Raptor nests and sightings within 5000 metres

469851, 5394915



461837, 5384258

Please note that some layers may not display at all requested map scales

Raptor nests and sightings within 5000 metres

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Raptor nests and sightings within 5000 metres

Verified Records

Nest Id/Location Foreign Id	Species	Common Name	Obs Type	Observation Count	Last Recorded
1159	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	2	24-Sep-2008
1916	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	11-Dec-2010
2581	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Nest	1	21-Mar-2019
	Accipiter novaehollandiae	grey goshawk	Sighting	1	05-Mar-1997
	Aquila audax	wedge-tailed eagle	Sighting	1	01-Mar-2020
	Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	Carcass	1	29-Oct-2009

Unverified Records

No unverified records were found!

Raptor nests and sightings within 5000 metres

(based on Range Boundaries)

Species	Common Name	SS	NS	Potential	Known	Core
Aquila audax subsp. fleayi	tasmanian wedge-tailed eagle	e	EN	1	0	0
Accipiter novaehollandiae	grey goshawk	e		1	0	1
Haliaeetus leucogaster	white-bellied sea-eagle	v		1	0	0

For more information about raptor nests, please contact Threatened Species Enquiries.

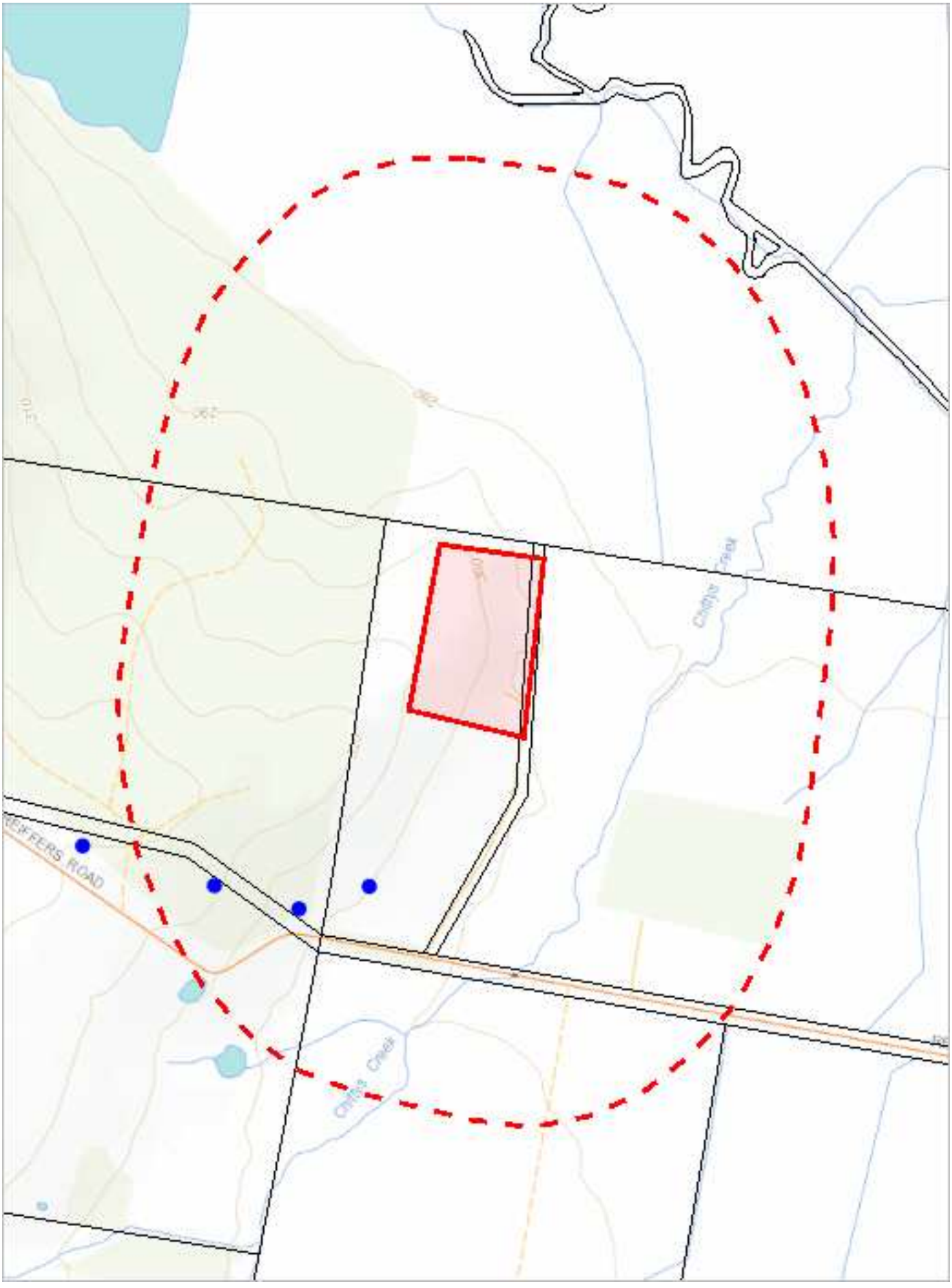
Telephone: 1300 368 550

Email: ThreatenedSpecies.Enquiries@nre.tas.gov.au

Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Tas Management Act Weeds within 500 m

466464, 5390423



465233, 5388772

Please note that some layers may not display at all requested map scales

Tas Management Act Weeds within 500 m

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Tas Management Act Weeds within 500 m

Verified Records

Species	Common Name	Observation Count	Last Recorded
Senecio jacobaea	ragwort	4	18-Jan-1996

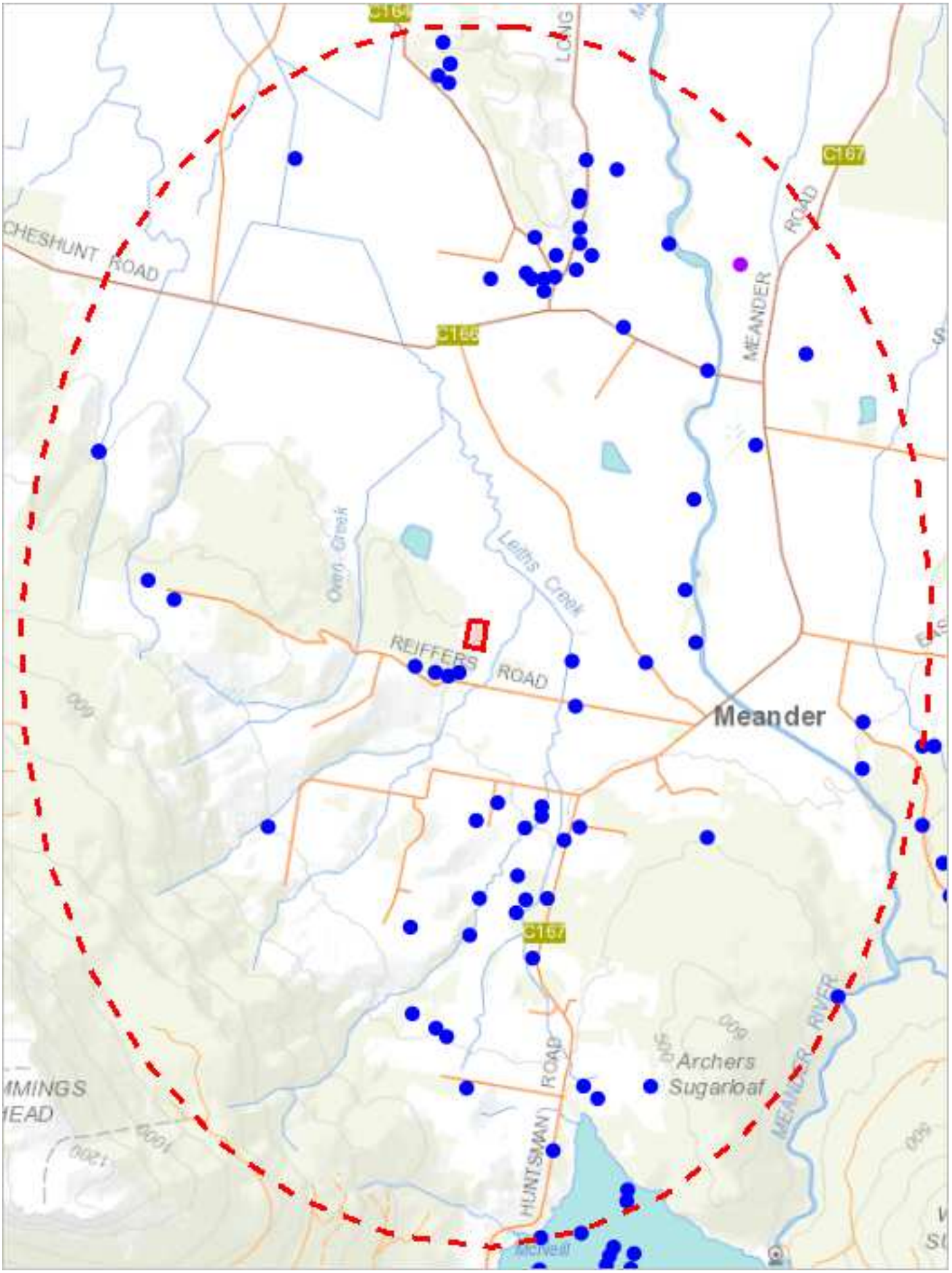
Unverified Records

For more information about introduced weed species, please visit the following URL for contact details in your area:

https://www.nre.tas.gov.au/invasive-species/weeds

Tas Management Act Weeds within 5000 m

469851, 5394915



461837, 5384258

Please note that some layers may not display at all requested map scales

Tas Management Act Weeds within 5000 m

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Tas Management Act Weeds within 5000 m

Verified Records

Species	Common Name	Observation Count	Last Recorded
Calluna vulgaris	heather	1	10-Feb-2004
Erica lusitanica	spanish heath	1	05-May-2017
Ilex aquifolium	holly	1	27-May-2016
Marrubium vulgare	white horehound	1	07-Jan-1999
Myriophyllum aquaticum	parrotfeather	1	01-Jun-2001
Oenanthe pimpinelloides	dropwort	1	10-Dec-2013
Pilosella aurantiaca subsp. aurantiaca	orange hawkweed	2	01-Jan-1989
Rubus echinatus	blackberry	3	15-Jan-1999
Rubus fruticosus	blackberry	3	19-May-2006
Senecio jacobaea	ragwort	54	11-Jan-1999
Ulex europaeus	gorse	20	01-Feb-2021

Unverified Records

Species	Common Name	Observation Count
Calluna vulgaris	heather	1

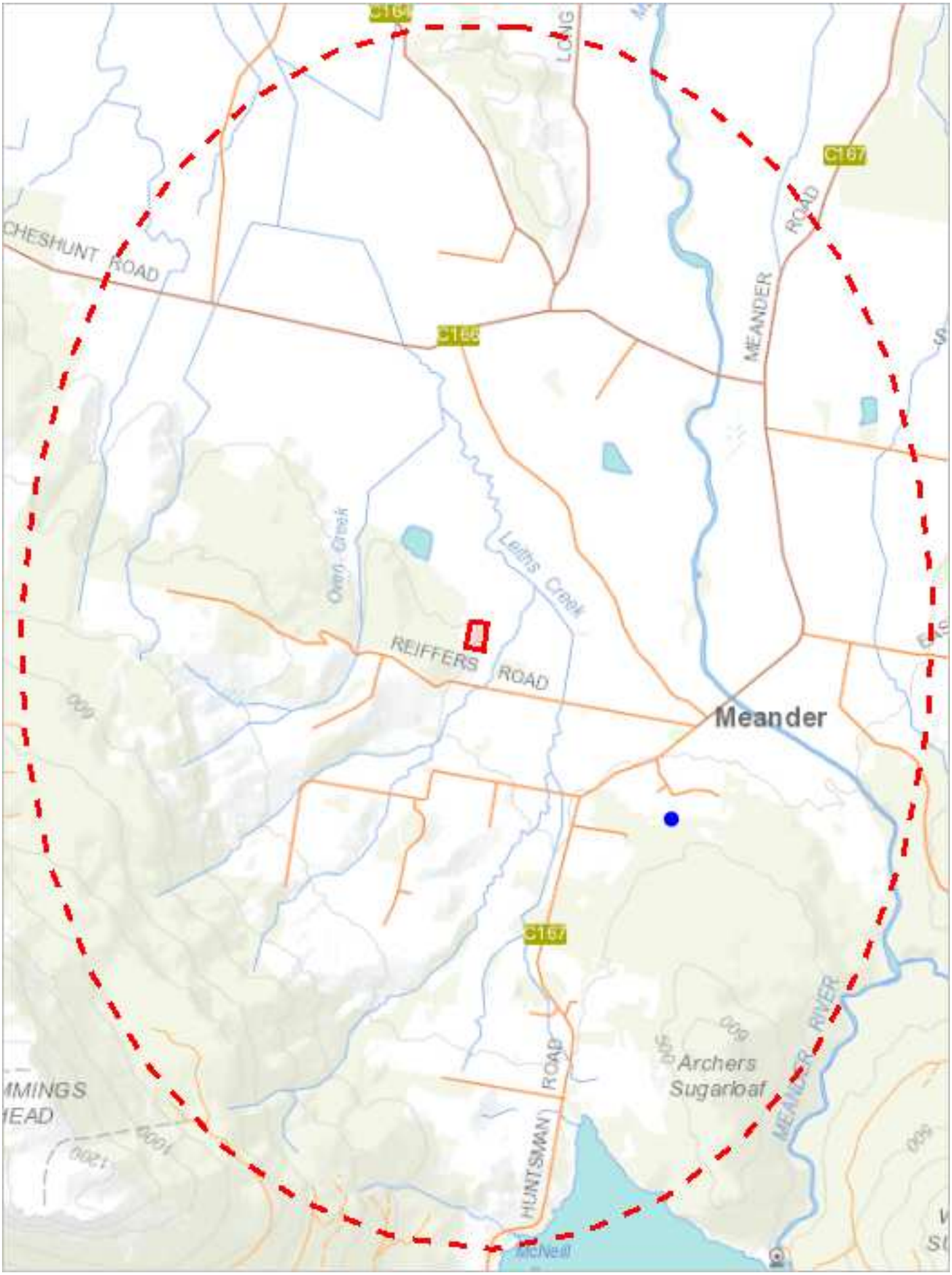
For more information about introduced weed species, please visit the following URL for contact details in your area:

https://www.nre.tas.gov.au/invasive-species/weeds

***** No Priority Weeds found within 500 metres *****

Priority Weeds within 5000 m

469851, 5394915



461837, 5384258

Please note that some layers may not display at all requested map scales

Priority Weeds within 5000 m

Legend: Verified and Unverified observations

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Cadastral Parcels

Priority Weeds within 5000 m

Verified Records

Species	Common Name	Observation Count	Last Recorded
Verbascum thapsus	great mullein	1	28-Feb-2019

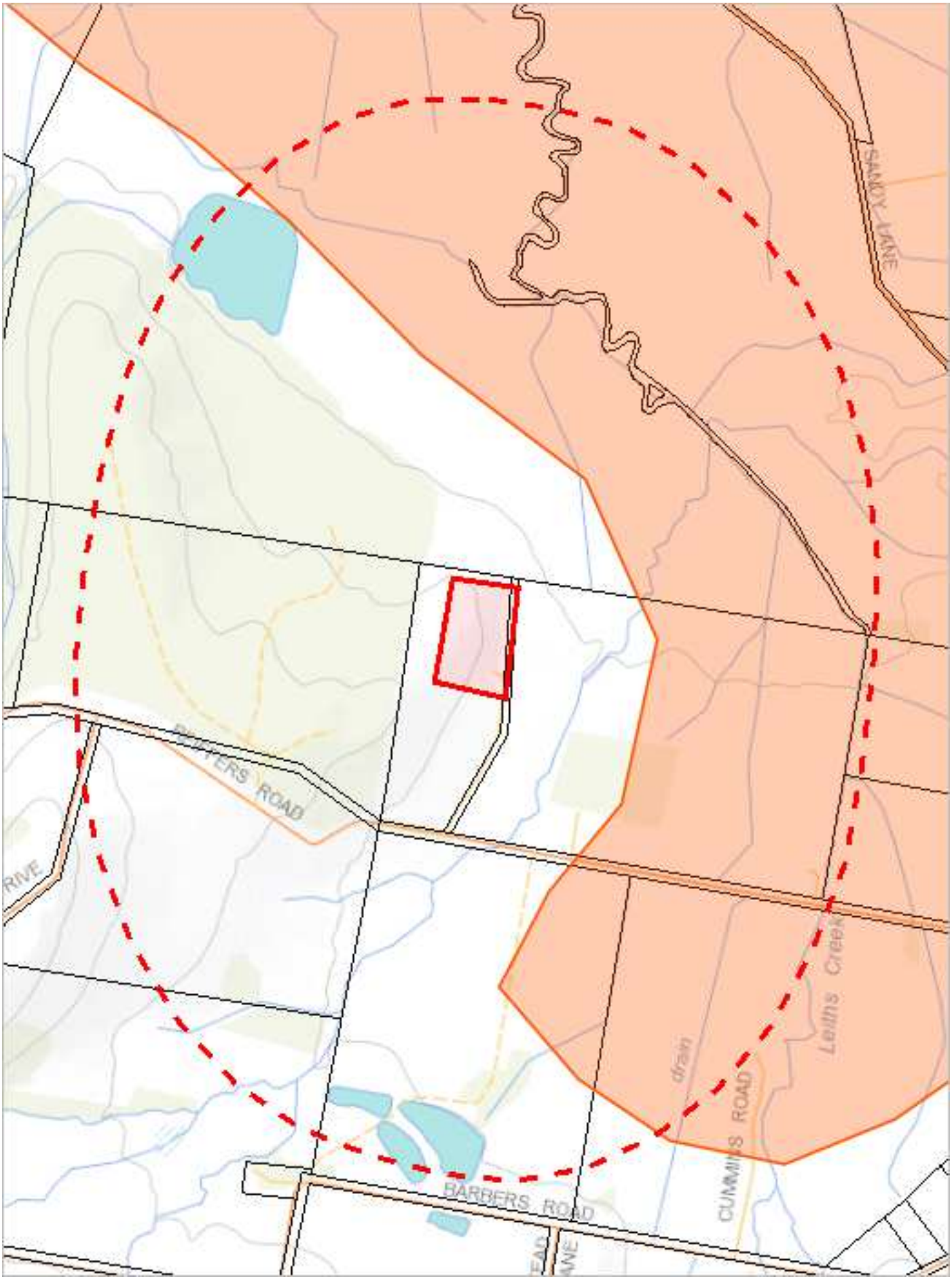
Unverified Records

For more information about introduced weed species, please visit the following URL for contact details in your area:

https://www.nre.tas.gov.au/invasive-species/weeds

Geoconservation sites within 1000 metres

466840, 5390922



464856, 5388270

Please note that some layers may not display at all requested map scales

Geoconservation sites within 1000 metres

Legend: Geoconservation (NVA)

Legend: Cadastral Parcels

Geoconservation sites within 1000 metres

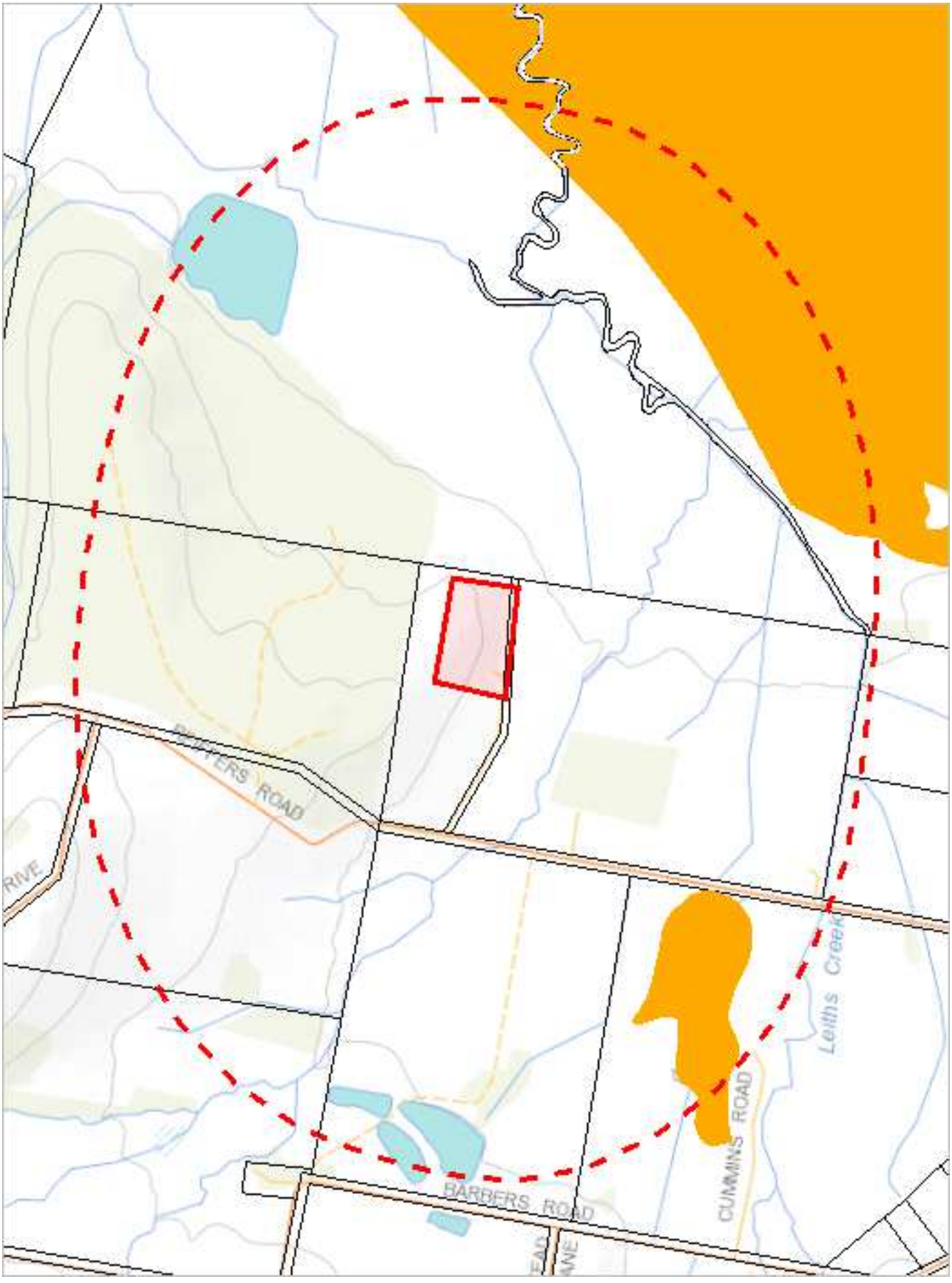
Id	Name	Statement of Significance	Significance Level	Status
2685	Mole Creek Karst	One of the three or four most extensively developed karst systems in Tasmania, including caves nationally or internationally renowned for their underground scenery, geomorphological and biological values.	National	Listed

For more information about the Geoconservation Database, please visit the website: https://www.nre.tas.gov.au/conservation/geoconservation or contact the Geoconservation Officer:

Telephone: (03) 6165 4401
Email: Geoconservation.Enquiries@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Acid Sulfate Soils within 1000 metres

466840, 5390922



464856, 5388270

Please note that some layers may not display at all requested map scales

Acid Sulfate Soils within 1000 metres

Legend: Coastal Acid Sulfate Soils (0 - 20m AHD)

High | Low | Extremely Low

Legend: Inland Acid Sulfate Soils (>20m AHD)

High | Low | Extremely Low

Legend: Marine Subaqueous/Intertidal Acid Sulfate Soil

High (Intertidal) | High (Subtidal)

Legend: Cadastral Parcels

Acid Sulfate Soils within 1000 metres

Dataset Name	Acid Sulfate Soil Probability	Acid Sulfate Soil Atlas	Description
Inland Acid Sulfate Soils	Low	Bm(p4)	Low probability of occurance (6-70% chance of occurrence in mapping unit). Hydrosols, ASS generally within upper 1m in wet/riparian areas with Hydrosols (Isbell 1996). Potential acid sulfate soil (PASS) = sulfidic material (Isbell 1996 p.122). No necessary analytical data are available and classifier has little knowledge or experience with ASS, hence classification is provisional.
Inland Acid Sulfate Soils	Low	Bu(p4)	Low probability of occurance (6-70% chance of occurrence in mapping unit). Unclassified - Insufficient landscape information available to classify map unit. Potential acid sulfate soil (PASS) = sulfidic material (Isbell 1996 p.122). No necessary analytical data are available and classifier has little knowledge or experience with ASS, hence classification is provisional.

For more information about Acid Sulfate Soils, please contact Land Management Enquiries.

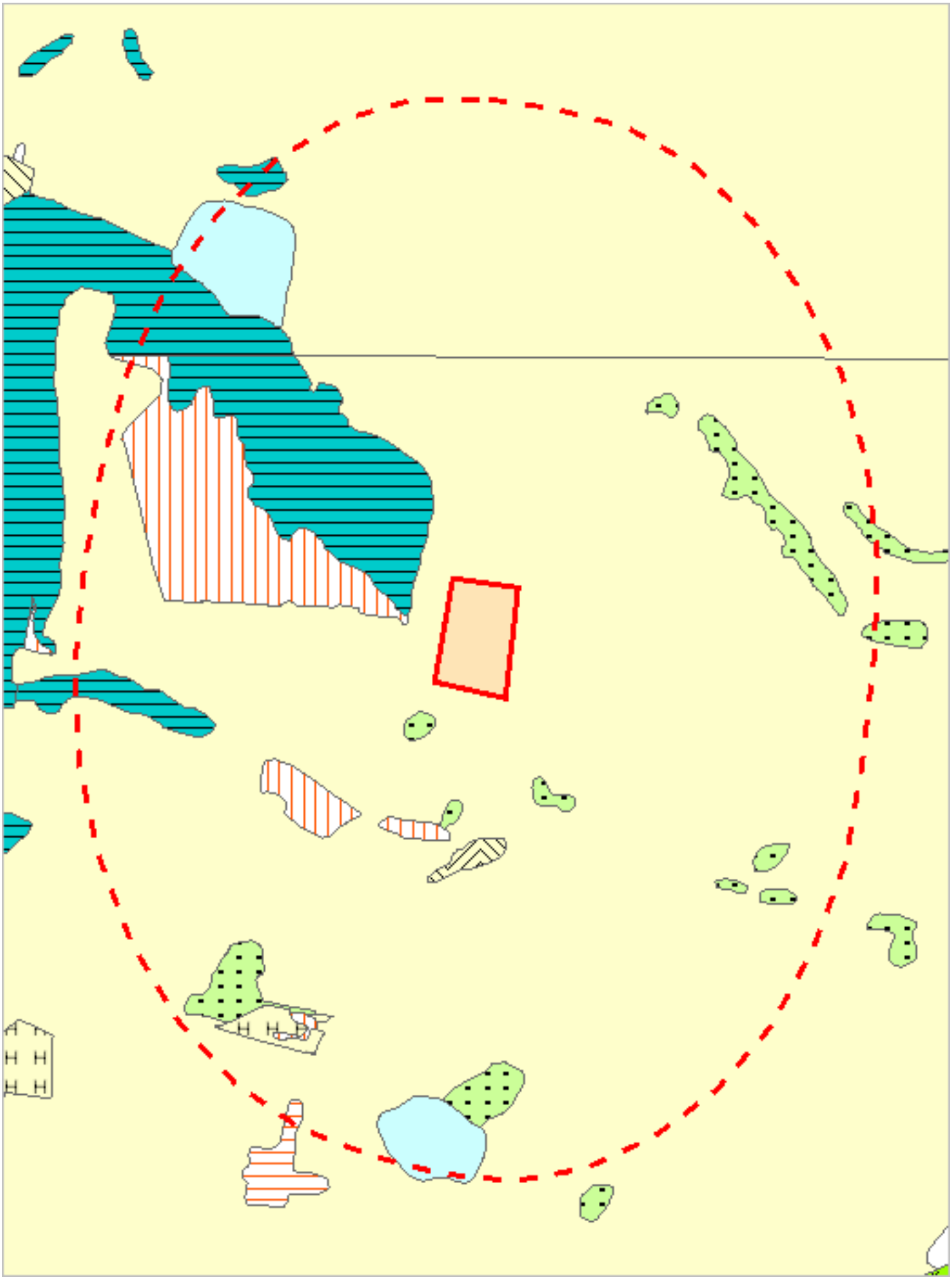
Telephone: (03) 6777 2227

Email: LandManagement.Enquiries@nre.tas.gov.au

Address: 171 Westbury Road, Prospect, Tasmania, Australia, 7250

TASVEG 4.0 Communities within 1000 metres

466840, 5390922



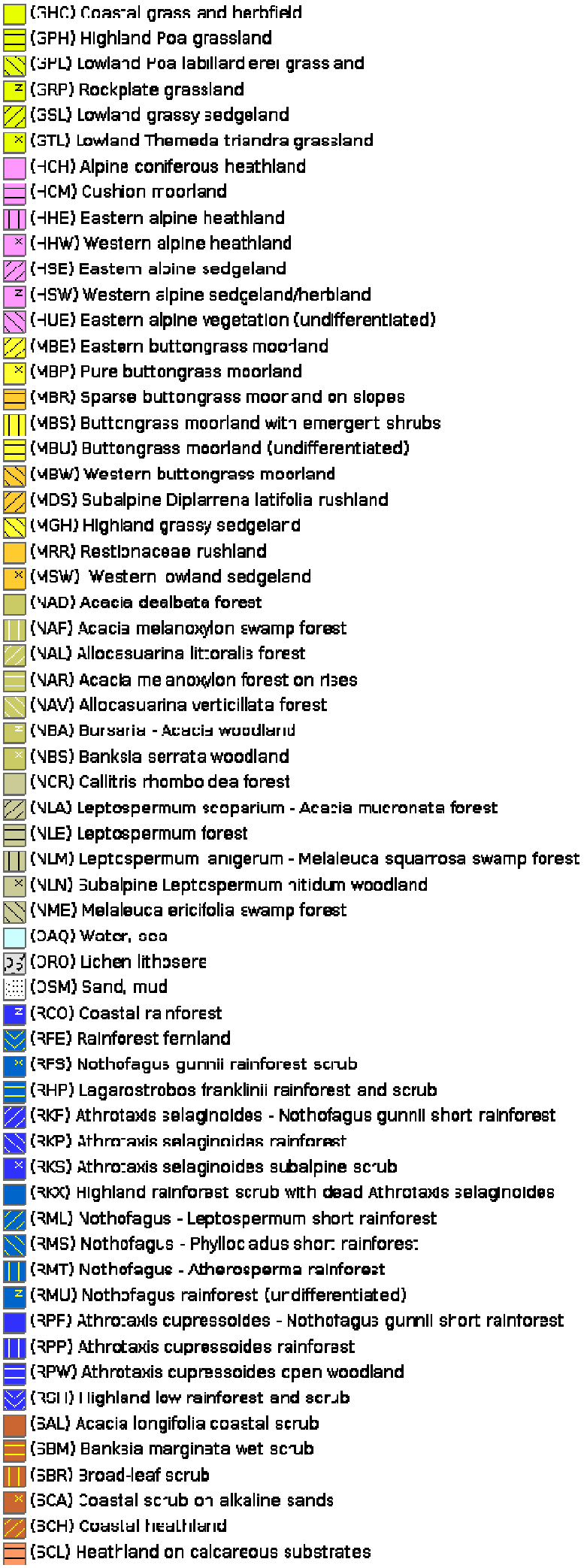
464856, 5388270

Please note that some layers may not display at all requested map scales

TASVEG 4.0 Communities within 1000 metres

Legend: TASVEG 4.0

TASVEG 4.0 Communities within 1000 metres



TASVEG 4.0 Communities within 1000 metres

Legend: Cadastral Parcels

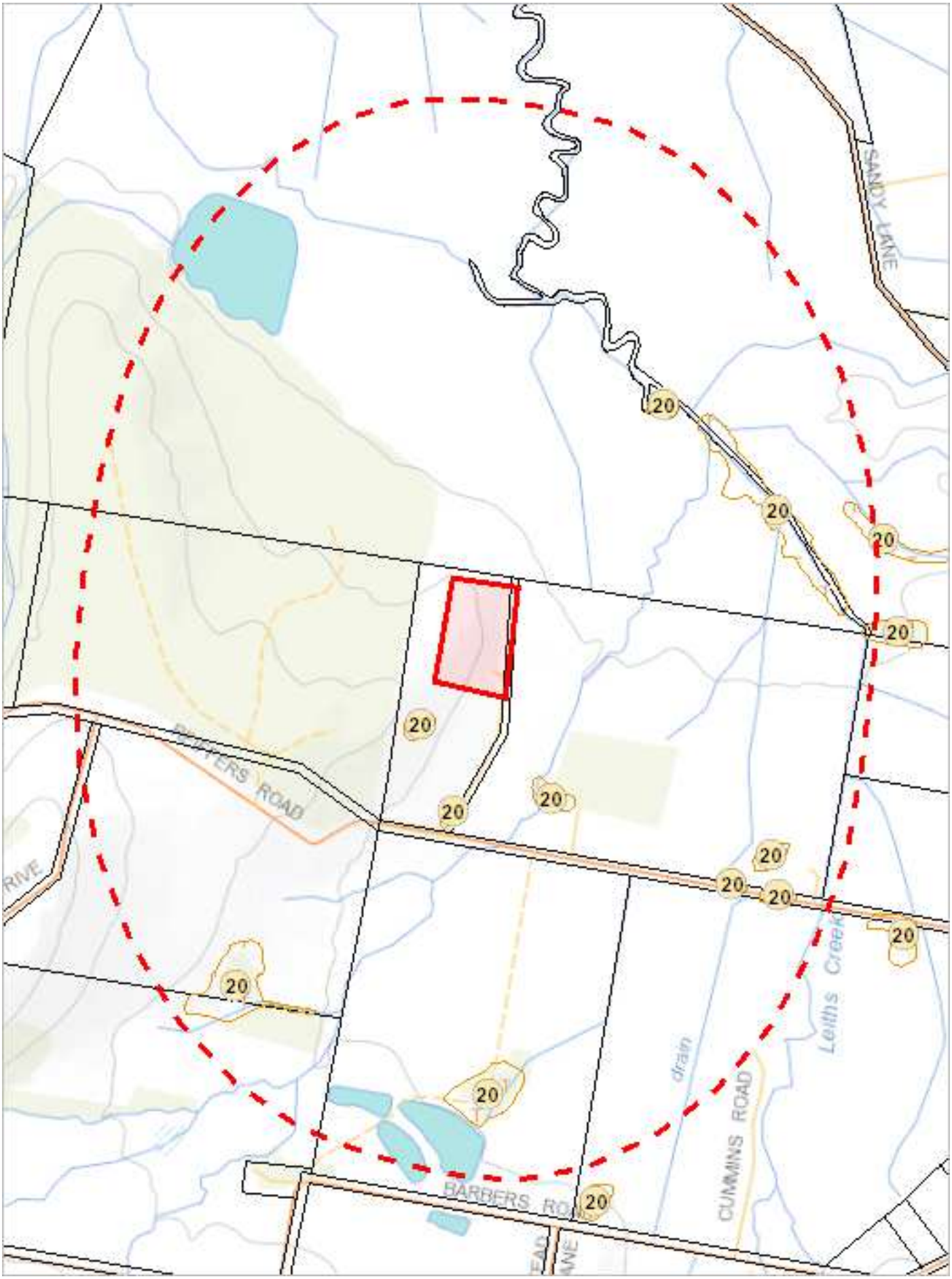
TASVEG 4.0 Communities within 1000 metres

Code	Community	Canopy Tree
DOV	(DOV) Eucalyptus ovata forest and woodland	
FAG	(FAG) Agricultural land	
FPH	(FPH) Plantations for silviculture - hardwood	
FPU	(FPU) Unverified plantations for silviculture	
FUM	(FUM) Extra-urban miscellaneous	
FWU	(FWU) Weed infestation	
OAQ	(OAQ) Water, sea	
WOU	(WOU) Eucalyptus obliqua wet forest (undifferentiated)	

For more information contact: Coordinator, Tasmanian Vegetation Monitoring and Mapping Program.
Telephone: (03) 6165 4320
Email: TVMMPSupport@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

Threatened Communities (TNVC 2020) within 1000 metres

466840, 5390922



464856, 5388270

Please note that some layers may not display at all requested map scales

Threatened Communities (TNVC 2020) within 1000 metres

Legend: Threatened Communities

- 1 - Alkaline pans
- 2 - Allocasuarina littoralis forest
- 3 - Athrotaxis cupressoides/Nothofagus gunnii short rainforest
- 4 - Athrotaxis cupressoides open woodland
- 5 - Athrotaxis cupressoides rainforest
- 6 - Athrotaxis selaginoides/Nothofagus gunnii short rainforest
- 7 - Athrotaxis selaginoides rainforest
- 8 - Athrotaxis selaginoides subalpine scrub
- 9 - Banksia marginata wet scrub
- 10 - Banksia serrata woodland
- 11 - Callitris rhomboidea forest
- 13 - Cushion moorland
- 14 -Eucalyptus amygdalina forest and woodland on sandstone
- 15 - Eucalyptus amygdalina inland forest and woodland on cainozoic deposits
- 16 - Eucalyptus brookeriana wet forest
- 17 - Eucalyptus globulus dry forest and woodland
- 18 - Eucalyptus globulus King Island forest
- 19 - Eucalyptus morrisbyi forest and woodland
- 20 - Eucalyptus ovata forest and woodland
- 21 - Eucalyptus risdonii forest and woodland
- 22 - Eucalyptus tenuiramis forest and woodland on sediments
- 23 Eucalyptus viminalis Eucalyptus globulus coastal forest and woodland
- 24 - Eucalyptus viminalis Furneaux forest and woodland
- 25 - Eucalyptus viminalis wet forest
- 26 - Heathland on calcareous substrates
- 27 - Heathland scrub complex at Wingaroo
- 28 - Highland grassy sedgeland
- 29 - Highland Poa grassland
- 30 - Melaleuca ericifolia swamp forest
- 31 - Melaleuca pustulata scrub
- 32 - Notelaea - Pomaderris - Beyeria forest
- 33 - Rainforest fernland
- 34 - Riparian scrub
- 35 - Seabird rookery complex
- 36 - Sphagnum peatland
- 36A - Spray zone coastal complex
- 37 - Subalpine Diplarrena latifolia rushland
- 38 - Subalpine Leptospermum nitidum woodland
- 39 - Wetlands

Legend: Cadastral Parcels

Threatened Communities (TNVC 2020) within 1000 metres

Scheduled Community Id	Scheduled Community Name
20	Eucalyptus ovata forest and woodland

For more information contact: Coordinator, Tasmanian Vegetation Monitoring and Mapping Program.
Telephone: (03) 6165 4320
Email: TVMMPSupport@nre.tas.gov.au
Address: GPO Box 44, Hobart, Tasmania, Australia, 7000

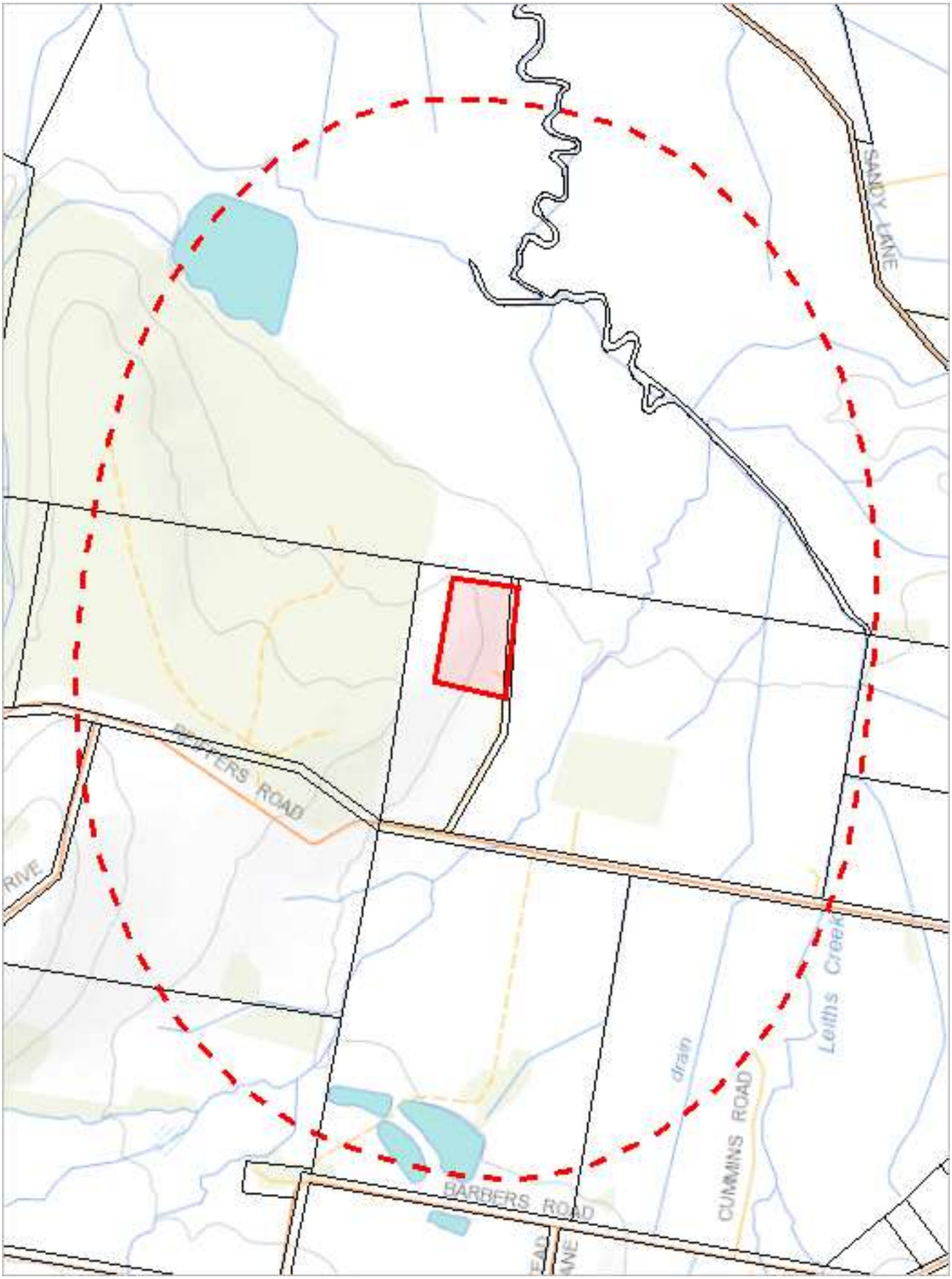
***** No Fire History (All) found within 1000 metres *****

***** No Fire History (Last Burnt) found within 1000 metres *****

***** No reserves found within 1000 metres *****

Known biosecurity risks within 1000 meters

466840, 5390922



464856, 5388270

Please note that some layers may not display at all requested map scales

Known biosecurity risks within 1000 meters

Legend: Biosecurity Risk Species

- Point Verified
- Point Unverified
- Line Verified
- Line Unverified
- Polygon Verified
- Polygon Unverified

Legend: Hygiene infrastructure

- Location Point Verified
- Location Point Unverified
- Location Line Verified
- Location Line Unverified
- Location Polygon Verified
- Location Polygon Unverified

Legend: Cadastral Parcels

Known biosecurity risks within 1000 meters

Verified Species of biosecurity risk

No verified species of biosecurity risk found within 1000 metres

Unverified Species of biosecurity risk

No unverified species of biosecurity risk found within 1000 metres

Generic Biosecurity Guidelines

The level and type of hygiene protocols required will vary depending on the tenure, activity and land use of the area. In all cases adhere to the land manager's biosecurity (hygiene) protocols. As a minimum always Check / Clean / Dry (Disinfect) clothing and equipment before trips and between sites within a trip as needed https://www.nre.tas.gov.au/invasive-species/weeds/weed-hygiene/keeping-it-clean-a-tasmanian-field-hygiene-manual

On Reserved land, the more remote, infrequently visited and undisturbed areas require tighter biosecurity measures.

In addition, where susceptible species and communities are known to occur, tighter biosecurity measures are required.

Apply controls relevant to the area / activity:

- Don't access sites infested with pathogen or weed species unless absolutely necessary. If it is necessary to visit, adopt high level hygiene protocols.
- Consider not accessing non-infested sites containing known susceptible species / communities. If it is necessary to visit, adopt high level hygiene protocols.
- Don't undertake activities that might spread pest / pathogen / weed species such as deliberately moving soil or water between areas.
- Modify / restrict activities to reduce the chance of spreading pest / pathogen / weed species e.g. avoid periods when weeds are seeding, avoid clothing/equipment that excessively collects soil and plant material e.g. Velcro, excessive tread on boots.
- Plan routes to visit clean (uninfested) sites prior to dirty (infested) sites. Do not travel through infested areas when moving between sites.
- Minimise the movement of soil, water, plant material and hitchhiking wildlife between areas by using the Check / Clean / Dry (Disinfect when drying is not possible) procedure for all clothing, footwear, equipment, hand tools and vehicles https://www.nre.tas.gov.au/invasive-species/weeds/weed-hygiene
- Neoprene and netting can take 48 hours to dry, use non-porous gear wherever possible.
- Use walking track boot wash stations where available.
- Keep a hygiene kit in the vehicle that includes a scrubbing brush, boot pick, and disinfectant https://www.nre.tas.gov.au/invasive-species/weeds/weed-hygiene/keeping-it-clean-a-tasmanian-field-hygiene-manual
- Dispose of all freshwater away from natural water bodies e.g. do not empty water into streams or ponds.
- Dispose of used disinfectant ideally in town though a treatment or septic system. Always keep disinfectant well away from natural water systems.
- Securely contain any high risk pest / pathogen / weed species that must be collected and moved e.g. biological samples.

Hygiene Infrastructure

No known hygiene infrastructure found within 1000 metres

Appendix 2: Geology and Geomorphology Appraisal (Geoton, 2015)

GEOTON Pty Ltd
Geotechnical Consultants

GEOLOGY AND GEOMORPHOLOGY APPRAISAL

Macquarie Franklin

Meander Quarry, Reiffers Road
Meander

GL14287Ab
23 January 2015

GEOTON Pty Ltd
Geotechnical Consultants

Geoton Pty Ltd ABN 69 315 541 003
PO Box 522 Prospect Vale TAS 7250
Unit 24, 16-18 Goodman Court
Invermay TAS 7248
T (+61) (3) 6326 5001 F (+61) (3) 6326 5003
www.geoton.com.au

23 January 2015

Reference No. GL14287Ab

Macquarie Franklin
PO Box 475
Prospect TAS 7250

Attention: Mr Greg Bullock

Dear Sir

RE: Geology and Geomorphology Appraisal
Meander Quarry, Reiffers Road, Meander

We have pleasure in submitting herein our report detailing the results of the investigation conducted at the above site.

Should you require clarification of any aspect of this report, please contact Matthew Street on 03 6326 5001.

For and on behalf of

Geoton Pty Ltd

Matthew Street

Geologist

CONTENTS

1 INTRODUCTION

As requested by Macquarie Franklin, Geoton Pty Ltd has conducted a Geology and Geomorphology Appraisal for the Meander Quarry, Reiffers Road, Meander.

We understand that the purpose of the appraisal is to provide technical information as part of an Environmental Effects Report (EER) for the quarry. The information required for the EER is as follows:

- Provide a description of the geology of the site, as well as details of the operations, and a discussion of the potential for the operations to impact on karst features;
- Description of soils and underlying rock types, and in particular, whether there is any evidence of oxidation of pyritic materials at the existing operations; and
- Should acidic mineralogy be identified on the site, provide details of plans to ensure oxidisation/acidification does not occur, or describe how such issues will be managed.

2 SCOPE OF WORKS

In order to address the information required for the EER the following scope of works has been conducted:

- Desktop study of available MRT records, karst records and published information of the site and surrounding area;
- Field investigation to assess the surface geomorphology of the site;
- Geological mapping of the quarry faces; and
- Acid Rock Drainage (ARD) prediction using acid-based accounting (ABA).

3 BASIS FOR ASSESSMENT

3.1 Karst

The development of karst terrain can present a series of challenges. Karst is generally formed within limestone and dolomite rocks, and some other minor soluble rock types.

It is the potential for solubility that allows the development of underground drainage and when fully developed the presence of significant features such as caves and surface landforms are unique to karst environments.

Land management can be difficult in karst areas as the underground drainage can be contradictory to the apparent drainage controlled by surface topography. Open conduits, such as caves, allow for the rapid movement of pollutants into the local groundwater and pollutants may become evident at the surface again from springs or cave resurgences to surface channels.

Other geomorphic hazards can also occur within karst environments such as ground surface collapse and accelerated sinkhole development.

The Mole Creek Karst is identified as one of the most extensively and well developed karst areas within Tasmania.

3.2 Acid Rock Drainage

Commonly occurring sulphide minerals, such as pyrite, can generate sulphuric acid when exposed to oxidising conditions and in the presence of certain metallogenic bacteria. The resulting acid drainage can mobilise heavy metals which can seriously affect soils and water quality in the receiving environments (Gurung, 2001/05).

In order to address ARD potential acid-based accounting analysis procedure is the commonly used static test for preliminary screening of acid-generating sulphidic rocks. The ABA analysis procedure involves determination of total sulphur (S%) and the acid neutralising capacity (ANC) of the rock material to derive net acid producing potential (NAPP) of a sample (Gurung, 2001/05) expressed in kgH_2SO_4/t. **NAPP values >20 kgH_2SO_4/t indicate that the rock unit has ARD generating potential (**Gurung, 2001/05 and Parbhakar *et al*, 2007).

The aim of the ABA analysis is to provide preliminary screening of rock materials with potential to generate acid and metal leaching capacity (Gurung, 2001/05).

In addition to NAPP, additional geochemical criteria, such as paste pH can be used to classify the reactivity of exposed sulphidic materials according to their relative ease of acid producing capacity.

4 BACKGROUND

4.1 Site Location

The quarry is located off Reiffers Road, approximately 2km west of the rural township of Meander, with central coordinates of 465 732E, 5 389 533N. The location of the site is shown within Figure 1 - Locality Plan.

4.2 Geology

The Mineral Resources Tasmania (MRT) Geology Map, 1:25,000 Scale, indicates that the existing quarry is situated on Permo-Carboniferous aged unfossiliferous dark grey pyritic mudstone with Permian aged predominantly fossiliferous mudstone, shale and sandstone located directly to the west. To the north and east of the quarry there is Quaternary aged sediments of stream alluvium, swamp and marsh deposits.

An extract of the Geology Map is provided as Figure 2.

4.3 Land Information Systems Tasmania (LIST)

The Geoconservation Sites layer from the LIST was examined with the Mole Creek Karst being identified as listed near the site. The quarry site is located adjacent to the south-east extent of the listed site area. The boundary is indicated as being approximately 300m to the east at its closest extent.

An extract from the LIST showing the site location and Geoconservation Site boundary is provided as Figure 3.

4.4 Meander Valley Council Planning Scheme

The Meander Valley Council (MVC) – Planning Scheme Karst Management Series map book was examined with the quarry site being identified as being within the Karst Low Sensitivity Area as well as being within the overall Karst catchment of the Mole Creek Karst area.

Planning conditions applied by the MVC for use and development within the Low Sensitivity Karst Area include management of sediment and avoidance of concentrated flows entering the groundwater system and surface karst features.

Figure 4 displays the site location on the MVC Karst Management Layer.

4.5 An Atlas of Tasmanian Karst

The most comprehensive information on karst areas in Tasmania can be found within Kiernan's (1999*) An Atlas of Tasmanian Karst.* The Mole Creek karst covers an approximate area of 200km², with an altitudinal range of 200 to 600 metres above sea level. The overall karst area is identified as a Category A Karst (intensively karstified).

This karst has been influenced by previous glacial, glaciofluvial and periglacial conditions. The current dominant climo-geomorphic system is fluvial, with the area partly covered by Quaternary sediments.

The Mole Creek Karst is complicated with some areas of the karst being subject to extensive studies to identify hydrological connections and identify surface karst features. This has principally been within the intensively karstified and exposed areas of the karst within the Mole Creek/Caveside region, which is approximately 15km to the north-west of the quarry site.

A smaller defined karst area is recognised north northwest of the site and approximately 7km from the quarry site. The Dairy Plains karst area is recognised as covering an area of approximately <0.4km², and identified as Category B Karst (substantially karstified). Some very small caves and sinkholes are known within this area.

Both areas are within Ordovician aged limestone.

There are no known caves or exposed Ordovician limestone within the Meander area.

4.6 Topographic Maps

The LIST digital 1:25 000 series scanned topographic maps were accessed and examined to establish if there are any features that have been identified and interpreted as karst features, such as sinkholes.

The closest interpreted features are approximately 3km to the northeast of the site where there is a sinkhole indicated, and approximately 4.5km to the northwest where two sinkholes are indicated.

Figure 5 displays the site and location of the interpreted and mapped sinkholes.

4.7 Aerial and Satellite Imagery

Aerial imagery accessed from the LIST and Google Earth was examined to identify if there are any features that will require an inspection during the site visit.

From the imagery a dry, rounded depression approximately 400m to the north of the quarry is identified as requiring a site visit. This feature is interpreted as a pond/small dam on the 1:25,000 topographic map. Google Earth imagery shows one historical image that has the depression being water filled (9/3/2013).

The features identified as sinkholes on the topographic mapping were examined further with the available imagery and the interpreted sinkholes to the northeast and the closest marked feature to the northwest appear to be excavations for small ponds, with the excavated materials close to the feature. Ground truthing of these features is beyond the scope of works of this investigation.

Figure 5 displays aerial and satellite images of these areas.

5 FIELD INVESTIGATION

The field investigation was conducted on 11 December 2014 and 15 January 2015 and involved an inspection by a geologist and geomorphologist of the following:

- The quarry faces and quarry stockpiles;
- The quarry settling pond and associated drainage;
- The depression to the north of the site; and
- Chittys Creek and the associated floodplain.

Samples of the stockpiles were taken for subsequent laboratory assessment.

6 SITE CONDITIONS

6.1 Quarry site

The quarry is within an exposed formation of mudstone and currently covers an approximate area 6500m^2 with a maximum depth of 11m. The quarry site is located within the lower slope of the hill flank that faces the east. To the north and east of the site there is a floodplain of Quaternary aged alluvial materials (Plates 1 to 3).

The quarry currently creates two products, namely “Cow Lane Mix” and “Crushed Blue Shale”. A stockpile of the Cow Lane Mix was located in the northeast corner of the site and a stockpile for the Crushed Blue Shale was located in the southeast corner of the site. The stockpiles are currently turned over every six months.

The quarry typically has a blast every six months. The current working faces exposed within the quarry ranged from 6 months to 18 months old. There is a small face in the south western corner of the site at the entrance to the quarry that is anecdotally approximately 8 years old.

The access roads to the quarry have been formed using the quarried materials. No signs of acid generation were identified along these roads.

6.1.1 Geomorphology

No exposed limestone, exposed karst or features indicative of karst were identified within the quarry or the rehabilitated area surrounding the site. The quarry is situated within a small

convex depression, however, this depression is the result of past quarrying activities and forms part of the rehabilitated area. The rehabilitated area is well vegetated with a thick cover of grass.

6.1.2 Geology

The geology of the quarry is interpreted as being a mudstone. The mudstone was very uniform across the quarry with no observed geology changes within the quarry faces (Plates 4 and 5). The mudstone contained numerous calcareous fossils that were evident throughout the quarry profile (Plates 6 and 7). In addition, minor inclusions of platy calcium carbonate were evident along the bedding planes (Plate 8) interpreted as being associated with the fossils. The calcium carbonate was confirmed through conducting a basic fizz test on rock samples using 8% Hydrochloric Acid.

No pyrite was visually observed within the mudstone with the rock samples inspected using a 10x hand lens.

Throughout the quarry profile only very minor iron staining was evident.

In addition, on the day of the inspection drilling was being undertaken for a future blast to the south (Plate 9). The drill cuttings were inspected with no visible signs of pyrite observed.

6.2 Depression to the north of quarry.

The depression identified on the 1: 25 000 topographic map to the north of the quarry is labelled as a waterbody. At the time of the investigation the depression held no water, with the bottom of the depression having a variety of aquatic plants present (Plates 10 to 12).

We understand from discussion with the landholder that clay materials were won from an excavation with the pond formed within. The excavation has broken through the upper clay layers and into a sandy layer of soil and is therefore not sealed with water lost through leakage into the sandy layer.

6.3 Drainage from the quarry

Drainage from the site is minimal due to the small catchment area above the site. Sediment is managed by a settling basin that is located at the lowest point of the quarry at the western end of the quarry (Plate 13). The settling basin overflows broadly onto the adjacent grassed slope and the land slopes down to a vegetated open drain (Plate 14) that runs into Chittys Creek.

No sediment was evident on the grassed slope downslope of the sediment pond. No odours or discolouring of the water was evident at the time of the investigation, and the vegetation downslope shows no evidence of changes to species composition or rates of growth.

Minor groundwater discharge/seepage was observed within the western face of the quarry. Only very minor iron staining was evident within this seepage area.

6.4 Chittys Creek

The creek was traversed with observations made of the condition of the stream and any outcropping rocks. The creek shows evidence of active incision into the bed of the waterway with areas of the bank having slumped with subsequent erosion. This was also observed

upstream of the area of inflow from the quarry site and is indicative of increased and concentrated flows entering Chittys Creek (Plates 15 and 16).

Several sections of the stream bed have eroded down to the underlying mudstone rock. No limestone, exposed karst or surface karst features were observed. In addition, there were no indications of karst influence to the surface, such as the stream bed losing flow to groundwater systems.

7 GEOCHEMICAL SAMPLING

A sample of each stockpile was taken, namely “Cow Lane Mix” and “Crushed Blue Shale”. The sampling was carried out in accordance with AS 1141.3.1 – 2012 Methods for sampling and testing aggregates – Sampling. Samples were transported to the Geoton office, and submitted to NATA accredited laboratory ALS in Burnie for sample preparation (crushing). Once prepared the samples were sent to ALS Environmental Division in Stafford, Queensland for subsequent chemical analysis.

The samples were analysed for the preliminary static tests used in ABA including the following:

- Net Aid Production Potential (NAPP);
- Acid Neutralising Capacity (ANC);
- Net Acid Generation (NAG); and
- pH and Electrical Conductivity.

A copy of the chain of custody documentation is provided in Appendix B. The certificate of analysis of the laboratory testing is provided in Appendix C.

7.1 Quality Control

As stated above all samples were submitted to NATA certified ALS Laboratories. NATA certification incorporates stringent laboratory quality control requirements. ALS Laboratories conducts an extensive laboratory QA/QC program for each project and supplies a full Quality Control report with each Certificate of Analysis. The Quality Control results from ALS Laboratories are provided in Appendix C.

8 LABORATORY RESULTS

The laboratory results are as follows:

Table 1 – Geochemical Laboratory Results

Sample	Stockpile	NAPP (kg H_2SO_4/t)	ANC (kg H_2SO_4 equiv./t)	Total Sulphur (%)	NAG pH	pH Value (Soils)
S1	Cow Lane Mix	11.3	19.6	1.01	2.6	8.6
S2	Crushed Blue Shale	16.2	21.7	1.24	2.7	8.8

NAPP = Net Acid Production Potential (% Total Sulphur x 30.6 – ANC)

ANC = Acid Neutralising Capacity

NAG = Net Acid Generation

9 DISCUSSION AND RECOMMENDATIONS

9.1 Karst

The quarry site is within the MVC defined karst water catchment, but within an area identified as having underlying Low Sensitivity Karst.

No features indicating karst processes were observed or identified at the quarry or surrounding area. No outcropping limestone was observed within the quarry, the bed of Chittys Creek or emergent from the Quaternary sediments of the floodplain to the north and east of the site.

The floodplain has no evidence of sinkholes, springs or features indicative of active karst processes between the surface and at depth.

There are no known limestone caves within the Meander township district, and no known outcrops of Ordivician limestone identified on the surface geology maps.

Two areas of the quarry operation require consideration:

- Blasting; and
- Drainage from the site.

Blasting is conducted twice a year, and this schedule is planned to continue. Modern blasting techniques now utilise smaller charges and delay detonators to produce smaller individual blast waves, rather than a single large blast wave. With no known exposed karst, or cave systems within the area it is considered that blasting operations are not damaging significant systems within the karst catchment.

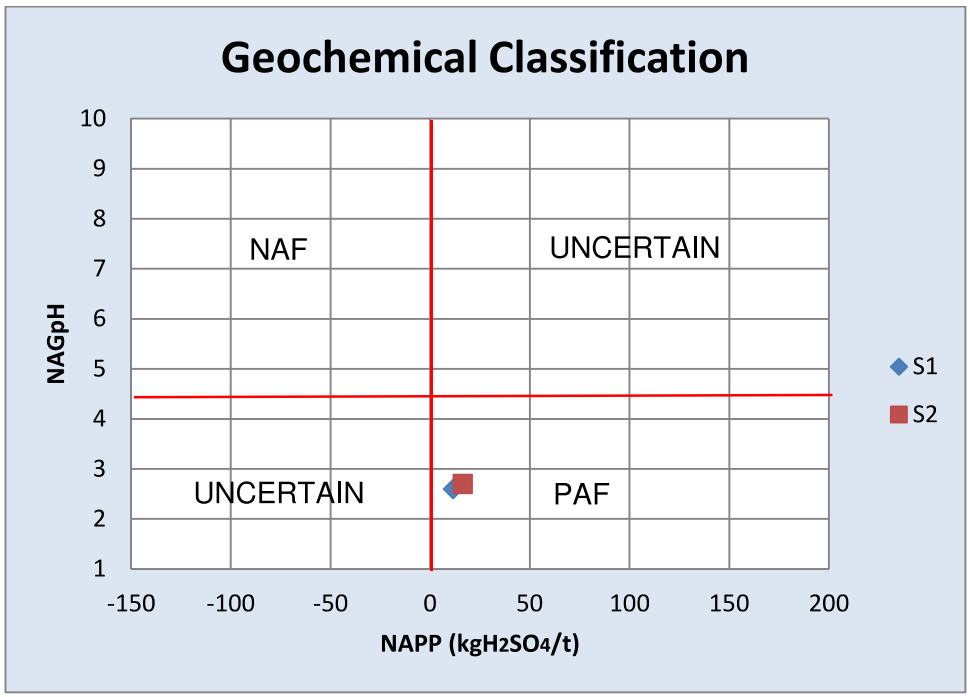
Drainage from the site is to continue the use of a settling pond, and maintain the broad dispersed flow across the grassed slope, rather than concentrating the flow. This will ensure further increase of the capture of sediment during periods of prolonged and heavy rainfall, prior to discharge to the open vegetated drainage channel and Chittys Creek.

In conclusion the location and operation of the quarry is unlikely to have an adverse environmental impact upon the Mole Creek Karst. In addition, the location and operation of the quarry is unlikely to increase the risk of geomorphic hazards from accelerated sinkhole formation or sudden ground collapse.

9.2 Acid Rock Drainage

In order to classify the quarry rocks to determine if they are potentially acid forming (PAF) a geochemical classification plot of NAGpH and NAPP is attached below (adapted from Parbhakar *et al*, 2007 and the ARD Test Handbook, 2002):

Plot 1 – Geochemical Classification Plot



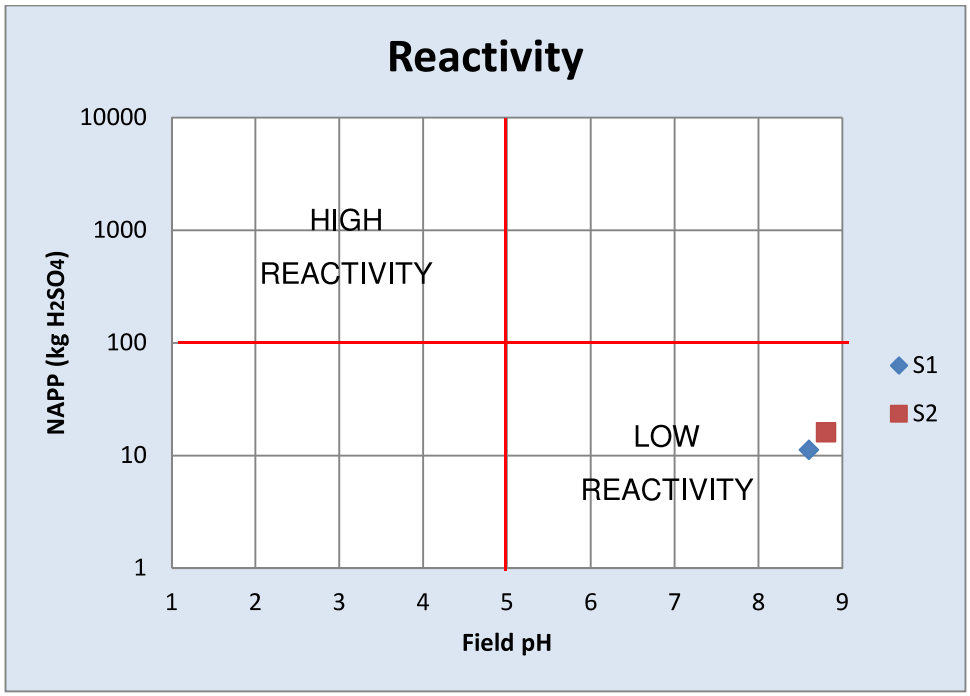
NAF = Non Acid Forming

PAF = Potentially Acid Forming

From the geochemical plot both samples are identified as being potentially acid forming. However, as the samples returned **NAPP values that were less than 20 kgH_2SO_4/t they are not considered to have ARD generating potential.**

In addition, a plot of field pH (soils) against NAPP can be used to classify the reactivity of exposed sulphidic materials according to their relative ease of acid producing capacity. A reactivity plot is attached below (adapted from Gurung, 2001/05).

Plot 2 – Reactivity



From the reactivity plot both samples are considered to have a low reactivity and therefore the ease of acid production is considered as being low.

Based on site observations combined with the laboratory results it is considered that site works to limit oxidation/acidification are not considered necessary at the quarry due to the following reasons:

- The Net Aid Production Potential (NAPP) from both samples are below the ARD threshold of 20 kg H_2SO_4/t;
- The quarry rocks are identified as being within the low reactivity zone;
- The site and surrounds consist of sedimentary rocks with no evidence of any significant inclusions of heavy metal mineralisation. Therefore any acid generation is unlikely to mobilise any heavy metals into the environment;
- The observed geology was fossiliferous with inclusions of acid neutralising calcium carbonate. No visual pyrite mineralogy was observed;
- The outflow from the quarry is considered as being minimal as the catchment is very small and only very minor groundwater seepage was encountered;
- Only minor iron staining was evident;
- No odours or discolouring of the water was evident at the time of the investigation, and the vegetation downslope shows no evidence of changes to species composition or rates of growth;
- No precipitation was evident along the drainage channel;

- The rehabilitated area is well vegetated with a thick cover of grass; and
- Roads inspected that were constructed using the quarry product did not display any signs of acid generation.

However, a future assessment should be undertaken with further testing conducted if certain conditions in the quarry change. Such changes are as follows:

- Any change within the geology of the material. In particular, is any pyrite (or other acidic mineralogy) visible within the quarried material. A visual assessment should be undertaken on the blast drillhole cuttings, with a further visual assessment after each blast. If pyrite is encountered consideration should be given to not blasting in that area until testing of the material has been conducted. The geological map indicates that pyritic mudstone is found locally in the area and is typically unfossiliferous and will most likely have a lower ANC and therefore a higher NAPP. Therefore any quarried material that is encountered that contains pyritic mudstone is potentially likely to produce some acid along the laneways and roads where it is used;
- An increase in iron staining and iron precipitation;
- Any increase in groundwater seepage and subsequent outflow from the quarry; and
- Any significant changes in the vegetation along the drainage channel.

10 REFERENCES

Land Information Systems Tasmania (LIST): Geoconservation sites layer http://maps.thelist.tas.gov.au/listmap/app/list/map

Gurung, Dr S (2001/05) Acid Drainage from abandoned mines in Tasmania.

Ian Walker Research Institute (2002) ARD Test Handbook.

Parbhakar, A; Edraki, M; Walters, S (2007) Developments in Acid Rock Drainage Prediction: A Case Study on the Abandoned Croydon Au-Mines, QLD, Australia.

Kiernan, K (1995) An Atlas of Tasmanian Karst – Part B. Tasmanian Forest Research Council. Research Report No.10

Meander Valley Council (2011) Planning Scheme Karst Management Series (map book)

GEOTON Pty Ltd

Geotechnical Consultants - Limitations of report

These notes have been prepared to assist in the interpretation and understanding of the limitations of this report.

Project specific criteria

The report has been developed on the basis of unique project specific requirements as understood by Geoton and applies only to the site investigated. Project criteria are typically identified in the Client brief and the associated proposal prepared by Geoton and may include risk factors arising from limitations on scope imposed by the Client. The report should not be used without further consultation if significant changes to the project occur. No responsibility for problems that might occur due to changed factors will be accepted without consultation.

Subsurface variations with time

Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. In the event of significant delays in the commencement of a project, further advice should be sought.

Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and at the time they are taken. All available data is interpreted by professionals to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, as it is virtually impossible to provide a definitive subsurface profile which includes all the possible variabilities inherent in soil and rock masses.

Report Recommendations

The report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until earthworks and/or foundation construction is almost complete and therefore the report recommendations can only be regarded as preliminary. Where variations in conditions are encountered, further advice should be sought.

Specific purposes

This report should not be applied to any project other than that originally specified at the time the report was issued.

Interpretation by others

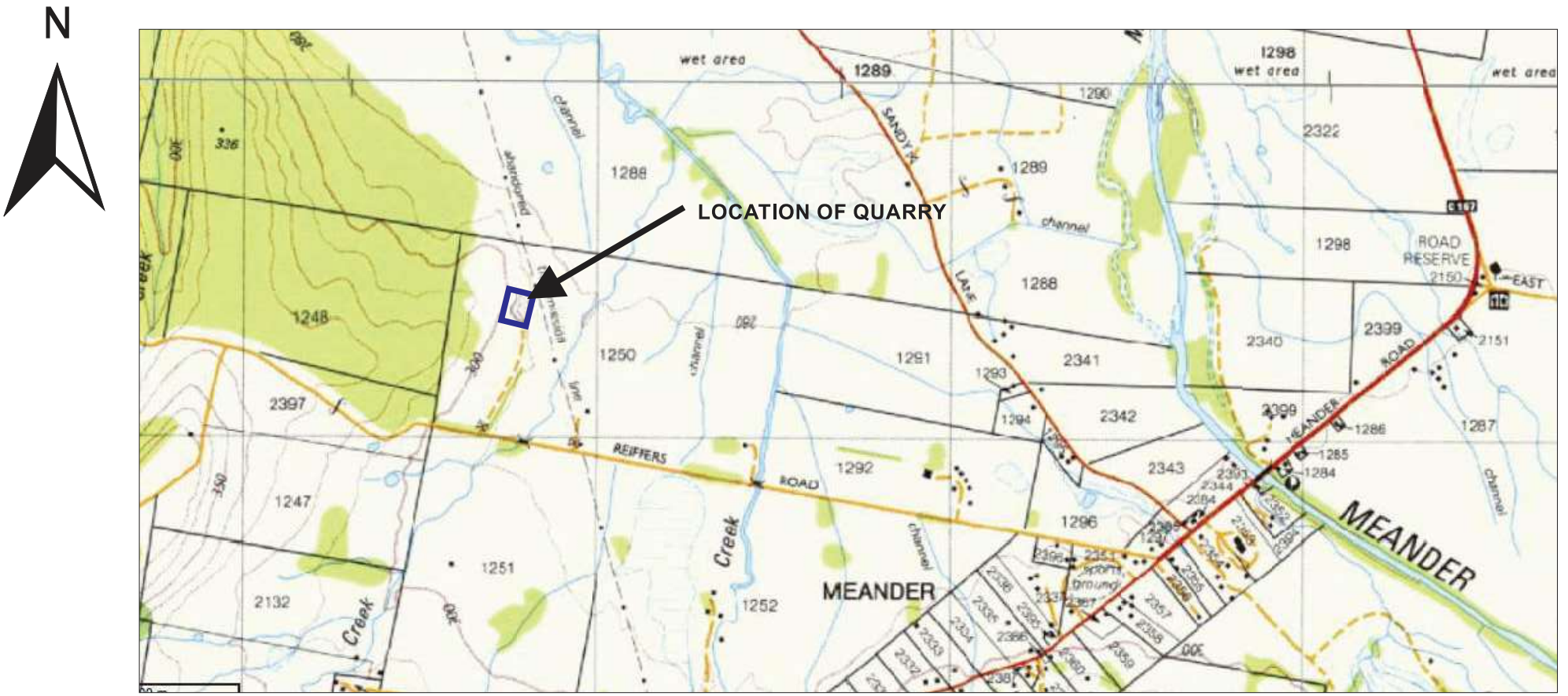
Geoton will not be responsible for interpretations of site data or the report findings by others involved in the design and construction process. Where any confusion exists, clarification should be sought from Geoton.

Report integrity

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way.

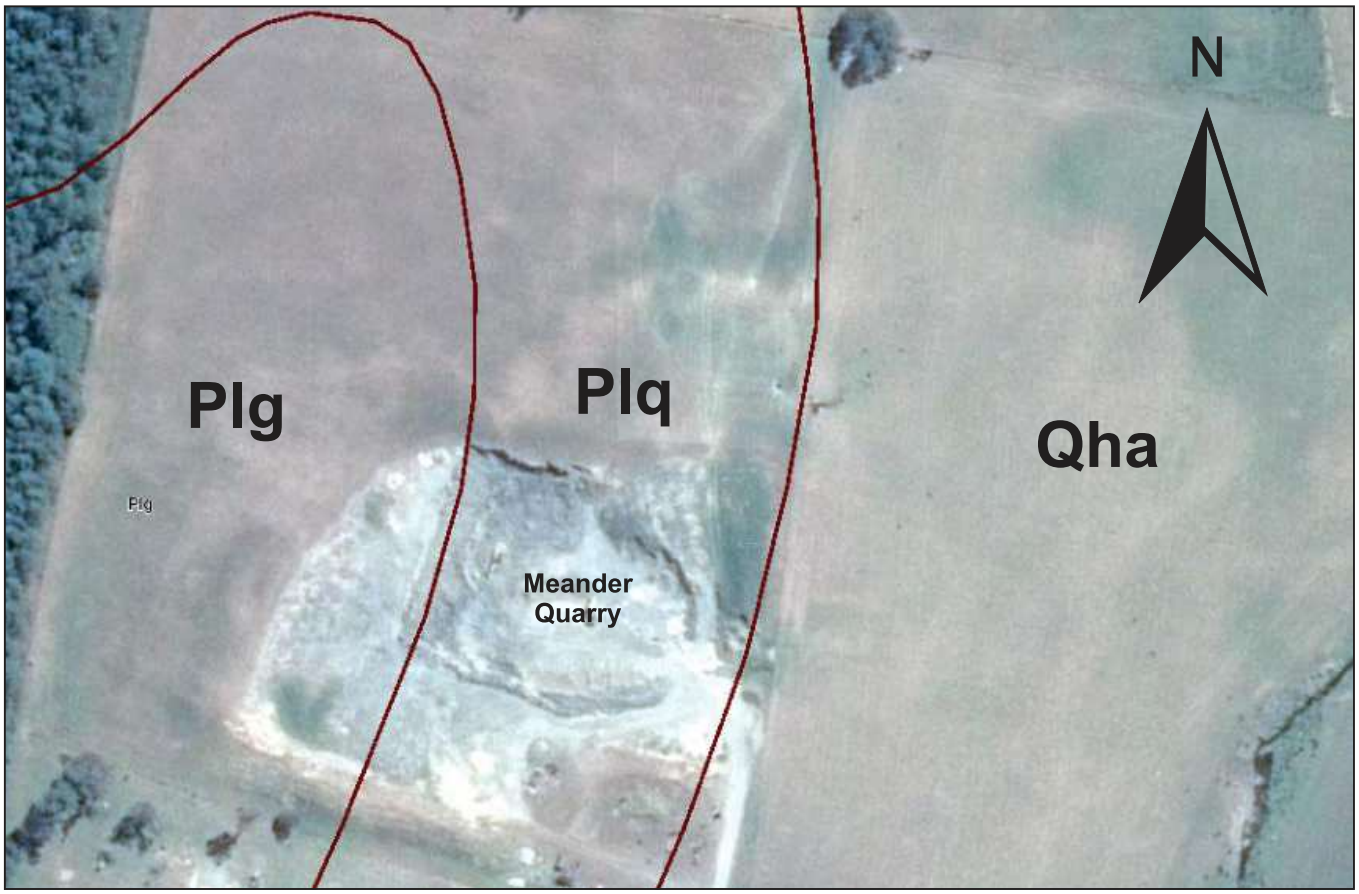
Geoenvironmental issues

This report does not cover issues of site contamination unless specifically required to do so by the client. In the absence of such a request, Geoton take no responsibility for such issues.



GEOTON Pty Ltd			
date	23/01/15	drawn	DR
scale	As Shown	approved	TB
original size	A4	rev	

client:	MACQUARIE FRANKLIN		
project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER		
title:	LOCATION PLAN		
project no:	GL14287A	figure no.	1



Approximate Scale (m)

0 50 100 150 200

Legend

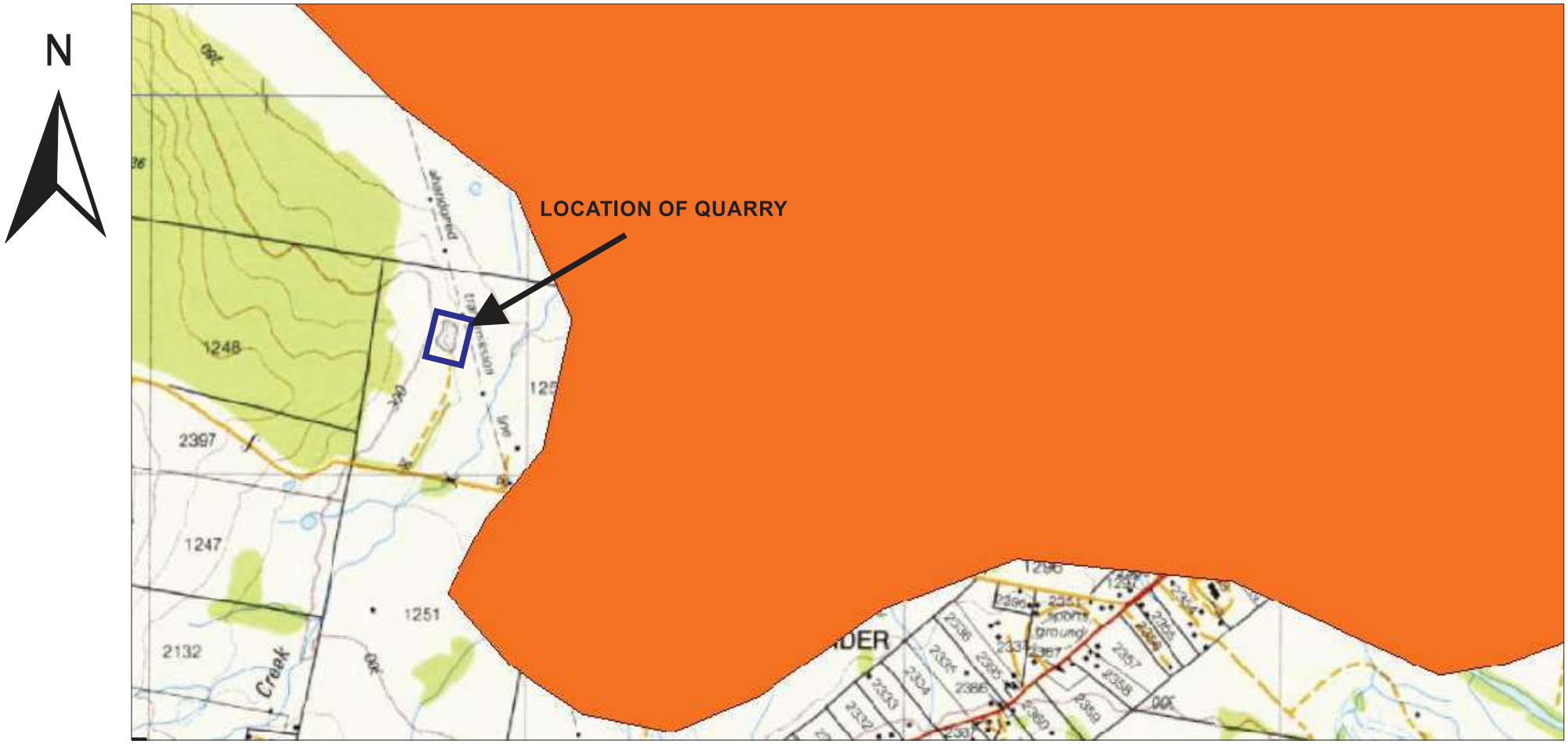
Geological boundary (MRT 1:25,000 Geology Map Series)

Qha **Quaternary aged - Stream alluvium, swamp and marsh deposits**

Plg **Permian aged - Predominantly fossiliferous mudstone, shale, limestone and sandstone (Golden Valley Group)**

Plq **Permo Carboninferous aged - Unfossiliferous dark grey pyritic mudstone (Quamby Mudstone)**

GEOTON Pty Ltd				client:	MACQUARIE FRANKLIN
				project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER
date	23/01/15	drawn	MS		
scale	As Shown	approved	TB	title:	GEOLOGY PLAN
original size	A4	rev		project no: GL14287A	figure no. 2



0 0.25 0.5 0.75 1.0

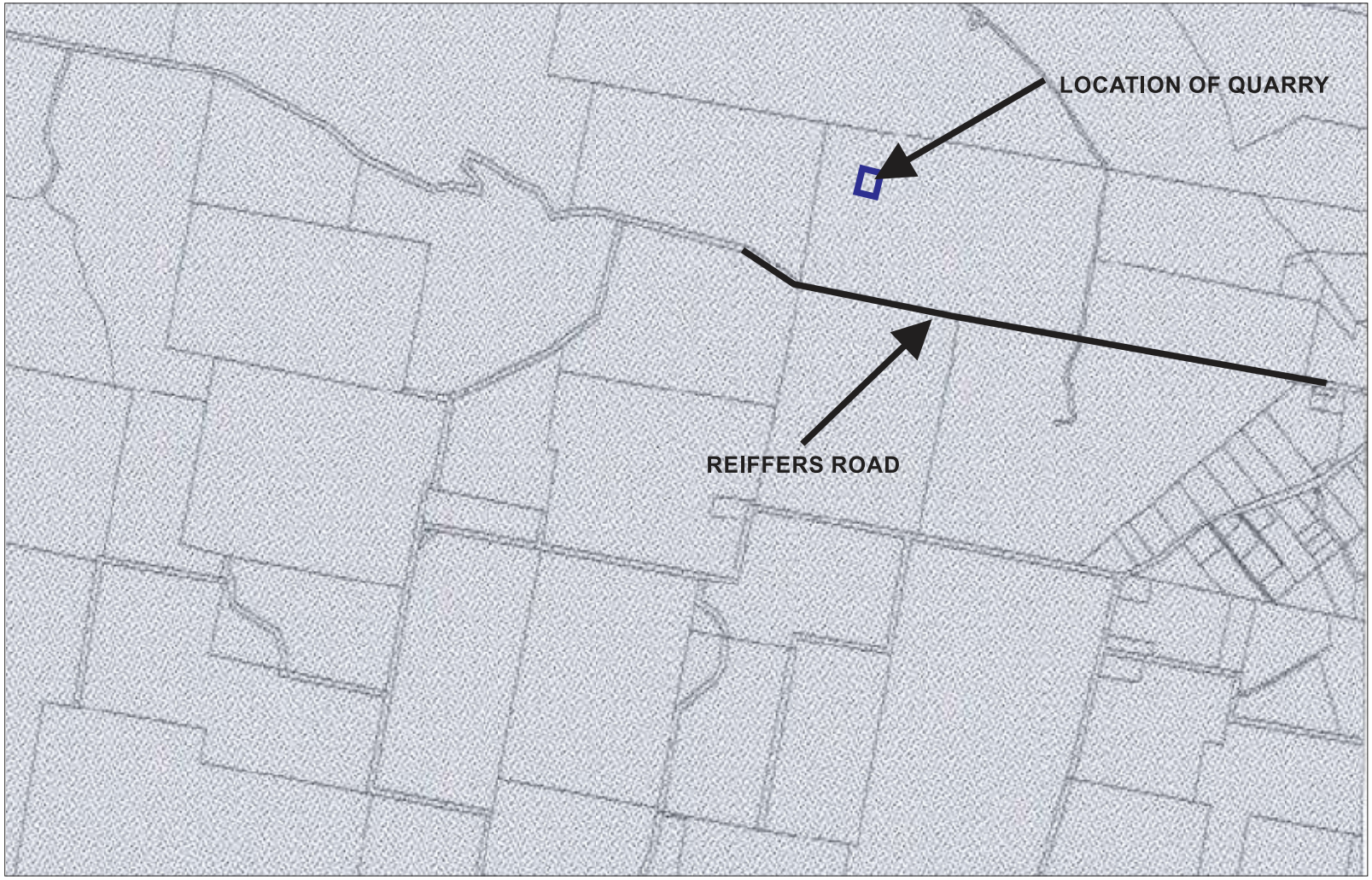
Approximate Scale (km)

Listed geoconservation site
Mole Creek Karst (ID:2685)
(The LIST accessed 19/1/15)

GEOTON Pty Ltd			
date	23/01/15	drawn	DR
scale	As Shown	approved	TB
original size	A4	rev	

client:	MACQUARIE FRANKLIN		
project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER		
title:	GEOCONSERVATION SITE LOCATION		
project no:	GL14287A	figure no.	3

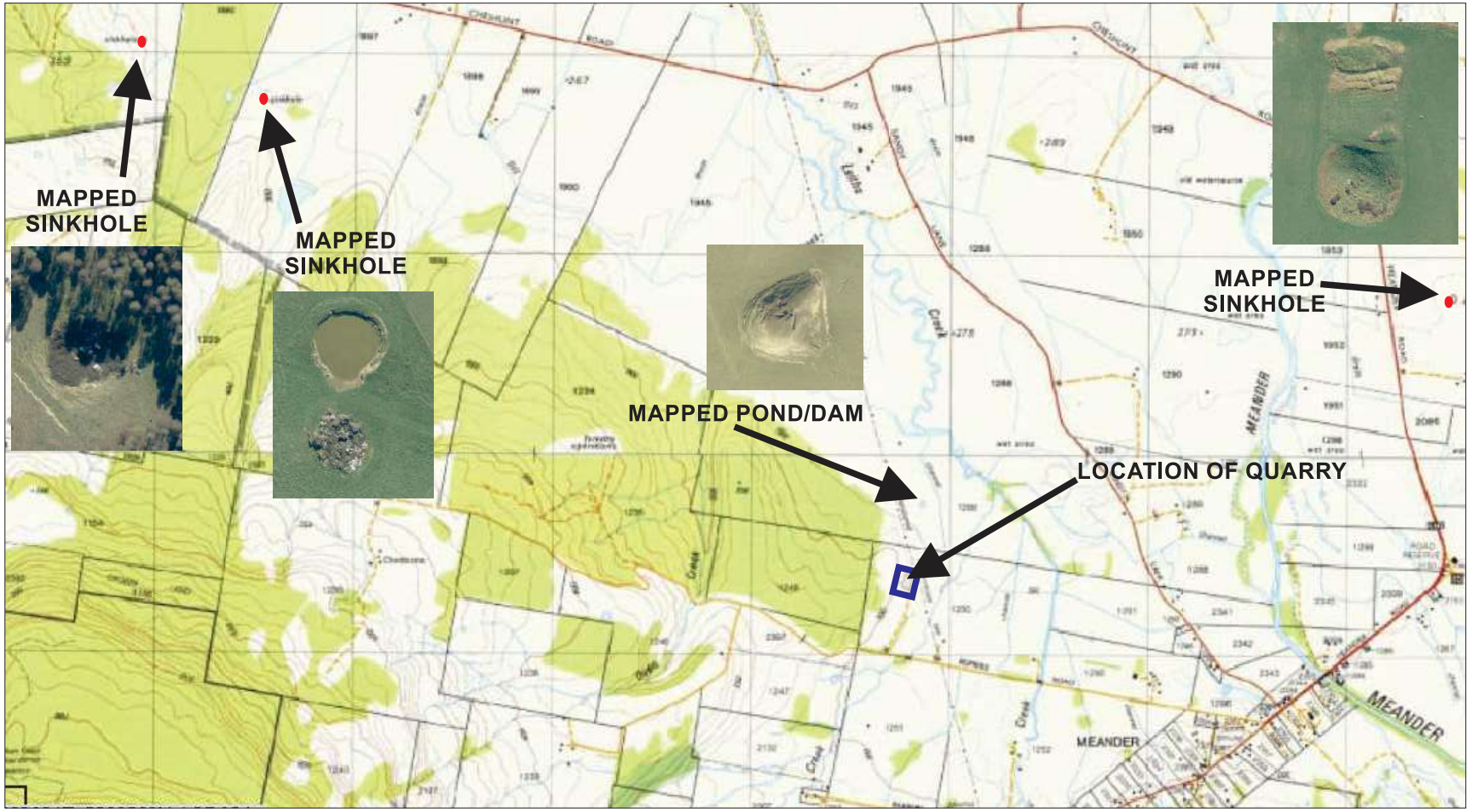
N



Karst Low Sensitivity Area
(Meander Valley Council - Planning Scheme Overlays - Karst Management Series 1:25 000)

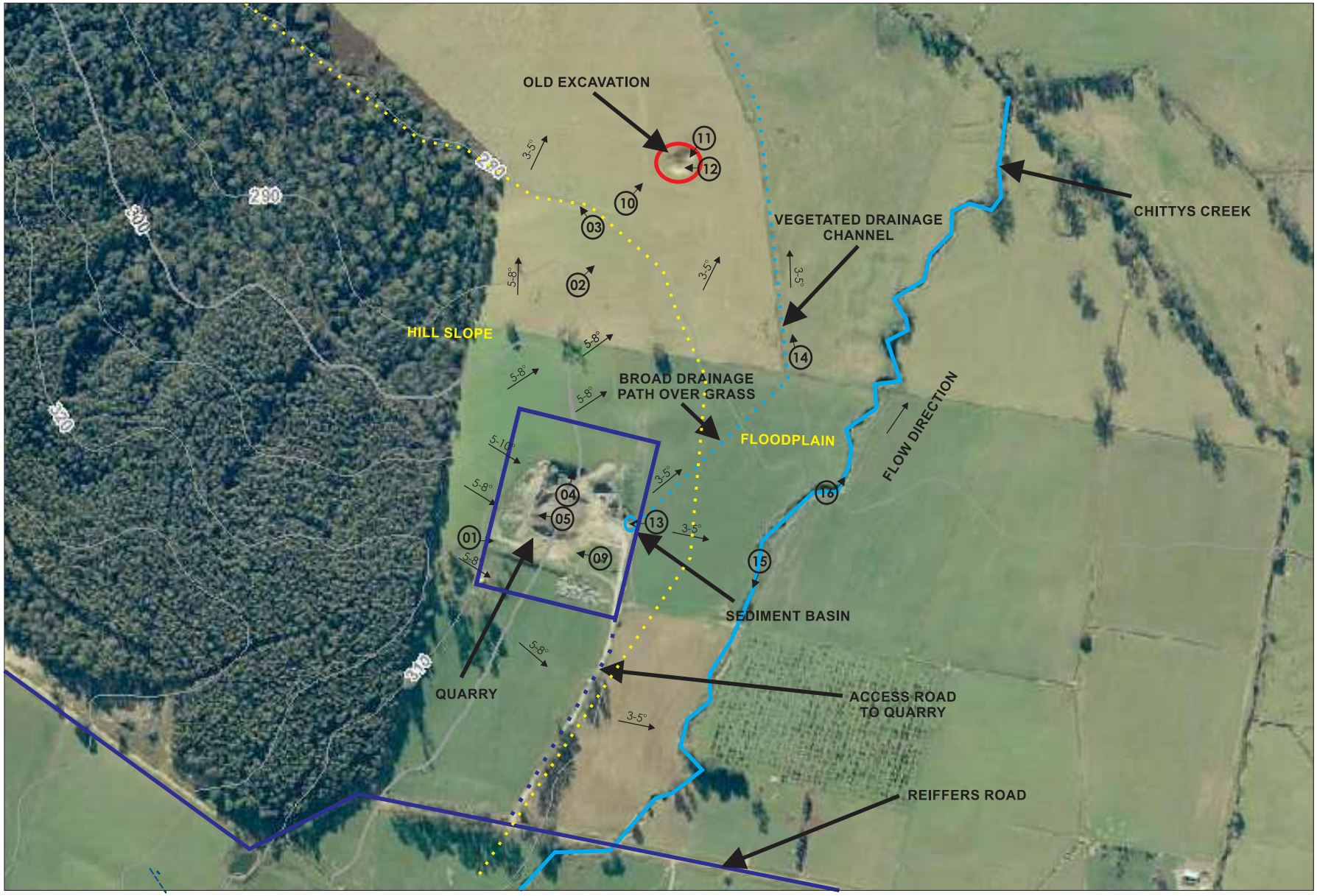
GEOTON Pty Ltd			
date	23/01/15	drawn	DR
scale	As Shown	approved	TB
original size	A4	rev	

client:	MACQUARIE FRANKLIN		
project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER		
title:	KARST MANAGEMENT PLANNING OVERLAY		
project no:	GL14287A	figure no.	4



GEOTON Pty Ltd			
date	23/01/15	drawn	DR
scale	As Shown	approved	TB
original size	A4	rev	

client:	MACQUARIE FRANKLIN		
project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER		
title:	TASMAP 1:25 000 MAPPED FEATURES		
project no:	GL14287A	figure no.	5



Legend

- 5° ← Approximate Slope Direction and Angle
- 01 → Approximate Photo Location and Direction
- Approximate Boundary Between Floodplain and Hill Slope.

0 50 100 150 200
Approximate Scale (m)

GEOTON Pty Ltd			
date	23/01/2015	drawn	DR
scale	As Shown	approved	TB
original size	A3	rev	

client:	MACQUARIE FRANKLIN
project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER
title:	SITE PLAN AND GEOMORPHOLOGY
project no:	GL14287A
figure no.	6

Appendix A

Site Photographs

PLATE 1 - View over quarry towards the west

PLATE 2 - View over slopes to the north of the quarry, looking north

GEOTON Pty Ltd				client:	MACQUARIE FRANKLIN
				project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER
title:	PHOTOGRAPH				
date:	15/01/2015	original size	A4	project no: GL14287A	figure no. PLATES 1 & 2

PLATE 3 - View over slopes to the north of the quarry, looking north-west

PLATE 4 - Northern face of the quarry

GEOTON Pty Ltd				client:	MACQUARIE FRANKLIN
				project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER
title:	PHOTOGRAPH				
date:	15/01/2015	original size	A4	project no: GL14287A	figure no. PLATES 3 & 4

PLATE 5 - Western face of the quarry

PLATE 6 - Fossils located near the top of the quarry profile

GEOTON Pty Ltd				client:	MACQUARIE FRANKLIN	
title:	PHOTOGRAPH			project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER	
date:	15/01/2015	original size	A4	project no:	GL14287A	figure no. PLATES 5 & 6

PLATE 7 - Fossil located near the base of the quarry profile

PLATE 8 - Platy calcium carbonate along bedding planes

GEOTON Pty Ltd				client:	MACQUARIE FRANKLIN	
title:	PHOTOGRAPH			project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER	
date:	15/01/2015	original size	A4	project no:	GL14287A	figure no. PLATES 7 & 8

PLATE 9 - Blast drill pattern to the south of the existing quarry

PLATE 10 - View over slopes to the north of the quarry looking north. Excavated depression indicated by arrow.

GEOTON Pty Ltd				client:	MACQUARIE FRANKLIN	
title:	PHOTOGRAPH			project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER	
date:	15/01/2015	original size	A4	project no:	GL14287A	figure no. PLATES 9 & 10

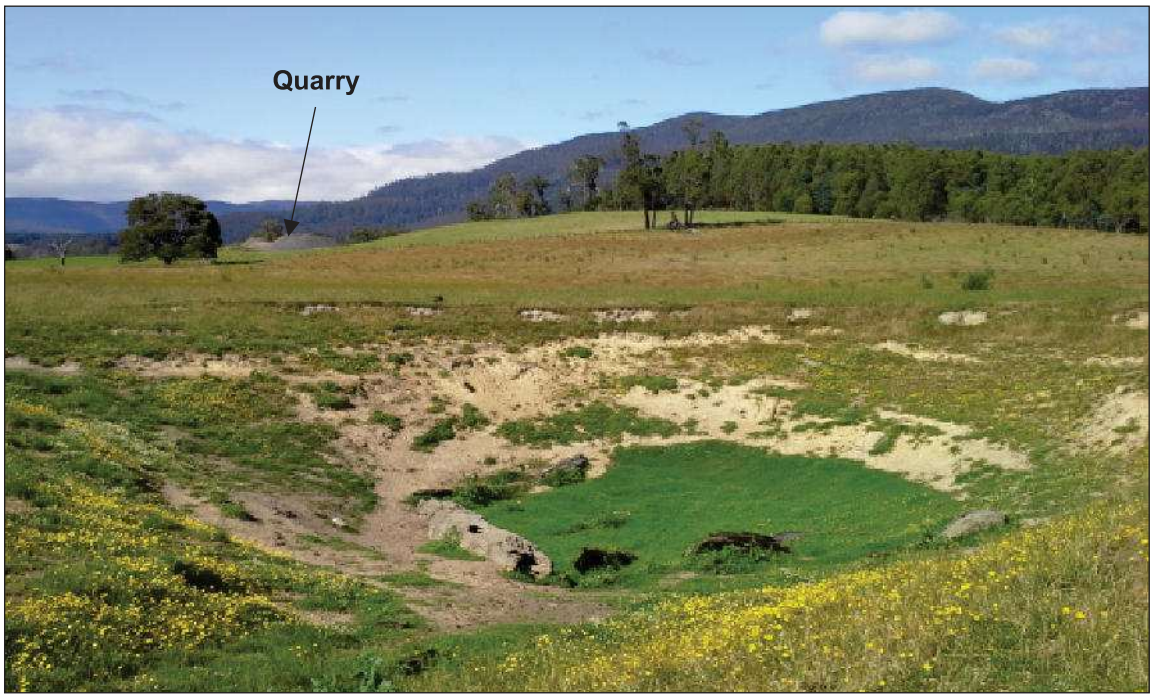


PLATE 11 - View of depression towards the south, quarry in background

PLATE 12 - View into base of excavation to the north of the quarry

GEOTON Pty Ltd				client:	MACQUARIE FRANKLIN
title:	PHOTOGRAPH			project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER
date:	15/01/2015	original size	A4	project no: GL14287A	figure no. PLATES 11 & 12

PLATE 13 - View of sediment basin to the west

PLATE 14 - View of the vegetated drainage channel looking north

GEOTON Pty Ltd				client:	MACQUARIE FRANKLIN
title:	PHOTOGRAPH			project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER
date:	15/01/2015	original size	A4	project no: GL14287A	figure no. PLATES 13 & 14

PLATE 15 - View of mudstone bedrock exposure within bed of Chitty Creek

PLATE 16 - View of the vegetated drainage channel looking north

GEOTON Pty Ltd				client:	MACQUARIE FRANKLIN
title:	PHOTOGRAPH			project:	GEOLOGY & GEOMORPHOLOGY APPRAISAL REIFFERS ROAD MEANDER
date:	15/01/2015	original size	A4	project no: GL14287A	figure no. PLATES 15 & 16

Appendix B

Chain of Custody

CASH SALE

CHAIN OF CUSTODY

ALS Laboratory: please tick →

CLIENT: Geoton Pty Ltd	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☑ Standard TAT (List due date):
OFFICE: Unit 24, 16-18 Goodman Court, Invermay, TAS, 7248		☐ Non Standard or urgent TAT (List due date):
PROJECT: Meander Quarry — PROJECT NO. GL14278A	ALS QUOTE NO.: BNBQ333	COC SEQUENCE NUMBER (Circle): COC: 1 2 3 4 5 6 7 — OF: 1 2 3 4 5 6 7
ORDER NUMBER: — PURCHASE ORDER NO.: GL14278A	COUNTRY OF ORIGIN: Australia	
PROJECT MANAGER: Matthew Street	CONTACT PH: (03) 6326 5001	
SAMPLER: Matthew Street	SAMPLER MOBILE: 0488 244 415	
COC Emailed to ALS? (YES / (NO)	EDD FORMAT (or default):	
Email Reports to (will default to PM if no other addresses are listed): mstreet@geoton.com.au		
Email Invoice to (will default to PM if no other addresses are listed): mstreet@geoton.com.au		

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		C	
Other comment			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Matthew Street			CHRIS
DATE/TIME: 15/12/14 2:30pm	DATE/TIME: 15/12/14 @ 2.45pm.	DATE/TIME:	DATE/TIME: 17/12/14 1210

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	SAMPLE DETAILS (MATRIX: Solid(S) Water(W))			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BAGS	EA 055	SPL-21	PUL-31b	IN-4S	ASS-1	EA011			Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	GL14278A - S1	9/12/14 - 1pm	S	B	1	✓	✓	✓	✓	✓	✓			Testing/Reporting as per email quote BNBQ333
2	GL14278A - S2	9/12/14 - 2pm	S	B	1	✓	✓	✓	✓	✓	✓			
				TOTAL										

ALS GROUP - Brisbane
EB1448755

C.O

Telephone : +61-7-3243 7222

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles, STT = Sterile Sodium Thiosulfate Preserved Bottles.

Appendix C

Certificate of Analysis

CERTIFICATE OF ANALYSIS

Work Order	: **EB1448755**	Page	: 1 of 2
Client	: **GEOTON PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR MATTHEW STREET	Contact	: Customer Services EB
Address	: UNIT 24 16-18 GOODMAN COURT INVERMAY TAS 7248	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: mstreet@geoton.com.au	E-mail	: ALSEnviro.Brisbane@alsglobal.com
Telephone	: +61 03 6326 5001	Telephone	: +61-7-3243 7222
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: ----	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: GL14278A	Date Samples Received	: 17-Dec-2014 12:10
C-O-C number	: ----	Date Analysis Commenced	: 20-Dec-2014
Sampler	: ----	Issue Date	: 15-Jan-2015 09:09
Site	: ----		
		No. of samples received	: 2
Quote number	: ----	No. of samples analysed	: 2

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Martina Louw	Inorganic Chemist	Brisbane Inorganics
Satishkumar Trivedi	2 IC Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

- **ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.**

Analytical Results

Sub-Matrix: **PULP** (Matrix: **SOIL**)			Client sample ID	**GL14278A - S1**	**GL14278A - S2**	-----	-----	-----
			Client sampling date / time	09-Dec-2014 13:00	09-Dec-2014 14:00	––	––	––
Compound	*CAS Number*	*LOR*	*Unit*	**EB1448755-001**	**EB1448755-002**	--------	--------	--------
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	––	0.1	pH Unit	**8.6**	**8.8**	----	----	----
EA009: Nett Acid Production Potential								
^ **Net Acid Production Potential**	––	0.5	kg H2SO4/t	**11.3**	**16.2**	----	----	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	––	1	µS/cm	**268**	**245**	----	----	----
EA011: Net Acid Generation								
pH (OX)	––	0.1	pH Unit	**2.6**	**2.7**	----	----	----
NAG (pH 4.5)	––	0.1	kg H2SO4/t	**15.2**	**13.1**	----	----	----
NAG (pH 7.0)	––	0.1	kg H2SO4/t	**21.0**	**18.6**	----	----	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	––	0.5	kg H2SO4 equiv./t	**19.6**	**21.7**	----	----	----
^ **ANC as CaCO3**	––	0.1	% CaCO3	**2.0**	**2.2**	----	----	----
Fizz Rating	––	0	Fizz Unit	**1**	**1**	----	----	----
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	––	0.01	%	**1.01**	**1.24**	----	----	----

QA/QC Compliance Assessment for DQO Reporting

Work Order	: **EB1448755**	Page	: 1 of 4
Client	: **GEOTON PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR MATTHEW STREET	Telephone	: +61-7-3243 7222
Project	: ----	Date Samples Received	: 17-Dec-2014
Site	: ----	Issue Date	: 15-Jan-2015
Sampler	: ----	No. of samples received	: 2
Order number	: GL14278A	No. of samples analysed	: 2

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002 : pH (Soils)						
Plastic Bag GL14278A - S1, GL14278A - S2	20-Dec-2014	16-Dec-2014	3	30-Dec-2014	20-Dec-2014	9
EA010: Conductivity						
Plastic Bag GL14278A - S1, GL14278A - S2	20-Dec-2014	16-Dec-2014	3	—-	—-	—-
ED042T: Total Sulfur by LECO						
Plastic Bag GL14278A - S1, GL14278A - S2	22-Dec-2014	16-Dec-2014	5	—-	—-	—-

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002 : pH (Soils)							
Plastic Bag (EA002) GL14278A - S1, GL14278A - S2	**09-Dec-2014**	**20-Dec-2014**	16-Dec-2014	×	**30-Dec-2014**	20-Dec-2014	×
EA010: Conductivity							
Plastic Bag (EA010) GL14278A - S1, GL14278A - S2	**09-Dec-2014**	**20-Dec-2014**	16-Dec-2014	×	**30-Dec-2014**	17-Jan-2015	✓
EA011: Net Acid Generation							
Plastic Bag (EA011) GL14278A - S1, GL14278A - S2	**09-Dec-2014**	**06-Jan-2015**	09-Dec-2015	✓	**08-Jan-2015**	05-Jul-2015	✓
EA013: Acid Neutralising Capacity							
Plastic Bag (EA013) GL14278A - S1, GL14278A - S2	**09-Dec-2014**	**06-Jan-2015**	09-Dec-2015	✓	**09-Jan-2015**	05-Jul-2015	✓
ED042T: Total Sulfur by LECO							
Plastic Bag (ED042T) GL14278A - S1, GL14278A - S2	**09-Dec-2014**	**22-Dec-2014**	16-Dec-2014	×	**22-Dec-2014**	20-Jun-2015	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acid Neutralising Capacity (ANC)	EA013	2	14	**14.29**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Electrical Conductivity (1:5)	EA010	1	6	**16.67**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Net Acid Generation	EA011	2	14	**14.29**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfur - Total as S (LECO)	ED042T	1	2	**50.00**	**10.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Acid Neutralising Capacity (ANC)	EA013	1	14	**7.14**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Electrical Conductivity (1:5)	EA010	1	6	**16.67**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Net Acid Generation	EA011	1	14	**7.14**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
pH (1:5)	EA002	1	20	**5.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfur - Total as S (LECO)	ED042T	1	2	**50.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	6	**16.67**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Sulfur - Total as S (LECO)	ED042T	1	2	**50.00**	**5.00**	✓	NEPM 2013 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to APHA 21st ed., 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Net Acid Production Potential	EA009	SOIL	In house: Referenced to Coastech Research (Canada)(Mod.). NAPP = Acid Production Potential (APP or MAP-Maximum Acid Potential) minus Neutralising Capacity (ANC). NAPP may be +ve, zero or -ve.
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to APHA 21st ed., 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 104)
Net Acid Generation	EA011	SOIL	In house: Referenced to Miller (1998) Titremetric procedure determines net acidity in a soil following peroxide oxidation. Titrations to both pH 4.5 and pH 7 are reported.
Acid Neutralising Capacity (ANC)	EA013	SOIL	In house: Referenced to USEPA 600/2-78-054, I. Miller (2000). A fizz test is done to semiquanititatively estimate the likely reactivity. The soil is then reacted with an known excess quanitity of an appropriate acid. Titration determines the acid remaining, and the ANC can be calculated from comparison with a blank titration.
Sulfur - Total as S (LECO)	ED042T	SOIL	In-house. Dried and pulverised sample is combusted in a high temperature furnace in the presence of strong oxidants / catalysts. The evolved S (as SO2) is measured by infra-red detector

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house
Dry and Pulverise (up to 100g)	GEO30	SOIL	#

QUALITY CONTROL REPORT

Work Order	: **EB1448755**	Page	: 1 of 4
Client	: **GEOTON PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR MATTHEW STREET	Contact	: Customer Services EB
Address	: UNIT 24 16-18 GOODMAN COURT INVERMAY TAS 7248	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: mstreet@geoton.com.au	E-mail	: ALSEnviro.Brisbane@alsglobal.com
Telephone	: +61 03 6326 5001	Telephone	: +61-7-3243 7222
Facsimile	: ----	Facsimile	: +61-7-3243 7218
Project	: ----	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: GL14278A	Date Samples Received	: 17-Dec-2014
C-O-C number	: ----	Date Analysis Commenced	: 20-Dec-2014
Sampler	: ----	Issue Date	: 15-Jan-2015
Site	: ----	No. of samples received	: 2
Quote number	: ----	No. of samples analysed	: 2

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out ir compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Martina Louw	Inorganic Chemist	Brisbane Inorganics
Satishkumar Trivedi	2 IC Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002 : pH (Soils) (QC Lot: 47784)									
EB1448737-027	Anonymous	EA002: pH Value	---	0.1	pH Unit	9.2	9.1	1.21	0% - 20%
EB1448371-001	Anonymous	EA002: pH Value	---	0.1	pH Unit	10.1	10.2	0.00	0% - 20%
EA010: Conductivity (QC Lot: 47785)									
EB1448371-001	Anonymous	EA010: Electrical Conductivity @ 25°C	---	1	µS/cm	92	80	14.0	0% - 20%
EA011: Net Acid Generation (QC Lot: 50881)									
EB1448727-003	Anonymous	EA011: NAG (pH 4.5)	---	0.1	kg H2SO4/t	<0.1	<0.1	0.00	No Limit
		EA011: NAG (pH 7.0)	---	0.1	kg H2SO4/t	3.3	3.3	0.00	0% - 20%
EB1449035-008	Anonymous	EA011: NAG (pH 4.5)	---	0.1	kg H2SO4/t	16.8	17.2	2.65	0% - 20%
		EA011: NAG (pH 7.0)	---	0.1	kg H2SO4/t	23.1	23.3	1.01	0% - 20%
EA013: Acid Neutralising Capacity (QC Lot: 50880)									
EB1448727-003	Anonymous	EA013: ANC as H2SO4	---	0.5	kg H2SO4 equiv./t	11.5	11.6	1.51	0% - 20%
EB1449035-008	Anonymous	EA013: ANC as H2SO4	---	0.5	kg H2SO4 equiv./t	<0.5	<0.5	0.00	No Limit
ED042T: Total Sulfur by LECO (QC Lot: 48478)									
EB1448755-001	GL14278A - S1	ED042T: Sulfur - Total as S (LECO)	---	0.01	%	1.01	1.08	6.53	0% - 20%

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002 : pH (Soils) (QCLot: 47784)								
EA002: pH Value	---	---	pH Unit	---	4 pH Unit	100	98	102
EA010: Conductivity (QCLot: 47785)								
EA010: Electrical Conductivity @ 25°C	---	1	µS/cm	<1	1412 µS/cm	101	97	103
EA011: Net Acid Generation (QCLot: 50881)								
EA011: NAG (pH 7.0)	---	---	kg H2SO4/t	---	23 kg H2SO4/t	95.1	70	130
EA013: Acid Neutralising Capacity (QCLot: 50880)								
EA013: ANC as H2SO4	---	---	kg H2SO4 equiv./t	---	100 kg H2SO4 equiv./t	106	82	120
ED042T: Total Sulfur by LECO (QCLot: 48478)								
ED042T: Sulfur - Total as S (LECO)	---	0.01	%	<0.01	0.15 %	106	70	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

Appendix 3: Aboriginal Heritage Tasmania (AHT) search of Tasmanian Aboriginal Site Index (TASI)