Modification Report

Origin Energy

Shoalhaven Hydro – Geotechnical Works
28 June 2022

Modification Report

Client name:	Origin Energy		
Project name:	Shoalhaven Hydro – Geotechnical Works		
Client reference:	Origin Energy Eraring Pty Ltd	**Project no:**	IS392600
Document no:	SSI-9816	**Project manager:**	Thomas Muddle
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Date:	28 June 2022	**File name:**	IS392600 Shoalhaven Hydro_Geotechnical Works_Modification Report

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
01	28/06/2022	Final	T Muddle	L Clear	M Luger	T Muddle

Acknowledgement of Country

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Jacobs Group (Australia) Pty Limited

Level 7, 177 Pacific Highway
North Sydney, NSW 2060
PO Box 632
North Sydney, NSW 2059
Australia

T +61 2 9928 2100
F +61 2 9928 2444
www.jacobs.com

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Executive Summary

Origin Energy Eraring Pty Ltd (Origin) proposes to develop the Shoalhaven Hydro Expansion Project which would almost double the capacity of the existing Origin operated Shoalhaven Pumped Hydro Scheme. The Shoalhaven Hydro Expansion Project including associated geotechnical works and ancillary development is declared critical State significant infrastructure under the Environmental Planning and Assessment Act 1979 (EP&A Act). Origin submitted a State significant infrastructure application (SSI 9816) in December 2018 seeking approval for geotechnical works required to inform the design of the Shoalhaven Hydro Expansion Project. Approval was subsequently granted by the then Minister for Planning following the exhibition of an environmental impact statement, response to submission and consideration by the then Department of Planning, Infrastructure and Environment.

The approval of SSI 9816 allowed for drilling at eight borehole locations to depths ranging between 25 and 650 metres and associated access and works areas (the approved geotechnical works).

The approved geotechnical works were considered a necessary precursor to realise the potential benefits of the broader Shoalhaven Hydro Expansion Project, as they provide critical geological information for the detailed design of key underground components including power station cavern, vertical shaft and tunnels. The approved geotechnical works were considered able to be achieved with minimal environmental impacts.

Following approval of SSI 9816 and the preparation and approval of an environmental management documentation, works were subsequently completed at four of the eight approved geotechnical works locations in August 2019. These works were undertaken in accordance with the conditions of approval and without incident.

Following completion of works at four locations, the development of the Shoalhaven Hydro Expansion Project was put on hold due to higher than expected estimated construction costs and uncertainty in the overall energy generation market. With increased confidence in the viability of the Project and the roll-out of NSW Government's Pumped Hydro Roadmap and Pumped Hydro Recoverable Grants Program, Origin has recommenced progressing detailed designs through a revised contractor engagement process. In revisiting the reference design, a number of optimisations have been nominated with the most consequential being potential relocation of underground cavern for the power station and associated access portal and tunnel.

To confirm the constructability of this optimised design, one new borehole location (location 9) is now proposed while two investigation locations associated with the former cavern location are no longer required. As such Origin are now seeking approval of a modification application to authorise works at this new location to be undertaken.

Proposed location 9 is in an area of prior disturbance and no vegetation clearing is required. An Aboriginal heritage due diligence assessment including detailed site inspection has also confirmed that no Aboriginal objects. All other impacts would be no worse than those associated with the approved geotechnical works.

The purpose of this modification report is to support Origin's application to modify SSI 9816 under Section 5.25 of the EP&A Act through the consideration of environmental impacts of the geotechnical investigation at the new location with regard to *State Significant Infrastructure Guidelines*. These considerations identify that the environmental consequences of the proposed modification are minor and similar to those approved and undertaken.

1. Introduction

1.1 Project overview

Origin Energy (Eraring) Pty Ltd (Origin) proposes to develop the Shoalhaven Hydro Expansion Project, to construct and operate a new pumped hydro power station on and under the land between the Fitzroy Falls Reservoir and Lake Yarrunga (Refer to Figure 1-1). An indicative layout of the Shoalhaven Hydro Expansion Project is provided in Figure 1-2. The Shoalhaven Hydro Expansion Project would draw on Origin's existing water allocations to pump water up from Lake Yarrunga consuming energy when it is in less demand. Energy would then be generated through the return of water from Fitzroy Falls Reservoir to Lake Yarrunga when demand for energy increases.

To confirm the constructability and overall feasibility of the Shoalhaven Hydro Expansion Project, an initial program of geotechnical works is required and was subject to assessment and approval under State significant infrastructure application 9816 (SSI-9816). The assessment of SSI-9816 involved the preparation and exhibition of the Geotechnical works environmental impact statement (the EIS) (Jacobs, 2019) addressing Secretary's Environmental Assessment Requirements and subsequent response to submissions report.

The Shoalhaven Hydro Expansion Project and associated geotechnical works are to be carried out in the Wingecarribee and Shoalhaven Local Government Areas (LGAs). Access to the upper portion of the Shoalhaven Hydro Expansion Project and associated geotechnical works on the plateau, would be via the Promised Land Trail. The Promised Land Trail is accessed from Moss Vale Road and traverses both WaterNSW land and the Morton National Park and was constructed as part of the original scheme. Access to the lower portion of the Shoalhaven Hydro Expansion Project within Kangaroo Valley would be via Bendeela Road from Moss Vale Road in the vicinity of the townships of Kangaroo Valley and Barrengarry.

The Shoalhaven Hydro Expansion Project is declared Critical State Significant Infrastructure by way of clause 13 of Schedule 5 of *State Environmental Planning Policy (Planning Systems) 2021* as follows:

(1) Development for the purposes of the Shoalhaven Hydro Expansion Project.

(2) The Shoalhaven Hydro Expansion Project includes the following—

(a) exploratory geotechnical works for the design of the project,

(b) a new underground pumped hydro power station,

(c) tunnels and underground and overground water pipelines,

(d) surge tanks and intake and outlet structures,

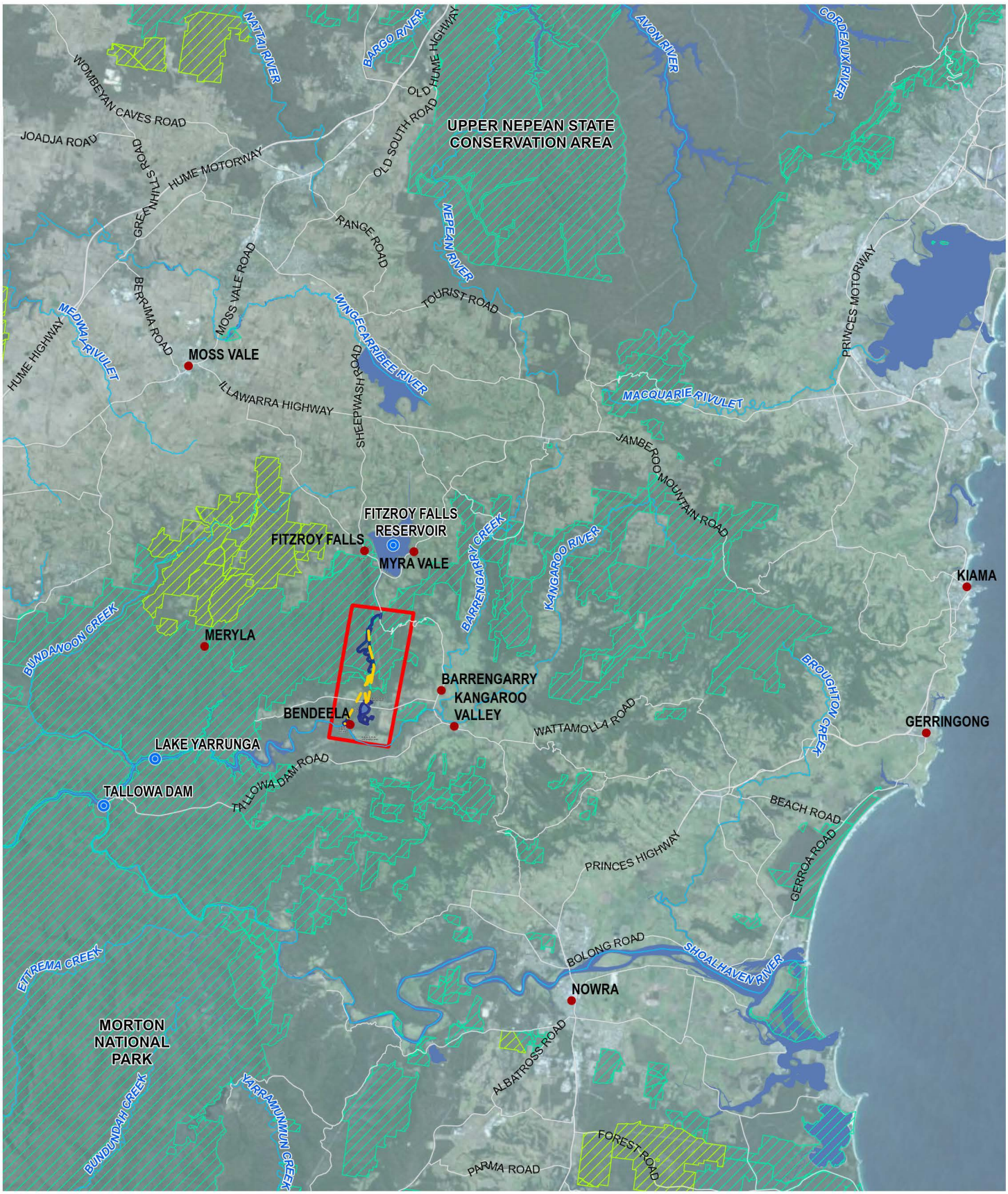
(e) the decommissioning of the underground pumped hydro power station and rehabilitation of the site.

(3) Development that is ancillary to other development in this section (including the upgrading or construction of access roads, utilities infrastructure, construction accommodation and construction compounds).

(4) The development is to be carried out on land in the suburbs of Kangaroo Valley, Barrengarry and Fitzroy Falls.

(5) In this section, development does not include the carrying out of surveys, sampling, environmental investigations, archaeological excavations or other tests or investigations for the assessment of the project.

A State Significant Infrastructure (SSI) application for the initial program of exploratory works including establishment of up to eight boreholes to depths of up to 650 metres, establishment of up to eight ancillary works areas, and establishment of new access tracks to the borehole sites was approved on 17 June 2019 under Application Number SSI-9816. Origin subsequently completed works at four of the approved eight borehole locations being locations 2, 3, 6 and 7.



Legend

- Indicative tunnel alignments
- Indicative Shoalhaven Hydro Expansion Project Footprint
- Study area
- NPWS Reserve
- State Forest

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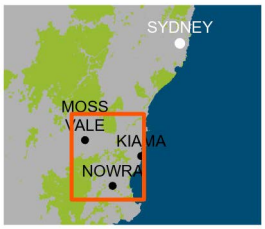

Data sources

Jacobs 2021
NSW Spatial Services 2021
© Department of Customer Service 2020

Figure 1.1 Shoalhaven Hydro Expansion Project Location

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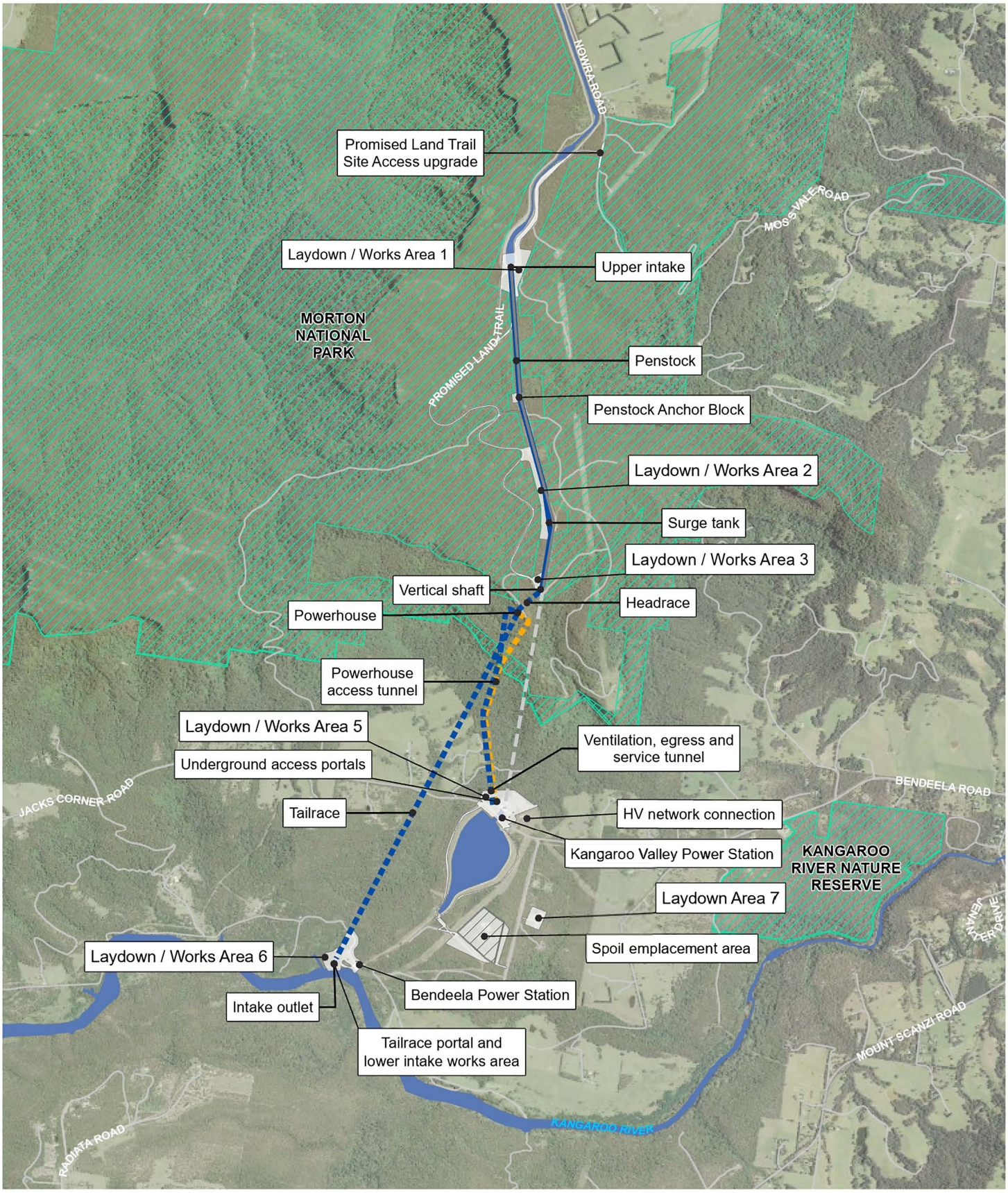


Figure 1.2 Shoalhaven Hydro Expansion Project Indicative layout

Origin has now identified a need for geotechnical works in a new location (location 9) while works at approved borehole locations 4 and 5 are no-longer proposed. The approval of the minister is now requested in accordance with Section 5.25 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for further geotechnical works at location 9 as detailed in Section 3 (the proposed modification).

1.2 Proponent details

Origin is the proponent for the Shoalhaven Hydro Expansion Project and are the entity that own the existing Shoalhaven Scheme generating and pumping assets (Kangaroo Valley and Bendeela Power Stations). WaterNSW own the existing connection pipelines and tunnel between the reservoirs.

Origin is Australia's largest energy retailer by customer accounts, with 4.3 million customers across electricity, natural gas and LPG. Origin has an electricity generation capacity of more than 6,000MW, has over 6,000 employees. Origin is committed to 'getting energy right for customers, the community and the planet'. To ensure this commitment is delivered upon Origin has publicly stated three key areas of focus for the near term:

- Decarbonisation: efforts to tackle climate change continue to support strong growth in renewables and gas as a partner of renewables
- Decentralisation: technological advancement enabling consumer empowerment and transition towards a decentralised energy future
- Digitisation: changing all aspects of operations and requiring an overhaul of business processes and interactions with customers.

The details of the Proponent are provided in Table 1-1.

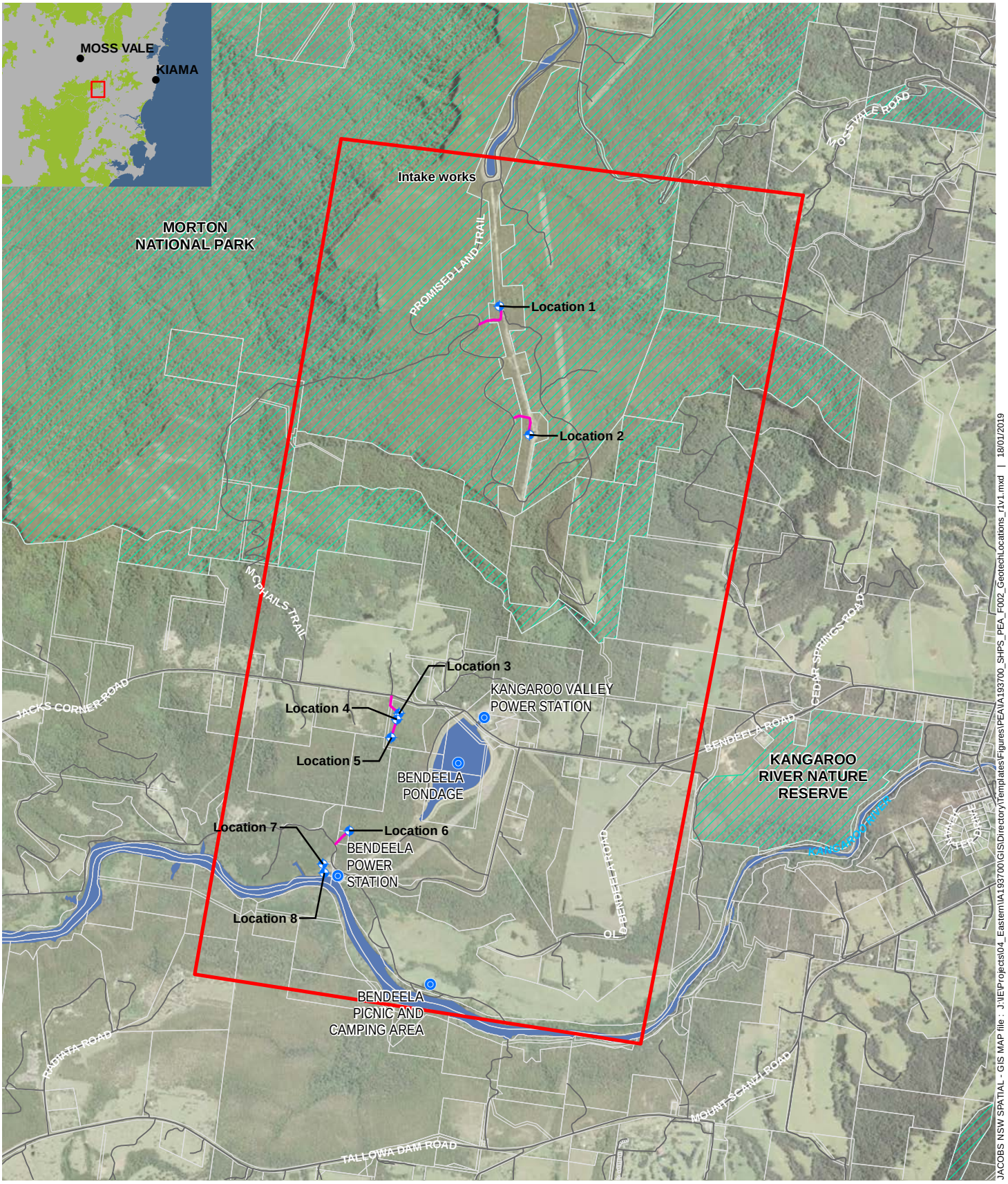
Table 1-1. Proponent details

Name	Origin Energy Eraring Pty Limited
Postal address	Shoalhaven Power Station, Bendeela Road, Kangaroo Valley, NSW, 2577
ABN	31 357 688 069

1.3 Summary of the approved project

The approved geotechnical works are limited to the drilling of up to eight boreholes ranging in depth from 25 to 650 metres below ground level and ancillary works to establish temporary access and works areas, geotechnical testing, decommissioning and rehabilitation. The target locations of the approved geotechnical works are illustrated in Figure 1-3 and were located at the proposed locations of key components of the Shoalhaven Hydro Expansion Project or were aimed at facilitating improved understanding of identified higher risk ground conditions. In the event that the project is deemed unfeasible, all geotechnical drilling locations would be decommissioned and rehabilitated to match the existing land use and habitat values of each location. Should the Shoalhaven Hydro Expansion Project proceed, some bores would be retained as groundwater monitoring bores.

The geotechnical works are on land owned by WaterNSW associated with the existing Kangaroo Valley and Bendeela Power Stations and water transfer operations. Geotechnical investigation locations were selected by the geotechnical engineering team according to the reference design for the Shoalhaven Hydro Expansion Project. These proposed locations were then reviewed by an archaeologist, ecologist, an environmental scientist and planner for potential environmental, cultural and social impacts. The reviews identified a number of investigation locations in moderately sensitive areas. Moderate sensitivity locations were removed or relocated to avoid or minimise environmental, cultural and social impacts. Following these reviews, a total of eight investigation locations were confirmed as part of the proposal and approved by the then Minister for Planning following the exhibition of the environmental impact statement, response to submission and consideration by the then Department of Planning, Infrastructure and Environment.



JACOBS NSW SPATIAL - GIS MAP file : J:\IE\Projects\04_Eastern\IA193700\GIS\Directory\Templates\Figures\PEA\IA193700_SHPS_PEA_F002_GeotechLocations_r1v1.mxd | 18/01/2019

Legend

- Points of interest
- Indicative Geotech Locations
- Study area
- Access tracks
- NPWS Reserve

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N

Figure 1.3 Approved Geotechnical Works Locations

Data sources
DFSI - Spatial Services
Jacobs 2018

Locations 1, 2, 7 and 8 were positioned in cleared areas with evidence of prior ground disturbance and with existing established access tracks. Locations 3, 4 and 5 were positioned within areas previously cleared for agricultural purposes that have revegetated naturally following the exclusion of agriculture. Location 6 was within an area that was partially cleared and subsequently naturally revegetated. Access to borehole locations 3, 4, 5 and 6 required limited clearing of shrubs to ground level to establish approximately 500 metres of temporary access tracks up to two metres in width to facilitate the access of drill rigs, and daily travel of support vehicles and utility vehicles. No excavation of the ground surface was proposed and large mature vegetation and other habitat features was proposed to be avoided.

1.4 Summary of the modification

The proposed modification would involve drilling one additional deep borehole (location 9) of approximately 800 metres in depth. The borehole would be located approximately 500 metres south of borehole location 2 and accessed by existing Promised Land Trail. Works at approved borehole locations 4 and 5 are no longer proposed. A full description of the proposed modification is provided in Section 3.

1.4.1 Background to the proposed modification

The overall Shoalhaven Hydro Expansion Project was put on hold in 2019 due to higher than expected estimated capital costs and uncertainty in the overall energy generation market. With increased confidence in the viability of the Project and the roll-out of NSW Government's Pumped Hydro Roadmap and Pumped Hydro Recoverable Grants Program, Origin sought an extension of the lapse date for the Secretary's Environmental Assessment Requirements (SEARs) of the Shoalhaven Hydro Main Works (SSI SSI-10033) and recommenced progressing reference design through a revised contractor engagement process with the intention of applying for NSW Grant Funding to complete detailed design, reach a financial investment decision and ultimately construct the Project to allow operations to commence prior to 31 December 2029 at the latest.

1.4.2 Reasons why modification is required

In revisiting the reference design, a number of optimisations have been nominated with the most consequential being potential relocation of underground cavern for the power station and access portal and tunnel. To confirm the constructability of this optimised design, one priority revised borehole location (location 9) is proposed while borehole locations 4 and 5 are no longer proposed to be investigated.

1.4.3 Consideration of feasible alternatives

There are no feasible alternatives available to adequately confirm that the proposed cavern location is suitable.

A do nothing alternative would necessitate commencement of construction of the main works project without the level of understanding necessary to confirm that the underground powerhouse could be safely constructed. As the location of the underground powerhouse cavern fundamentally affects the overall scheme design and performance including access tunnel arrangements and headrace and tailrace lengths which when combined could materially change the financial viability of the project and as such needs to be confirmed as soon as possible.

1.5 Secretary's Environmental Assessment Requirements

Secretary's Environmental Assessment Requirements (SEARs) were issued for the original application (SSI 9816) but no SEARs have been issued in relation to the proposed modification. The assessment of impacts of the proposed modification addresses implications on matters identified in the original SEARs which comprised:

- Biodiversity in accordance with the NSW Biodiversity Conservation Act 2016, the Biodiversity Assessment Method (BAM)
- Heritage including an assessment of the Aboriginal and historic heritage
- Land
- Water
- Transport
- Noise
- Air
- Public Safety.

1.6 Structure of this report

The structure and content of this report are outlined in Table 1-2 and follow the requirements of *State significant infrastructure guidelines – preparing a modification report: Appendix F to the State significant infrastructure guidelines* (Department of Planning, Industry and Environment, 2021).

Table 1-2 Structure and content

Chapter	Description
Chapter 1 Introduction	Sets the context for the detailed assessment of the modified project
Chapter 2 Strategic context	Describes the strategic context for the proposed modification
Chapter 3 Description of proposed modification	Provides a description of the proposed modification
Chapter 4 Statutory context	Identifies the relevant statutory requirements for assessing the modification to the project
Chapter 5 Community engagement	Provides a summary of community consultation undertaken
Chapter 6 Assessment of impacts	Provides a summary of the findings of any further assessment of the impacts of the proposed modification
Chapter 7 Justification of modified project	Provides a justification and evaluation of the modified project as a whole
Appendix A	Provides an updated project description
Appendix B	Provides updated mitigation measures table
Appendix C	Contains the Aboriginal heritage due diligence assessment of borehole location 9

2. Strategic context

The geotechnical works are essential to facilitate a financial investment decision on the Shoalhaven Hydro Expansion Project. The geotechnical works are required to facilitate an understanding of below ground geotechnical conditions and are essential for confirming that the Shoalhaven Hydro Expansion Project can be engineered, constructed and operated in a safe and economically viable manner.

The strategic context remains as described in the EIS with the only changes being the progression of various State and Commonwealth government policies towards decarbonisation of the National Energy Market, with which the Project remains fully aligned.

3. Description of modification

3.1 Summary of proposed modification

A comparison of the proposed modification to the approved project is provided in Table 3-1. The investigation works at location 9 would be similar to those successfully undertaken at location 2 as described in the sections that follow.

Table 3-1 Comparison of approved and modified project

Aspect	Approved project	Modified project
Summary	Drill of up to eight boreholes ranging in depth from 25 to 650 metres in depth to collect geotechnical and groundwater information.	No increase to total number of boreholes or rehabilitation with addition of one new borehole location (location 9) and removal of two approved locations (locations 4 and 5).
Boreholes	Drill eight cored boreholes ranging in depths from 25 to 650 metres including: ▪ 1 deep bore (location 2 – 650 metres) ▪ 3 bores of medium depth (locations 3 to5 – between 200 and 300 metres) ▪ 4 shallow bores (locations 1, and 6 to 8 – up to 70 metres). Take the drill cores to existing facilities at Kangaroo Valley power station for further analysis and use the boreholes to collect groundwater data.	One additional deep borehole (location 9 of approximately 800 metres in depth). Surrender of two planned medium depth bores (locations 4 and 5).
Access	▪ Locations 1 and 2 accessed from Mona Vale Road, Promised Land Track and existing access tracks ▪ Locations 3 to 5 accessed from Mona Vale Road, Bendeela Road, Jacks Corner Road, a disused access off Jacks Corner Road and new access tracks. ▪ Locations 6 to 8 accessed from Mona Vale Road, Bendeela Road, lower Bendeela Road and an existing access track.	Location 9 accessed Mona Vale Road, Promised Land Track and existing access tracks as per locations 1 and 2.
Traffic	One heavy vehicle (up to12 metres long) movement to deliver and remove the drill rig to location 2 and less than four medium truck trips per day and 12 light vehicle trips per day for each of the eight locations.	Repeat of traffic movements undertaken for location 2 with no increase in daily vehicle movements.
Water supply	Up to 1320 m^3 required in total for drilling and dust suppression (between 2000 and 6000 litres per day per borehole on average) to be imported to each location by .	No change noting potential variability of water loss may require additional volumes on any given day.
Waste	Up to 100 m^3 of liquid waste, primarily drill cuttings and waste drilling mud to be collected and stored in above ground tanks next to the drilling rigs before being removed from the site for treatment for disposal at a licenced facility.	No change.
Rehabilitation	Grout and cap boreholes after use, remove all other infrastructure and waste and re-establish cleared vegetation.	No change.

Aspect	Approved project	Modified project
Timing	Around 5 months with: ▪ The shallow boreholes taking around 2 weeks each ▪ The medium boreholes around 4-6 weeks each ▪ The deep borehole around 3 months Works would be carried out during regular construction hours, Monday to Saturday 7am-6 pm.	Borehole 9 anticipated to be drilled over an approximate 12-week period within regular construction hours.
Jobs	Up to 20 workers if works is carried out concurrently at several locations.	No change

None of the conditions of the approval granted on 17 June 2019 under Application Number SSI-9816are required to be changed to facilitate the proposed modification. The only changes requested is that the definition of EIS in schedule 1 of the Project approval is updated to include reference to this modification report and that the "Indicative Development Layout" depicted in Figure 1 and associated inserts in Appendix 1 of the Project approval are updated such that the works at location 9 can be considered generally in accordance with the EIS thus facilitating the ability to comply with Condition 1 of schedule 2. The revised indicative development layout comprising the proposed modification is illustrated in Figure 3-1.

3.2 Location 9 access

Location 9 is within land managed by WaterNSW as part of the existing scheme and is accessed via the existing Promised Land Trail through the Morton National Park. No new access tracks are required associated with the proposed modification. Origin would ensure ongoing 24/7 access for the existing Water NSW water supply infrastructure.

3.3 Location 9 establishment

The works area for location 9 would be pegged or marked out before work begins. An area of approximately 1600 m^2 has been assessed for location 9 in which geotechnical works area would be arranged to avoid the need for vegetation clearing while facilitating ongoing access. Temporary fencing is to be erected to create an exclusion zone around the geotechnical work area prior to the commencement of drilling operations. Drill pads within the geotechnical works area would be bunded with layers of geofabric and heavy duty plastic placed under the rig and areas that have the potential for drill water, drilling mud, hydrocarbon spills or hydraulic leaks and sized accordingly.

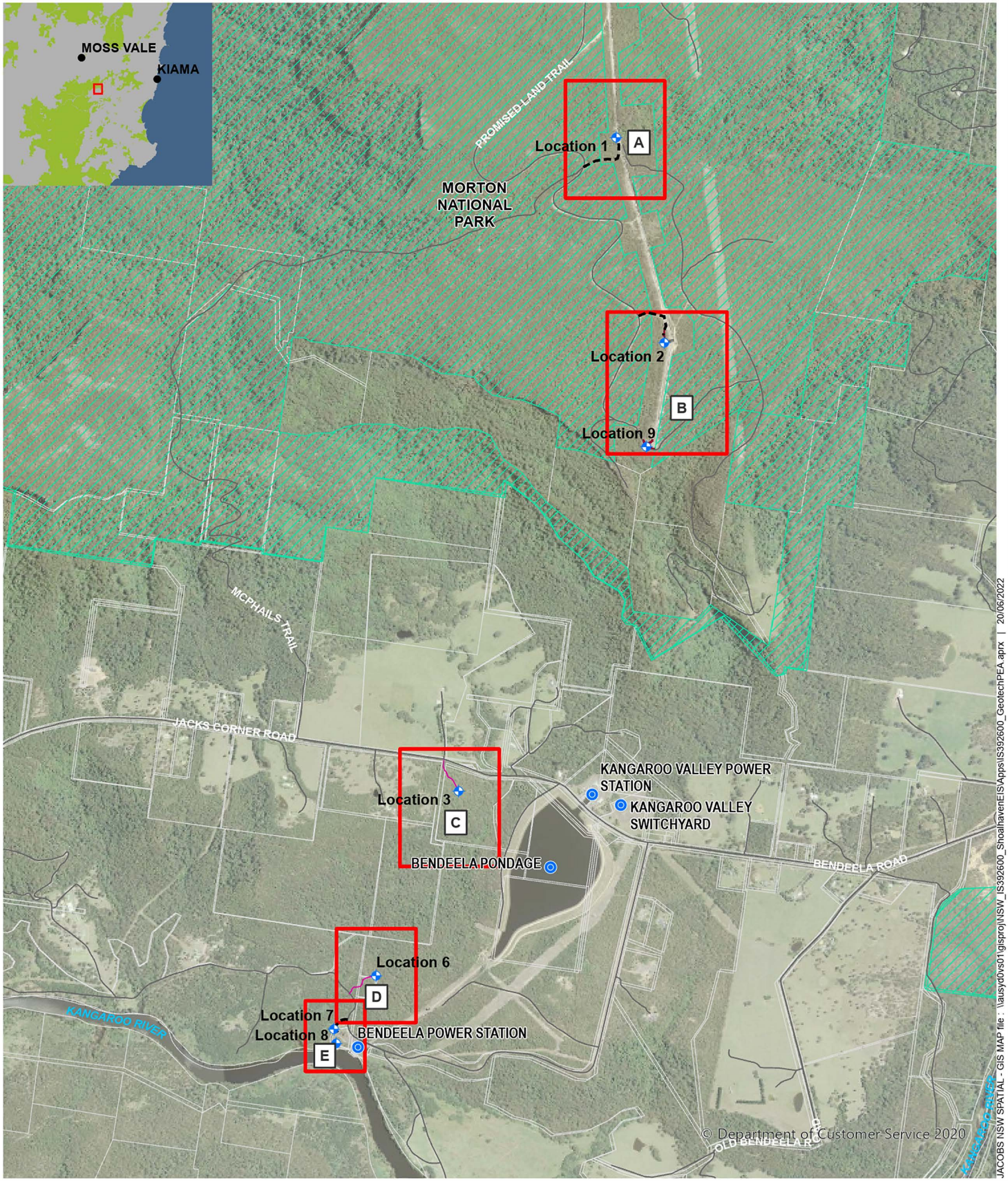
The borehole is anticipated to primarily be 96 mm in diameter. However, this may be varied between about 75 and 150 mm depending on drilling conditions. No further earthworks are anticipated at geotechnical investigation location 9 or for access tracks.

The semi-isolated nature of location 9 would require the establishment of temporary amenities including portable toilet facilities, shelter for meeting area and equipment storage likely to take the form of small shipping containers. Parking for construction vehicles would occur on the access track or other suitable disturbed area near the location 9 geotechnical work area to avoid the need for vegetation clearing. Drill cores will be removed to the existing core shed at Kangaroo Valley Power Station for further analysis. No major maintenance of plant is to be undertaken on site.

3.4 Location 9 construction hours, duration and timing

The investigation at location 9 are expected to be completed over a 12 week period in the fourth quarter of 2022 subject to approval and weather permitting.

The geotechnical works at location 9 would be carried out during standard working hours as per the approved project.



Legend

- Indicative Geotech Locations
- Existing access tracks (No clearing required)
- Indicative work site - with clearing
- Indicative access tracks - with clearing
- NPWS Reserve
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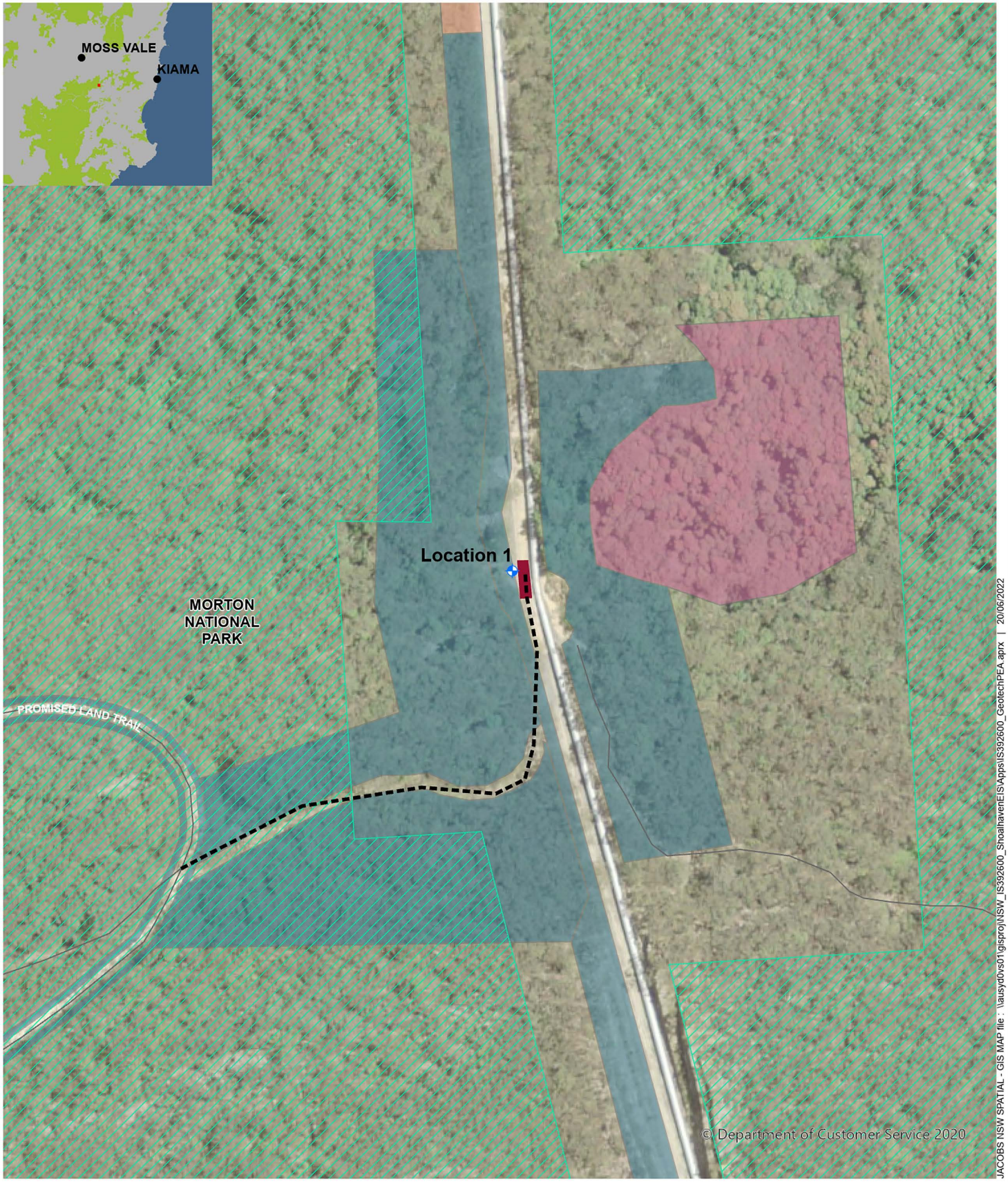
Data sources
DFSI - Spatial Services
Jacobs 2022

Figure 3.1 Revised indicative development layout



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- Indicative Geotech Locations
- Existing access tracks (No clearing required)
- Indicative work site - no clearing
- NPWS Reserve
- PCT 769 - Coachwood - Lilly Pilly warm temperate rainforest in moist sandstone gullies, Sydney Basin Bioregion
- PCT 1082 - Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion
- PCT 1156 - Silvertop Ash - Red Bloodwood - Sydney Peppermint heathy open forest on moist sandstone plateaux, southern Sydney Basin Bioregion

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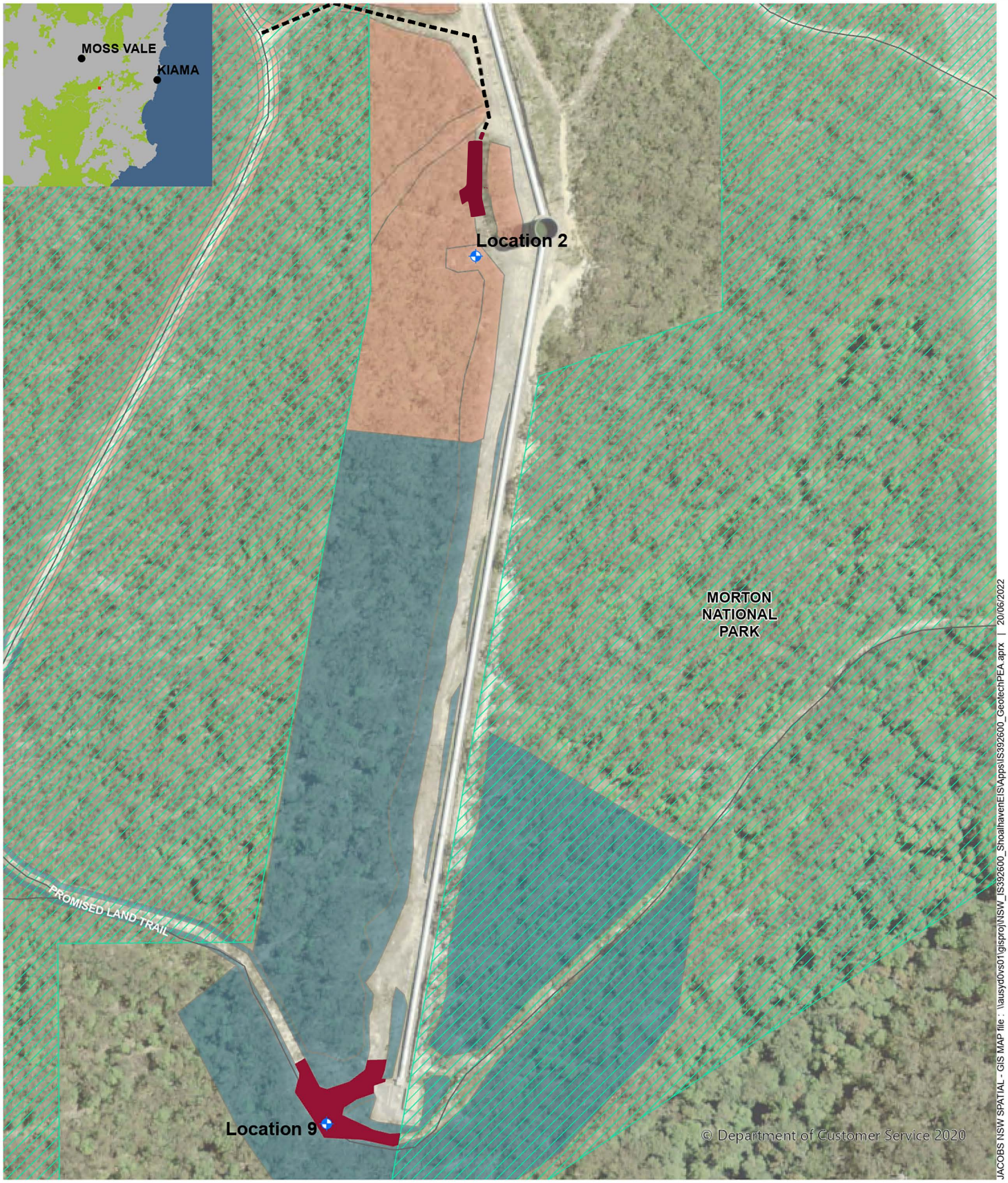
Figure 3.1 | Insert A



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- Indicative Geotech Locations
- Existing access tracks (No clearing required)
- Indicative work site - no clearing
- NPWS Reserve
- PCT 1082 - Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion
- PCT 1156 - Silvertop Ash - Red Bloodwood - Sydney Peppermint heathy open forest on moist sandstone plateaux, southern Sydney Basin Bioregion

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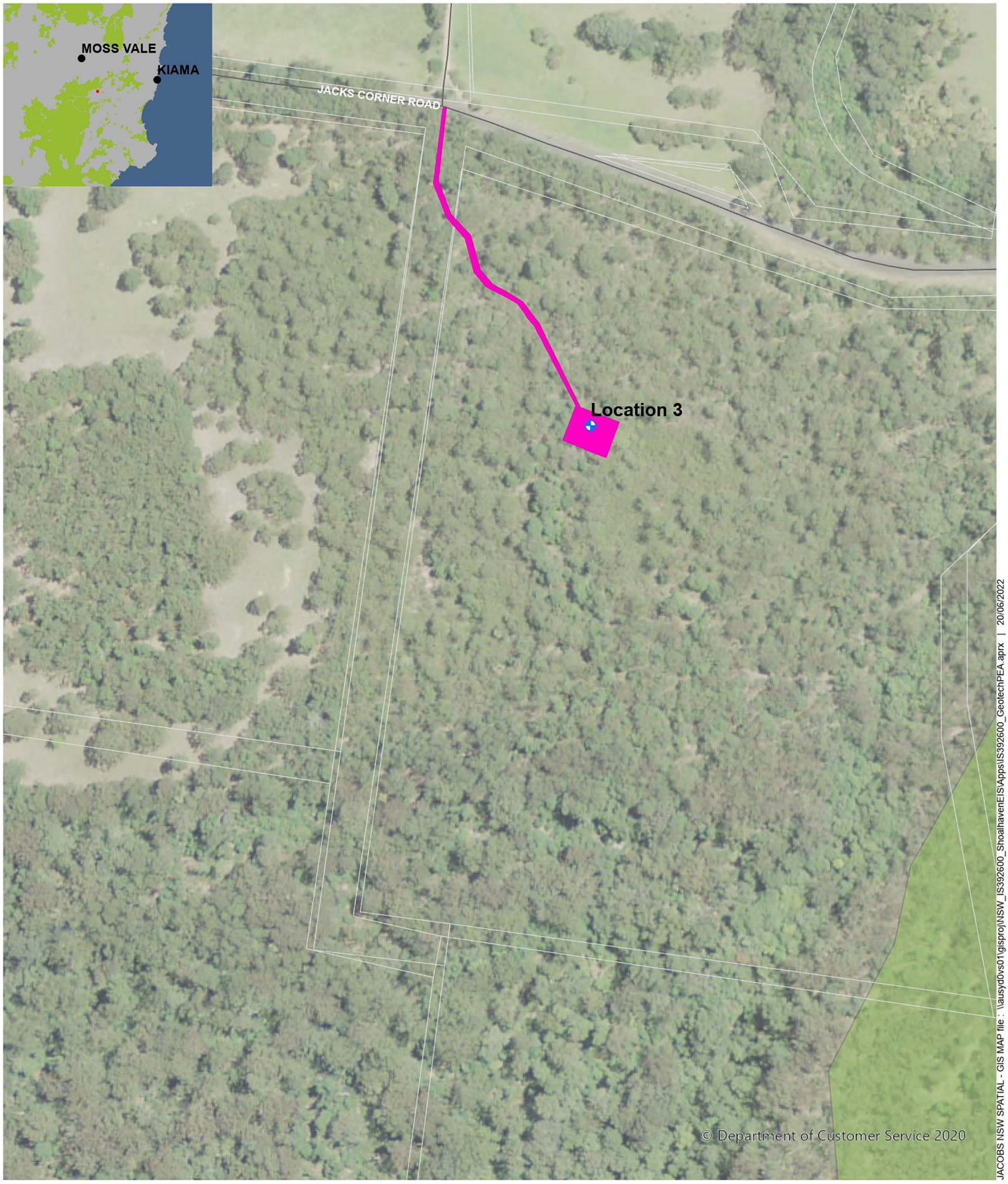
Jacobs 2022

Figure 3.1 | Insert B



Legend

- Indicative Geotech Locations
- Indicative work site - with clearing
- Indicative access tracks - with clearing
- PCT 1283 - Turpentine - Red Bloodwood - Sydney Peppermint shrubby open forest on the foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion

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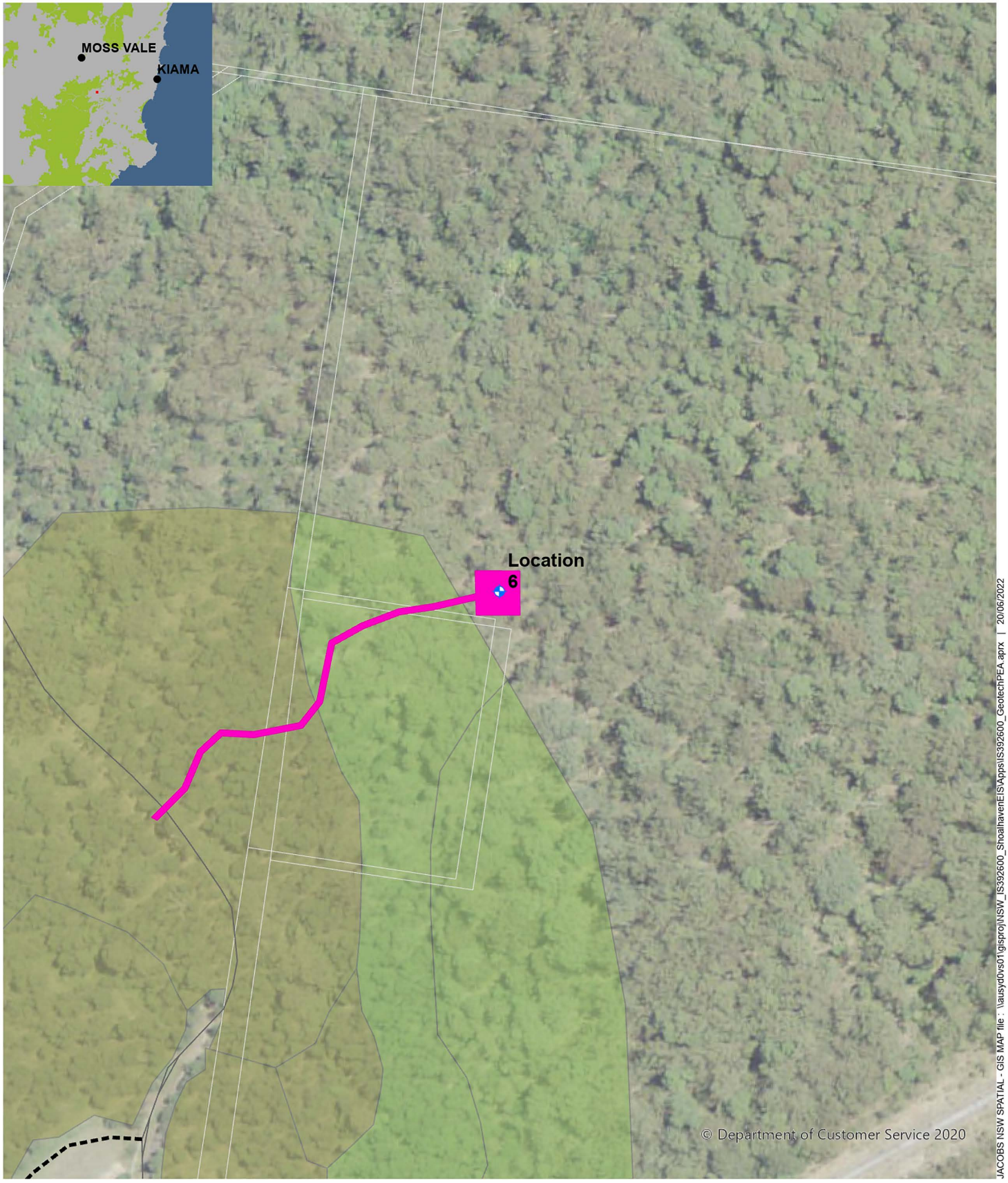
DFSI - Spatial Services
Jacobs 2022

Figure 3.1 | Insert C



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- Indicative Geotech Locations
- Existing access tracks (No clearing required)
- Indicative work site - with clearing
- Indicative access tracks - with clearing
- PCT 1108 - River Peppermint - Rough-barked Apple - River Oak herb/grass riparian forest of coastal lowlands, southern Sydney Basin Bioregion and South East Corner Bioregion
- PCT 1283 - Turpentine - Red Bloodwood - Sydney Peppermint shrubby open forest on the foothills, southern Sydney Basin Bioregion and northern South East Corner Bioregion

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Data sources
DFSI - Spatial Services
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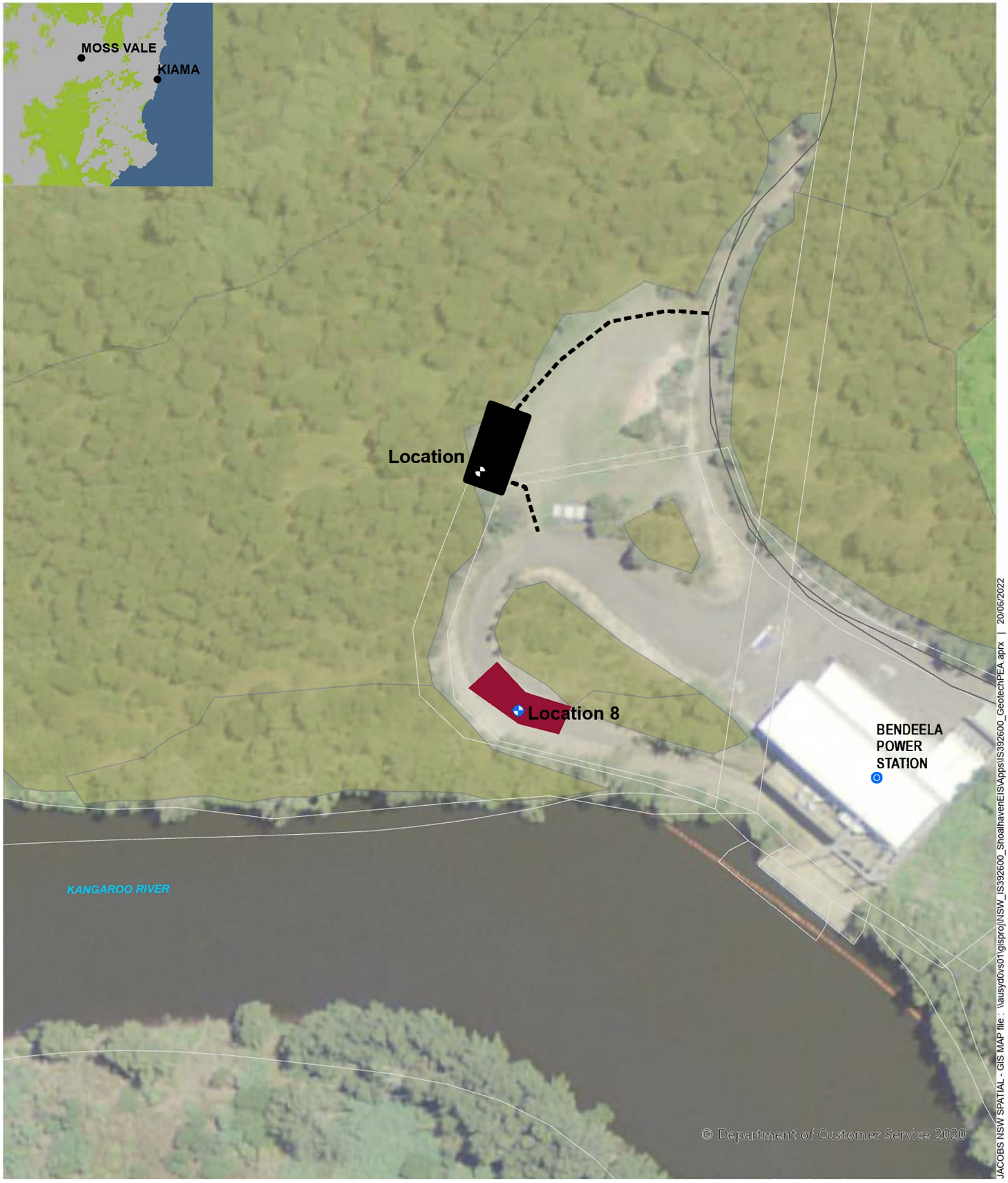

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Data sources
DFSI - Spatial Services
Jacobs 2022

Figure 3.1 | Insert E

3.5 Location 9 materials, plant and equipment

The works at location 9 will not require any extraction of water from a local water course. Water supply would be required for drilling, depending on the strata type, drilling depth and testing requirements. Daily haulage of water required for drilling operations would be provided by water cart and sourced from local supplies subject to appropriate agreements. Minor quantities of a biodegradable polymer would be used to lubricate drill bits. Bentonite would be used to stabilise holes and pits during the drilling.

Drill rig, vacuum truck and other site vehicles would be fuelled by diesel, with all refuelling operations carried out off-site for mobile plant with drill rig refuelled within the bunded area only. All chemicals would be stored in appropriately bunded and covered areas.

The plant and equipment required at location 9 would include:

- Large drill rig
- Support utility vehicles
- Hand tools
- Water tanker
- Vacuum truck.

3.6 Location 9 drilling and testing methods

Methods and requirements for drilling and testing are expected to involve the following:

- Boreholes will be advanced by augering in the upper soil profile where feasible, followed by wash boring to rock head
- Rock core drilling will commence from the top of bedrock and advanced to the target depth. The borehole is anticipated to primarily be undertaken using coring with a diameter of 96 mm.
- The drilling will be undertaken such that the borehole will not encroach within 30 m of the existing Kangaroo Valley Shaft.
- Down-hole water injection (Lugeon) rock mass permeability testing will be carried out within the borehole
- Down-hole in situ stress measurements using over-coring techniques
- A borehole geophysics and televiewer survey including full wave sonic, natural gamma, density and temperature profiles for the full depth of the borehole
- Groundwater monitoring installations including a combination of screened standpipe piezometers and grouted-in vibrating wire piezometers (VWP).

In agreement with WaterNSW, completion of the works and restorations will be verified to a state that supports the intended ongoing land use.

3.7 Location 9 waste generation and management

Drilling at location 9 will use a biodegradable polymer for lubrication of the drill bit. Bentonite will be used for stabilisation of the borehole. Unused portions of this material will be removed from the work area. Waste materials from the drilling process will be limited to excess drilling fluid, very small quantities of slurry and rock cuttings and native soils from wash boring the upper portion of the drill holes through the weathered profile. All drilling fluids will be recirculated through a closed loop system to minimise usage and waste. Any excess drilling fluid would be disposed of off-site at a suitably licensed facility.

Substantial quantities of waste materials are not expected to be generated from the proposed works. Any materials (including any packaging) that cannot be reused on-site will be removed and recycled or disposed of at a suitably licensed facility. Similarly, any contaminated material will be classified according to the Waste Classification Guidelines: Parts 1 and 2 (EPA, 2014) and disposed of at a suitably licensed facility.

Drilling fluids will be captured and transferred by poly pipe to an above-ground holding tank. Above-ground mud tanks are to be covered with lids constructed from timber frames and ply overnight to prevent spillage and overflow of sediment-laden water in the event of heavy rainfall. The area around the drill rig where drilling fluids and waste will be handled will be bunded using a geofabric membrane and heavy duty plastic sheeting placed under the drill pad and sized to adequately capture potential spills and leaks. The edges of bunding will be raised upslope to divert upslope waters around works, reduce runoff velocity and prevent overland flows impacting the drilling site. Downslope containment will be managed by a suitably sized berm

to reduce runoff velocity and capture sediment prior to discharge into receiving waterbodies. The creation of berms will not require ground disturbance but would make use of wood.

4. Statutory context

Section 5.25 of the EP&A Act states:

> *5.25 Modification of Minister's approval (cf previous s 115ZI)*
>
> *(1) In this section—*
>
> *Minister's approval means an approval to carry out State significant infrastructure under this Division, and includes an approval granted on the determination of a staged infrastructure application.*
>
> *Modification of an approval means changing the terms of the approval, including revoking or varying a condition of the approval or imposing an additional condition on the approval.*
>
> *(2) The proponent may request the Minister to modify the Minister's approval for State significant infrastructure. The Minister's approval for a modification is not required if the infrastructure as modified will be consistent with the existing approval under this Division.*
>
> *(3) The request for the Minister's approval is to be lodged with the Planning Secretary. The Planning Secretary may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister.*
>
> *(4) The Minister may modify the approval (with or without conditions) or disapprove of the modification.*

While Clause 180 of the EP&A Regulations 2021 states:

> *(1) A modification request must—*
>
> *(a) be in the approved form, and*
>
> *(b) contain details of the modification, and*
>
> *(ba) be prepared having regard to the State Significant Infrastructure Guidelines, and*
>
> *(c) be submitted on the NSW planning portal.*

Section 5.25 of the EP&A Act and the State Significant Infrastructure Guidelines referenced under Clause 180 of the EP&A Regulations make clear that the Ministers approval is not required if the development as modified will be consistent with the existing approval. No conditions of the Project approval are required to be changed to facilitate the proposed modification. The only change requested is that the definition of EIS is amended to include reference to this modification report and the "Indicative Development Layout" depicted in Figure 1 in Appendix 1 of the project approval is updated such that the modified project can be considered generally in accordance with the EIS.

The application of the Biodiversity Conservation Act 2016 is required under Section 7.17 of that Act as follows:

> *7.17 Modifications of planning approvals or activities*
>
> *(1) Subsection (2) applies to an application for the modification of a development consent, or State significant infrastructure approval, that was granted after the commencement of this Division.*
>
> *(2) The provisions of this Division relating to applications for development consent or State significant infrastructure approvals apply to any such application for modification as follows—*
>
> *(a) the provisions apply in relation to the original development as proposed to be modified,*
>
> *(b) a biodiversity development assessment report is required to be submitted and taken into consideration if this Division applies to the original development as proposed to be modified even if a biodiversity development assessment report was submitted in connection with the application for the original development or even if this Division did not apply to the original development (for example,*

because the modification results in the development exceeding the biodiversity offsets scheme threshold),

(c) however a further biodiversity development assessment report is not required to be submitted if the authority or person determining the application for modification (or determining the environmental assessment requirements for the application) is satisfied that the modification will not increase the impact on biodiversity values,

(d) the biodiversity development assessment report submitted with the application for modification is to take into account any measures already taken to avoid, minimise or offset the impact on biodiversity values in connection with the consent or approval before the proposed modification,

(e) if an application for the original development as proposed to be modified would have been required to be refused because of serious and irreversible impacts on biodiversity values, the application for modification is required to be refused.

(3) The regulations may make further provision with respect to any such applications for modification (including exemptions to the application of this section).

(4) The regulations may make provision with respect to the application of this Division in relation to any modification of an activity for which the proponent elected to obtain a biodiversity development assessment report for the original activity.

As proposed borehole location 9 is restricted to existing disturbed sites that do not support native vegetation, and no clearing is required for the access tracks, it can be demonstrated that impacts to biodiversity values would not increase. The surrender of locations 4 and 5 that would otherwise involve clearing of native vegetation would result in a reduced biodiversity impact.

The original EIS identified the need for separate WaterNSW approval under Water NSW Regulation and as per previous works this would be addressed separately in the form of an access agreement. No other approvals were identified as necessary.

5. Community engagement

Origin consulted with WaterNSW as the landowner of location 9 via teleconference on 5 April 2022 to outline the intention to undertake additional geotechnical investigation works. WaterNSW also attended a site inspection with Origin at which time location 9 was inspected. WaterNSW identified that the maintenance of access was a key consideration as was the protection of water quality. The geotechnical investigation location would be arranged to best facilitate access and the controls successfully implemented for investigation works at location 2 would be implemented including establishment of a bunded drilling pad and covered above ground water and waste containers. A licence agreement is required from WaterNSW and it is expected that an updated environmental management plan for location 9 would be a requirement to secure the issue of this licence.

Origin has also consulted with NSW National Parks and Wildlife Services regarding the use of the Promised Land Trail through the Morton National Park. It is expected that as with location 2, an agreement will be sought and issued by National Parks and Wildlife Services for this purpose.

6. Assessment of impacts

This section provides further assessment of the impacts of the proposed modification. Table 6-1 compares the summary of approved impacts to impacts likely to result from the proposed modification in order to scope the need for further assessment of specific environmental aspects. Where changes are identified, further consideration is provided in the sections that follow.

Table 6-1. Summary of environmental impacts of proposed modification

Environmental aspect	Approved impact	Change associated with proposed modification
Biodiversity	0.21 hectares of native vegetation would be cleared, including 0.02 hectares of the River-Flat Eucalypt forest endangered ecological community. This clearing would not result in any significant impacts on the relevant vegetation communities, threatened species or their habitat. Based on its assessment, the department considers the impacts of the Project to be too minor to warrant offsets and that Origin should instead be required to restore any existing vegetation cleared for the project during the rehabilitation of the site.	Minor change (reduced impact). Borehole location 9 is accessible via existing access tracks and requires no additional clearing. With borehole locations 4 and 5 no longer proposed, overall clearing and impacts to biodiversity values will be reduced. In the absence of increased biodiversity impacts a revised BDAR has not been prepared. Further detail is provided in Section 6.1.
Soil	Through design, Origin has limited new ground disturbance. There is no evidence of land contamination on site. Standard erosion and sediment controls would be used during the project. The land would be restored to its former use following rehabilitation.	No change. Borehole location 9 would be established in an existing disturbed area associated with access, construction and maintenance of the existing scheme. In the event that the Shoalhaven Hydro Expansion Project were to proceed, location 9 would be within the proposed maximum disturbance footprint of this application. The conditions of approval and mitigation measures provided in Appendix B would be applied at location 9. No further consideration of soil impacts is provided.
Water	The risk of surface or groundwater pollution is low as Origin would: ▪ Protect existing water supply infrastructure ▪ Use standard erosion and sediment controls and water management procedures during the project ▪ Cease work during and after rainfall ▪ Implement standard spill management procedures on site ▪ Collect and store all liquid waste from the drilling in a covered above ground tank and remove it from the site	No change. No sensitive surface or groundwater environments are located near geotechnical works location 9 and no additional risks to water are likely. The conditions of approval and mitigation measures provided in Appendix B would be applied at location 9. No further consideration of water impacts is provided.

Environmental aspect	Approved impact	Change associated with proposed modification
	▪ Drill the bores in accordance with standard practice and ensure that any groundwater monitoring undertaken targets a single aquifer ▪ Grout and cap all boreholes following use ▪ Rehabilitate the site. The project would not have any adverse impacts on any surrounding groundwater bores.	
Traffic	The project would generate very little traffic. The existing road network can easily accommodate this traffic. The existing intersection of Moss Vale Road and the Promised Land Trail does not comply with the required Safe Intersection Sight Distance in the Austroads Guide to Road Design. The traffic safety risk of this would be mitigated by: ▪ Choosing a relatively short heavy vehicle to deliver the drill rig to location 2 (up to 12metres) ▪ Ensuring all access to the site is from the south ▪ Using spotters on each of the approaches when the intersection is being used ▪ Opening the gate onto the trail prior to any large vehicle entering the site. With these measures in place the project is unlikely to result in any unacceptable traffic risks.	Minor change with no increase in daily traffic movements. Refer to Section 6.2.
Hazards	Origin would: ▪ Minimise the fire safety risks of the project given some of the boreholes would be located on bushfire prone land ▪ Ensure suitable emergency procedures and equipment are in place to respond to any fires that may occur on site or in the surrounding area ▪ Monitor methane levels in the boreholes and implement standard safety procedures if these levels rise above 5% concentrations.	No change. No new hazards are introduced through the inclusion of a new investigation location and no further consideration of hazards is provided.
Heritage	▪ The Project would not affect any known Aboriginal or historic heritage items. ▪ Standard mitigation measures would be used to ensure there is no impact on the area of potential archaeological sensitivity to the west of locations 7 and 8. ▪ Origin would implement a standard chance find procedures in the unlikely event of any	No change anticipated. A due diligence assessment of borehole location 9 has confirmed the area is within previously disturbed land and away from areas of archaeological sensitivity. The absence of archaeological sensitivity would be validated via a site survey

Environmental aspect	Approved impact	Change associated with proposed modification
	new heritage items being discovered on site during the project.	with RAPs for the Main Works project prior to mobilisation. Refer to Section 6.3 for further details. Location 9 is a considerable distance from listed non-Aboriginal heritage items and no further assessment of non-Aboriginal heritage is provided.
Noise	Noise from the drilling and traffic at locations 3-5 would be audible at the 5 dwellings located within 500 metres of these locations. This noise would only occur for short periods (4-6 weeks) would be restricted to only be carried out during standard construction hours, Monday to Saturday (7am to 6 pm). Standard mitigation measures would be used to ensure these noise levels comply with the relevant noise criteria in the Interim Construction Noise Guidelines.	No change Proposed borehole location 9 is no closer to receptors than borehole location 3 (225 m) which was drilled without complaint. Borehole 9 is over 1.3 kilometres from nearest receivers with no direct line of site due to topography. Drilling of location 9 would employ all reasonable and feasible noise mitigation measures to ensure that no exceedance of construction noise criteria as determined for the approved project would eventuate. This includes that geotechnical works would be limited to standard construction hours.
Dust	Standard dust controls would be used to ensure there are no adverse dust impacts on the surrounding dwellings.	No change. Geotechnical works at location 9 do not require clearing or ground leveling and as such are unlikely to generate air quality impacts. No further assessment of air quality impacts is provided.

6.1 Biodiversity

6.1.1 Summary of approved impacts

A streamlined assessment was undertaken for the geotechnical works in line with the relevant State and Commonwealth environmental and threatened species legislation and policy including Biodiversity Assessment Method as required at the time. The assessment was documented in a BDAR which concluded as follows:

"The Biodiversity Offset Scheme applies to State Significant Infrastructure projects unless the Secretary of the Department of Planning and Environment and the Chief Executive of OEH determine that the project is not likely to have a significant impact. This document is the BDAR for the project as required under the Biodiversity Assessment Method (BAM). This BDAR documents the results of the biodiversity streamlined assessment undertaken for the geotechnical investigations is in line with the relevant State and Commonwealth environmental and threatened species legislation and policy.

Based on the minor and temporary nature of the geotechnical investigations, the avoidance of habitat features in locating works areas and access tracks and the low to moderate condition of plant community

types and threatened ecological communities present it is considered unlikely that significant impacts to biodiversity values would occur. Following completion of the geotechnical investigations, all locations would be allowed to, or actively managed to, rehabilitate to their current standard.

There is unlikely to be any significant impacts to any threatened ecological communities and threatened or migratory species listed as a Matter of National Environmental Significance. The geotechnical investigations do not require a referral to the Federal Department of the Environment and Energy for these matters.

Other impacts relevant to the geotechnical investigations in relation to the BAM include prescribed impacts. The prescribed impacts of relevance include:

- *Impacts of development on rocks that provide habitat for threatened species;*
- *Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range; and ·*
- *Impacts of the development on movement of threatened species that maintains their life cycle.*

The effects of the prescribed impacts are considered to be minor in the context of the geotechnical investigations and would likely be avoided.

There are no impacts on a potential entity that are serious and irreversible impacts. Overall, the biodiversity impacts of the geotechnical investigations are considered to be minor but some mitigation is required and will be planned.

No clearing or permanent impacts are proposed in areas mapped as Key Fish Habitat and with all drilling water and wastes to be contained and disposed of off site no impacts to Key Fish Habitat are likely".

Vegetation clearing was limited to locations 3, 4, 5 and 6, with locations 1, 2, 7 and 8 accessed via existing tracks and located in existing cleared areas or areas of non-native vegetation. A total of 0.21 hectares of native vegetation was approved for impact, including:

- 0.06 ha of Endangered Ecological Communities (EECs) or Critically Endangered Ecological Communities (CEECs)
- 0.21 ha of PCTs that contain threatened species habitat.

Clearing associated with locations 3 and 6 has been undertaken and successfully rehabilitated.

6.1.2 Proposed modification impacts

Full biodiversity survey in accordance with the Biodiversity Assessment Method has been completed for the Main Works project and included the indicative footprint of location 9 geotechnical works. Location 9 has been selected to avoid clearing to native vegetation as illustrated in Figure 1-3.

Surrounding vegetation has been mapped as plant community type (PCT) 1156 Silvertop Ash - Red Bloodwood - Sydney Peppermint heathy open forest on moist sandstone plateaux, southern Sydney Basin Bioregion. This PCT is not a listed threatened ecological community and would not be impacted.

No habitat features are mapped in close proximity to location 9. Cliffs located 80 m south of location 9 may provide breeding habitat for large-eared pied bat but these would not be impacted by the geotechnical works.

With the avoidance of native vegetation clearing no increased impacts to biodiversity values are likely due to the proposed geotechnical works at location 9.

Based on the assumptions of the BDAR locations 4 and 5 were predicted to involve impacts to shrubs and ground cover over a maximum 1040 m^2 associated with a 2 m wide access over a distance of up to 120 m and two 20 by 20 metre works areas. This clearing is no longer proposed and therefore there would be a reduced impact on biodiversity associated with the modification.

6.1.3 Updated mitigation measures

In the absence of additional biodiversity impacts no additional mitigation measures are proposed. Measures developed and implemented as part of the approved project would be applied as reproduced in Appendix B.

6.2 Traffic

6.2.1 Summary of approved impacts

Forecast traffic generation for the approved geotechnical works are summarised in Table 6-2

Table 6-2. Approved forecast traffic generation

Vehicle Type	Location 1	Location 2	Locations 3, 4 and 5	Locations 6, 7 and 8
Articulated truck		1 trip at commencement and 1 trip upon completion		
Medium truck / water tanker	2 trips per day for 2 to 4 days	2 trips per day for 60 to 90 days	4 trips per day for 60 days	4 trips per day for 40 days
Utility or light vehicle	6 trips per day for 2 to 4 days	6 trips per day for 60 to 90 days	12 trips per day for 60 days	12 trips per day for 40 days

The forecast traffic generated was expected to be low and it was considered that this traffic would not have any measurable impact on existing users of Nowra Road, Moss Vale Road, Bendeela Road, Jacks Corner Road, or Lower Bendeela Road.

6.2.2 Proposed modification traffic impacts

Geotechnical works at location 9 would happen independently of other approved investigation locations and as such generates additional traffic. The traffic generated would be low and no higher at any time than that assessed and generated by completed works at location 2.

At the time of writing, Moss Vale Rd was closed between Bunkers Hill Rd and Myra Vale Rd, in both directions until further notice. In the event that the road remains closed or unsuitable for use, access to site may be required from the north in which case additional controls would be adopted to facilitate safe access. Otherwise, road safety risk mitigation would be employed for location 9 as was successfully implemented for works at location 2.

In the absence of increased intensity traffic movements, traffic impacts for location 9 geotechnical works are also considered low and unlikely to have any measurable impact on existing road users.

6.2.3 Proposed mitigation measures

In the absence of increased traffic intensity no additional mitigation measures are proposed. Measures developed and implemented as part of the approved project would be applied as reproduced in Appendix B. The approved traffic management plan would be revised to adopt appropriate safety controls with regard to the status of Moss Vale Road at the time.

6.3 Aboriginal heritage

6.3.1 Summary of approved impacts

The approved project EIS included an Aboriginal cultural heritage assessment undertaken with reference to the Due Diligence of Practice Code of Practice for the Protection of Aboriginal Objects in NSW published by the Office of Environment & Heritage (OEH). This outcome of the due diligence assessment is summarised as follows:

Extensive AHIMS searches was undertaken on 13 and 17 September 2018.The AHIMS search identified 15 sites in the surrounding area with the nearest AHIMS site, an artefact scatter, located over 2 km to the west of the closest geotechnical investigation location.

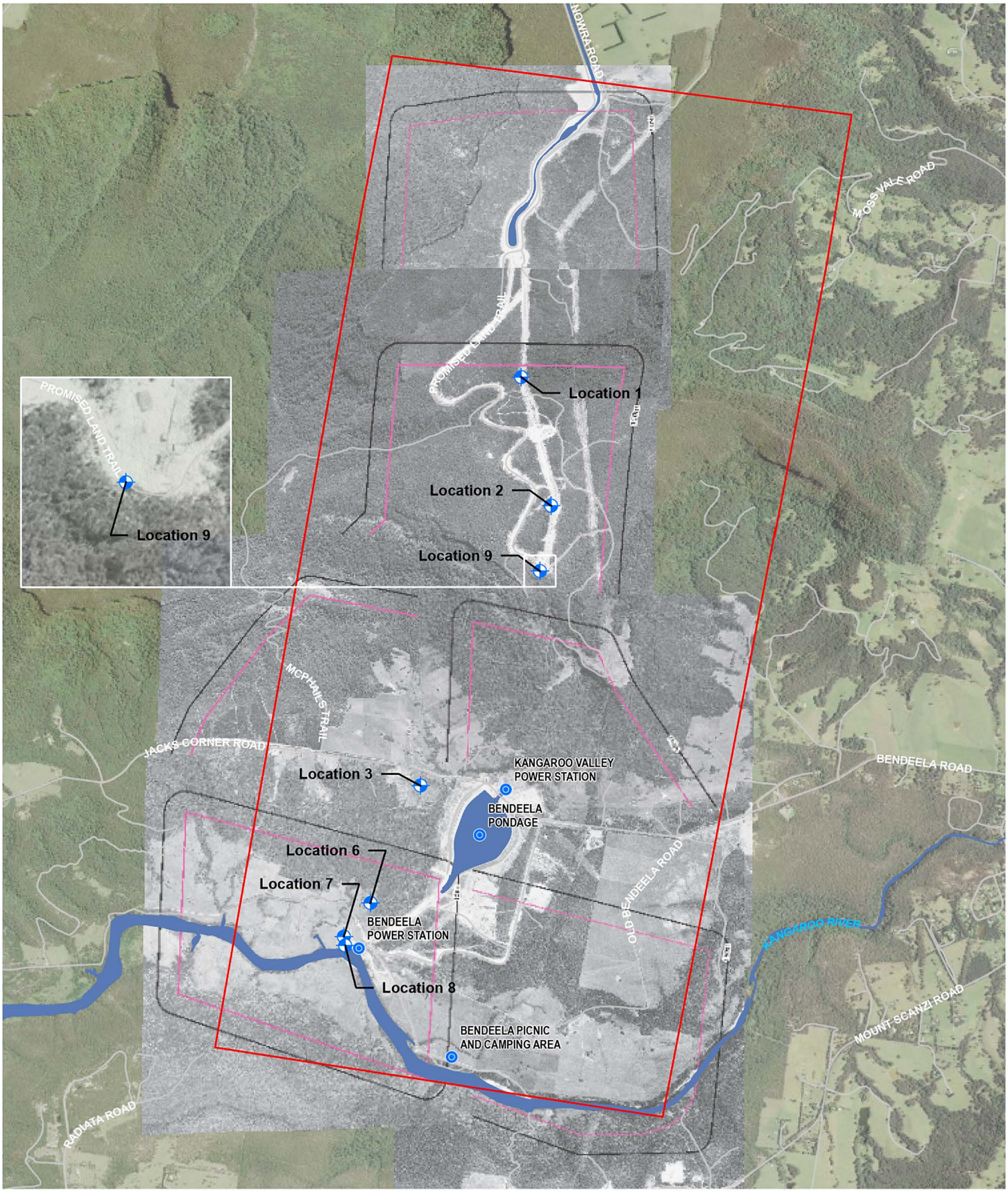
A preliminary site inspection established that most of the geotechnical investigations occur within significantly disturbed landforms, with extensive ground disturbance from the original project construction. There were no Aboriginal objects or sites identified during the inspection. One area of moderate archaeological sensitivity was recorded near the intake site adjacent near Lake Yarrunga. The findings of this assessment have resulted in geotechnical investigation locations being relocated to areas of low sensitivity.

As the geotechnical investigation locations have been confined to areas of low risk or previously disturbed landforms, consultation with Aboriginal stakeholders has been largely limited to email and telephone conversation. Telephone consultation with the Nowra and Illawarra Local Aboriginal Land Councils (LALC) to validate low risk locations was conducted on 21 December 2018. The geotechnical investigations are contained within the Illawarra LALC boundary and as such they are the primary point of preliminary consultation for the project.

A site inspection was conducted on 24 January 2019 with Paul Knight (CEO, Illawarra LALC) of the six proposed geotechnical borehole drilling locations which occur within or close to areas of low to moderate potential archaeological sensitivity. The inspection with Illawarra LALC confirmed that there are no Aboriginal heritage sites identified within the geotechnical investigation area and that the geotechnical drilling program is unlikely to impact any Aboriginal objects. Consultation with Illawarra LALC on site confirmed that no further assessment for the geotechnical drilling program was required.

6.3.2 Proposed modification impacts

Borehole location 9 has targeted a location of prior disturbance as illustrated in figure 6. and does not require vegetation clearing. Nevertheless, a due diligence assessment including revised AHIMS search and desktop assessment and detailed site inspection has been undertaken to confirm the absence of Aboriginal heritage value and is attached as Appendix C.



Legend

- Indicative goetech location
- Points of interest
- Project location
- Road
- Waterbody

0 1 2 km

1:40,000 at A4

GDA2020 MGA Zone 56

Data sources

Jacobs 2021
NSW Spatial Services 2021
© Department of Customer Service 2020

Figure 6.1 Historic context (1974)

The findings of the due diligence assessment in Table 6-3 :

Table 6-3. Due Diligence questions and responses

Question	Answer	Comment
Will the activity disturb the ground surface or any culturally modified trees?	Yes	The geotechnical investigation will require surface disturbance of up to one square metre and drilling to a depth of 800 m at Borehole Location 9. No culturally modified trees will be impacted by the geotechnical activities. No culturally modified trees have been previously identified in proximity to the Location 9 geotechnical works area.
Are there any: ▪ Confirmed AHIMS records ▪ Other sources of information ▪ Landscape features	Yes	A total of 9 previously recorded Aboriginal sites were identified by the extensive AHIMS search. None of the previously identified sites are located in close proximity to Location 9 geotechnical works area. The majority of local studies have been conducted on the Kangaroo Valley floor, indicating a degree of survivability of Aboriginal objects in even disturbed contexts. The Location 9 geotechnical works area is located on the Barrengarry Mountain escarpment at 572 m ASL.
Can harm to Aboriginal objects be avoided?	Yes	The Location 9 geotechnical works area has been significantly disturbed by historic land practices. These land practices would have significantly impacted upon the survivability of Aboriginal objects. It is determined that harm to Aboriginal objects will be avoided by the proposed geotechnical works.
Does a desktop assessment and visual inspection confirm the presence of Aboriginal objects, or that they are likely to be there?	No	With consideration for the nature of the surrounding environment, the surrounding AHIMS site record and the level of disturbance resulting from historic land use practices, it is considered to be unlikely that the proposed Location 9 geotechnical works will impact upon Aboriginal objects.
Is further assessment required?	No	The Due Diligence assessment has concluded that the proposed Location 9 geotechnical works are unlikely to impact upon Aboriginal objects as there is a low to nil likelihood of them being present. As such, the works can proceed with caution.

6.3.3 Updated mitigation measures

In the absence of additional heritage impacts no additional mitigation measures are proposed. Measures developed and implemented as part of the approved project would be applied as reproduced in Appendix B. Consultation with Registered Aboriginal Parties is being undertaken for the Main Works project which includes the footprint of geotechnical works location 9. This consultation is expected to be completed prior to drilling commencing at location 9 to confirm that no unidentified cultural values are likely to be impacted.

7. Justification of the overall geotechnical works as modified

The benefits of the geotechnical works, including at location 9, being greater confidence that the Shoalhaven Hydro Expansion Project can proceed in a safe and economically viable manner, are considered to outweigh the identified temporary and minimal adverse impacts.

While there would be some environmental risks and minimal environmental impacts as a consequence of the geotechnical works such as a small area of vegetation disturbance, temporary increases in noise and minor increase in traffic, these have been avoided or minimised wherever possible through design and mitigation measures. The proposed modifications are not considered to result in any additional adverse environmental or social impacts.

7.1.1 Social costs and benefits

The geotechnical works were found to have some localised social impacts. These would include minor volumes of additional traffic, potential noise impacts on surrounding landowners within 500 meters. Positive social impacts were found to include the flow-on effects of workers accessing goods and services in the region.

No ongoing social costs or benefits would result from the geotechnical works as modified.

7.1.2 Biophysical costs and benefits

The approved geotechnical works were found to involve less than 0.25 hectares of low impact vegetation clearing that would avoid impacts to habitat features. The findings of biodiversity investigations indicated that it was unlikely that the geotechnical works would significantly impact biodiversity values. Following completion of the geotechnical works, all disturbed areas would be returned to their current state unless otherwise approved. As such the geotechnical works would not have ongoing impact terrestrial or aquatic environments.

No other permanent or ongoing impacts would result to the biophysical environment given the temporary nature of the works and absence of permanent, or operation development components. The proposed modifications do not introduce additional biophysical impacts and the surrender of works at locations 4 and 5 would reduce biophysical impacts from those identified for the approved geotechnical works.

7.1.3 Economic costs and benefits

The geotechnical works as modified would facilitate a financial investment decision on the larger Shoalhaven Hydro Expansion Project.

The proposed modification would result in additional spend on the engagement of drilling contractors, laboratory fees and drilling supervision. Local benefits would be limited to spending by additional workers required for the geotechnical works on accommodation, food and services in the local area.

7.1.4 Public Interest

The geotechnical works as modified represent a cost-efficient private investment in the assessment of an energy generation project that, if approved and implemented, would result in long-term social and economic benefits through the provision of stable and affordable energy storage. Any short-term impacts during the geotechnical works would be outweighed by the long-term benefits should the Shoalhaven Hydro Expansion Project proceed.

As a result, the geotechnical works including the proposed modification are considered to remain in the public interest.

7.2 Objectives of the EP&A Act

The objectives of the EP&A Act, and how these are addressed in relation to the geotechnical works as modified, are presented in Table 7 1.

Table 7 1: Consideration of Objectives of the EP&A Act

Objective	Comment
(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The geotechnical investigation planning, impacts, safeguards and management measures detailed in this modification report and the approved project EIS allow for the proper management, development and conservation of natural and artificial resources. The geotechnical works are considered to have no long-term impacts and limited short term environmental impacts. The geotechnical works are a necessary step in confirming the viability of the Shoalhaven Hydro Expansion Project which, if approved and developed, would maximise the use of the existing WaterNSW storage assets in the provision of energy storage and generation.
(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	Ecologically sustainable development is considered in Sections 7.2.1 to 7.2.4 below.
(c) to promote the orderly and economic use and development of land.	The existing scheme was developed with future expansion in mind. The geotechnical works are a necessary step in assessing the development of such an expansion which would be wholly aligned with the orderly and economic use of land as it would allow the more efficient and reliably use existing WaterNSW water storage assets in the storage, generation and supply of electricity to the National Energy Market.
(d) to promote the delivery and maintenance of affordable housing.	Not applicable.
(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The geotechnical works have been planned to avoid clearing to the extent possible while still resulting in adequate understanding of geotechnical properties to allow the Shoalhaven Hydro Expansion Project to proceed. The temporary nature of the geotechnical works, and avoidance of habitat features is considered to avoid significant impacts to biodiversity values including threatened and other species of native animals, plants, ecological communities and their habitats.
(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The geotechnical works have been planned to avoid areas of potential built or cultural heritage.
(g) to promote good design and amenity of the built environment.	The geotechnical works do not involve the installation of any permanent built features.

Objective	Comment
(h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not applicable
(i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	The application has been made in accordance with relevant State and Local environmental planning instruments and has been prepared to respond to applicable environmental planning legislation.
(j) to provide increased opportunity for community participation in environmental planning and assessment.	The geotechnical investigation development process involved consultation with relevant stakeholders. Given the absence of likely additional impacts, consultation for the proposed modification was limited to affected landowners being WaterNSW and NPWS.

7.2.1 The Precautionary Principle

This principle states: "if there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation".

The geotechnical investigation planning has sought to take a precautionary approach to minimising environmental impact through the avoidance of impacts. A range of environmental safeguards are proposed to address identified impacts. These safeguards would be implemented during the geotechnical works. No safeguards have been postponed as a result of lack of scientific certainty. No threat of serious or irreversible damage is considered likely as a result of the geotechnical works as modified.

7.2.2 Intergenerational Equity

The principle states: *"the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations"*.

The geotechnical workss are a necessary step in the assessment and development of the Shoalhaven Hydro Expansion Project. The Shoalhaven Hydro Expansion Project has been identified as critical to meeting an identified energy generation shortfall post 2022. If developed, the Shoalhaven Hydro Expansion Project would represent a low impact energy storage solution that would allow the continued penetration of renewable energy projects into the National Energy Market. This in turn would reduce the current reliance on non-renewable energy sources to the benefit of future generations.

7.2.3 Conservation of Biological Diversity and Ecological Integrity

This principle states: "the diversity of genes, species, populations and communities, as well as the ecosystems and habitats to which they belong, must be maintained and improved to ensure their survival".

The geotechnical works are considered unlikely to significantly impact biodiversity values due to the avoidance of clearing to the extent possible and temporary and entirely reversible nature. The proposed modification further reduces biodiversity impacts.

7.2.4 Improved Valuation, Pricing and Incentive Mechanisms

This principle is defined as:

Improved valuation, pricing and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as:

(i) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,

(ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,

(iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

The Project represents an investment by Origin aimed at assessing the Shoalhaven Hydro Expansion Project and securing increased reliability and capacity of generation associated with existing WaterNSW water storage assets. Development of the Shoalhaven Hydro Expansion Project would only proceed where demonstrated that it can be developed in a viable manner from an economic and social perspective.

7.2.5 Summary and conclusion

Geotechnical works, including the proposed modification, are required to confirm that the Shoalhaven Hydro Expansion Project can be constructed and operated in a safe and cost-effective manner. The Shoalhaven Hydro Expansion Project, including the required geotechnical works, have been declared Critical SSI and as such will be assessed under Division 5.2 of the EP&A Act.

While there would be some environmental risks and minimal environmental impacts as a consequence of the geotechnical works as modified, these have been avoided or minimised wherever possible through design and mitigation measures.

The modification is considered justified on the basis that it is required to realise the benefits of the overall the Shoalhaven Hydro Expansion Project with no additional environmental of social impacts.

As a whole, the geotechnical worksremain justified on the basis that the benefits, being greater confidence that the Shoalhaven Hydro Expansion Project can proceed in a safe and economically viable manner, are considered to outweigh any identified adverse impacts in the short and long term. While some environmental impacts cannot be avoided, in all cases they would be minimised through the implementation of mitigation measures.

8. References

Jacobs. (2019). *Shoalhaven Pumped Hydro Energy Storage Expansion - Geotechnical Investigations Environmental Impact Statement* .

Appendix A. Updated project description

A.1 Overview

The currently proposed drilling program includes 7 cored boreholes as shown in Figure A-1. Most holes are to be drilled vertically with target depth ranging from 25 m to 800 m as provided in Table A-1, totalling some 1,895 m of drilling. Location 9 is planned to be drilled at a nominal inclination of 20 degrees towards the southwest to target the revised cavern location.

Table A-1. Preliminary borehole locations and depths

Borehole ID	Location	Inclination (°)	Approximate Elevation RL (m)	Hole Length (m)
Location 1	Pipeline anchor block	90	548	25
Location 2	Vertical shaft (complete)	90	636	480 - 650
Location 3	Cavern area (complete)	90	179	250
Location 4	No longer required	-	-	-
Location 5	No longer required	-	-	-
Location 6	Access tunnel portal and tailrace tunnel (Complete)	90	69	70
Location 7	Tailrace tunnel initial portal drive (Complete)	90	73	55
Location 8	Tailrace channel cut	90	73	45
Location 9	Revised cavern	20	569	800

Final borehole locations, depths, and orientations will be confirmed before the commencement of the drilling program.

At each location the proposed activity will require the establishment of a temporary works area of approximately 400 square metres. Accessing locations 3 and 6, would require the establishment of temporary tracks of under 500 metres in length and 2 metres in width with less than 300 metres of this requiring clearing. In total, under 0.21 hectares of clearing is anticipated.

A.2 Drilling Works

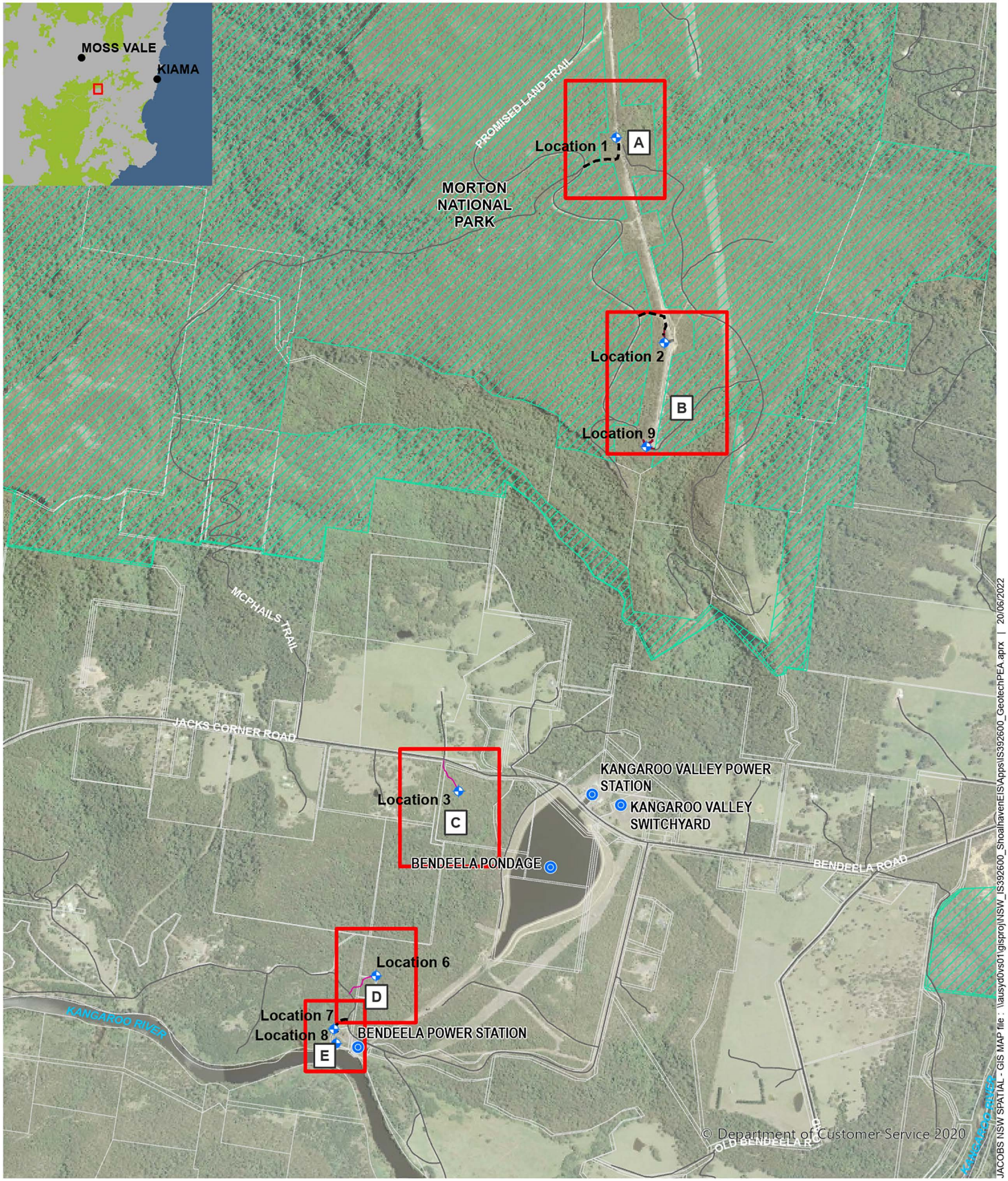
A.2.1 Methods and core sizes

General methods and requirements for drilling are expected to involve the following:

- Preparation of a bunded work area lined with a basal geotextile mat and then overlain by a heavy-duty plastic impervious sheet. Bunded above ground mud pits/ tanks to prevent off site drilling fluid discharges and other requirements. The mud pits will be fully impervious using both geotextile and plastic sheeting and additional barriers and redundancy to prevent any discharges
- Boreholes may be advanced by auguring in the upper soil profile, followed by wash boring to the rock head which is expected to be a maximum of about 10 m below the surface. For drilling in soils, Standard Penetration Tests (SPT) may be performed in soils and undisturbed tube samples may be collected in cohesive or fine-grained soils
- Rock core drilling would commence from the top of bedrock and advanced to the target depth.

The drilling hole sizes are likely to range from 75 to 140 millimetres in diameter.

Drill cores will be removed to a core shed on land at Kangaroo Valley Power Station for further analysis. Residual spoil and drilling mud would be removed from the site as required but typically on a daily basis.



Legend

- Indicative Geotech Locations
- Existing access tracks (No clearing required)
- Indicative work site - with clearing
- Indicative access tracks - with clearing
- NPWS Reserve
- Inset

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Data sources
DFSI - Spatial Services
Jacobs 2022

Figure A-1 | Indicative borehole locations

The following ancillary works would be undertaken at each geotechnical investigation location:

- Packer Testing - Down-hole water injection (Lugeon) rock mass permeability testing will be carried within various boreholes using a gas-inflated packer wireline apparatus with a single packer configuration as the hole is advanced to the required depth for each test interval.
- In situ stress testing – A narrow 0.5m deep pilot hole drill will be drilled into the base of the borehole at various depths and a stress testing tool wedged into pilot hole. The pilot hole will then be over-cored and the stress testing tool will record deformations in the pilot hole resulting from relief of in situ stress during the over coring process.
- Borehole Geophysics and Televiewer Surveys - All borehole walls will be imaged using acoustic televiewer (ATV) below the water table and optical televiewer (OTV) in dry sections of borehole. Geophysical surveys including full wave sonic, natural gamma, density and temperature profiles for the full depth for each hole will also be undertaken. These surveys will be undertaken at the completion of the drilling and prior to installation of groundwater monitoring installations and or back-grouting of holes
- Groundwater Monitoring Installations - Groundwater monitoring installations will include a combination of screened standpipe piezometers and grouted-in vibrating wire piezometers (VWP). The standpipe piezometers will allow for periodic groundwater quality sampling and level monitoring.
- Bore Completion Works - All holes that are not to be instrumented for long term groundwater monitoring will be fully grouted at the completion of drilling work. The remaining holes that are to be completed for groundwater monitoring will be fully grouted to the base depth of the monitoring well. The piezometer will be finished with stick up of between 0.6m and 0.8 metres above ground level and finished with installation of a steel lockable monument.

A.3 Access

As a preferred drilling contractor has not yet been selected, precise details relating to plant and operational details are not available. It is however assumed that three drilling rigs will be used simultaneously to complete the drilling and local testing regime within a three- to four-month period. This will allow the results of the geotechnical works to be analysed and interpreted to inform the design and costing of the civil and structural aspects of the Shoalhaven Hydro Expansion Project. Works at location 9 would occur separately to other locations.

The drilling rigs are anticipated to be predominantly tracked rigs, with the larger drilling rig being transported to site via a “beaver-tail boggie” (an articulated truck), and the smaller rigs being transported to site via “tilt tray trucks” (similar to that used by tow truck operators to convey broken-down cars or small trucks). It is also possible that the drilling rigs may be truck mounted and will be able to drive to site. Transport routes and geotechnical investigation location access routes are illustrated in Figure A-2and described below.

For Locations 1, 2 and 9 the transport trucks will travel along the Illawarra Highway (A46), then via the Moss Vale / Nowra Road (B73) to the existing National Parks and Wildlife Services’ The Promised Land Track. The track is located approximately 2.6km south of the Nowra Road Myra Vale Road intersection. This track was used for construction the existing scheme and currently facilitates access to WaterNSW’s Fitzroy Falls canal, control works, surface water pipeline and surge tank. It also serves as a National Parks and Wildlife Services’ fire trail and in particular on weekends, portions of the track are used by walkers and mountain cyclists. The transport trucks will likely park along the wide section of The Promised Land Track where it runs parallel to the Fitzroy Falls canal and the drilling rigs will then be unloaded and propel themselves to the borehole locations.

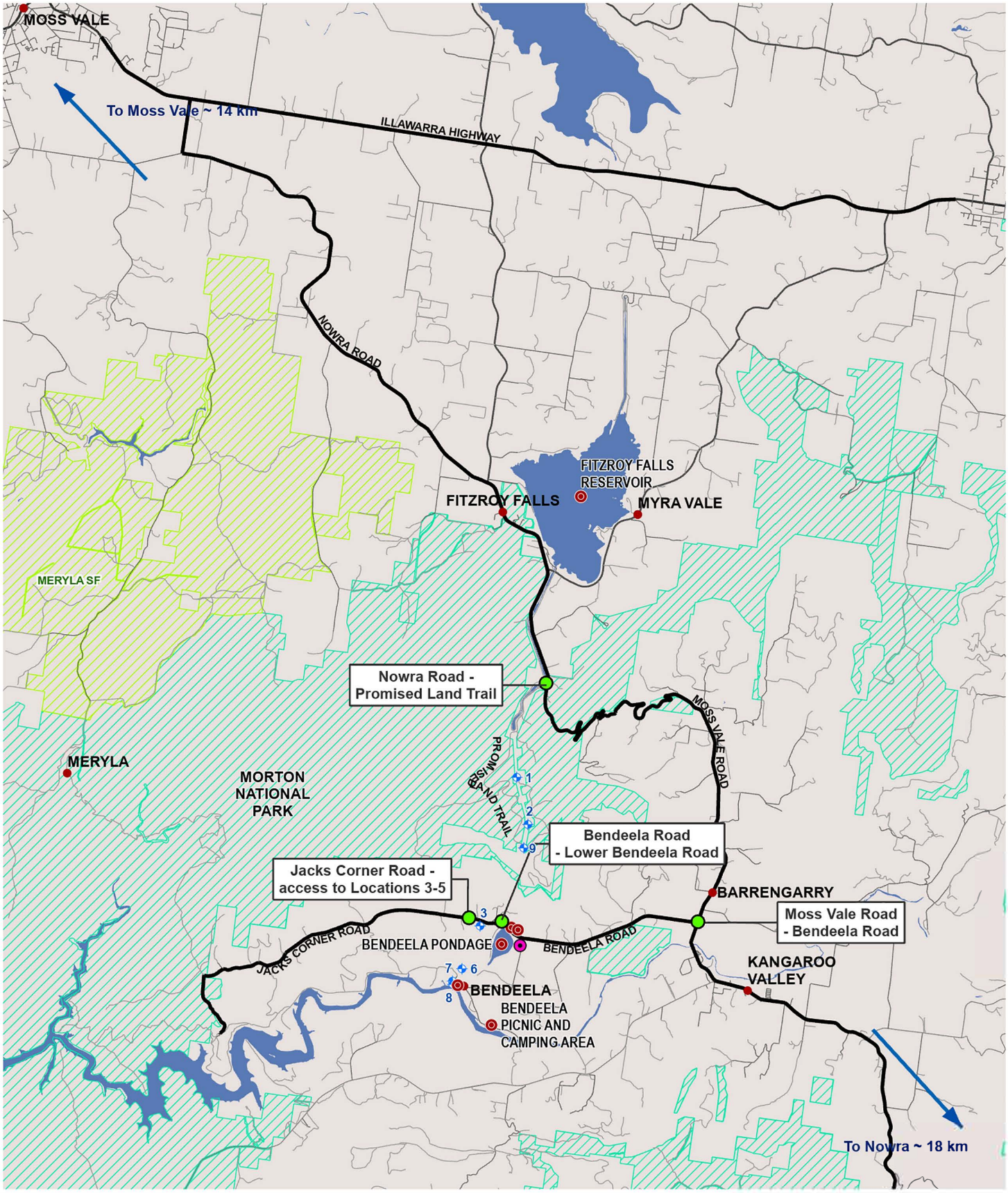

Figure A-2 Proposed transport routes

The rigs will only deploy to the site at the commencement of drilling and will be retrieved after the holes are completed. The borehole at Location 1 would be drilled by a small drilling rig and drilling is anticipated to last two to four days. The borehole at Location 2 and 9 would require a larger drilling rig and drilling is expected to take 10 to 12 weeks to complete. Each rig will also have a support truck and water tanker that will service the site daily, while up to three utility or light vehicles (four-wheel drives) will make a total of about six trips daily to convey people and equipment to each site. No new, or modified access tracks are required for these locations. The anticipated traffic movements to and from the site from the Nowra Road is estimated in Table A-2:

Table A-2: Forecast vehicle movements locations 1, 2 and 9

Vehicle type	Location 1	Location 2 and 9
Articulated truck	-	1 trip at commencement and 1 trip upon completion
Medium truck/ water tanker	2 trips per day for 2 to 4 days	2 trips per day for 60 to 90 days
Utility or light vehicles	6 trips per day for 2 to 4 days	6 trips per day for 60 to 90 days

It is assumed that the truck movements will be primarily from and towards the north, while the utility vehicles will turn both north and south onto Nowra Road to travel towards the Illawarra Highway or to proceed to the Kangaroo Valley. For location 9, access arrangements will be subject to status of road closure on Moss Vale Road.

Borehole locations 3 will be accessed via Jacks Corner Road from Moss Vale Road, and access to borehole locations 6, 7 and 8 will be via Lower Bendeela Road from Bendeela Road/Jacks Corner Road. For Location 3 the drilling rigs' transport truck(s) will most likely park on the edge of Jacks Corner Road some 700 metres west of the Kangaroo Valley Power Station to allow the rig/s to drive off the tilt tray, across the road verge, through the existing gate into the WaterNSW property and along the proposed temporary access track.

Access to borehole locations 3 and 6 would require limited clearing of shrubs to ground level to establish approximately 500 metres of temporary access tracks up to two-metre-wide to facilitate the access of drill rigs, and daily travel of support vehicles and utility vehicles. No excavation of the ground surface would be undertaken and large, mature vegetation and other habitat features are to be avoided.

The anticipated traffic movements to and from borehole locations 3 from the Nowra Road via Bendeela Road/ Jacks Corner Road is estimated in Table A-3:

Table A-3. Forecast vehicle movements locations 3

Vehicle type	Location 3, 4 and 5
Medium truck/ water tanker	4 trips per day for 60 days
Utility or light vehicles	12 trips per day for 60 days

For Locations 6 to 8, the rig/s transport truck/s will drive down Lower Bendeela Road and offload in the hardstand areas at the Bendeela Power Station. The rig/s will drive off the tilt tray trucks and access the drilling locations. The anticipated traffic movements to and from the site is estimated in Table A-4**Error! Reference source not found.**.

Table A-4: Forecast vehicle movements locations 6, 7 and 8

Vehicle type	Location 6, 7 and 8
Medium truck/ water tanker	4 trips per day for 40 days
Utility or light vehicles	12 trips per day for 40 days

A.4 Waste Management

Over the three to four month drilling program, the geotechnical works are anticipated to generate a total of 20 m^3 to 200m^3, or one to five road tankers, of liquid waste consisting of the following residual spoil material:

- Native soils from wash boring the upper portion of the drill holes through the weathered profile;
- Drill cuttings consisting of very fine particles of rock from the drill bit as it cuts the central rock core free from the earth so that the core can be extracted; and
- Waste mud consisting of biodegradable mud used to lubricate the drill head, help to keep the borehole from collapsing and carrying the drill cuttings to the surface.

Small quantities of these materials build up in the water management drilling tanks positioned adjacent to each drilling rig. When the tank/s needs to be emptied, this "liquid" waste will be conveyed by the support trucks or utility vehicles to a centrally located tanker trailer proposed to be located at the Kangaroo Valley power station. When the centralised tanker trailer is full, it will be collected and travel to a licensed off site treatment/ waste disposal facility as described in Section 7.6. No liquid or solid waste will be dispose of on-site.

Specific waste management details will depend on the methods employed by the drilling contractor. Regardless of methods employed, the EIS makes the following commitments in relation to waste management such that the risk of waste related impacts will be low:

- Geotechnical investigation locations will be appropriately lined and bunded such that hazardous substance and waste drilling products are prevented from coming in contact with the ground.
- All waste would be appropriately stored and removed from site as soon as possible and disposed of as per the Waste Classification Guidelines (EPA, 2014).
- All surficial soils, if any, and drilled rock cores will be collected and stored in an off-site core shed.
- All rock debris/fine sediments produced from drilling will be stored in above-ground tanks and transported off site.

A.5 Water requirements

Water is required for Packer Testing (rock mass permeability injection testing), lubrication of drilling mud and potentially dust suppression purposes. The volume of water required could range from 2 m^3 to 6 m^3 per rig per day. As such the total water required for the geotechnical investigation could amount to between 440 m^3 and 1,320 m^3. Water will be conveyed and stored in water carts prior to being used for lubrication or testing. Water would be most likely be sourced from Council.

Liquid waste comprising primarily drill cuttings and waste drilling mud will be removed from the drilling site locations as required to minimise the amount stored on site. It will be transported offsite via a tanker to a suitably licenced treatment/ disposal facility. Over the three to four month drilling program, a total of 20 m^3 to 200 m^3 of liquid will need to be disposal of to a suitably licenced disposal facility.

A.6 Rehabilitation

The National standards for the practice of ecological restoration (National Restoration Standards) identifies the principles underpinning restoration philosophies and methods, and outlines the steps required to plan, implement, monitor and evaluate a restoration project to increase the likelihood of its success. The objective of the Exploration Code of Practice: Rehabilitation is that the final condition should be as good or better than as it existed prior to exploration activities, or one that allows the proposed final land use(s) to be sustained. The Exploration Code of Practice: Rehabilitation identifies that, as a first principle, title holders should aim to prevent or minimise (where prevention is not practicable) the extent of disturbance associated with exploration activities as a means to reduce the extent of rehabilitation required.

The geotechnical investigation locations do not have an intended future land beyond buffer lands to the existing scheme assets. For the currently cleared and disturbed locations 1, 2, 7, 8 and 9 where ongoing use is for access and maintenance requirements of the existing scheme, rehabilitation efforts to improve ecosystem functioning are not proposed beyond the decommissioning of wells and removal of equipment and waste.

Locations 3 and 6 are within the special area protecting the WaterNSW Shoalhaven water storages. The ongoing landuse is limited to Special Areas being "successfully managed to provide high quality raw water in

reservoirs, by protecting the ecological integrity, and natural and cultural values of the areas" (WaterNSW and Office of Environment & Heritage, 2015). Due to the low impact approach to the geotechnical investigation, with ground disturbance limited to the drill hole and vehicle movements over temporary access tracks, rehabilitation needs will be limited. Aligned with the mandatory requirements of the *Exploration Code of Practice: Rehabilitation*, rehabilitation strategy will include the following:

Prior to commencement:

- A risk assessment would be undertaken in parallel with the development of the geotechnical works environmental management plan to account for contractor specific works methods;
- Existing conditions of access tracks and works areas will be documented as part of pre-mobilisation demarcation of access tracks and works areas in the presence of an ecologist and archaeologist; and
- All plant and equipment would be cleaned and confirmed to be free of materials that may contain seeds.

Immediately following completion of works:

- All exploration plant, equipment and associated infrastructure would be removed;
- All drill cores and collected cuttings would be removed;
- All boreholes not being retained for ongoing monitoring purposes would be surveyed, sealed and rehabilitated in accordance with departmental guidelines;
- Statutory notification/reporting (as required) of any unsealed parts of any boreholes or any tools lost down boreholes/wells would be completed;
- Damage to existing access tracks would be repaired and stabilised;
- A visual survey would be undertaken to confirm and document that there are no visible signs of contamination following the removal of plant, equipment and materials and that all rubbish and waste materials have been removed from the site; and
- A follow-up visual survey(s) would be undertaken to confirm weeds have not been introduced as a result of the geotechnical works.

Additional rehabilitation in the event that the Shoalhaven Hydro Expansion Project does not proceed:

- Within 12 months of completion or following a decision that the Shoalhaven Hydro Expansion Project would be delayed or not proceed, the geotechnical investigation locations would be revisited to document success of unassisted vegetation rehabilitation; and
- Where observable difference in vegetation integrity between access and works areas to the surrounding environment, deliberate rehabilitation efforts would be developed and implemented in consultation with WaterNSW.

A.7 Duration and Timing

The geotechnical works are scheduled to proceed immediately following approval and satisfaction of any pre-mobilisation requirements and occur over a three to five month period. On this basis, geotechnical works are intended to occur between March and July 2019. Location 9 would be undertaken in 2022 or 2023.

The deepest boreholes (Location 2 and 9) are anticipated to take up to three months. The shallow boreholes (Locations 1, 6, 7 and 8) are each expected to be completed over a one or two week timeframe. Each medium depth borehole (Locations 3) is anticipated to be drilled over a four to six week period.

In order to facilitate a timely completion of the feasibility assessment and to allow the Shoalhaven Hydro Expansion Project to proceed as soon as possible, the drilling is likely to involve the concurrent mobilisation of three drill rigs. This would include a large drill rig at Location 2 for a three month period and smaller rigs consecutively drilling the other locations. Location 9 would be drilled separately to other works.

Rehabilitation efforts would commence immediately following completion of works at each location. Rehabilitation status at Locations 3 and 6 would be reviewed within 12 months of completion of drilling, or if a decision not to proceed with the Shoalhaven Hydro Expansion Project is made, and any deliberate revegetation efforts would be agreed with WaterNSW, implemented and monitored until self-sustaining.

Drilling is proposed to be limited to the Interim Construction Noise Guideline (ICNG) (DECC 2009) standard daytime period from 7am to 6pm on Monday to Saturday. No works are proposed to occur on Sundays and Public Holidays.

A.8 Workforce

Workforce numbers are estimated to be four to six people per drilling rig. Workers would be sourced locally to the extent possible and be accommodated in existing facilities in the surrounding towns.

A.9 Environmental Management

Works would be undertaken generally in accordance with Department of Planning and Environment (2017a) *Exploration Code of Practice: Environmental Management* and Department of Planning and Environment (2017b) *Exploration Code of Practice: Rehabilitation.* Consolidated management, monitoring and mitigation measures that would be implemented during drilling and rehabilitation are provided in Appendix B.

Appendix B. Updated mitigation measures

Table B-1. Summary of Mitigation Measures

Issue	Commitment
Biodiversity	The following avoidance and measures would be implemented to ensure impacts to existing vegetation and habitat is minimised: • Where possible, vegetation clearance has been avoided or minimised through appropriate siting of the geotechnical investigation sites and associated access routes in the identified locations in this report; • Modified and degraded areas such as trails and easements have been utilised where possible; • Lopping and direct avoidance should always be used to protect tree cover where possible, this could involve tying back tree branches during the investigation rather than lopping; • Native vegetation shrub and ground cover should be driven over rather than completely removed where possible to minimise direct impacts to smaller shrubs and tree seedlings; • The drip-line of remnant trees is to be avoided including storing materials and equipment, and when undertaking excavations; • No native vegetation material should be removed from site; • Stockpile, storage and depot sites should be situated in cleared/disturbed areas, such as maintained grassland • No trees, hollows, large logs, surface rocks will be removed during access and drilling. • Pre-clearance surveys will be carried out by an experienced ecologist to identify and mark threatened plant species and important fauna habitat attributes (such as hollow-bearing trees and substantial areas of fallen timber) to be protected during the proposal. Where required to protect TECs from inadvertent damage, communities will be marked out during pre-clearance surveys. • The proposal will avoid all threatened flora populations known to occur within the proposal area through the appropriate sighting of locations with advice from an ecologist. Vegetation clearing in any single area will: • Not commence before pre-clearance surveys are completed by an ecologist; • Be kept to a minimum and below a total of 0.25 hectares. Where vegetation impacts are unavoidable, vegetation lopping will be carried out in preference to tree removal and groundcover will be left intact, where possible; • Use the shortest possible distance where access tracks need to be cleared to minimise the loss of native vegetation while avoiding habitat features; • Where possible, ground cover and shrubs will be driven over rather than removed to minimise direct impacts on shrubs and small saplings; and • All field staff working on the site will be trained in their responsibilities in relation to biodiversity. The proposal will: • Use the smallest practicable machinery to access investigation locations within dense vegetation; • Implement a washdown procedure for plant and machinery to prevent introduction of new weeds on site and to prevent spread of weeds across the site; • Not stockpile or store plant and equipment within the drip lines of trees; and

Issue	Commitment
	• Boreholes will not be left open overnight to avoid presenting an obstacle or trap to fauna. If unexpected threatened fauna or flora species are discovered within the impact area, works will cease immediately and not recommence until appropriate measures are put in place to avoid impacts.
Aboriginal Heritage	The following recommendations will be implemented during the geotechnical works: • Works can occur in areas of low to moderate archaeological sensitivity for the purpose of establishing the site and drilling geotechnical boreholes; • Consultation with Illawarra LALC on site confirmed that no further cultural heritage assessment for the geotechnical drilling program was required; • Aboriginal heritage training/induction for geotechnical contractors; and • If any unexpected Aboriginal objects are found during the proposal, the Unexpected Finds Protocol outlined below will be implemented.
Historic Heritage	The following management measures will be implemented for the geotechnical works in relation to historic heritage: • Prior to mobilisation, access tracks and works areas for geotechnical investigation locations 3, 4, 5 and 6 are to be visually inspected and demarcated to avoid visible evidence that could be considered a relic; • In the event that a relic is encountered along access tracks or in works areas, all works will cease, the find reported to the Heritage Council in accordance with the Heritage Act 1977 requirements, and works not to proceed until such time as any necessary additional assessment and been completed and clearance to proceed has been received.

Land and Soil	The following standard safeguards and management measures would be implemented to address potential short-term impacts of the proposal on land, soil and instability:
	• Erosion and sediment control measures will be implemented and maintained to:
	  • Limit erosion of soil;
	  • Prevent sediment moving off-site and sediment laden water entering any water course, drainage lines, or drain inlets;
	  • Reduce water velocity and capture sediment on site;
	  • Minimise the amount of material transported from site to surrounding pavement surfaces; and
	  • Divert clean water around the site.
	• Erosion and sediment control measures would be established before geotechnical works commence at each site.
	• All surficial soils and drilled rock cores will be collected and stored in an off-site core shed.
	• All rock debris/fine sediments produced from drilling will be stored in above-ground tanks and transported off site.
	• Upon conclusion of the geotechnical investigation, all boreholes will be grouted.
	• All affected land, including temporary access tracks and borehole works areas will be restored to as close as possible to their original state upon completion of the geotechnical works.

Surface Water	The following surface water mitigation measures would be implemented for the geotechnical works: • All waste would be appropriately stored and removed from site as soon as possible and disposed of as per the Waste Classification Guidelines (EPA, 2014);

Issue	Commitment
	• Spill management procedures during drilling activities, including an Emergency Spill Plan, would be developed and incorporated into the contractor's EMP; • Appropriate erosion and sediment controls would be detailed in the EMP and installed and maintained as necessary; • As soon as drilling has been completed, all materials used or generated would be removed from site; • There is to be no release of any solid or liquid into drainage lines and/or waterways; • Visual monitoring of local water quality (ie. turbidity, hydrocarbon spills/slicks) is to be undertaken on a regular basis to identify any potential spills or deficient containment or erosion and sediment controls, and • EMP to detail measures to prevent any materials (eg. concrete, grout, sediment etc) from entering the environment.

Groundwater	The following ground water mitigation measures would be implemented for the geotechnical works:
	• Drilling rigs are to be equipped with mobile spill kits and contractors to have established spill clean-up procedures. This must ensure:
	  • adequate spill prevention and absorbent materials (including absorbent pads, granular absorbent and disposal bags) required to manage spills and leaks for all potential pollutants which are on site are readily available at all times.
	  • that appropriate equipment and materials are available to capture any drips and spills which occur during the transfer of potential pollutants, and when carrying out maintenance of hydrocarbon filled plant and equipment.
	  • that spills of potential pollutants are contained and cleaned up immediately. Such spillage must not be cleaned up by hosing, sweeping, or otherwise releasing contaminants to any watercourse, waterway, groundwater, wetland, or lake.
	• In accordance with the Geotechnical Drilling Specification (Jacobs, 2018), boreholes containing VWPs are to be grouted to the surface using a sacrificial tremie pipe and a mix consisting of 5% to 8% bentonite by volume or about 1% to 2% by weight. In accordance with NSW Government Trade & Investment Resources & Energy (2012), each grout lift is to be no more than 200 metres in height. If the bore can be fully grouted in one grout lift then it is recommended that the grout is circulated to ensure placement occurs without bridging.
	• Boreholes with piezometers are to target one aquifer only and are not to be screened across two or more aquifers. A bentonite seal will be situated within the annulus above the filter/gravel pack and the remainder of the annulus fully grouted to the surface.
	• Piezometers are to be constructed in accordance with the Minimum Construction Requirements for Water Bore in Australia (Australian Government, National Water Commission, 2012).
	• Methane monitoring will be undertaken at the surface of the boreholes that may intersect potential gas bearing zones to monitor methane levels. Management measures will be implemented if methane concentrations exceed 5% of the lower explosive limit.

Noise and Vibration	The following noise and vibration mitigation measure would be implemented as necessary to comply with the identified noise criteria and minimise disturbance of sensitive receptors as follows. The following would be undertaken prior to mobilisation to each location:

Issue	Commitment
	• Potentially affected sensitive receivers would be notified in advance of commencement of geotechnical works and the expected duration and timing along with information on who to contact in relation to concerns; • Actual equipment sound power levels would and predicted impacts would be confirmed; • Where management levels are predicted to exceeded, feasible and reasonable noise mitigation would be developed along with a noise monitoring program to confirm compliance with noise management levels; and • A complaint investigation and response plan would be established. The following source controls would be applied during drilling works where drilling is identified as likely to be audible at sensitive receivers: • Mitigation of drilling equipment with damping devices or using portable screens where possible expected to result in a 5 dB(A) reduction in noise level to receiver; Orienting noise generating equipment away from sensitive receivers.
Air	Although it was predicted that there was limited potential for air quality impacts during the geotechnical works, the following mitigation and management measures are recommended: • Ensure all vehicles, plant, and equipment operate in a proper and efficient manner. • Switch off all vehicles, plant and equipment when not in-use for extended periods of time. • Impose and signpost suitable maximum of 40 km/ hour on-site speed limits to limit the generation of dust. • If material is tracked onto public roads use a street sweeper to remove any debris. • As identified to be necessary, use water-carts to supress any dust emanating from the site and associated access tracks. • Conduct regular site inspections to ensure that air quality measures are being implemented and are effective.
Traffic	The following traffic mitigation measures would be implemented for the geotechnical works: • A Traffic Management Plan inclusive of warning signage required will be formulated as part of the EMP.

Public safety	The following mitigation measures for public safety would be incorporated into the geotechnical works management plan and implemented during works:
	• A Fire Safety Management Plan will be formulated as part of the Environmental Management Plan (EMP) and implemented throughout the duration of the project to avoid instigating a bushfire, or in the event of a bushfire.
	• All field personnel mobilising to site are required to undertake the project HSE induction. Bushfire awareness will be covered within the Induction to ensure all team members are aware of the risks associated with potential bushfire emergency.
	• Prior to accessing the site each day, the following must be completed:
	  • Download the Rural Fire Service Application 'FiresNearMe'.
	  • Check weather conditions at www.bom.gov.au.
	  • Check the fire danger rating (FDR) - this can be found at http://www.bom.gov.au/nsw/forecasts/bushfire.shtml. If FDR is Extreme or Catastrophic, all fieldwork must be cancelled.
	• Evacuation route/s and procedures will be documented for each geotechnical investigation location and all personnel will be made are aware through project inductions.

Issue	Commitment
	• The Geotechnical works would comply with WaterNSW catchment closures during periods of elevated bush fire risk. • Geotechnical investigation locations will be appropriately lined and bunded such that hazardous substance and waste drilling products are prevented from coming in contact with the ground. • Refuelling will take place in a designated area within the works area, away from ignition sources and trees or vegetation and with appropriate controls to prevent any spills coming into contact with the ground. • Any contaminated material will be classified according to the Waste Classification Guidelines: Parts 1 and 2 (EPA, 2014) and disposed of at a licensed disposal facility. • Minimal volumes of fuel, chemical and liquid will be handled on site and none would be stored on-site. • Appropriately stocked emergency spill kit will be provided at each geotechnical investigation location at all times while works are in progress. All staff will be made aware of the location of the spill kit and trained in its use.

Appendix C. Aboriginal heritage due diligence assessment

Geotechnical Works Location 9: Aboriginal heritage Due Diligence Report

Origin Energy
Application Number SSI-10033

Shoalhaven Hydro – Geotechnical Works
28 June 2022

Geotechnical Works Location 9: Aboriginal heritage Due Diligence Report

Client name:	Origin Energy		
Project name:	Shoalhaven Hydro – Geotechnical Works		
Client reference:	Application Number SSI-10033	**Project no:**	IS392600
Document no:	IS392600	**Project manager:**	Thomas Muddle
Revision no:	00	**Prepared by:**	Matt Finlayson
Date:	28 June 2022	**File name:**	IS392600_Shoalhaven_Hydro Expansion_Geotech_ADD_Final
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Revision	Date	Description	Author	Checked	Reviewed	Approved
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Jacobs Group (Australia) Pty Limited

Level 7, 177 Pacific Highway
North Sydney, NSW 2060
PO Box 632
North Sydney, NSW 2059
Australia

T +61 2 9928 2100
F +61 2 9928 2444
www.jacobs.com

Executive summary

The Shoalhaven Hydro Expansion Project including associated geotechnical investigations and ancillary development is declared critical State significant infrastructure under the *Environmental Planning and Assessment Act 1979* (EP&A Act). Origin Energy Eraring Pty Ltd (Origin) submitted a State significant infrastructure application (SSI 9816) in December 2018 seeking approval for geotechnical works required to inform the design of the Shoalhaven Hydro Expansion Project. Approval was subsequently granted by the then Minister for Planning following the exhibition of an environmental impact statement (EIS), response to submission and consideration by the Department of Planning, Infrastructure and Environment.

Origin has engaged Jacobs to prepare a modification application to SSI9816 to undertake geotechnical works at one new location (location 9). As per the original EIS, the modification application considers the potential Aboriginal heritage impacts associated with geotechnical works adopting a Due Diligence assessment for Aboriginal cultural heritage in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (Department of Environment, Climate Change & Water [DECCW] 2010; hereafter the Due Diligence Code of Practice) and within the legislative context of the National Parks and Wildlife Act 1974 (NPW Act).

No Aboriginal objects were identified in the location of Borehole Location 9 as a result of the visual inspection. Due to the coverage of the inspection and generally good surface visibility, it is likely that if Aboriginal objects were present on the ground surface within the project area they would have been identified during the survey.

The location of Borehole Location 9 has been significantly disturbed by cut and fill disturbance for the Promised Land Trail, historic forestry practices, installation of sub-surface amenities for sewerage and electrical services and construction of the adjacent pipeline, underground race and ancillary buildings. This level of disturbance significantly limits the potential for Aboriginal objects to be present within the project area. As such it is determined that the project area has a low to nil likelihood to contain Aboriginal objects.

No further Aboriginal cultural heritage assessment actions are warranted at Borehole Location 9 , and the proposed works can proceed with caution.

If Aboriginal objects are discovered during the proposed works, works must stop immediately and an assessment must be undertaken in accordance with Part 6 of the *National Parks and Wildlife Act 1974*. If the activity cannot avoid harm to Aboriginal objects, work cannot proceed until an Aboriginal Heritage Impact Permit (AHIP) has been issued.

An Unanticipated Finds Protocol is included in this report and must be followed if any Aboriginal object or suspected Aboriginal object is discovered.

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Acronyms and abbreviations

ADD	Aboriginal Due Diligence
AHIMS	Aboriginal Heritage Information Management System
ASL	Above Sea Level
DECCW	Department of Environment, Climate Change & Water
DPE	Department of Planning and Environment
EIS	Environmental Impact Statement
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
MW	Megawatts
NPW Act	*National Parks and Wildlife Act* 1974
OEH	Office of Environment and Heritage
PAD	Potential Archaeological Deposit
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy
SHI	State Heritage Inventory
SHR	State Heritage Register
SSD	State Significant Development
SSDA	State Significant Development Application
SSI	State Significant Infrastructure

1. Introduction

1.1 Project summary

The Shoalhaven Hydro Expansion Project including associated geotechnical investigations and ancillary development is declared critical State significant infrastructure under the *Environmental Planning and Assessment Act 1979* (EP&A Act). Origin Energy Eraring Pty Ltd (Origin) submitted a State significant infrastructure application (SSI 9816) in December 2018 seeking approval for geotechnical works required to inform the design of the Shoalhaven Hydro Expansion Project. Approval was subsequently granted by the then Minister for Planning following the exhibition of an environmental impact statement (EIS), response to submission and consideration by the Department of Planning, Infrastructure and Environment.

Origin has engaged Jacobs to prepare a modification application to SSI9816 to undertake geotechnical works at one new location (location 9) (refer to Figure 1.1). As per the original EIS, the modification application considers the potential Aboriginal heritage impacts associated with geotechnical works adopting a Due Diligence assessment for Aboriginal cultural heritage in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (Department of Environment, Climate Change & Water [DECCW] 2010; hereafter the Due Diligence Code of Practice) and within the legislative context of the National Parks and Wildlife Act 1974 (NPW Act).

1.2 What is Due Diligence

The *National Parks and Wildlife Act 1974* (NPW Act) establishes the strict liability offence of harming Aboriginal objects where they were not known to be present. The Due Diligence process was established to provide a defence to this offence. Therefore, Due Diligence is a legal defence against prosecution where Aboriginal objects are harmed when it was reasonably considered that they would not be present. In effect, following a due diligence process amounts to taking reasonable and practicable steps to protect Aboriginal objects.

The determination of whether Aboriginal objects are present or are likely to be present can be made by following the Due Diligence Code of Practice, in situations where it is appropriate and applicable to do so. Undertaking Due Diligence will allow the identification of where Aboriginal objects are, or are likely to be, whether the proposed activity is likely to harm those objects and determine whether an Aboriginal heritage impact permit (AHIP) or other approval is required prior to the commencement of that activity.

Undertaking the Due Diligence does not constitute consent to harm Aboriginal objects, nor are they a 'site clearance' mechanism to allow activities to occur in an area where Aboriginal objects are likely or known to be present. If it is known or considered likely that Aboriginal objects are present, a full assessment must be undertaken and an AHIP or other lawful authority granted prior to that activity taking place.

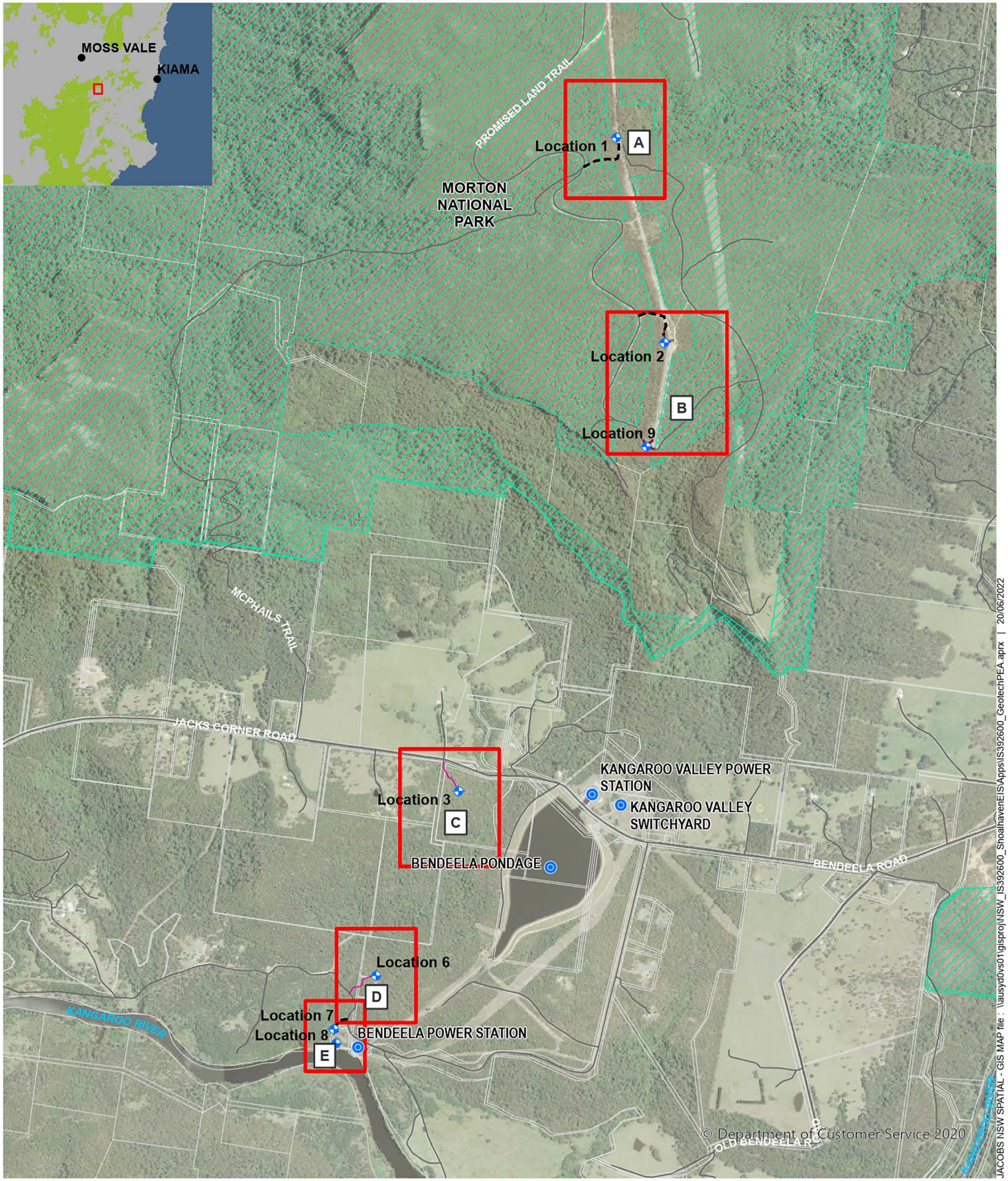
1.3 Purpose

The purpose of this report is to confirm that no Aboriginal objects are likely to be impacted through the proposed geotechnical works at location 9 to support the preparation of a modification application to SSI9816.

The Due Diligence Code of Practice sets out reasonable and practicable steps which must be followed to:

- Identify whether Aboriginal objects are, or are likely to be, present in an area
- Determine whether proposed activities are likely to harm Aboriginal objects if present
- Determine whether an AHIP or other approval must be in place prior to the commencement of activities.

Consultation with the Aboriginal community is not a formal requirement of the Due Diligence process, however, consideration of undertaking some form of consultation should occur, particularly if it will assist in informing any decision-making. If Aboriginal objects are identified and would be harmed, consultation must be undertaken in accordance with the requirements of Section 60 of the *National Parks and Wildlife Regulation 2019*, as described in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010).



Legend

- Indicative Geotech Locations
- Existing access tracks (No clearing required)
- Indicative work site - with clearing
- Indicative access tracks - with clearing
- NPWS Reserve
- Inset

0 1 1 km

1: @ A4

N

Data sources
DFSI - Spatial Services
Jacobs 2022

Figure 1.1 Revised indicative development layout

1.4 Appropriateness of the use of Due Diligence for this report

This modification is being approved under Section 5.25 of the EP&A Act. The Due Diligence Code of Practice states that Due Diligence does not apply to projects approved under certain sections of the EP&A Act, but that the considerations in the code may be used to identify whether the proposed works will cause harm to Aboriginal objects. For the purposes of this project, the Due Diligence has been prepared to identify if Aboriginal objects will be harmed by the proposed works, as shown in Table 1 (based on flowchart on Page 1 of the Due Diligence Code of Practice (DECCW 2010)).

Table 1. Determination of the suitability of employing a Due Diligence process for this activity

Question	Answer	Comment
Is the activity considered a Major Project under Part 4, Division 4.7 or Part 5, Division 5.2 of the EP&A Act?	Yes	For the purposes of this project, Due Diligence has been undertaken to determine if Aboriginal objects are likely to be present in the project area and if the proposed works will cause harm to any objects present
Is the activity exempt from the *National Parks and Wildlife Act 1974* or *Regulation 2019*?	No	No exemptions apply to this activity except that an AHIP is not required for approved SSI under Section 5.23 of the EP&A Act.
Will the activity involve harm that is trivial or negligible?	No	Examples of trivial or negligible harm include picking up and replacing a stone artefact, crushing or breaking a stone artefact while gardening or walking or similar activities. This does not apply to this activity.
Is the activity in an Aboriginal Place or there are known Aboriginal objects in the project area?	No	There are no known Aboriginal Places or known Aboriginal objects within the activity area.
Is the activity a low impact activity in accordance with the *National Parks and Wildlife Regulation 2019*?	No	The activity is not considered a low impact activity.
Do you want to follow an industry specific Code of Practice?	No	There is no industry specific Code of Practice applicable.
Follow the Due Diligence Code of Practice	Yes	Follow and comply with this code to determine the appropriate course of action for this activity.

1.5 Aboriginal cultural values

This report addresses the archaeological potential for Aboriginal objects and places only. It does not include formal consultation with any Aboriginal groups or individuals; therefore, it does not include input from potential Aboriginal stakeholders or cultural knowledge-holders. This due diligence does not include an assessment of Aboriginal cultural values associated with the proposed works area.

1.6 Authorship

This report was authored by Matt Finlayson (Project Archaeologist, Jacobs) with review by Fran Scully (Principal Archaeologist, Jacobs).

2. Project Information

2.1 Project background

Origin is the current operator of the Shoalhaven Pumped Hydro Energy Storage Scheme (the existing scheme). The existing scheme is located in the New South Wales (NSW) Southern Highlands, approximately 150 kilometres (km) south east of Sydney (refer to **Error! Reference source not found.**). The existing scheme was commissioned in 1977 and currently has a generating capacity of 240 megawatts (MW).

The Shoalhaven Hydro Expansion Project including associated geotechnical investigations and ancillary development is declared critical State significant infrastructure under the Environmental Planning and Assessment Act 1979 (EP&A Act). Origin submitted a State significant infrastructure application (SSI 9816) in December 2018 seeking approval for geotechnical works required to inform the design of the Shoalhaven Hydro Expansion Project. Approval was subsequently granted by the then Minister for Planning following the exhibition of an environmental impact statement, response to submission and consideration by the Department of Planning, Infrastructure and Environment.

To confirm the constructability of this optimised design, one new borehole location (location 9) is now proposed while two investigation locations associated with the former cavern location are no longer required. As such Origin are now seeking approval of a modification application to SSI 9816 to authorise investigations at this new location to be undertaken.

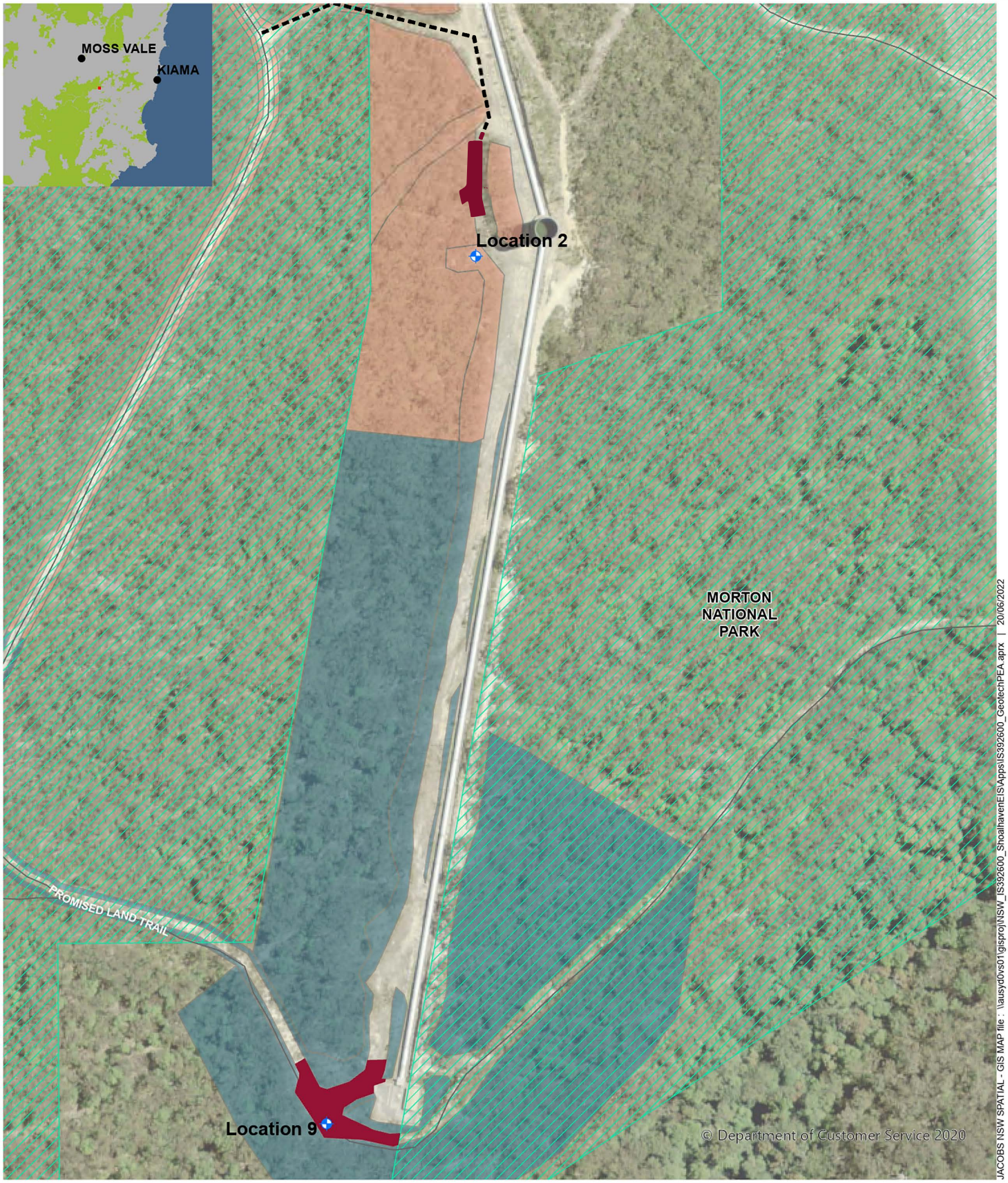
2.2 Proposed geotechnical works at location 9

An additional geotechnical borehole is required to provide the necessary geotechnical data to inform the Shoalhaven Hydro Station Expansion Project at new geotechnical works location 9 (see Figure 2-1). Geotechnical works at location 9 would include:

- Establishment of a geotechnical works area of approximately 400 m 2 within the assessed 1600 m2 area for location 9, arranged to avoid the need for vegetation clearing while facilitating ongoing access
- Erection of temporary fencing to create an exclusion zone around the geotechnical work area prior to the commencement of drilling operations
- Bunding of drill pads within the geotechnical works area with layers of geofabric and heavy duty plastic placed under the drill rig and areas that have the potential for drill water, drilling mud, hydrocarbon spills or hydraulic leaks and sized accordingly
- Ground disturbance limited to drilling of a borehole to a depth of approximately 800 m within a diameter of between 75 and 150
- Establishment of temporary amenities including portable toilet facilities, shelter for meeting area and equipment storage likely to take the form of small shipping containers
- Parking for construction vehicles on the existing access track or other suitable disturbed area near the location 9 geotechnical work area to avoid the need for vegetation clearing.

2.3 Project area

The Borehole Location 9 is located within Lot 1 DP 780552 on the Promised Land Trail outside of the curtilage of Morton National Park at approximately 572 m above sea level (ASL). Location 9 is immediately adjacent and west of the aperture of an existing underground pipeline to the Bendeela Pondage / Kangaroo Valley Power Station, and in an area previously disturbed associated with the construction of the existing scheme as illustrated in Figure 2-2.



Legend

- Indicative Geotech Locations
- Existing access tracks (No clearing required)
- Indicative work site - no clearing
- NPWS Reserve
- PCT 1082 - Red Bloodwood - Hard-leaved Scribbly Gum - Silvertop Ash heathy open forest on sandstone plateaux of the lower Shoalhaven Valley, Sydney Basin Bioregion
- PCT 1156 - Silvertop Ash - Red Bloodwood - Sydney Peppermint heathy open forest on moist sandstone plateaux, southern Sydney Basin Bioregion

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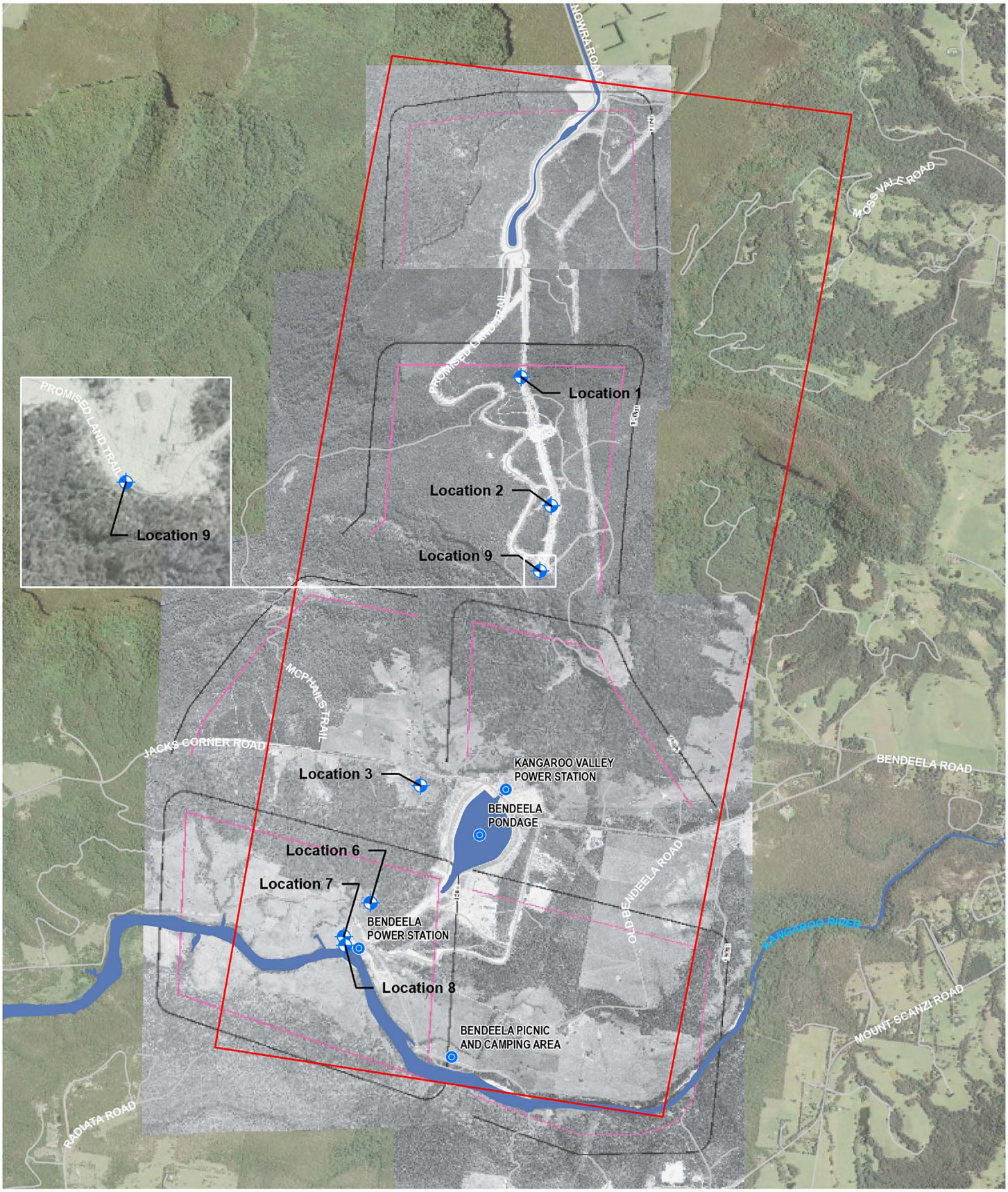
Data sources

DFSI - Spatial Services
Jacobs 2022

Figure 2.1 | Location 9 indicative works area



Legend

- Indicative goetech location
- Points of interest
- Project location
- Road
- Waterbody

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GDA2020 MGA Zone 56

Data sources

Jacobs 2021
NSW Spatial Services 2021
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Figure 2.2 Historic context (1974)

3. Legislation

3.1 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) protects Aboriginal heritage within New South Wales (NSW).

An 'Aboriginal object' is defined in Section 5(1) of the NPW Act in the following way:

> *Aboriginal object means any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area hat comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction and includes Aboriginal remains.*

An 'Aboriginal place' is a place gazetted by the Minister, under Section 84 of the NPW Act:

> *The Minister may, by order published in the Gazette, declare any place specified or described in the order, being a place that, in the opinion of the Minister, is or was of special significance with respect to Aboriginal culture, to be an Aboriginal place for the purposes of this Act.*

Protection of Aboriginal heritage is outlined in Section 86 of the NPW Act as follows:

- "a person must not harm or desecrate an object that the person knows is an Aboriginal object" (Section 86(1))
- "a person must not harm an Aboriginal object" (Section 86(2))
- "a person must not harm or desecrate an Aboriginal place" (Section 86(4))

Harm is defined in Section 5 of the NPW Act as:

> *Any act or omission that destroys, defaces, or damages the object or place, or – in relation to an object – moves the object from the land on which it had been situated.*

Section 87(1) of the NPW Act provides that it is a defence to these provisions if the harm is authorised by an AHIP while under Section 5.23 of the EP&A Act a permit under Section 87 of the NPW Act is not required for approved SSI.

Section 87(2) of the NPW Act provides that it is a defence to the provisions of Section 86(2) if the defendant exercised due diligence to determine whether an Aboriginal object would be harmed, and reasonably determined that no Aboriginal object would be harmed. That is, a proponent could be found not guilty of the strict liability offence if they can demonstrate that they undertook all reasonable steps to investigate the likelihood of Aboriginal objects and places being present and harmed by the proposed activity.

3.2 Due Diligence does not provide a defence to the offence of knowingly harming an Aboriginal object (offences that contravene Section 86(1)).Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (NSW; EP&A Act) regulates environmental planning and assessment of NSW. Land use planning requires that environmental impacts are considered as part of the environmental approval assessment for any development. This includes impact or likely impacts to Aboriginal cultural heritage.

3.3 Native Title Act 1994

The *Native Title Act 1994* was introduced to ensure that the laws of NSW are consistent with the Commonwealth *Native Title Act 1993*. Native Title claims, registers and Indigenous Land Use Agreements are administered under the Act.

A search of the National Native Title Tribunal database, on 10 February 2022, found that the study area is located within an identified Native Title claim area with the South Coast people. This claim has not been determined to date. Details regarding the claim have been summaries in Table 2 below.

Table 2. Schedule of Native Title Determination applications

Tribunal ID	Name	Date lodged	Registration status
NC2017/003	South Coast People	3 August 2017	Accepted for registration 31 January 2018

3.4 Aboriginal Land Rights Act 1983

The Aboriginal Land Rights Act 1983 (ALR Act) established Aboriginal Land Councils (at State and Local levels). These bodies have a statutory obligation under the ALR Act to:

> *(a) take action to protect the culture and heritage of Aboriginal persons in the council's area, subject to any other law, and*
>
> *(b) promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area.*

The study area is located within the boundaries of the Illawarra Local Aboriginal Land Council (LALC).

4. Register Searches

Aboriginal objects are recorded on the Aboriginal Heritage Impact Management System (AHIMS) and Aboriginal Places on the Aboriginal Place Atlas. Items of state heritage significance for Aboriginal and shared heritage values are recorded on the State Heritage Inventory.

4.1 AHIMS search

An extensive search of the AHIMS database was undertaken by Ryan Taddeucci (Senior Archaeologist, Jacobs) on 11 February 2022.

It should be noted that the AHIMS database does not represent an exhaustive list of all Aboriginal objects in NSW. Rather, Aboriginal objects are recorded on AHIMS once they have been identified, usually as a result of an assessment process. A lack of recorded Aboriginal objects within a particular area does not necessarily mean that Aboriginal objects will not be present, just that they have not been previously identified and recorded. Heritage NSW has determined that for the purposes of Due Diligence, the results of an AHIMS search are valid for twelve months from the date of the search.

The area surrounding the project area was searched in order to gain information on the archaeological context of the study area and to ascertain whether any previously recorded Aboriginal sites are located within the study area. The details of the AHIMS search parameters are included in Table 3.

Table 3. AHIMS search parameters

Search Criteria	Parameters
Datum	GDA
Zone	56
Eastings	264974 to 273849
Northings	6150178 to 6162300
Buffer	0 m
Client Service ID	658782

A total of 9 previously recorded Aboriginal sites were identified by the extensive AHIMS search. The nature of and location of the registered sites reflects past Aboriginal occupation from which they derive, but is also influenced by historical land-use, and the nature and extent of previous archaeological investigations. Although Aboriginal occupation covered the whole of the landscape, the availability of fresh water, and associated resources, was a significant factor in repeated and long-term occupation of specific areas within the landscape. AHIMS lists 20 standard site features that can be used to describe a site registered with AHIMS, and more than one feature can be used for each site. The frequency of recorded site types is summarised in Table 4.

Table 4. Summary of AHIMS site features

Aboriginal Place Type	Frequency	Per cent (%)
Artefact : -, Potential Archaeological Deposit (PAD) : -, Grinding Groove : -	1	11%
Ochre Quarry : -, Water Hole : -	1	11%
Artefact : -, Potential Archaeological Deposit (PAD) : -	1	11%
Grinding Groove : -, Potential Archaeological Deposit (PAD) : -	1	11%
Axe Grinding Groove	1	11%
Isolated Find	1	11%

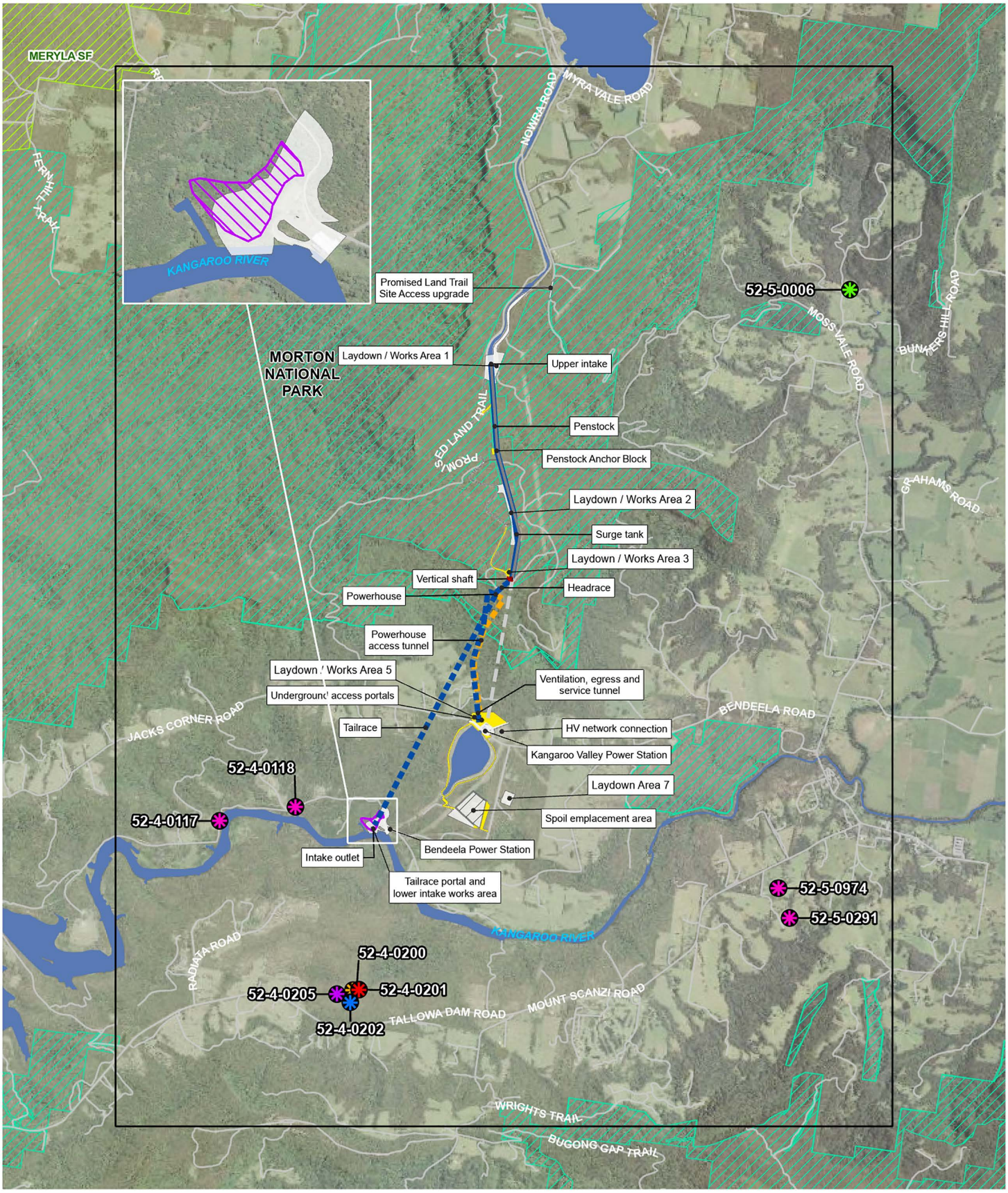
Aboriginal Place Type	Frequency	Per cent (%)
N/A	3	33%
Total components	9	100.00

Certain site types, such as culturally modified trees, are particularly vulnerable to destruction through historical occupation, while others, such as stone artefacts, are more resilient. The majority of sites comprise mixed 'Art' and 'PAD' sites, including isolated and low density artefact scatters that is partially indicative of the level of historic disturbance present in the Kangaroo Valley. The lack of recorded scarred trees can be considered both a result of disturbance of the valley floors and lack of surveys / data for the escarpment. The distribution of the recorded sites within the AHIMS search area is shown in Figure 4-1. The results of the AHIMS search are appended in Appendix A.

The majority of the registered AHIMS sites are located to the south, southwest and southeast of the project area and were likely identified during the heritage assessments prepared for the development of the land on the Kangaroo Valley floor. Therefore, additional archaeological resources may be present but have not been identified due to lack of previous archaeological investigations, particularly on the sandstone escarpment.

Eight of the nine Aboriginal sites have been recorded utilizing the Australian Geodetic Datum (AGD), indicating older / earlier sites on the AHIMS or former National Parks register. Despite conversion of the sites to modern GDA 1994 coordinates, it can be considered that the AGD sites are likely to varying degrees inaccurate. Four of the sites have been recorded in association with Tallowa Dam Road. Two additional sites are located in proximity to Lake Yarrunga, likely in association with the Boot (2002) PhD study for the South Coast hinterland.

The closest site to the project area is Lake Yarrunga 4 (#52-4-0118) and is located 3.6 km to the southwest of Location 9. No previously identified sites will be impacted by the proposed works.



Legend

- Existing KV tunnel alignment
- Existing scheme pipeline
- Indicative above ground pipeline
- Indicative tunnel alignment
- Indicative access tunnel
- Disturbance area
- Spoil site
- Additional areas since 2019

- Art (Pigment or Engraved), Artefact, Potential Archaeological Deposit (PAD)
- Art (Pigment or Engraved), Artefact, Potential Archaeological Deposit (PAD), Grinding Groove
- Art (Pigment or Engraved), Grinding Groove, Potential Archaeological Deposit (PAD)
- Art (Pigment or Engraved), Ochre Quarry, Water Hole
- Artefact
- Grinding Groove

- Potential archaeological sensitivity
- BH 9 investigation area
- AHIMS search extent
- State Forest
- NPWS Reserve
- Road
- Waterway
- Waterbody

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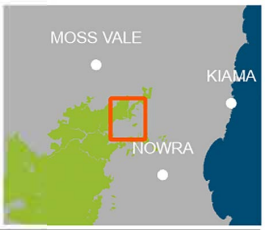
GDA2020 MGA Zone 56



Data sources

Jacobs 2022
Department of Planning and Environment 2022
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Figure 4.1 AHIMS

4.2 Aboriginal Place Atlas search

A search for Aboriginal Places in proximity to the project area was undertaken on 15 June 2022 by Matt Finlayson (Project Archaeologist, Jacobs).

No gazetted Aboriginal Places are in proximity to Borehole Location 9.

4.3 State Heritage Inventory search

Searches of the following relevant historic heritage databases were undertaken on 15 June 2022 by Matt Finlayson (Project Archaeologist, Jacobs):

- Commonwealth Heritage Register
- National Heritage Register
- Shoalhaven LEP 2014
- S170 Government Agency Heritage Register.

No historic or Aboriginal heritage places listed on the above registers are located within close proximity to Borehole Location 9.

5. Archaeological Context

5.1 Environmental context

The project area is located in the north end of the Sydney Basin, a geological feature located within New South Wales. Lying between the New England and the Lachlan Fold Belt, the Sydney Basin was formed roughly 300 million years ago as an effect of the river delta replacement of oceans (Rose 1996).

Shoalhaven is dominated by Permian age sandstones and siltstone (Branagan and Packham 2000). The surrounds of the project area are dominated by Early Permian layers consisting of the Shoalhaven Group which includes Nowra Sandstone, and the Berry Formation. Overlaying the Shoalhaven Group is the Illawarra Coal Measures, before being overlain with the Hawkesbury Sandstone. There are small pockets of Quaternary alluvium to the west of the project area.

The soil present within Shoalhaven comprise part of a fluvial landscape containing active flood plains with levees and backwater swamps on alluvium (Artefact Heritage 2012:4). The levees present within the soil are made up of brownish black fine sandy loam which overlays brown sandy clay loam also known as Prairie Soils.

The soils of the Shoalhaven region fluctuate between moderately to strongly acidic, with a higher risk of acid sulphate soils on the lower floodplains of the Shoalhaven River (Endeavour Energy 2012:30).

The closest water sources include Fitzroy Falls Reservoir to the North of the project area, Bendeela Pondage and Lake Yarrunga to the South of the project area, Yarrunga Creek to the West and Miller Creek to the East.

In 1805 it was recorded by James Meehan that the area was compressed of grasslands, freshwater swamps, as well has areas covered by 'rainforest, brush cedar, softwoods, coachwood, blackbutt, sassafras, flametrees, brushes, palms, ferns, vines, orchids, eucalyptus, and casuarinas' (as cited in Bayley 1975:18).

5.2 Historic land use

This section relates to historic land use that may have impacted the survivability of Aboriginal objects. Aerial imagery indicates the surrounds of the project area currently encompasses predominantly National Parkland with some residential and agricultural properties. The original landscape within the project area has changed since the arrival of Europeans. Though patches of original vegetation remain, such as Eucalypt woodland, much of the original vegetation has been cleared to make room for pastural practices. Dairy cattle farming is the primary industry in the region which has meant areas of land are fences off and ploughed.

The Borehole Location 9 is located on the Promised Land Trail adjacent west of the northern aperture of the underground water race to the Kangaroo Valley Power Station, to the south. The surrounding area has been subject to significant disturbance from historic clearing / management of forestry, clearing of vegetation and topsoil for the Promised Land Trail and construction of the nearby water pipeline including ancillary structures and above / underground services.

5.3 Summary of previously completed archaeological assessments

Towle, C. C. 1941 as cited in (Bindon 1976)

Work by Bindon (1976) examines research conducted by Towle, C. C. in 1941 which concentrated in the Mundamia Creek area. In this area a variety of archaeological sites were uncovered, including rock art, scarred trees and a bora grounds. Photographs on glass plate negatives were taken and allow the stone arrangements and scarred trees to be examined as they no longer exist. Similarly, the rock art which was recorded has deteriorated due to vandalism and graffiti.

Artefact Heritage (2012)

Commissioned by Parson Brinkerhoff, this archaeological assessment was undertaken due to a proposed expansion and refurbishment of the existing Nowra 33kV feeder line. The study area which was investigated was a 7.1 km corridor which passed through north Nowra, across the Shoalhaven River and south toward west Nowra. Located within an area of high cultural significance, there were 78 previously recorded Aboriginal sites within the vicinity. Among these, four sites were located within 50m from the proposed work location (AHIMS #52-5-0544 located within the transmission line; AHIMS #52-5-0390; AHIMS #52-5-0542; AHIMS #52-5-0262).

The survey carried by Artefact Heritage (2012) did not result in the identification of any additional Aboriginal sites or objects. Though no new sites were recorded, the survey reidentified site #52-5-0544, an isolated find consisting of a red fine-grained siliceous core with one flake scare, and an artefact scatter (#52-5-0390). Both sites were unable to be relocated and as such it was recommended that this location be cordoned off to prevent secondary impact during the proposed works.

Artefact Heritage (2018)

This Aboriginal Cultural Assessment investigated an area over the Shoalhaven River at Nowra where the construction of a new bridge on the A1 Prince Highway was proposed. The area analysed was situated 120 km south of Sydney and 30 km south west of Kiama, comprising a total area of 61 hectares centered on the Princes Highway and located at around 13-14 km from the coastline. This area is situated between two different geomorphological and botanical zones. These topographical characteristics seem to suggest that there might be a high density of Aboriginal sites resulting in activities such as camping. However, ground surface disturbance and vegetation clearance has occurred across the area which may have impacted on the preservation of Aboriginal cultural heritage.

A previous assessment within this area by Kelleher Nightingale Consulting (2010) identified 28 sites within Bomaderry Creek Regional Park. The majority of these sites (19 sites) were rock shelters and some of these showed traces of art. The other sites included artefact scatters, a midden, isolated finds, and a grinding groove. The archaeological survey (2018) identified five Aboriginal sites and five areas with PADs.

Test excavations identified five additional Aboriginal sites in the area of the proposed works. The test excavation also registered a high disturbance in all sites within the study area, supporting the idea that this area and the preservation of sites has been impacted on. An additional archaeological survey was performed during the test excavation to support some changes in the study area and this revealed the presence of a new Aboriginal site.

Navin Officer (2002)

Navin Officer (2002) performed a heritage survey which investigated 8 km of the pipeline road between Bendeela pondage and Fitzroy Falls reservoir, 3.6 km of road around Bendeela pondage, and 3.5 km along the Lake Yarrunga. This survey identified four Aboriginal sites located on the access road on north side of Lake Yarrunga. Two of the sites were found on the lower slopes of south-facing spurs, one about 400m north of the Kangaroo River and one approximately 250 m west of the Kangaroo River. Another site was located on a lower slope about 20m west of the Kangaroo River and the final site was found on a basal slope situated approximately 25 m north of the Kangaroo River (Navin Officer 2002).

The recorded sites were all considered low density scatters, located in disturbed contexts and ranged in size from a single artefact up to 13 artefacts. From these site locations, a model was developed which indicates that sites may occur particularly on the spurs in the valley floor and within at least 400 m of the Kangaroo River.

Navin Officer (2005)

Commissioned by CH2MHill, this report was developed with the aim of identifying any Aboriginal heritage that may be impacted by the proposed development of a sewerage scheme for the Kangaroo Valley. A sewerage strategy study was performed to develop options for improving the water waste management within the region. The study area was located within the Kangaroo Valley and corresponds directly to the project area of the Shoalhaven Hydro Expansion project. Examination into previous archaeological investigations revealed there was no previously recorded sites directly associated with the project area. An isolated artefact within 5 km of the study area and three grinding grooves sites within a 180 km^2 area within the valley were present. However, this site data was affected by the lack of prior systematic survey and thus, may not be a true reflection of site numbers and location.

Part of the report provided an investigation into the few archaeological surveys which had been conducted within the Kangaroo Valley. One such survey was conducted Silcox (1991). Silcox (1991) surveyed a linear transect located immediately to the east of Bendeela Pondage and a pipeline route extending eastwards to the Nowra Road. No Aboriginal sites were located as a result of the survey and for this reason it was assessed a low archaeological potential for this area. However, the absence of Aboriginal sites appears to have been due to low visibility at the time. In 1994, Peter Kuskie surveyed the northern side of the Kangaroo Valley and recorded an isolated find, however the report was not catalogued as the DEC Hurstville Office and cannot be located. This isolated find was located during the Navin Officer (2005) survey. Following this, a survey was

conducted by Oakley (1997), in relation to a bridge construction project at Nugents Creek. No Aboriginal sites were recorded, however similarly to Silcox (1991), the visibility was low.

The survey conducted to develop this report recorded two Aboriginal sites (KVIF1, a single artefact and KVAS1 which comprised of 11 artefacts within an area 50m x 30m) and nine areas with archaeological potential (KVPAD1, KVPA2, KVPA3, KVPA4, KVPA5, KVPA6, KVPA7, KVPA8, KVPA9). A full survey of the pipeline routes from and though Kangaroo River, however, was not conducted. During the survey it was also noted that there were subsurface archaeological deposits and, thus, there is potential for additional information which is likely to be undisturbed and in situ. The report concludes that the lack of previous archaeological research within the Kangaroo Valley means that prediction about the nature and extent of subsurface deposits can only be uncertain.

Harper *et al*. (2012)

The test investigations by Harper *et a*l. (2012) investigated any Aboriginal heritage that may have been impacted by the proposed development of a sewerage scheme for the Kangaroo Valley. The construction of the Kangaroo Valley Sewerage Scheme would include impacts at one of the previous recorded sites (KVIF1/AHIM#52-5-0432) and an area of a PAD (KVPAD1/AHIM#52-5-0644). For this reason, an Aboriginal subsurface test excavation and a surface artefact salvage program were initiated for AHIMS sites #52-5-0432 and #52-5-0644. The archaeological surface collection was to recover the artefacts that were previously recorded and may have been impacted on by the construction of proposed works. A total of three Aboriginal stone artefacts, were collected during the surface collection, two artefacts were collected from the ground surface of the previously recorded site KVIF1 (AHIMS#52-5-0432) and the other one was found and collected in the vicinity of Pit 35 At KVPAD1 (AHIMS #52-5-0644).

5.4 Visual inspection

A visual inspection of the project area was undertaken on Friday 10 June 2022 by Ryan Taddeucci (Senior Archaeologist, Jacobs) and Pauline Ramsey (Project Archaeologist, Jacobs).

5.4.1 Methodology

The visual inspection was conducted via meandering pedestrian transects to achieve maximum coverage of the project area. GPS tracks were taken in .GPX format to provide a record of the survey coverage and photographs were taken to provide a visual sample of conditions present within the project area.

5.4.2 Results

The southern portion of the Borehole Location 9 area has been subject to cut and fill disturbance consistent with establishment of the pre-existing track (Picture 5.1). The northern section has been subject to laydown of imported gravel as well as disturbance from built infrastructure (amenities, site buildings etc.) (Picture 5.2). Underground services were inferred to be present through the project area including sewerage and sub-surface electrical lines.

Soils generally comprised fine grained sand consistent with the underlying sandstone escarpment geology with gravel inclusions, particularly in the southern portion of the project area (Pictures 5.3 and 5.4). Surface visibility in the southern portion was generally at 30%, with 10% exposures. The northern portion of the project area contain bedrock outcrops in limited deposits (Picture 5.6). Visibility in the northern portion was 80% with 40% exposures.

Surrounding vegetation is noted to be dense, comprising predominantly Eucalyptus spp., with new growth trees and occasional shrub and grass species as undergrowth (Picture 5.7). The area has been historically cleared as a result of forestry land practices, significantly reducing the potential for Aboriginal scarred trees to be located in proximity to the project area.

No Aboriginal objects or areas of high archaeological sensitivity constituting Potential Archaeological Deposits (PAD) were identified as a result of the visual inspection of the project area. It was determined that there was a low to nil potential for Aboriginal objects to be present within the project area.

Picture 5-1. The project area, facing west from the eastern boundary (Promised Land Trail).

Picture 5-2: Promised Land Trail facing east, including cut and fill disturbance for the trail (left and right of photo).

Picture 5-3: Existing structures and fence adjacent to the project area, facing east.

Picture 5-4: Ground surface conditions within the project area at Promised Land Trail.

Picture 5-5: Southern end of project area, gravel roadbase.

Picture 5-6: Outcropping of underlying geology, northern end of project area.

Picture 5-7: Juvenile / regrowth vegetation of the project area surrounds, facing generally north up the Promised Land Trail.

5.4.3 Summary and Discussion of Results

No Aboriginal objects were identified within the Borehole Location 9 area as a result of the visual inspection. Due to the coverage of the inspection and generally good surface visibility, it is likely that if Aboriginal objects were present on the ground surface within the project area they would have been identified during the survey.

The project area has been significantly disturbed by cut and fill disturbance for the Promised Land Trail, historic forestry practices, installation of sub-surface amenities for sewerage and electrical services and construction of the adjacent pipeline, underground race and ancillary buildings. This level of disturbance significantly limits the potential for Aboriginal objects to be present within the project area. As such it is determined that the project area has a low to nil likelihood to contain Aboriginal objects.

6. The Due Diligence Process

The Due Diligence Code of Practice provides a series of questions that must be answered to determine the outcome of the Due Diligence process. These questions are addressed in Table 5.

Table 5. Due Diligence questions and responses

Question	Answer	Comment
Will the activity disturb the ground surface or any culturally modified trees?	Yes	The geotechnical investigation will require surface disturbance of up to one square metre and drilling to a depth of 800 m at Borehole Location 9. No culturally modified trees will be impacted by the geotechnical activities. No culturally modified trees have been previously identified in proximity to the project area.
Are there any: ▪ Confirmed AHIMS records ▪ Other sources of information ▪ Landscape features	Yes	A total of 9 previously recorded Aboriginal sites were identified by the extensive AHIMS search. None of the previously identified sites are located in close proximity to the project area. The majority of local studies have been conducted on the Kangaroo Valley floor, indicating a degree of survivability of Aboriginal objects in even disturbed contexts. The project area is located on the Barrengarry Mountain escarpment at 572 m ASL.
Can harm to Aboriginal objects be avoided?	Yes	The project area comprising Borehole Location 9 has been significantly disturbed by historic land practices. These land practices would have significantly impacted upon the survivability of Aboriginal objects. It is determined that harm to Aboriginal objects will be avoided by the proposed geotechnical investigations.
Does a desktop assessment and visual inspection confirm the presence of Aboriginal objects, or that they are likely to be there?	No	With consideration for the nature of the surrounding environment, the surrounding AHIMS site record and the level of disturbance resulting from historic land use practices, it is considered to be unlikely that the proposed geotechnical activities will impact upon Aboriginal objects.
Is further assessment required?	No	The Due Diligence assessment has concluded that the proposed geotechnical borehole is unlikely to impact upon Aboriginal objects as there is a low to nil likelihood of them being present. As such, the works can proceed with caution.

7. Conclusions and Recommendations

A total of 9 previously recorded Aboriginal sites were identified by the extensive AHIMS search. Eight of the nine Aboriginal sites have been recorded utilizing the Australian Geodetic Datum (AGD), indicating older / earlier sites on the AHIMS or former National Parks register. Despite conversion of the sites to modern GDA 1994 coordinates, it can be considered that the AGD sites are likely to varying degrees inaccurate. Four of the sites have been recorded in association with Tallowa Dam Road. Two additional sites are located in proximity to Lake Yarrunga, likely in association with the Navin Officer (2002) study for the Bendeela Pondage to Fitzroy Falls Reservoir.

The closest site to the project area is Lake Yarrunga 4 (#52-4-0118) and is located 3.6 km to the southwest of Location 9. No previously identified sites will be impacted by the proposed works.

No Aboriginal objects were identified within the Borehole Location 9 area as a result of the visual inspection. Due to the coverage of the inspection and generally good surface visibility, it is likely that if Aboriginal objects were present on the ground surface within the project area they would have been identified during the survey.

The project area has been significantly disturbed by cut and fill disturbance for the Promised Land Trail, historic forestry practices, installation of sub-surface amenities for sewerage and electrical services and construction of the adjacent pipeline, underground race and ancillary buildings. This level of disturbance significantly limits the potential for Aboriginal objects to be present within the project area. As such it is determined that the project area has a low to nil likelihood to contain Aboriginal objects.

The following recommendations are made for Borehole Location 9:

- The proposed project area does not contain and is not likely to contain any Aboriginal objects. It is recommended that no further Aboriginal cultural heritage assessment actions are required, and the proposed works can proceed with caution
- This Due Diligence assessment does not constitute consent to harm Aboriginal objects, nor is it a 'site clearance' mechanism to allow activities to occur in an area where Aboriginal objects are likely or known to be present
- If Aboriginal objects are discovered during the proposed works, works must stop immediately and the unanticipated finds protocol approved under condition 1 of Schedule 3 of the Project approval implemented (refer to in Appendix B).

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Appendix A. Extensive AHIMS Search Results

AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : IS392600
Client Service ID : 658782

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
52-4-0200	Tallowa Dam Road 1	AGD	56	267625	6151544	Closed site	Valid	Art (Pigment or Engraved) : -, Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact: Searle	Recorders: Nowra LALC						Permits:		
52-4-0201	Tallowa Dam Road 2	AGD	56	267653	6151550	Closed site	Valid	Art (Pigment or Engraved) : -, Artefact : -, Potential Archaeological Deposit (PAD) : -, Grinding Groove : -		
	Contact: Searle	Recorders: Philip Boot						Permits:		
52-4-0205	Tallowa Dam Road 6	AGD	56	267400	6151500	Closed site	Valid	Art (Pigment or Engraved) : -, Ochre Quarry : -, Water Hole : -		
	Contact: Searle	Recorders: Philip Boot						Permits:		
52-4-0202	Tallowa Dam Road 3	AGD	56	267555	6151404	Closed site	Valid	Art (Pigment or Engraved) : -, Grinding Groove : -, Potential Archaeological Deposit (PAD) : -		
	Contact: Searle	Recorders: Philip Boot						Permits:		
52-5-0974	JCR ISO 01	GDA	56	272548	6152901	Open site	Valid	Artefact : -		
	Contact:	Recorders: Artefact - Cultural Heritage Management - Pyrmont,Miss.Julia McLachlan						Permits:		
52-5-0006	Barrengarry;	AGD	56	273259	6159554	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	
	Contact:	Recorders: Australian Museum						Permits:		
52-4-0117	Lake Yarrunga 3	AGD	56	266060	6153481	Open site	Valid	Artefact : 3		
	Contact:	Recorders: Doctor.Julie Dibden						Permits:		
52-4-0118	Lake Yarrunga 4	AGD	56	266927	6153640	Open site	Valid	Artefact : 1		
	Contact:	Recorders: Doctor.Julie Dibden						Permits:		
52-5-0291	nilda 1;	AGD	56	272570	6152370	Open site	Valid	Artefact : -	Isolated Find	
	Contact:	Recorders: Mr.Peter Kuskie						Permits:		

**** Site Status**
Valid - The site has been recorded and accepted onto the system as valid
Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.
Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground
Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 11/02/2022 for Ryan Taddeucci for the following area at Datum :GDA, Zone : 56, Eastings : 264974.0 - 273849.0, Northings : 6150178.0 - 6162300.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 9

This information is not guaranteed to be free from error omission. Heritage NSW and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

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Appendix B. Unexpected Finds Protocol

This process must be followed if an Aboriginal object (including objects that are suspected to be Aboriginal objects) are encountered during the proposed works.

Note: A discovery of human remains or suspected human remains (e.g. skeletal material), triggers a separate process (see below).

1) All ground surface disturbance in the area of the finds should cease immediately and Jacobs Site Manager and Jacobs Project Manager notified immediately.

2) If the find is suspected to be human skeletal material, Jacobs/ Origin to contact the NSW Police as soon as possible.

3) If there is doubt regarding an Aboriginal origin for the finds, then gain a qualified opinion from a Jacobs archaeologist. This can circumvent proceeding further along the protocol for items which turn out not to be of cultural origins. If the identification is positive, then proceed to the next step.

4) Immediately notify the following authorities or personnel of the discovery:

    a) Heritage NSW (1300 361 967);

    b) Relevant Aboriginal Community Representatives; and

    c) WaterNSW (Incident Number 1800 061 069).

5) Facilitate, in co-operation with the appropriate authorities and relevant Aboriginal community representatives:

    a) The recording and assessment of the finds;

    b) Fulfilling any legal constraints arising from the find(s). This will include complying with HeritageNSW directions; and

    c) The development and implementation of appropriate management strategies. Strategies will depend on consultation with stakeholders and the assessment of the significance of the find(s).

If human remains, or suspected human remains, are discovered during project works, the following actions will be taken:

1) All ground-disturbing works in the area of the remains will cease immediately following the discovery. The discoverer of the remains will notify machinery operators in the area to ensure work is halted.

2) The remains will not be removed from the area or disturbed in any other way.

3) The area will be secured by use of protective barriers, to ensure no harm can occur to the remains.

4) The site supervisor, the project manager and the client will be immediately informed of the discovery.

5) The project archaeologist will be informed of the discovery. The project archaeologist will determine if further assessment of the suspected remains is required. A specialist in the identification of human remains will need to be engaged to undertake this assessment.

6) If it is determined that the suspected remains are not human, work can recommence.

7) If it is determined that the suspected remains are human, or are likely to be, the following steps must occur, in accordance with the relevant legislation (including the *Coroners Act* 2009, the *National Parks and Wildlife Act* 1974 and the *Heritage Act* 1977).

8) Notify the following organisations:
    a. NSW Police
    b. Heritage NSW - 1300 361 967
9) The NSW Police will determine if the suspected human remains are human and if they represent a crime scene. If the human remains are determined to represent a criminal act, the NSW Police will direct proceedings, including deciding when works may continue.
10) If NSW Police determine that the suspected human remains are human and are Aboriginal Ancestral Remains, or non-Aboriginal Ancestral Remains, Heritage NSW will be responsible for determining the next course of action.
11) All activities will be directed by Heritage NSW.
12) Works cannot proceed on site until Heritage NSW determine that it is appropriate to do so.