Targeted Ecological Impact Assessment

Greater Sydney Rockfall Stabilisation Program - Nepean Dam (Site 005D)

Water NSW

28 February 2023

→ **The Power of Commitment**

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1. Introduction

1.1 Background

GHD Pty Ltd (GHD) has been engaged by WaterNSW to prepare this Targeted Ecological Impact Assessment report (EIA) for an embankment located at the Nepean Dam (identified by WaterNSW as Site 005D), located at Bargo, NSW (refer to Figure 1 Site 005D locality). The stabilisation of the embankment is proposed as a part of WaterNSW's proposed Greater Sydney Rockfall Stabilisation Program. The stabilisation works are required in order to reduce the risk of infrastructure damage and personnel injury and has been prompted in response to a number of rockfalls at WaterNSW Dam sites over the last few years. It is understood that the remediation works may be completed in sections (chainages) to mitigate impacts to fauna, if required.

WaterNSW has indicated that the proposal would be assessed under Division 24 s. 2.159 (2)(b) of *State Environmental Planning Policy (Transport and Infrastructure) 2021* (TISEPP), and as such, is development permitted without consent that would be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). WaterNSW would be the consent authority.

Several studies have been conducted at the site by GHD, including a detailed design report and a biodiversity constraints report (see section 1.2). This EIA was required to further assess the potential for threatened fauna (i.e. Large-eared Pied Bat (*Chalinolobus dwyeri*)) to occur and to map the locations of the threatened species Woronora Beard-heath (*Leucopogon exolasius*) that was identified at Site 005D during previous investigations (see Section 3).

1.2 Previous studies

GHD previously prepared the following two reports relevant to this assessment:

– *Greater Sydney Rockfall Stabilisation Project, Detailed Design Report* dated January 2020 (GHD, 2020); and
– *Nepean Dam Site 005D - Biodiversity Constraints Assessment* dated June 2022 (GHD 2022).

The above reports are discussed in the following sections.

1.2.1 Greater Sydney Rockfall Stabilisation Project, Detailed Design Report

GHD was previously engaged by WaterNSW to carry out slope remediation design for a number of dam sites across the greater Sydney Area. The assessment was required to support WaterNSW's legislative requirements with regards to biodiversity for the proposed Greater Sydney Rockfall Stabilisation Program. The dam sites, which included Site 005D, had been prioritised by WaterNSW for treatment on the basis of risk assessment carried out in previous studies. GHD (2020) provided a scope of work and specifications for the remediation of the risk sites.

GHD (2020) employed a risk-based approach to assess and develop the rockfall mitigation, which included adopting the pragmatic 'ALARP' principle ("As Low As Reasonably Practicable") because reduction of risk to higher levels was often not viable. This resulted in proposed risk management techniques/methods that are varied and minimal in design, and also require little to no ongoing maintenance. Hence, the disturbance to the surrounding environment, both during and following remediation, is expected to be minimal.

The proposed slope remediation works for Site 005D includes the following:

– Devegetation – predominantly comprising the removal of trees, stags, stumps and shrubs that are contributing to the risk of rockfall/inhibiting remediation due to their location
– Targeted removal and scaling[1] of 150 m^2 of rock
– The installation of ~70 rock bolts
– The installation of 40 m^2 of reinforced shotcrete; and
– The installation of 25 m^2 of pinned rockfall mesh

The design drawings for site 005D have been provided in Appendix A.

[1] The removal of loose rock

1.2.2 Nepean Dam Site 005D - Biodiversity Constraints Assessment

GHD previously completed a high-level biodiversity constraints assessment (BCA) at Site 005D to provide preliminary advice on the potential for impacts on threatened species, populations and communities (threatened biota) resultant from the proposed works; and the need for further assessment.

Key biodiversity values recorded at the site by GHD (2022) included a population of threatened flora, potential roosting habitat for microbats, and native vegetation that may provide habitat for a range of threatened species. Field surveys completed as part of the constraints assessment identified a population of the threatened plant *Leucopogon exolasius*, listed as Vulnerable under the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on the rock wall during the surveys. Four individuals were recorded between CH-215 and CH-225 along the rock wall), with approximately another 15 individuals to the north, outside of the boundary of Site 005D. The constraints assessment also identified the presence of suitable habitat for the Large-eared Pied Bat (*Chalinolobus dwyeri*), which is listed as Vulnerable under the BC Act and EPBC Act, and the Large Bent-winged Bat (*Miniopterus orianae oceanensis*), which is listed as Vulnerable under the BC Act. These species were considered to have the potential to roost in 'honeycomb' crevices in the sandstone outcrops on the rock wall (occurring at approximately CH110 m to CH135 m along the rock wall and near rockfall hazard N31 – as shown on the design plans).

Based on the results of the constraints assessment, GHD (2022) considered the below (in order of their likely constraint) to the proposed works:

– Very high constraint: Areas which contain a population of the threatened species *Leucopogon exolasius*
– High constraints: Areas that may contain significant habitat resources for threatened fauna (crevices in sandstone outcrops and hollow-bearing trees)
– Medium constraint: Native vegetation that provides habitat for native flora and fauna.

The works associated with the stabilisation remedial solutions were considered likely to impact the areas supporting the population of *Leucopogon exolasius*, and the hollow-bearing trees and sandstone outcrops that contain suitable breeding habitat for threatened microbats.

GHD (2022) recommended that an EIA should be undertaken to map the full extent of the population of *Leucopogon exolasius* at Site 005D. Given the access limitations it was recommended that the surveys be undertaken during the flowering period (August/September) to aid in identification of the species. It was also recommended that a bat survey be undertaken in the proposal site to investigate the potential breeding habitat for the Large-eared Pied bat on the proposal site. The surveys would involve deploying Anabat devices near the potential breeding habitat and visual inspection (where possible) of crevices in sandstone outcrops.

The EIA would assess the likely significance of impacts of the proposal on biodiversity values, in particular threatened biota and their habitats listed under the BC Act and MNES; and whether further assessment or reporting would be required.

1.3 Proposal description

Based on the remediation design plans[2], the proposed works include a mix of methods, including scaling and grooming, tree lopping/removal of vegetation, shotcrete and pinned rock fall mesh in localised areas across Site 005D (see Section 3). It is understood that the remediation works are intended to be completed in the following sections to allow for the management of threatened biota at Site 005D:

– Between CH-25 to CH35; and
– Between CH35 to CH250 (the remainder of works).

This report presents the results of the EIA. Further information describing the aims and purposes of this report are provided in Section 1.2 and 1.4.

[2] *Slope stabilization treatment – Nepean Dam – Site 005D* drawings prepared by GHD for WaterNSW, Greater Sydney Rockfall Stabilisation, Drawing No. 12519708-N005D dated 17 January 2020 (the design plans)

1.4 Purpose of this report

The aims of this EIA report are to:

- Describe the existing environment within Site 005D
- Map the locations and extent of *Leucopogon exolasius* across Site 005D
- Determine the presence of threatened fauna (i.e. *Chalinolobus dwyeri*) within areas that may be impacted by the proposal
- Assess the likely impacts on the above threatened biota resulting from the proposed works
- Recommend mitigation measures to reduce impacts on biodiversity values
- Provide concluding statements regarding the likely significance of impact of the proposed works on threatened biota listed under the BC Act and/or Matters of National Environmental Significance (MNES) including threatened and migratory biota listed under the EPBC Act, and the requirement or otherwise for further assessment or approvals at the State or Federal level.

1.5 Scope and limitations

This report: has been prepared by GHD for Water NSW and may only be used and relied on by Water NSW for the purpose agreed between GHD and Water NSW as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Water NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

1.6 Terms and definitions

The following definitions have been used in this report:

- The '**proposal**' or '**proposed works**' refers to the proposed stabilisation remediation works, briefly discussed in Section 1.1, and as shown in the design plans
- '**Site 005D'** refers to the entire 005D site as defined by WaterNSW, and as shown on Figure 2. It is noted that Site 005D is made up of a series of chainages (from -25 m to 240 m), as shown on the design plans, and Figure 2. Site 005D is described further in Section 2 below
- The '**remediation area**' refers to those areas directly impacted by the proposed works. This comprises the individual proposed remediation locations, as well as access routes required to complete the proposed works
- The '**locality'** is the area within a 10 km radius of Site 005D.

Figure 1 *Site 005D locality*

2. Legislative context

2.1 NSW State legislation

2.1.1 Environmental Planning and Assessment Act 1979

The EP&A Act forms the legal and policy platform for proposal assessment and approval in NSW and aims to, amongst other things, 'encourage the proper management, development and conservation of natural and artificial resources'. All development in NSW is assessed in accordance with the provisions of the EP&A Act and the Environmental Planning and Assessment Regulation 2000.

The proposed works, as an activity that is permissible without consent, is to be determined under Part 5 of the Act and WaterNSW is the 'determining authority' for the purposes of the Act.

The EP&A Act is subject to the provisions of Part 7 of the BC Act and Part 7A of the *Fisheries Management Act 1994* (FM Act). Part 7.3 of the *Biodiversity Conservation Act 2016* (BC Act) and section 220ZZ of the FM Act list factors that must be taken into account when determining the significance of potential impacts of a proposed activity on threatened species, populations or ecological communities (or their habitats) listed under the BC Act and the FM Act. The 'assessment of significance' is used to assist in the determination of whether a proposal is 'likely' to impose 'a significant effect' on threatened biota and thus whether a species impact statement (SIS) is required under the BC Act or FM Act. Under the BC Act, there is also the option to prepare a Biodiversity Development Assessment Report (BDAR) rather than an SIS, where a significant impact is likely.

Assessments of significance have been prepared for threatened biota that would be impacted or are likely to be impacted by the proposal and are provided in Appendix B.

2.1.2 Biodiversity Conservation Act 2016

The BC Act provides legal status for biota of conservation significance in NSW. The BC Act aims to, amongst other things, 'maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development'. It provides for the listing of threatened species and communities, establishes a framework to avoid, minimise and offset the impacts of proposed development (the Biodiversity Offsets Scheme, BOS), and establishes a scientific method for assessing the likely impacts on biodiversity values and calculating measures to offset those impacts (the Biodiversity Assessment Method, BAM). As this proposal is being assessed under Part 5 of the EP&A Act, assessment in accordance with the BAM is not required unless there is likely to be a significant impact on threatened biota.

Part 7.3 of the BC Act lists five factors that must be taken into account when determining the significance of potential impacts of a proposed activity on threatened species, populations or ecological communities (or their habitats) listed under the BC Act. The 'five part test' or 'assessment of significance' is used to assist in the determination of whether a proposal is 'likely' to impose 'a significant effect' on threatened biota and thus whether a species impact statement (SIS) is required. There is also the option to prepare a Biodiversity Development Assessment Report (BDAR) rather than an SIS, where a significant impact is likely.

All field surveys for this assessment were carried out under a Section 132C scientific licence (SL100146) issued under the BC Act.

The BC Act has been addressed in this assessment through:

- Review of GHD (2022) to determine the threatened species, populations or ecological communities that have been previously recorded within the locality and hence could occur subject to the habitats present
- Field surveys for listed threatened species, populations and ecological communities.
- Assessment of the potential for threatened species (or their habitat) to occur and be impacted.
- Assessment of potential impacts on listed threatened species, populations and ecological communities.
- Assessment of the likely significance of impacts and requirement or otherwise for a species impact statement (SIS) or biodiversity development assessment report (BDAR).
- Identification of suitable impact mitigation and environmental management measures.

2.1.3 Fisheries Management Act 1994

The objectives of the FM Act are to conserve, develop and share the fishery resources of the State for the benefit of present and future generations. It provides for the listing of threatened species, populations and ecological communities, key threatening processes and requirements or otherwise for the preparation of a SIS. One of the objectives of the FM Act is to 'conserve key fish habitats' which includes aquatic habitats that are important to the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. To assist in the protection of key fish habitats, DPI has produced the *Policy and guidelines for fish habitat conservation and management* (DPI 2013).

The FM Act has been addressed in this assessment through undertaking:

– A desktop review of GHD (2022) to determine the threatened species, populations or ecological communities that have been previously recorded within the locality of the proposal and hence could occur subject to the habitats present.
– Assessment of potential impacts on aquatic habitats, including identification of key threatening processes of relevance to the proposal, impacts on key fish habitat and fish passage.
– Assessment of the potential for impacts on listed threatened species, populations and ecological communities and the requirement or otherwise for an SIS.
– Identification of suitable impact mitigation and environmental management measures to avoid or mitigate impacts on the aquatic environment.

While there is aquatic habitat in the vicinity of Site 005D (i.e. the Nepean River), there is no aquatic habitat in Site 005D and the works are not expected to impact any nearby aquatic habitats.

2.1.4 Local Land Services Act 1993

This pathway sets out the clearing of native vegetation in regulated rural areas for allowable activities that are authorised without any other approval under Part 5A of the LLS Act, provided the clearing is undertaken in accordance with the Land Management (Native Vegetation) Code 2018 (NSW).

Under the allowable activities pathway, Part 7 of the BC Act does not apply to clearing in a rural area, provided it does not require authorisation under Part 4 or Part 5 of the EP&A Act. As the proposed works are located in a rural area and do not require development consent under the EP&A Act, there would be no requirement to prepare a BDAR or to secure biodiversity offsets under Part 7 of the BC Act. If a significant impact on threatened biota listed under the BC Act is likely, then an environmental impact statement would be required and an alternative approval pathway would apply.

The LLS Act has been addressed in this assessment through:

– A desktop review to determine the threatened species, populations or ecological communities that have been previously recorded within the locality of the proposal and hence could occur in the proposal site, subject to the habitats present.
– Assessment of potential impacts on listed threatened and/or migratory species, populations and ecological communities pursuant to part 7.3 of the BC Act, as described above.
– Identification of suitable impact mitigation and environmental management measures to minimise potential impacts on threatened biota.

2.1.5 Biosecurity Act 2015

The *Biosecurity Act 2015* provides for risk-based management of biosecurity in NSW. It provides a statutory framework to protect the NSW economy, environment and community from the negative impact of pests, diseases and weeds.

The primary object of the Act is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers.

In NSW, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

2.2 State Environmental Planning Policies (SEPP)

2.2.1 SEPP (Biodiversity and Conservation) 2021 - Chapter 4 Koala habitat protection 2021

Chapter 4 (Koala Habitat Protection 2021) of State Environmental Planning Policy (Biodiversity and Conservation) 2021 aims to encourage the 'proper conservation and management of areas of natural vegetation that provide habitat for Koalas (*Phascolarctos cinereus)* to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline'.

Part 4.1 of Chapter 4 identifies Local Government Areas (LGAs) to which this SEPP 44 applies. Wollondilly Shire Council Local Government Area is listed in Chapter 4 as having the potential to contain Potential Koala Habitat and/or Core Koala Habitat:

– Potential Koala Habitat are areas of native vegetation where the trees of the types listed constitute at least 15 per cent of the total number of trees in the upper or lower strata of the tree component.
– Core Koala Habitat is an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

Potential impacts on the Koala have been considered in this report given the species' is listed as Endangered under both the BC Act and the EPBC Act, and is discussed in Section 5.4.2.2.

2.3 Commonwealth legislation

2.3.1 Environment Protection and Biodiversity Conservation Act 1999

The purpose of the EPBC Act is to ensure that actions likely to cause a significant impact on MNES or the environment of Commonwealth land undergo an assessment and approval process. Under the EPBC Act, an action includes a proposal, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things. An action that 'has, will have or is likely to have a significant impact on a MNES or a significant impact to the environment of Commonwealth land is deemed to be a 'controlled action' and may not be conducted without prior approval from the Australian Minister for the Environment.

The EPBC Act identifies MNES as:

– World heritage properties.
– National heritage places.
– Wetlands of international importance (Ramsar wetlands).
– Threatened species and ecological communities.
– Migratory species.
– Commonwealth marine areas.
– Nuclear actions (including uranium mining).
– A water resource, in relation to coal seam gas development and large coal mining development.

The EPBC Act has been addressed in this assessment through:

– Desktop review to determine the threatened and/or migratory species or threatened ecological communities that have been previously recorded within the locality and hence could occur within the study area, subject to the habitats present.
– Desktop review of any other additional MNES e.g. Ramsar sites or World Heritage Areas that are present in the locality and that may be impacted by the proposal.
– Targeted field surveys for threatened biota listed under the Act.

- Identification of suitable impact mitigation and environmental management measures for threatened biota, where required.
- Assessment of potential impacts on MNES and any potential requirement for a referral or being a controlled action.

3. Methods

The following approach was adopted to assess potential ecological impacts of the proposed activity:

– Desktop assessment;
– Field surveys including mapping the locations of *Leucopogon exolasius*;
– Assessment of significance of impacts, based on indicative remediation locations and mitigation of impacts.

3.1 Desktop assessment

A review of ecological databases and other existing information was undertaken by GHD (2022) to identify threatened biota listed under the BC Act and ecological MNES listed under the EPBC Act previously recorded or predicted to occur in the locality that may be affected by the proposed works (DAWE, 2022; DPE, 2022b). While database and literature reviews were completed as part of GHD (2022), additional reviews of BioNet NSW data were also completed as a part of this EIA with an aim to identify populations of *Leucopogon exolasius* and *Chalinolobus dwyeri* surrounding, and near to, Site 005D to inform the Test of Significance (5-Part Test).

A review of photographs used to build photogrammetry models of the slopes to provide an initial assessment of the existing environment, including site conditions, vegetation type, floristic composition and habitat suitability for threatened biota was also completed.

3.2 Field survey

This assessment relies on the field surveys completed as part of the constraints assessment completed in May 2022 (GHD 2022), as well as supplementary field surveys completed in September 2022 to focus on matters identified within that constraints assessment. Methods included in GHD (2022) included a site inspection in May 2022 to ground-truth and verify vegetation mapping (NPWS, 2003), habitat values and conservation significance, as reported in GHD (2022). Tasks included:

– mapping of the extent of native vegetation and identifying PCTs and condition classes according to the NSW Biodiversity Assessment Method (BAM) (DPIE, 2020)
– identification of TECs listed under the BC Act or EPBC Act
– broad scale terrestrial habitat assessment to identify potential habitat for threatened and migratory species.
– mapping the presence and extent of *Leucopogon exolasius* within Site 005D and immediate surrounds (see section 3.2.1 for more detail).
– microbat surveys at ‘honeycombed’ rock overhangs in Site 005D for a period of 12 days (i.e. 15 to 26 September 2022) (see section 3.2.2 for more detail).

3.2.1 Targeted threatened flora surveys

Targeted surveys undertaken for *Leucopogon exolasius* involved two surveyors walking slowly, about 2 metres apart over accessible terrain, mapping any occurrences of the species on a handheld GPS. Given the terrain of the site, not all areas were able to be traversed on foot. In these instances, rock walls were visually scanned using binoculars, and the location of threatened plants was estimated using aerial photo interpretation and mapped using GPS.

See Section 4.5.2 for results.

3.2.2 Terrestrial fauna survey

Microbat ultrasonic echolocation call recordings (Anabat surveys) were undertaken using one Anabat Express Zero Crossing detector over two weeks in the locations of the honeycombed overhangs reported in GHD (2022) (i.e. between CH110 and CH150 – see Figure 2). It is noted that two Anabat devices were set up in the field, however, one device failed to record any data.

The *Bat calls of NSW: Region based guide to the echolocation calls of microchiropteran bats* (Pennay et al. 2004) was used to assist call analysis. Call identification was also assisted by consulting distribution information for

potential species (Pennay et al 2011; Churchill 2008; Van Dyck et al. 2013) and records from BioNet (January 2022). No reference calls were collected during the survey.

A call (pass) was defined as a sequence of three or more consecutive pulses of similar frequency and shape. Calls with less than three defined consecutive pulses of similar frequency and shape were not unambiguously identified to a species but were used as part of the activity count for the survey area. Due to variability in the quality of calls and the difficulty in distinguishing some species the identification of each call was assigned a confidence rating (see Mills *et al.* 1996 & Duffy *et al.* 2000 for similar process) as summarised in Table 1. A conservative approach was taken when analysing calls due to the absence of reference calls from the study area, high level of variability within a bat call and overlap in call characteristics between some species.

Species nomenclature follows Armstrong, K.N., Reardon, T.B., and Jackson, S.M. (2020). A current taxonomic list of Australian Chiroptera. Australasian Bat Society. Version 2020-06-09.

Table 1. Confidence ratings applied to calls

Identification	Description
D - Definite	Species identification not in doubt.
PR - Probable	Call most likely to represent a particular species, but there exists a low probability of confusion with species of similar call type or call lacks sufficient detail.
SG - Species Group	Call made by one of two or more species. Call characteristics overlap making it too difficult to distinguish between species for e.g. *Chalinolobus gouldii /Ozimops sp.* *Nyctophilus sp.* The calls of *Nyctophilus geoffroyi / gouldi* cannot be distinguished during the analysis process and are therefore lumped together. *Nyctophilus sp/Myotis macropus.* The calls of these species can be easily confused during the analysis process and are therefore often lumped together.

See Section 4.5.3 for results.

3.2.3 Survey conditions

Surveys were conducted in early spring, with weather conditions being generally cool with frequent rain. Temperatures ranged between 4.3°C and 16.1°C, with precipitation ranging between 1.0 mm and 13.0 mm over six (non-consecutive) days. Temperature and rain details for the nearest weather station No. 068262 (i.e. High Range) are provided in Table 2 (BOM, 2022)[3].

Table 2 Daily weather data over the survey period

Date	Minimum temperature (°C)	Maximum temperature (°C)	Rainfall (mm)
15 September 2022	6.2	11.9	1.0
16 September 2022	7.8	15.7	8.2
17 September 2022	6.8	13.7	0
18 September 2022	6.7	13.1	0
19 September 2022	6.8	13.4	0
20 September 2022	4.3	16.1	0
21 September 2022	8.9	13.1	0
22 September 2022	9.6	12.6	7.0
23 September 2022	9.8	15.0	13.0
24 September 2022	10.2	14.1	8.8
25 September 2022	5.4	15.9	4.2
26 September 2022	5.8	14.5	0

[3] **BOM Climate Data - September 2022**

3.2.4 Survey limitations

As the study area comprises steep rocky terrain susceptible to landslide, and is also densely vegetated in parts, some areas were inaccessible by foot for the survey. Given the nature of the study area, surveys were rapid, focussing on accessible areas and areas of potential impact. Areas that could not be assessed on foot were photographed using an unmanned aerial vehicle (UAV) to obtain high resolution images for later assessment.

The locations of *Leucopogon exolasius* in and adjacent to the study area were recorded using a hand-held GPS with an accuracy of **+/-** 3 m. Therefore, the locations reported herein are approximate only. The recording of specimen locations with a sub-meter accuracy differential GPS was considered unsuitable from a safety perspective given the steep and unstable terrain.

Given the short duration and timing of the field survey it is likely that some species that use the study area (permanently, seasonally or transiently) were not detected during the survey. Also, given the limited survey effort, GHD is unable to dismiss species occurring at the site based on the bat analysis results. Some flora species only flower after fire or are annual, ephemeral or cryptic species. Some fauna species are also highly mobile and transient in their use of resources, some fauna species are cryptic in their habits, and some frogs call at other times of year.

The habitat assessment conducted for the site identifies habitat resources for threatened species likely to occur as reported in GHD (2022). As such, the survey was not designed to detect all species, but rather, provide a targeted assessment for the *Leucopogon exolasius* and *Chalinolobus dwyeri*. This was then used to predict potential impacts of the proposal on these species.

3.3 Constraints mapping

Constraints mapping was undertaken by GHD (2022) to identify and map the following biodiversity constraints in the areas of proposed disturbance:

- Biodiversity value and condition
- Level of legislative protection
- Level of biodiversity assessment and offsets likely to be required to support a development approval.

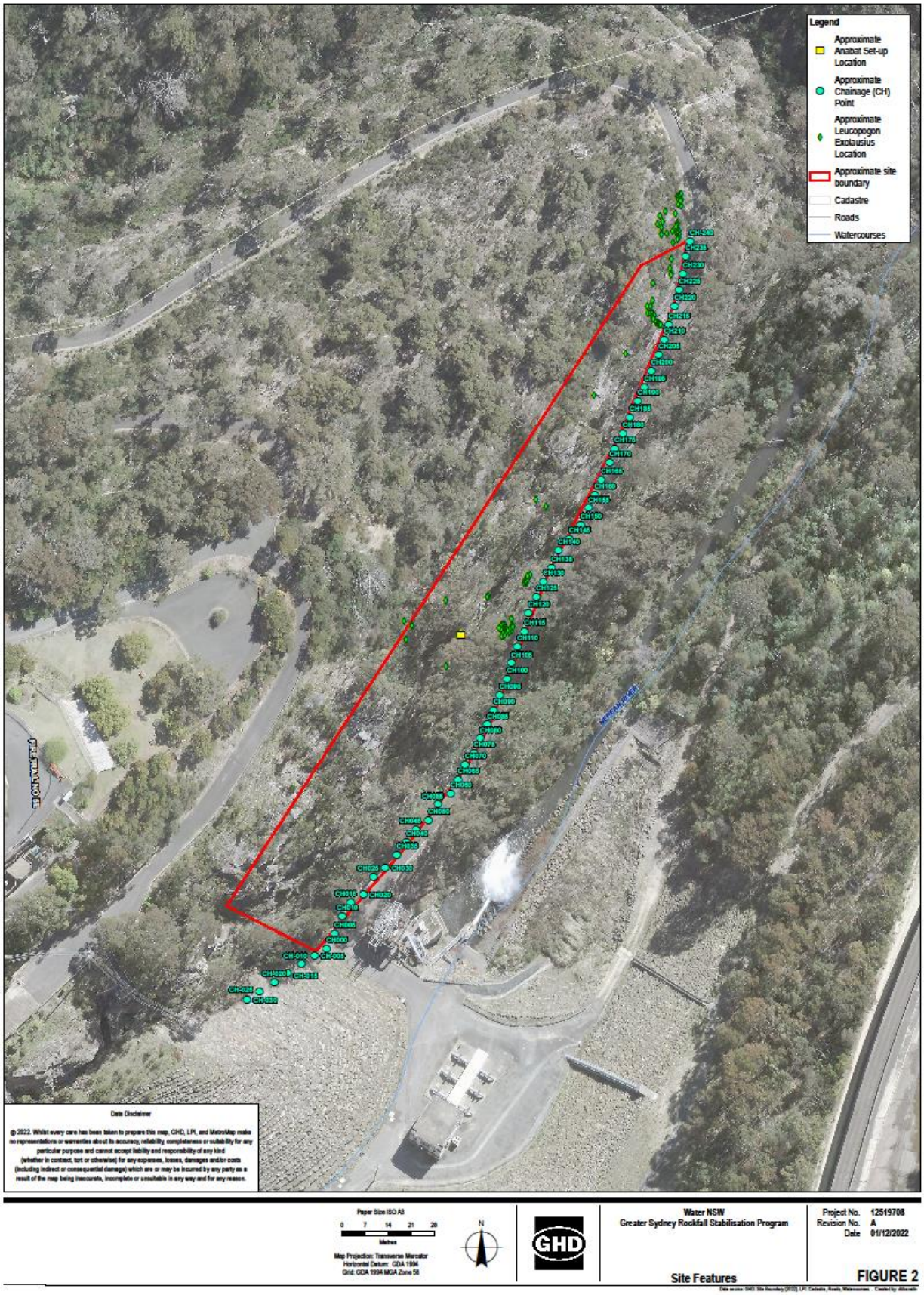

Figure 2 *Locations of Leucopogon exolasius and Anabat recording device at Site 005D*

4. Existing environment

4.1 Site Information

4.1.1 Site description

Site 005D is situated on the downstream left abutment slopes of Nepean Dam directly above the lower portion of the access road that leads down to the toe of the dam embankment. Directly adjacent to the road is a near-vertical sandstone cutting up to about 10 m high however for the most part it is less than 5 m high.

The roadside cutting is situated below a steep, rugged natural escarpment that forms the lower side of the Nepean River Valley, as shown on Photo 1 below. The escarpment is about 45 m high and extends up to the access road that leads to the left abutment. The escarpment is heavily vegetated with mature eucalypt trees and undergrowth. The lower parts of the escarpment typically comprise steep colluvial slopes.

A series of stepped and broken cliff lines extend upwards above the colluvial slopes with shear rock faces up to about 20 m high. Several prominent sandstone overhangs are formed within the upper sections of cliff-line.

Site 005D is identified as part Lot 12, Deposited Plan 1092321.

Photo 1 ***View of the southern portion of Site 005D (facing south) showing the steepness of the embankment***

4.1.2 Geology and soils

Based on the Wollongong-Port Hacking 1:100,000 Geology Sheet, geology at Site 005D comprises Hawkesbury Sandstone which is described as medium to coarse-grained quartz sandstone with very minor shale and laminite lenses.

The Wollongong-Port Hacking 1:100,000 Soils Landscape Sheet maps erosional soils of the Gymea Landscape at Site 005D. These soils are characterised by shallow to moderately deep sandy loams and clayey sands and are limited by localised steep slopes, a high erosional hazard, rocky outcrops, shallow highly permeable soil with very low fertility. When found on side-slopes, as with Site 005D, soils are discontinuous with rocky outcrops covering 25% of the ground surface.

4.1.3 Hydrology

The closest watercourse is the Nepean River, which is located approximately 40 m east of Site 005D. The Nepean River is a major perennial river that flows in a general northern direction towards its mouth at the Hawkesbury River.

4.2 Desktop assessment

In addition to the desktop assessment completed for GHD (2022), additional assessments were required to supplement GHD (2022) and inform this EIA. The results are as follows:

A review of BioNet NSW records collected for GHD (2022) reported that there were two populations of *Leucopogon exolasius* within 5 km of Site 005D, with one population of over 200 individuals southeast of Site 005D and another population in excess of 500 individuals southwest. Much smaller populations were also reported to the northwest. In general, *Leucopogon exolasius* appeared to be present in many of the ridges and gullies of the locality.

Sightings of Large-eared Pied Bat (*Chalinolobus dwyeri*) were reported 2 km east of Site 005D, with no other records within10 km. A number of other threatened species including Large Bent-winged Bat (*Miniopterus orianae oceanensis)*, Greater Broad-nosed Bat *(Scoteanax rueppellii)*, Little Bent-winged Bat *(Miniopterus australis)*, Golden-tipped Bat *(Phoniscus papuensis)*, Southern Myotis *(Myotis macropus)*, Eastern False Pipistrelle *(Falsistrellus tasmaniensis),* Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis)* and Yellow-bellied Sheathtail-bat *(Saccolaimus flaviventris)* were all reported within 10 km.

4.3 Vegetation and habitat values

The vegetation comprised an occurrence of Nepean Sandstone Gully Forest (Map Unit 27; NPWS, 2003) which closely matches the floristic and landscape description of PCT 1081 Red Bloodwood - Grey Gum woodland on the edges of the Cumberland Plain, Sydney Basin Bioregion (DPE, 2022b). The vegetation was described in GHD (2022) as being in good condition; with remnant native vegetation with near-intact over storey, midstorey and groundcover; and having a high species richness. This PCT is not commensurate with any TECs listed under the BC Act or EPBC Act. There was moderate exotic plant cover along the road site, with Blackberry (*Rubus fruticosus* spp. ag.), Crofton Weed (*Ageratina adenophora*), Ribwort Plantain (*Plantago lanceolata*), Fireweed (*Senecio madagascariensis*), Purpletop (*Verbena bonariensis*) and Catsear (*Hypochaeris radicata*) recorded in this vegetation zone.

No threatened ecological communities (TECs) listed under the BC Act or EPBC Act were recorded at Site 005D, however, a population of *Leucopogon exolasius* was recorded on the rock wall during the surveys. Four individuals were recorded between CH-215 and CH-225 along the rock wall), with approximately another 15 individuals to the north, outside of the boundary of Site 005D, as shown on Figure 2.

Habitat resources across the study area included:

- Canopy trees, sap, nectar, fruits and leaves as well as foraging substrate, and some fruiting and flowering small trees and shrubs
- Fallen timber and leaf litter
- At least four hollow-bearing trees (between CH55 and CH100 along the rock wall)
- Cavities in rock overhangs.

GHD (2022) reported that the intact native vegetation within Site 005D was suitable habitat for threatened insectivorous bats including the Large-eared Pied Bat, which is listed as Vulnerable under the BC Act and EPBC Act, and the Southern Myotis (*Myotis macropus*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*), the Eastern Coastal Freetail Bat (*Micronomus norfolkensis*), and Eastern False Pipistrelle (*Falsistrellus tasmaniensis*), which are listed as Vulnerable under the BC Act. The cave-roosting Large-eared Pied Bat and Large Bent-winged Bat may roost in 'honeycomb' crevices in the sandstone outcrops on the rock wall (occurring at approximately CH110 m to CH135 m along the rock wall and near rockfall hazard N31 – as shown on the design plans).

Four trees with hollows were reported in GHD (2022), between CH55 and CH100 along the rock wall. The hollow-bearing trees were observed to support hollows of small to medium size, suitable for small woodland birds, arboreal mammals and microbats. Observations made during field work for the EIA also reported one tree, located between CH125 and CH130, with hollows that were a suitable size (20 cm) for large forest owls or cockatoos.

The woodland on the rock wall and in adjoining areas contains habitat resources for threatened birds including the:

– Swift Parrot (*Lathamus discolor*) (listed as Endangered in the BC Act and Critically Endangered under the EPBC Act)
– Gang-gang Cockatoo (*Callocephalon fimbriatum*) (listed as Vulnerable under the BC Act and Endangered under the EPBC Act)
– South-eastern Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*) which is listed as Vulnerable under the BC Act and EPBC Act
– Scarlet Robin (*Petroica boodang*), Varied Sittella (*Daphoenositta chrysoptera*), Little Lorikeet (*Glossopitta pusilla*) and Dusky Woodswallow (*Artamus cyanopterus cyanopterus*), which are all listed as Vulnerable under the BC Act.

The woodland vegetation may also provide habitat for the Koala (*Phascolarctos cinereus*), which has been reported in NSW BioNet within 150 m of Site 005D. The Koala is listed as vulnerable under the BC Act and endangered under the EPBC Act, with many of the favoured food tree species recorded in Site 005D. No evidence of the presence of koalas (e.g. scats or scratch marks on trees) were reported in GHD (2022).

4.4 Priority weeds

The study area contains two species (Blackberry [*Rubus fruticosus* spp] and Fireweed [*Senecio madagascariensis*]) declared as priority weeds for the Greater Sydney region, which includes Wollondilly Shire Council LGA. These species were observed scattered along the roadside and in an area of disturbance in the south-west (top of the embankment) of Site 005D. However, these weeds did not form serious infestations in any one location.

4.5 Conservation significance

4.5.1 Threatened ecological communities

No threatened ecological communities (TECs) listed under the BC Act or EPBC Act were recorded in the study area, as summarised in Section 4.3.

4.5.2 Threatened flora species and populations

A total of 118 *Leucopogon exolasius* individuals were recorded in and immediately surrounding Site 005D (i.e. in areas that might be used for access to Site 005D). It is noted that most individuals were located in two areas, with one being located north, outside of Site 005D, and the other located in Site 005D. All other individuals were spread across the site, with most located in the northern and central portions, and only a small number located in the southern portion.

As mentioned in Section 1, it is understood that the remediation works may be completed in sections (chainages) to mitigate against impacts to flora (if required). It is noted that no individuals were recorded in the first stage of works (i.e. CH-25 to CH35), with all individuals recorded in the remainder of Site 005D (i.e. CH35 to CH250), as shown on Figure 2.

It is noted that of the individuals recorded, 39 were reported between CH230 to CH240. It is understood that most of these individuals were located outside (upgradient) of the proposed remediation areas, as such, no remediation works, or disturbance, is proposed for the individuals in this location.

No other threatened flora species were identified at or adjacent to Site 005D.

4.5.3 Threatened fauna species

Based on the results of the Anabat surveys, the Large-eared Pied Bat (*Chalinolobus dwyeri*) was positively (Definitely) identified. It was definitely recorded from 12 calls on the night of the 21 September 2022. This species was also tentatively (PR/probably) recorded on the 18, 19 and 20 September 2022. The calls from the night of the 21 September were from between 19:15 and 19:27 approximately 57 mins past civil twilight. The timing of the calls is well after the emergence period, however, call timing and activity does suggest that the species occupies the

study area for at least short periods of time. This species is considered cave obligate-meaning it relies on caves for its entire life cycle (breeding and daily diurnal roosting).

The BC Act listed Large Bent-winged Bat (*Miniopterus orianae oceanensis)* and Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis)* were both tentatively (PR) recorded from one file each during the survey.

The vast majority of calls (90% +) were attributed to the species group *Vespadelus* sp./Chocolate Wattled Bat (*Chalinolobus morio)*. Poor call quality and lack of pulses prevented clear species identification however it is most likely the majority of calls belonged to the Chocolate Wattled Bat. Although not listed under the EPBC Act or BC Act this species is sometimes known to roost in caves

The Smaller Horseshoe Bat *(Rhinolophus megaphyllus)* was also recorded most nights of the survey. Although not listed under the BC Act it is worth noting that this is a cave obligate species, like the Large Bent-winged Bat and Large-eared Pied Bat. This species has been recorded cohabitating roosts with the Large Bent-winged Bat and Large-eared Pied Bat. Table 3 presents a summary of the species recorded for each site for each survey period as a result of the bat call analysis.

Table 3 Summary of number of calls for each species and species group

Species	15 Sep 22	16 Sep 22	17 Sep 22	18 Sep 22	19 Sep 22	20 Sep 22	21 Sep 22	22 Sep 22	23 Sep 22	24 Sep 22	25 Sep 22	26 Sep 22
Chalinolobus dwyeri (V, v)	0	0	0	**PR (3)**	**PR (1)**	**PR (1)**	**D (12)**	0	0	0	0	0
Chalinolobus gouldii	0	0	0	D	0	0	**PR**	0	0	0	**PR**	0
Chalinolobus morio	**D**	**D**	**D**	**D**	**D**	**D**	**D (12)**	**D**	**0**	**D**	**D**	**D**
Micronomus norfolkensis (v)	0	0	0	0	**PR (1)**	0	0	0	0	0	0	0
Miniopterus orianae oceanensis (v)	0	0	0	**PR (1)**	0	0	0	0	0	0	0	0
Rhinolophus megaphyllus	0	0	D	D	D	D	0	0	0	0	D	D
Vespadelus pumilus	0	**PR**	0	0	0	0	0	0	0	0	0	0
Vespadelus vulturnus	0	**PR**	0	0	0	0	0	0	0	0	0	0
C. gouldii/O ridei/M. norfolkensis	0	0	0	0	**SG**	0	0	0	0	0	0	0
M. australis/V. pumilus	**SG**	**SG**	**SG**	0	0	0	0	0	0	0	0	0
M. o. oceanensis/V. vulturnus	0	0	0	**SG**	0	0	0	0	0	0	0	0
M. o. oceanensis/Vespadelus sp.	0	0	0	0	0	**SG**	0	0	0	0	0	0
S. orion/F. tasmaniensis	0	0	0	0	0	0	0	0	0	0	**SG**	0
Vespadelus sp./C. morio	**SG**	**SG**	**SG**	**SG**	**SG**	**SG**	**SG**	**SG**	0	**SG**	**SG**	**SG**
Vespadelus vulturnus/V. pumilus	0	SG	0	0	0	0	0	0	0	0	0	0
Bat calls (poor quality not identifable)	**2**	0	0	0	**3**	0	**5**	**1**	0	**1**	0	**1**
Total number of bat calls	**73**	**408**	**738**	**931**	**228**	**510**	**752**	**110**	**0**	**238**	**169**	**168**
Not bat calls/ miscellaneous sound	595	1660	332	216	69	124	383	1862	7948	14546	6927	1243
Number of .zc files	668	2068	1070	1147	297	634	1135	1972	7948	14784	7096	1411
% of bat calls recorded from files	10.93	19.73	68.97	81.17	76.77	80.44	66.26	5.58	0.00	1.61	2.38	11.91
Approximate survey effort (hrs:mins)	10	10	10	10	10	10	10	10	10	10	10	10

Table Notes:

Total number of species recorded for each night/site is based on definite (D) identification only. Total number of D species for each night includes one *Nyctophilus* species where recorded. See Table 1 for confidence rating e.g. D or Pr

ce, e, v - species listed under the *NSW Biodiversity Conservation Act 2016*.
CE, E, VU – species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Survey effort: estimate of time between sunset and sunrise for a successful night of Anabat detection.

4.5.4 Chapter 4 – SEPP (Biodiversity and Conservation) 2021

The study area contains at least two Koala Feed Tree species listed in SEPP (Biodiversity and Conservation) 2021- Koala Habitat Protection, namely Ribbon Gum *(Eucalyptus viminalis*), listed as a primary feed tree, and Grey Gum *(Eucalyptus punctata*), listed as a secondary feed tree. It is noted that only one *Eucalyptus viminalis* was recorded at Site 005D during field works for GHD (2022).

As reported in GHD (2022), there is one previous record of the Koala approximately 200 m west of Site 005D. No other records in the vicinity were reported however there are approximately 1700 records of the species in the locality (i.e. with a 10 km radius of Site 005D, suggesting a healthy population in the locality, but not necessarily in the vicinity of Site 005D).

No evidence of the presence of Koalas was observed during the site inspections (e.g. scat or scratch marks on smooth-barked trees). It is possible that the steep slope and topography of the site may prevent the Koala from using vegetation within the site, given the near vertical rock wall. The species may be more likely to use surrounding vegetation where the terrain is not as steep to traverse the local area.

4.5.5 Migratory fauna species

No migratory species were recorded during field surveys. There is potential for a number of migratory woodland bird species to forage on occasion within the study area, during their migration to breeding habitats elsewhere.

Important habitat for migratory birds is defined in the significance criteria for listed migratory species (DoE 2013) as follows:

- Habitat utilised by a migratory species occasionally or periodically within the region that supports an ecologically significant proportion of the population of the species
- Habitat that is of critical importance to the species at particular life-cycle stages
- Habitat utilised by a migratory species which is at the limit of the species range
- Habitat within an area where the species is declining.

Habitat in the study area is unlikely to be important habitat for migratory species as it would not support an ecologically significant proportion of the population, is not critical to the lifecycle of these species and is not at the limit of these species' range. While these species may occur on occasion, they would not rely on the habitats present for their survival in the locality.

5. Impact assessment

5.1 Avoidance of impacts

There has been an ongoing and lengthy process of impact avoidance undertaken by Water NSW and their contractors, in order to minimise impacts on biodiversity values as a result of the proposal. As stated in Section1.2.1, a minimalistic remediation approach has been adopted, where the aims are to do the least amount of work (and thus disturbance) to stabilise the escarpment at Site 005D.

5.2 Remediation impacts

5.2.1 Remediation methodology

As per the remediation design plans and GHD (2020), remediation works will consist of:

- Devegetation – predominantly comprising the removal of up to 37 trees (plus nine stags and one stump) that are contributing to the risk of rockfall/inhibiting remediation due to their location. The remediation design plans do not stipulate whether part or all of a tree is to be removed as a part of works, therefore, it has been assumed that trees marked for de-vegetation/lopping on the plans are to be removed unless otherwise stated.
- Targeted removal and scaling[4] of 150 m^2 of rock
- The installation of ~70 rock bolts
- The installation of 40 m^2 of reinforced shotcrete; and
- The installation of 25 m^2 of pinned rockfall mesh

All access to Site 005D will be on foot and descending to remediation locations by abseiling via ropes. All remediation works will be completed using portable hand tools.

No laydown areas are proposed in Site 005D as appropriate laydown areas are located in parking areas adjacent. Similarly, no vehicles will be entering Site 005D due to the steep slopes and lack of access tracks.

5.2.2 Removal of vegetation and threatened flora

Based on a review of the remediation design plans, all vegetation clearing comprises the removal or lopping of up to 37 trees (plus nine stags) in the remediation areas as follows:

- *Corymbia gummifera* – up to eight trees
- *Eucalyptus globoidea* – up to twelve trees
- *Eucalyptus punctata* – up to nine trees
- *Eucalyptus piperata* - up to two trees
- *Eucalyptus racemosa* – up to two trees
- *Eucalyptus viminalis* – up to one tree
- Three trees that could not be accurately identified due to access
- Up to nine stags
- At least one stump

Most proposed stabilisation works in the vicinity of the recorded *Leucopogon exolasius* individuals comprise areas of scaling and grooming along rockfaces, ledges and overhangs; and pinned rockfall mesh. Shotcrete is expected to be limited to one location between CH040 to CH050, an area where no *Leucopogon exolasius* were recorded. Given that the *Leucopogon exolasius* individuals were recorded via accessible areas, these areas are likely to be utilised to access the remediation locations, and as such, represent the biggest threat to the *Leucopogon exolasius,* via trampling under foot.

[4] The removal of loose rock from slopes

5.2.3 Removal of fauna habitats

Up to 37 trees plus nine stags and one stump may be removed as a part of remediation works, which includes the potential removal of one *Eucalyptus viminalis* and up to nine *Eucalyptus punctata,* which are listed as feed trees for the Koala. The vegetation removal would remove habitat resources for native fauna including shelter, food and foraging substrate. Despite this, impacts associated with loss and modification of fauna habitat would be minor and localised and are unlikely to remove a significant proportion of the habitat resources that are relied upon by local fauna populations, including the Koala.

Of the 37 trees and nine stags, four trees with hollows were reported in GHD (2022), between CH55 and 100 along the rock wall. The hollow-bearing trees were observed to support hollows of small to medium size (5 cm-15 cm diameter) suitable for small woodland birds, arboreal mammals and microbats. Observations made during field work for the EIA also reported one tree, located between CH125 and CH130, with hollows that were a suitable size (e.g. 20 cm) for large forest owls or cockatoos. The removal of the identified trees from Site 005D is considered to have a negligible impact on fauna with the exception of the tree with large hollows between CH125 and CH130, as hollows of this size are rare. As such, hollow replacement, or the retention of this tree (if possible), is recommended.

Based on a review of the remediation design plans, the removal of some unstable potential microbat habitat is proposed. This includes the two honeycombed overhangs at Site 005D where threatened microbat species were recorded. Given that the Anabat survey was completed outside of the roosting period for *Chalinolobus dwyeri* (i.e. October to March), further survey effort would be required to confirm the use of the honeycombed overhangs as roosting sites. This species is known to roost and breed in cave overhangs, especially in sandstone and gorges (DoE, 2010), making the overhangs at Site 005D suitable roosting habitat for *Chalinolobus dwyeri.* No other threatened microbat species that were potentially recorded during the surveys are likely to breed in this habitat, however some species may roost on occasion outside the breeding season (see Section 6.4).

It is understood that the remediation of loose rock of the honeycombed overhangs may be postponed, altered or even abandoned if recommended (from an ecological perspective) to reduce impacts to threatened fauna habitat. Therefore, it should be considered that the removal of rock from these overhangs would only be completed if deemed necessary from a safety perspective. If remediation is required, these works should take place outside of the roosting period of October to March. Environmental safeguards including pre-clearing surveys, fauna rescue and relocation protocols, are proposed in Section 6.2 to minimise the risk of mortality of fauna as a result of potential rocky habitat removal.

5.2.4 Fauna injury and mortality

There is potential for injury or mortality of native fauna where native vegetation and rocky habitat is to be cleared or disturbed. Species most at risk of injury and mortality include small terrestrial species that may be sheltering in leaf litter.

The clearing of hollow-bearing trees could result in the injury or mortality of roosting or denning species, such as microbats, arboreal mammals and birds. The proposal may result in the removal of at least five hollow-bearing trees, as well as other hollow-bearing trees or stags that were not identified during the field surveys. Mortality of less mobile individuals, such as nestlings may also occur if nests are present in vegetation to be removed.

The proposal may cause temporary displacement of more mobile fauna, such as birds, given noise and other disturbance during remediation. Birds are relatively mobile and so most individuals would be able to avoid vegetation clearing (which is minimal) or remediation operations.

Environmental safeguards including pre-clearing surveys, fauna rescue and relocation protocols, are proposed in Section 6.2 to minimise the risk of mortality of fauna as a result of clearing.

5.2.5 Aquatic impacts

Although Site 005D is adjacent to the Nepean River, there are no expected impacts to aquatic biota, threatened or otherwise, resulting from the remediation works.

5.2.6 Indirect impacts

5.2.6.1 Habitat fragmentation

Given that the site is less than 1 ha in size, and the remediation works are localised to small areas, the proposed works will not contribute to the fragmenting of habitat. The works would take place in an area already subject to historical disturbance, along a narrow, linear strip of highly unstable vegetation adjacent to dam operations and a picnic area. The proposal would not result in the creation of any barriers to movement for native species or pollinators, beyond those that already exist.

5.2.6.2 Weed invasion and edge effects

'Edge effects' refers to increased noise and light or erosion and sedimentation at the interface of intact vegetation and cleared areas. Edge effects may result in impacts such as changes to vegetation type and structure, increased growth of exotic plants, increased predation of native fauna or avoidance of habitat by native fauna.

There is the potential for additional impacts on native vegetation in the study area through dispersal of weed propagules on vehicles or equipment and through disturbance of vegetation and surface soil, which may provide increased opportunities for recruitment of new weed species.

Environmental safeguards, including weed control and minimising impacts on native vegetation are proposed in Section 6.2 to minimise the spread of weeds and edge effects.

5.2.6.3 Soil and water pollution

Given that the proposed remediation works will be completed using hand tools and on foot (or via rope), it is considered there is a relatively low risk of impacts associated with dust generation or erosion and sedimentation due to the limited surface disturbance areas at Site 005D.

5.2.6.4 Introduction of pests and pathogens

The proposal would not involve the transport of any animals or any other activities that are likely to directly contribute to the introduction of pest fauna species.

Remediation activities have the potential to introduce or spread pathogens such as Phytophthora (*Phytophthora cinnamomi*) and Myrtle Rust (*Uredo rangelii*) throughout the study area through vegetation disturbance and increased visitation.

Phytophthora and Myrtle Rust may result in the dieback or modification of native vegetation and damage to fauna habitats.

Environmental safeguards, including industry standard protocols for hygiene on construction sites are proposed in Section 6.2 to minimise the potential for introduced pathogens.

5.2.6.5 Noise and vibration

Given that the remediation works are to be completed using portable hand tools, noise and vibration resulting from the remediation works is expected to be minimal, but still may affect roosting and breeding bats. Any species present would be habituated to some degree of noise and light disturbance from the existing dam infrastructure and regular operations.

Remediation works would occur during daylight hours and impacts associated with increased light or light spill are unlikely.

5.3 Key threatening processes

A key threatening process (KTP) is a process that threatens, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community.

KTPs are listed under the BC Act, FM Act and EPBC Act. Some KTPs are listed under more than one Act. KTPs of relevance to the proposal are discussed in Table 4. Mitigation measures to limit the impacts of these KTPs are discussed in Section 6.2.

Table 4 Key threatening processes of relevance to the proposal

KTP	Status	Comment
Clearing of native vegetation	BC Act; EPBC Act	Clearing of native vegetation refers to the removal of one or more strata within a stand of native vegetation. There are numerous impacts as a result of clearing native vegetation, including: destruction of habitat causing a loss of biological diversity; fragmentation of populations; riparian zone degradation; disturbed habitat which may permit the establishment and spread of exotic species; and loss of leaf litter, removing habitat for a wide variety of vertebrates and invertebrates (DPIE, 2021d). The proposal would result in the clearing of up 37 trees and nine stags.
Loss of hollow-bearing trees	BC Act	Tree hollows are cavities formed in the trunk or branches of a living or dead tree. Hollows are usually more characteristic of older, mature to over mature trees. Hollows occur primarily in old eucalypts trees and are uncommon in many other native and introduced species. The presence, abundance and size of hollows is positively correlated with tree trunk diameter, which is an index of age. As such, large old hollow-bearing trees are relatively more valuable to hollow-using fauna than younger hollow-bearing trees. The latter are important as a future resource. The proposal would result in the removal of up to five hollow-bearing trees. The implementation of fauna management measures would minimise potential impacts on fauna as a result of the removal of these hollow-bearing trees (see Section 6.2).
Removal of dead wood and dead trees	BC Act	Fallen timber and hollow-bearing stags provide important habitat for a range of native species and are important to ecosystem health. The proposal may result in the removal of stag trees and fallen timber during remediation. The implementation of fauna management measures would minimise potential impacts on fauna as a result of removal of dead wood and stag trees (see Section 6.2).
Invasion of plant communities by perennial exotic grasses	BC Act	Exotic perennial grasses of concern include *Hyparrhenia hirta*, *Cortaderia* spp., *Sporobolus fertilis*, *Nassella neesiana*, *Nassella trichotoma* and *Eragrostis curvula*. There is evidence that these perennial grass species have significant adverse impacts on biodiversity, including increases to fuel loads that result in changes to fire regimes that can alter the structure of native vegetation communities and lead to local extinctions of some native species (DPIE, 2021d). While none of the above grasses were observed on site, it is possible that they may be introduced to site during remediation works. Weed management procedures would be implemented to prevent any further spread of weeds as a result of the proposal (see Section 6.2).
Invasion and establishment of exotic vines and scramblers	BC Act	Exotic vines can have a significant effect on biodiversity, through smothering native vegetation and seedlings, and preventing natural recruitment, particularly in riparian areas. While none of the relevant exotic vines or scramblers were observed on site, it is possible that they may be introduced to site during remediation works. Weed management procedures would be implemented to the introduction of weeds such weeds to Site 005D as a result of the proposal (see Section 6.2).
Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae	BC Act	Remediation activities have the potential to introduce Myrtle Rust to the study area. The fungus infects leaves of susceptible plants producing spore-filled lesions on young actively growing leaves, shoots, flower buds and fruits. Leaves may become buckled or twisted and may die as a result of infection. Infection on highly susceptible plants may result in plant death. Implementation of hygiene protocols would minimise the risk of introduction or spread of this pathogen (see Section 6.2).

KTP	Status	Comment
Infection of native plants by *Phytophthora cinnamomi*	BC Act; EPBC Act	*Phytophthora cinnamomi* is a soil borne pathogen that occurs in warm, moist conditions. Infected species may show a range of symptoms, and some plants may be killed and lead to areas of dieback. The proposal has the potential to introduce or spread this pathogen throughout the study area, through the transport and movement of workers and equipment during remediation works. Implementation of hygiene protocols would minimise the risk of introduction or spread of this pathogen (see Section 6.2).

5.4 Likely significance of impacts on threatened biota and migratory species

The proposal will likely result in direct impacts to the local occurrence of the threatened plant *Leucopogon exolasius*, as well as potential impacts to the habitat of a number of threatened fauna species. The following sections provide an assessment of the likely significance of those impacts on threatened biota.

5.4.1 Threatened flora species

At least 118 *Leucopogon exolasius* individuals were recorded in and adjacent to Site 005D.

An assessment of significance pursuant to Section 7.3 of the BC Act (5 part test) has been prepared for potential impacts on the *Leucopogon exolasius* population at Site 005D (Appendix C). The outcome of the assessment is that the proposal is unlikely to result in a significant impact on this species, given:

– While there is a risk of trampling of *Leucopogon exolasius,* the bulk of the population throughout Site 005D are not located in areas of proposed remediation and, as such, are less likely to be damaged or destroyed due to remediation works
– Larger populations of *Leucopogon exolasius* are present within 5 km of Site 005D
– The proposal is unlikely to result in the risk that this species would be placed at risk of extinction, given the existing degree of disturbance and modification of vegetation within the study area.
– The proposal is unlikely to result in the isolation of viable stands of habitat from other patches of vegetation, given this species sedentary nature.
– The proposal would include environmental management measures, to mitigate against the operation of relevant KTPs where possible.

5.4.2 Threatened fauna species

5.4.2.1 Large-eared Pied Bat

The proposal will remove an as yet unquantified, yet expectedly low volume of rocky habitat that represents potential roosting habitat for the Large-eared Pied Bat during remediation works. It is also understood that WaterNSW may avoid works altogether in this area if it is shown that the overhangs are being utilised as a roosting habitat for the Large-eared Pied Bat.

An assessment of significance pursuant to Section 7.3 of the BC Act (5 part test) has been prepared for impacts on this species (Appendix B). The outcome of the assessment is that the proposal would be unlikely to have a significant impact, given:

– Limited potential roosting habitat would be removed or disturbed
– No areas of habitat would become isolated as a result of the proposal
– There is suitable alternative habitat available in the locality
– Mitigation measures to minimise direct and indirect impacts would be included in the CEMP.

5.4.2.2 Koala

The proposal will remove up to 37 trees , including up to ten potential feed trees for the Koala.

An assessment of significance pursuant to Section 7.3 of the BC Act (5 part test) has been prepared for impacts on this species (Appendix B) The outcome of the assessment is that the proposal would be unlikely to have a significant impact, given:

– Site 005D comprises generally unsuitable habitat for the species, given that it is located along a steep escarpment that would be difficult for the Koala to traverse
– There are extensive areas of suitable habitat in adjoining areas and the broader locality
– The small area of potential habitat within Site 005D is highly unlikely to be important to the long-term survival the species
– Mitigation measures to minimise direct and indirect impacts, including avoiding removal of feed trees where possible, would be included in the CEMP (see Section 6.2).

5.4.2.3 Hollow-dependent fauna

The proposal will remove up to four small to medium hollows located between CH55 and CH100 along the rock wall and one tree with a large hollow between CH125 and CH130.

The Anabat recordings identified that Eastern Coastal Free-tailed Bat may utilise Site 005D, and this species has also been recorded in the locality. Additional species recorded in the locality that may also use hollows found in Site 005D are the Little Bent-winged Bat, Golden-tipped Bat, Southern Myotis, eastern false Pipistrelle, Eastern Coastal Free-tailed Bat and the Yellow-bellied Sheathtail-bat. The Barking Owl and Powerful Owl have both been recorded in the locality and may use the large hollow reported at Site 005D.

Assessments of significance pursuant to Section 7.3 of the BC Act (5 part test) has been prepared for impacts for the above hollow-dependent fauna that might utilise hollows on site (Appendix B). The outcome of the assessments is that the proposal would be unlikely to have a significant impact, given:

– There are extensive areas of suitable habitat in adjoining areas and the broader locality
– The potential habitat within Site 005D is highly unlikely to be important to the long-term survival the species
– Mitigation measures to minimise direct and indirect impacts, including avoiding removal of hollows, or relocation of hollows where possible, would be included in the CEMP (see Section 6.2).

5.4.3 Migratory species

Given the prevalence of adjacent habitat, it is considered that there is a lack of likely impacts to potential migratory species. Therefore, no assessments of significance have been prepared.

5.4.4 Summary of impacts

The proposal would result in impacts to threatened species habitat and removal of vegetation commensurate with threatened ecological species listed under the BC Act and/or EPBC Act.

Assessments of significance pursuant to Section 7.3 of the BC Act (5 part tests) indicate that to the proposal is unlikely to result in a significant impact on any entities listed under the BC Act. The findings of the 5 part tests have been considered with reference to the EPBC Act *MNES Significant Impact Guidelines 1.1* (DEWHA 2013), and the proposal is unlikely to result in a significant impact on any MNES listed under the EPBC Act.

6. Mitigation

6.1 Avoiding and minimising impacts

The overall proposal site location is constrained by the steep slope and unstable, rocky terrain, making it difficult to access to the site by any other means other than by foot or by rope. This has resulted in remediation works that are minimal in nature, and thereby minimising impacts to threatened flora and fauna at Site 005D.

6.2 Mitigating impacts

The environmental safeguards outlined in Table 5would be implemented to address the potential impacts of the proposal on biodiversity values. A Construction Environmental Management Plan (CEMP) would be prepared, that would identify the specific measures to be implemented during the ‘Pre-remediation’ and ‘remediation’ stages of the proposal and would include work methods, contingencies, roles and responsibilities.

Table 5 Environmental safeguards

Issue	Safeguard	Timing	Responsibility
Environmental management	A CEMP will be prepared, including the specific mitigation/management measures and sub-plans listed below along with work methods, contingencies, roles and responsibilities. The mitigation/management measures included in the CEMP and sub-plans would be implemented during pre-remediation and remediation stages.	Pre-remediation	Remediation contractor
Worker inductions	Ensure all workers are provided with an environmental induction prior to starting construction activities on site. This would include information on the ecological values of the site and protection measures to be implemented to protect biodiversity during construction.	Pre-remediation	Remediation contractor
Erosion and sediment	Erosion and sediment control plans would be established prior to the commencement of construction. Controls would be managed and maintained in accordance with the CEMP to ensure their ongoing functionality. Erosion and sediment control controls would be regularly inspected, particularly following rainfall events, to ensure their ongoing functionality. All stockpiled material should be stored in bunded areas and kept away from waterways to avoid sediment or contaminants entering waterways.	Pre-remediation / remediation	Remediation contractor
Dust	Specific measures will be incorporated into the CEMP to minimise the generation of dust and associated impacts on natural environments during remediation works.	Pre-remediation / remediation	Remediation contractor
Contaminants	Specific measures will be incorporated into the CEMP to minimise the potential for chemical spills and associated impacts on natural environments during remediation works Spill kits would be made available to construction vehicles. A management protocol for accidental spills would be put in place.	Pre-remediation / remediation	Remediation contractor
Protection of native flora	The locations of *Leucopogon exolasius* recorded at the site will be mapped on a sensitive values map and flagged with tape or bunting with an aim to allow easy location of the species by workers and avoid any unnecessary removal or damage to the *Leucopogon exolasius* during remediation. To reduce the potential for adverse impacts on native flora, efforts should be made to minimise vegetation clearance and disturbance, including impacts to canopy trees as far as possible. Where possible, limit clearing to trimming rather than the removal of whole plants.	Pre-remediation / remediation	Remediation contractor. Site ecologist/ environmental officer
Fauna management	It is preferable for the clearing of hollow-bearing trees to occur outside of the breeding season of bats with the potential to occur (typically during September-December), and periods when some species (microbats) are in torpor (typically during June-August) or during the breeding period for large forest owls (typically from May to November). A trained ecologist should be present during the clearing of native vegetation or removal of potential fauna habitat (e.g. rock overhangs) to avoid impacts on resident fauna and to salvage habitat resources as far as is practicable. Pre-clearing surveys for microbats that may be roosting in any in hollows should be completed by a suitably qualified ecologist who is vaccinated and able to handle bats if necessary.	Pre-construction/ construction	Remediation contractor. Site ecologist/ environmental officer

Issue	Safeguard	Timing	Responsibility
	Pre-clearance fauna surveys, should be undertaken in accordance with the following procedure: – An initial pre-clearance survey of the proposal footprint will be undertaken by a suitably qualified ecologist prior to the commencement of any clearing activities. During the initial survey all hollow-bearing trees and significant habitat features such as fallen logs, will be identified with an "H" in high visibility spray paint. Significant environmental or priority weed infestations would also be identified and communicated to the contractor. – A daily pre-clearance fauna survey is also to be undertaken by a suitably qualified ecologist each day prior to the clearing of native vegetation. – Surrounding vegetation (i.e. non-hollowing bearing trees and understory plants) will be inspected by the ecologist for the presence of fauna. – If animals are found, procedures outlined in the protocol for capture and relocation (below) will be followed. Surrounding vegetation within the proposal footprint can then be cleared. – If no fauna are found, then surrounding non-hollow-bearing vegetation (within the proposal footprint) can be cleared. This process will be monitored by the ecologist in case fauna are found to be at risk. – The ecologist will document the outcomes of this process (e.g. number and species encountered/rescued). –		
Hollow-bearing tree and hollow-log management	As discussed above, clearing of hollow-bearing trees and rocky habitat/rock overhangs is recommended to take place outside the breeding and torpor periods for the majority of species that may potentially occur (i.e. October to March). As such it is unlikely that any breeding activity would be present. A suitably qualified and appropriately licenced ecologist is to be present during clearing of all native vegetation to ensure felling of trees is carried out in an appropriate manner, and that any fauna present can be rescued and relocated. All trees marked with an "H" are to be felled in accordance with the procedure detailed below: – When clearing within the approved area, all vegetation surrounding a hollow-bearing tree (excluding other hollow-bearing trees and logs) will be removed at least 24 hours prior to the hollow-bearing tree or log being removed. – At least 24 hours after the removal of surrounding (non "H" marked) vegetation, the hollow-bearing tree or log can be removed (in accordance with the technique outlined below). Appropriate fauna 'capture and release' techniques will be implemented (see procedure below). During the removal of any identified sensitive habitat or hollow-bearing trees: A suitably qualified and experienced ecologist will be present, with appropriate animal-handling equipment and holding containers. For hollow-bearing trees: Prior to felling or removal, clearing machinery will be used to gently shake or 'bang' the habitat tree for a period of 2-3 minutes (dependant on tree health and structural integrity) to encourage any resident fauna to vacate hollows. Sticks, poles or other similar hand-held objects will also be used to hit the trunk of the tree or log at various points, to encourage animals to vacate the tree. The tree will be observed for at least 5 minutes prior to completing this action.	Pre-work/during works	Remediation contractor. Site ecologist/ environmental officer

Issue	Safeguard	Timing	Responsibility
	After the observation period, trees will be gently lowered/felled using an excavator bucket or dozer blade for support if possible. The ecologist will observe the tree felling and ensure that any hollows are not blocked by being placed against the ground. Once deemed safe by the plant operator, the ecologist will inspect each tree and hollows for fauna that may be present (uninjured, injured or deceased). Use of fibre-optic cameras to assist this process is recommended. The ecologist will document this process using the tree hollow inspection register. Felled habitat trees with any occupied hollows will be left on the ground overnight or up to 24 hours to allow the animal to exit the hollow. Habitat trees can then be cut into appropriate sections according to the protocol for habitat salvage and relocation (described below). For any hollow logs: Gently knock the log with an excavator for a short time while the log is observed by the ecologists. Any fauna leaving the log will be rescued by the ecologists according to the protocol for fauna capture and relocation (described below). If no fauna emerge after an appropriate time (>5 min), the ecologists will inspect the hollow and instruct the plant operator to salvage hollows or translocate the log in accordance with the protocol for habitat salvage and relocation (described below). Significant habitat features (fallen logs and tree hollows) removed from site would be salvaged and relocated within adjacent areas of vegetation if appropriate given potential for contamination.		
Animal handling/ethics/capture	Animals that require handling must not be approached or handled until the ecologist is present, unless in an emergency (e.g. when there are both no authorised persons present and where the failure to immediately intervene would place the animal at significant risk). In such an emergency, the site manager may obtain over the phone instructions from the project ecologist to ameliorate the situation. A wildlife rescue organisation (e.g. WIRES) should be made aware of operations in case any injured fauna are found. All animals encountered will be treated humanely, ethically, and in accordance with relevant codes under the NSW *Prevention of Cruelty to Animals Act 1979*, including: – Australian code of practice for the care of animals for scientific purposes (NHMRC, 2013). – Code of practice for the welfare of wildlife during rehabilitation (DPI VIC, 2001). – Animal ethics considerations and protocols outlined in this document. If the project ecologist considers an animal is at risk of injury or undue stress, it is to be gently directed into secure adjoining habitat. Where deemed necessary by the project ecologist, the animal may be required to be captured and released. Capture and release operations will proceed via the following protocols: – All activities that are considered by the project ecologist to be likely to increase the risk of injury, mortality or stress to the animal will be halted until the animal has been removed, which will be enforced with the co-operation of the Contractor. Activities that do not contribute to the risk of injury, mortality or stress to the animal can continue (as determined by the project ecologist). – Only qualified ecologists or wildlife carers are authorised to handle animals. – Animals will be captured (if required) by the project ecologist using a safe and ethical technique, as is appropriate for the particular species (see below). Native animals that are unable to depart of their own	Pre-work/during works	Remediation contractor. Site ecologist/ environmental officer

Issue	Safeguard	Timing	Responsibility
	accord will be captured and held in a receptacle appropriate for that species until release. All captive-held animals will be provided with food, water and warmth as is appropriate for the species. Each receptacle will only hold one animal at a time and will be cleaned and disinfected between use to avoid the spread of disease. – Details of any fauna relocated from hollows would be recorded on the tree hollow inspection register. Any other fauna relocated from trees, shrubs or other areas would also be recorded. The contractor is to contact the Project ecologist for advice if any unexpected fauna are found during the works period (i.e. following clearing of native vegetation when the Project ecologist is no longer on site).		
Habitat resource salvage	Fallen timber will be salvaged during clearing. Plant operators will be instructed to maximise the salvage of habitat resources wherever possible. The following protocol is recommended for the salvage of hollows and subsequent habitat enhancement in the adjacent areas of retained vegetation: – Significant hollows (as determined by the project ecologist) will be salvaged during clearing. Following felling, hollow-bearing trees will be left in place for a period of 24 hours. During this period, the ecologist will identify and mark any hollows to be salvaged. – Felled habitat trees and logs can be cut into sections after at least 24 hours on the ground/post clearing to permit the recovery of hollow resources. The project ecologist is to direct an appropriately accredited chainsaw operator in these works. – Hollow trunks and limbs should be inspected using a fibre-optic camera and/or tapped by the ecologists prior to being cut to check that fauna have departed. – Following clearing operations, salvaged hollows are to be relocated in the adjacent vegetated area, under direction from the project ecologist. – Any stockpiled hollow sections of trunks or branches should be placed on their ends (with the hollow opening against the ground) to minimise the chance of fauna entering hollows while they are stockpiled. – Vegetation in the adjacent areas is not to be damaged during relocation of habitat features. Appropriately, sized machinery should be used to relocate hollow trunks and limbs and will use existing tracks or disturbed areas only. A post-clearing report will be prepared documenting all animals that are handled, or otherwise managed, within the proposal footprint (and wider proposal site if necessary). Data to be recorded includes: – Date and time of the sighting and details of the observer – Species – Number of individuals recorded – Adult/juvenile – Condition of the animal (living/dead/injured/sick) – Management action undertaken (e.g. captured, handled, taken to vet) – Results of any management actions (e.g. released, placed in a nest box, euthanised, placed with carer). An inventory of hollows and fallen timber salvaged and relocated will be maintained.	Pre-work/during works	Habitat resource salvage

Issue	Safeguard	Timing	Responsibility
Protection of native fauna	If native fauna is encountered on site, stop work and allow the fauna to move away un-harassed. A local wildlife rescue service or the ecologist responsible for pre-clearing surveys should be engaged to assist with fauna removal and rescue if fauna fails to move away on its own.	Pre-remediation / remediation	Remediation contractor
Protection of threatened species not listed in this EIA	If any threatened species (flora or fauna) not listed in this EIA is discovered during the works, stop work immediately and notify the Sydney Water Environmental Representative. Work will only recommence once the impact on the species has been assessed and appropriate control measures provided.	Pre-remediation / remediation	Remediation contractor / WaterNSW Environmental Representative
Pathogen management	Manage plant and animal disease and pathogens such as Phytophthora, Myrtle Rust and Chytrid fungus. General mitigation measures would include: – exclusion zones around retained areas of native vegetation – 'clean on entry, clean on exit' policy – provision of machine and footwear washdown stations for all equipment and personnel working in areas of native vegetation. Protocols to prevent introduction or spread of Phytophthora, Myrtle Rust and Chytrid fungus should be implemented following OEH Hygiene protocol for the control of disease in frogs (DPIE, 2020). Working under the assumption that the area where works are to be undertaken in is free of the disease and therefore needs to be protected against infection, and that the activity to be undertaken has the potential to introduce the disease (Hornsby Shire Council, 2014).	Remediation	Remediation contractor

7. Conclusion

Based on the results of this targeted EIA, impacts resulting from the proposal have been avoided wherever practical through design and selection of remediation techniques that minimise impacts on biodiversity matters. Notwithstanding, the proposal would result in the following impacts to threatened biota listed under the BC Act:

– Removal of up to 37 native trees and nine stags, including four hollow-bearing trees that may provide potential habitat for threatened hollow-dependant microbats and one hollow-bearing tree that may provide potential habitat for threatened owls or cockatoos
– The removal of rock from overhangs that comprises suitable roosting habitat for the Large-eared Pied Bat that is known to utilise the overhangs
– The potential removal of up to ten Koala feed trees
– Incidental clearing or trampling of the threatened plant *Leucopogon exolasius* that has been recorded at Site 005D.

Assessments of the likely significance of impacts of the proposal on threatened species have been prepared pursuant to Section 7.3 of the BC Act. The proposal is unlikely to have a significant impact on the Large-eared Pied Bat, the Koala, the *Leucopogon exolasius* and any hollow-dependent fauna that might utilise Site 005D provided that mitigation measures described in Section 6 are implemented, most notably, by avoiding remediation works in the honeycombed overhangs (between CH110 and CH150) during the roosting period of October to March.

As the proposal is unlikely to result in a significant impact on any threatened biota listed under the BC Act, the proposal will not trigger the Biodiversity Offsets Scheme (BOS). Therefore, assessment and biodiversity offsets under the Biodiversity Assessment Methodology (BAM), via a Biodiversity Development Assessment Report (BDAR) or Species Impact Statement (SIS), are not required.

The proposal is unlikely to result in a significant impact on threatened biota or migratory species listed under the EPBC Act and Referral of the proposal to the Australian Minister for the Environment is therefore not considered necessary.

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Appendix A

Remediation Design Plans

WATERNSW

GREATER SYDNEY ROCKFALL STABILISATION

SLOPE STABILISATION TREATMENT NEPEAN DAM - SITE 005D

12519708

LOCALITY PLAN
SCALE N.T.S.

IMAGE SOURCE: SIXMAPS 2019

DRAWING LIST	
DRG and FIG No.	TITLE
12519708-N005D -01	SITE 005D - COVER SHEET, DRAWING LIST AND LOCALITY PLAN
12519708-N005D -02	SITE 005D - GENERAL NOTES
12519708-N005D -03	SITE 005D - SLOPE STABILISATION TREATMENT PHOTOMOSAIC - SHEET 1 OF 10
12519708-N005D -04	SITE 005D - SLOPE STABILISATION TREATMENT PHOTOMOSAIC - SHEET 2 OF 10
12519708-N005D -05	SITE 005D - SLOPE STABILISATION TREATMENT PHOTOMOSAIC - SHEET 3 OF 10
12519708-N005D -06	SITE 005D - SLOPE STABILISATION TREATMENT PHOTOMOSAIC - SHEET 4 OF 10
12519708-N005D -07	SITE 005D - SLOPE STABILISATION TREATMENT PHOTOMOSAIC - SHEET 5 OF 10
12519708-N005D -08	SITE 005D - SLOPE STABILISATION TREATMENT PHOTOMOSAIC - SHEET 6 OF 10
12519708-N005D -09	SITE 005D - SLOPE STABILISATION TREATMENT PHOTOMOSAIC - SHEET 7 OF 10
12519708-N005D -10	SITE 005D - SLOPE STABILISATION TREATMENT PHOTOMOSAIC - SHEET 8 OF 10
12519708-N005D -11	SITE 005D - SLOPE STABILISATION TREATMENT PHOTOMOSAIC - SHEET 9 OF 10
12519708-N005D -12	SITE 005D - SLOPE STABILISATION TREATMENT PHOTOMOSAIC - SHEET 10 OF 10

FOR CONSTRUCTION

No	Revision	Drawn	Job Manager	Project Director	Date
0	ISSUED FOR CONSTRUCTION	JM	DF*	AH*	17.01.20

Note: * indicates signatures on original issue of drawing or last revision of drawing

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DO NOT SCALE

Drawn	J. McMILLAN	Designer	K. DOUGLAS
Drafting Check	D. FIELD*	Design Check	A. HUNTER*
Approved (Project Director)	A. HUNTER*		
Date	17.01.20		
Scale	N.T.S.	This Drawing must not be used for Construction unless signed as Approved	

Client **WATERNSW**
Project **GREATER SYDNEY ROCKFALL STABILISATION**
Title **SLOPE STABILISATION TREATMENT - NEPEAN DAM - SITE 005D**
COVER SHEET, DRAWING LIST AND LOCALITY PLAN

Original Size **A3** Drawing No: **12519708-N005D-01** Rev: **0**

Plot Date: 17 January 2020 - 12:21 PM Plotted By: Alister Maclean Cad File No: G:\21\12519708\CADD\Drawings\12519708-N005A-01.dwg

GENERAL NOTES

1. These design drawings shall be read in conjunction with the Greater Sydney Rockfall Design Report, Ref 12519708-27928 Rev 1 (the GHD report).
2. Photomosaic coverage of some slopes may be partly obscured by in-situ vegetation, hence not all slope hazards may have been identified during scoping.
3. Extent of slope stabilisation treatments and chainages/ scales shown on photomosaics are approximate only and shall be confirmed on site prior to commencement of construction.
4. The geotechnical conditions and geological profiles shown on drawings are indicative, and have been inferred from limited scoping and investigations. Should the encountered geotechnical conditions and geological profile differ, the design shall be referred to the designer for review to ensure suitability of the design to encountered conditions.
5. Prior to construction site set-up, the contractor shall submit the following to the Principal for review:
   a. All safe working method statements and plans.
   b. Traffic control and construction staging plans.
   c. All shop drawings.
   d. Rock bolt product details and installation method.
   e. Grout mix proportions, types of additives/admixtures (if used) and test results demonstrating compliance with compressive strength requirements on these drawings.
   f. The contractor is to determine a colour additive and dosage for the shotcrete to match the general colour of the existing rock. Shotcrete colour to be approved by WaterNSW prior to application.
   g. Inspection test plans (ITPs).
6. Site to be returned to original condition or better.
7. Refer discrepancies to the Principal before proceeding with work.
8. Nomination of proprietary items does not indicate exclusive preference, but indicates required properties of item. Similar alternatives having required properties may be offered for approval. Approval is at discretion of the Principal. Approval does not authorise a variation to the contract. Install propriety items in accordance with manufacturer's requirements and recommendations.
9. Give two working days (48 hours) notice so that inspection by a geotechnical representative engaged by the Principal may be made of critical stages of work.
10. Inspections and reviews undertaken by the principal or others do not relieve contractor of responsibility for compliance with drawings.
11. Do not obtain dimensions by scaling drawings.
12. Verify on site setting out dimensions and existing member sizes shown on drawings before shop drawings, construction and fabrication is commenced. Existing structures shown on drawings are at approximate locations only.

SCHEDULE OF QUANTITIES

No.	DESCRIPTION	UNIT	QUANTITY
1	General rock scaling and devegetation - nominally a four person scaling crew accessing via EWP, crane man box, rope access, excavator, backhoe or similar	m^2	7320
2	Targeted rock removal and scaling, jack hammer etc	m^3	150
3	Supply and installation of 6m rock bolts	No.	23
4	Supply and installation of 4m rock bolts	No.	15
5	Supply and installation of 3m rock bolts	No.	15
6	Supply and installation of 2m rock bolts	No.	7
7	Supply and installation of reinforced shotcrete	m^2	40
8	Supply and installation of pinned rock fall mesh and all associated components	m^2	25

Note: Mesh quantities listed in table above are estimated surface areas of the slope that require the nominated support type. These areas do not include allowances for mesh overlaps, joining or rock surface irregularities etc. Contractor to make their own assessment of actual mesh quantities required.

SAFETY IN DESIGN

1. The safety risk mitigation items below are based on GHD's design experience and do not necessarily account for all construction, operation, maintenance and demolition safety risks. Based on information available when this drawing was made, in it capacity as designer only, GHD has tried to identify safety risks pertaining to construction, operation, maintenance and demolition phases of the asset. Inclusion (or not) of any item does not reduce or limit obligations of constructor, user, maintainer and demolisher to undertake appropriate risk management activities to reduce risk and is not an admission by GHD that inclusion of any item is designer's responsibility.
2. Provide safe working platform and / or protection systems when working at height.
3. Review adequacy of working space available for construction activities. Ensure separation of plant and personnel on site, including movements of both.
4. Provide protection to personnel from plant and equipment, including rock bolt/ mesh installation works.
5. Ensure isolation safe systems of work or protective measures are installed before working adjacent to WaterNSW infrastructure and assets. Provide protection of all WaterNSW infrastructure within/ adjacent to rockfall stabilisation works during construction.

ROCK BOLTS

1. Refer Slope Stabilisation Treatment photomosaics for estimated extents of treatment, to be confirmed on-site at the time of construction by the geotechnical representative engaged by the principal.
2. Rock bolts and grout to be in accordance with:
   a. Drawing 12519708-Q001.
   b. Rock Scaling, Rockbolt and Shotcrete Specification in Appendix B of the GHD report.
   c. The GHD report.
3. Use rotary or rotary-percussion drilling equipment for drilling to ensure minimal remoulding of in-situ materials within the drill holes. Do not use drilling fluids other than air or cementitious grout, unless otherwise approved by the geotechnical representative engaged by the principal.
4. Selection of drilling equipment to be suitable for expected ground conditions.
5. Provide centraliser for rock bolts at maximum 2000mm intervals. First and last centraliser must be 300mm from ends of rock bolt. Provide minimum of 3 centralisers.

SHOTCRETE

1. Shotcrete to be in accordance with:
   a. Drawing 12519708-Q002.
   b. Rock Scaling, Rockbolt and Shotcrete Specification in Appendix B of the GHD report.
   c. The GHD report.
2. Minimum compressive strength of shotcrete must be 40MPa at 28 days.
3. Shotcrete mix design to exposure classification B2.
4. Shotcrete to be tested for slump and compressive strength, in accordance with RMS R68 clause 8.5 and annexure R68/L.
5. 150mm HDPE strip filter drain to be in accordance with GHD Specifications.

PINNED ROCK FALL MESH

1. Geobrugg Spider S4-130 ® high tensile wire mesh product or similar approved by geotechnical representative engaged by the principal.
2. Installation to be in accordance with:
   a. The manufacturer's recommendations.
   b. Drawing 12519708-Q004.
   c. The GHD report.

SCHEDULE OF HOLD POINTS AND WITNESS POINTS

1. Refer to the following specifications in the GHD report:
   a. Rock Scaling, Rockbolt and Shotcrete Specification.
   b. Specification for Draped Rockfall Protection Mesh.

INDICATIVE CONSTRUCTION SEQUENCE

1. Identify, relocate/divert any utilities within the vicinity prior to commencement of stabilisation works.
2. Identify and apply appropriate protection to WaterNSW assets and infrastructure.
3. Establish appropriate site fencing and exclusion zones around the work sites.
4. Set-up traffic control as necessary in accordance with the Principal's requirements.
5. Install environmental controls around the construction site as necessary.
6. Clear vegetation growing on the rock face and within 3m distance of cutting crest, extent of clearance to be confirmed with the geotechnical representative engaged by the Principal.
7. Conduct general scaling and/or removal of unstable rock blocks which may impact the installation of rock bolts, rock fall mesh, reinforcing mesh and shotcrete, scaling/rock removal to use hand tools or machine scaling methods (see relevant specifications).
8. Set-out/ mark-up of selected specialist treatments including rock bolts, shotcrete and mesh coverage by the geotechnical representative engaged by the Principal. Specific rock bolts may require relocation as identified by the Principal's geotechnical representative.
   Hold points - confirm the following with the geotechnical representative engaged by the Principal:
   a. Extent of works.
   b. Setout of specialist treatment including rock bolts, shotcrete, meshing and rockfall fence coverage.
9. Install rock bolts subject to pull out testing
10. Conduct pull out testing in accordance with the specification in the GHD report.
11. Hold point - Confirm pull out testing test results with the geotechnical representative engaged by the principal.
12. Install production rock bolts.
13. Apply shotcrete.
14. Apply pinned rock fall mesh.
15. Restore the site to its original condition, or better, repairing any damage to Water NSW infrastructure (including road pavements, fencing, posts, signposts, etc.).

REFERENCES & SPECIFICATIONS

ITEM	REFERENCE/SPECIFICATION
Scaling, rock bolt and Shotcrete	GHD Report 12519708-27928 Rev 1 - Appendix B - Rock Scaling, Rockbolt and Shotcrete Specification

FOR CONSTRUCTION

No	Revision	Date	Check	Auth
0	Issued for Construction	17/01/20	DF	AH
1	Issued for Construction	15/08/22	DF	AH
2	Issued for Construction	24/08/22	DF	AH

Client: **WaterNSW**
Project: **Greater Sydney Rockfall Stabilisation Project**
Location: **Site 005D Nepean Dam**
Slope:

Title: **Slope Stabilisation Treatment Design - General Notes**

Compiled By: DW, KD & AH Checked By: AH Date: 24/08/2022
Figure No. 12519708 - N005D - 02

REFER FIGURE 12519708 - N005D - 04

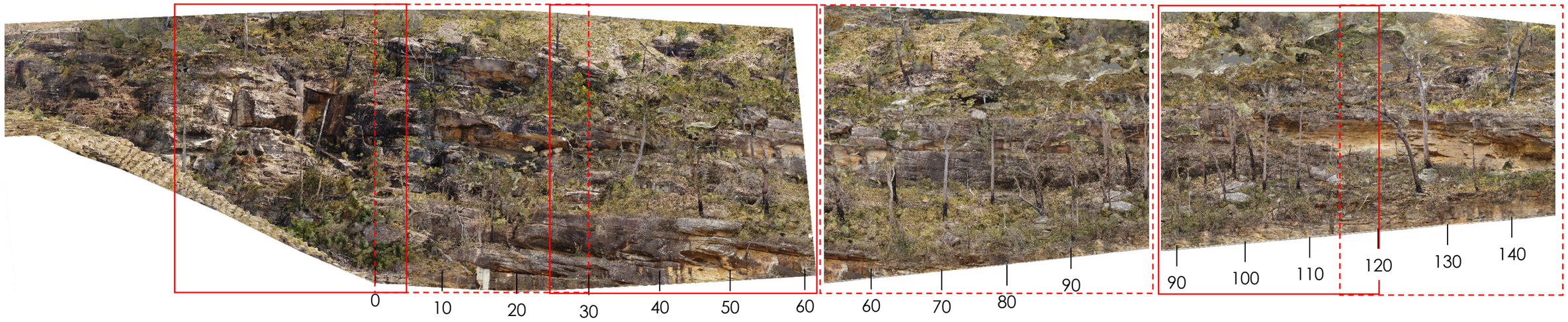
REFER FIGURE 12519708 - N005D - 05

REFER FIGURE 12519708 - N005D - 06

REFER FIGURE 12519708 - N005D - 07

REFER FIGURE 12519708 - N005D - 08

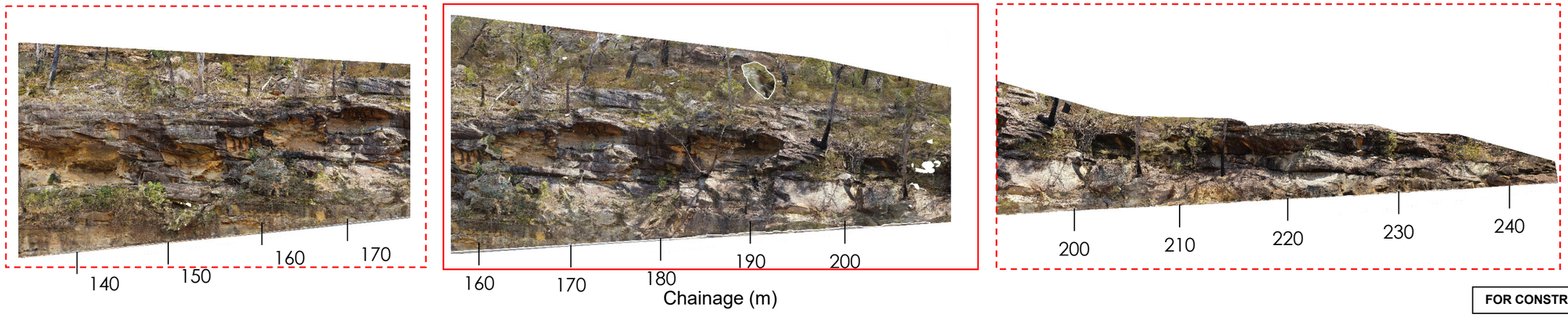
REFER FIGURE 12519708 - N005D - 09



REFER FIGURE 12519708 - N005D - 10

REFER FIGURE 12519708 - N005D - 11

REFER FIGURE 12519708 - N005D - 12



FOR CONSTRUCTION

TARGETED SCALING, TREE-LOPPING, SHOTCRETE & MESH CONSTRUCTION

N01 **Rockfall Hazard Feature ID**

Refer hazard feature ID description sheets for details

Scaling and Grooming **Tree-lopping/ Devegetation**

Areas requiring selective scaling and grooming as directed to remove loose or detached rock masses or soil accumulations.

Shotcrete (structural)

Locations requiring application of mesh reinforced shotcrete

Pinned Rock Fall Mesh

Selected boulder and block wall hazards requiring in-situ support via pinned mesh

ROCK BOLTS

(approx. locations shown)

- 2m long rock bolt
- 3m long rock bolt
- 4m long rock bolt
- 6m long rock bolt

GENERAL NOTES

1. Ortho-photomosaic subject to parallax distortion effects. Do not scale. Extent of hazard features and work boundaries are approximate.
2. Refer to Sheets 2 to 10 for close-up views of slope and proposed stabilisation details.
3. Refer to cutting reference chainages marked along toe of rock slope.
4. Alpha numeric labels (eg: N01) denote individual slope hazard features - refer to description sheets for more details.
5. All trees/saplings growing on rock face are to be removed and stumps poisoned (Refer Project Specification).
6. Systematic scaling of all loose rock material to be carried out across entire rock face and upper slope using hand tools (Refer Project Specification).
7. Locations of specialist treatment (rock bolts/ shotcrete/ mesh) to be confirmed by GHD representative, installation as per Project Specification.

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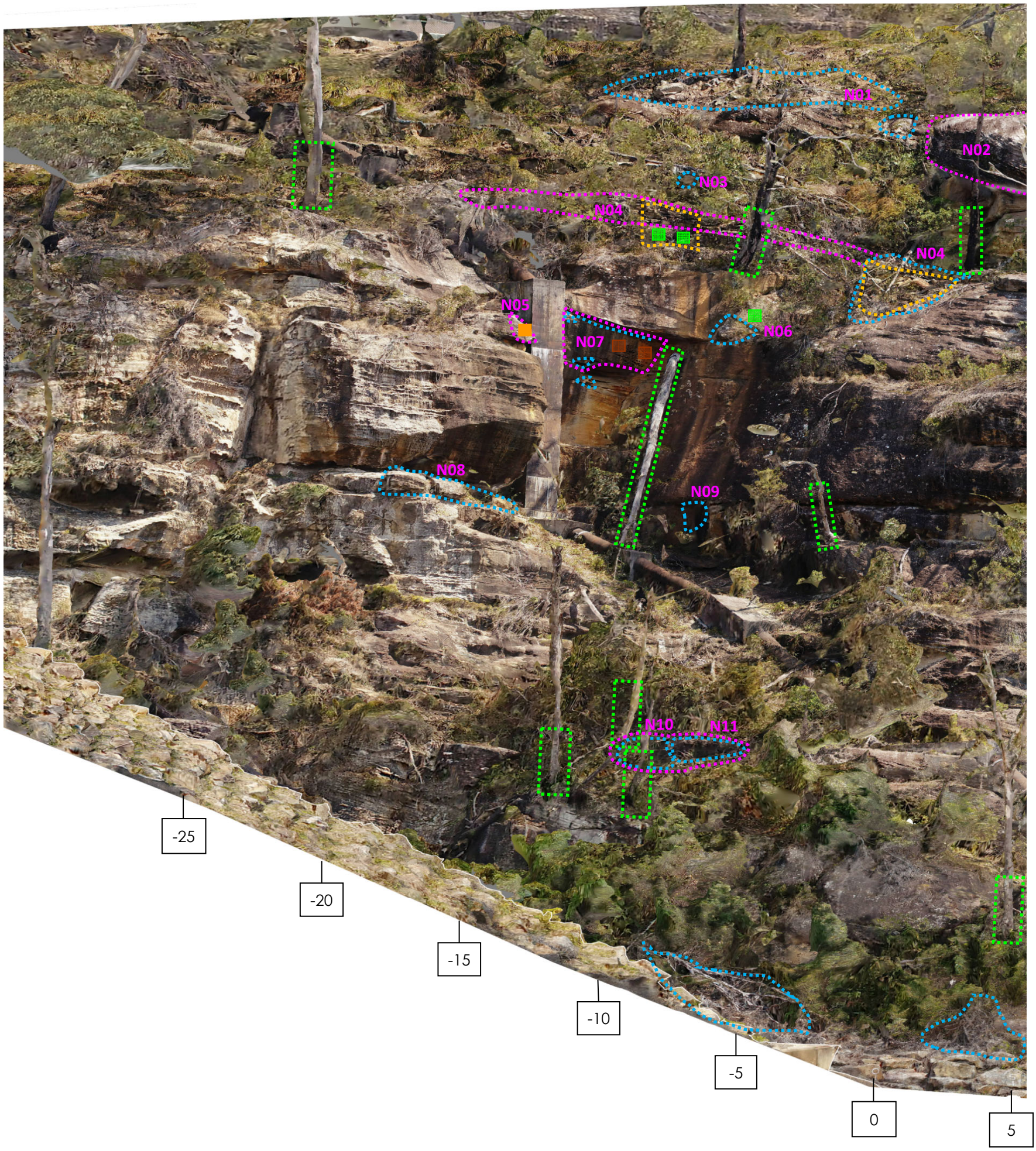
2	Issued for Construction	24/08/22	DF	AH

GHD

Client: **WaterNSW**
Project: **Greater Sydney Rockfall Stabilisation Project**
Location: **Site 005D - Nepean Dam**
Slope: **Ch 0 - 240m**

Title: **Slope Stabilisation Treatment Photomosaic Sheet 1 of 10**
Mapped By: DF, KD & AH Checked By: DF Date: 24/08/2022
Figure No. 12519708 - N005D - 03



Chainage (m)

FOR CONSTRUCTION

TARGETED SCALING, TREE-LOPPING, SHOTCRETE & MESH CONSTRUCTION

N01 **Rockfall Hazard Feature ID**
Refer hazard feature ID description sheets for details

Scaling and Grooming **Tree-lopping/ Devegetation**
Areas requiring selective scaling and grooming as directed to remove loose or detached rock masses or soil accumulations.

Shotcrete (structural)
Locations requiring application of mesh reinforced shotcrete

Pinned Rock Fall Mesh
Selected boulder and block wall hazards requiring in-situ support via pinned mesh

ROCK BOLTS
(approx. locations shown)

- 2m long rock bolt
- 3m long rock bolt
- 4m long rock bolt
- 6m long rock bolt

GENERAL NOTES

1. Cropped ortho-photomosaic subject to parallax distortion effects. Do not scale. Extent of hazard features and work boundaries are approximate.
2. Refer to Sheet 1 for location of this sheet in ortho-photomosaic of entire slope. Cutting reference chainages marked along toe of rock cutting.
3. Alpha numeric labels (eg: N01) denote individual slope hazard features - refer to description sheets for more details.
4. All trees/saplings growing on rock face are to be removed and stumps poisoned (Refer Project Specification).
5. Systematic scaling of all loose rock material to be carried out across entire rock face & upper slope using hand tools (Refer Project Specification).
6. Locations of specialist treatment (rock bolts/ shotcrete/ mesh) to be confirmed by GHD representative, installation as per Project Specification).

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1	Issued for Construction	15/08/22	DF	AH
2	Issued for Construction	24/08/22	DF	AH

Client: **WaterNSW**
Project: **Greater Sydney Rockfall Stabilisation Project**
Location: **Site 005D - Nepean Dam**
Slope: **CH -25 -5m**

Title: **Slope Stabilisation Treatment Photomosaic**
Sheet 2 of 10

Mapped by: DW, KD & AH
Figure No. 12519708 - N005D - 04
Checked by: DF
Date 24/08/22

GHD

FOR CONSTRUCTION

TARGETED SCALING, TREE-LOPPING, SHOTCRETE & MESH CONSTRUCTION

N01 **Rockfall Hazard Feature ID**
Refer hazard feature ID description sheets for details

Scaling and Grooming **Tree-lopping/ Devegetation**
Areas requiring selective scaling and grooming as directed to remove loose or detached rock masses or soil accumulations.

Shotcrete (structural)
Locations requiring application of mesh reinforced shotcrete

Pinned Rock Fall Mesh
Selected boulder and block wall hazards requiring in-situ support via pinned mesh

ROCK BOLTS
(approx. locations shown)

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- 3m long rock bolt
- 4m long rock bolt
- 6m long rock bolt

GENERAL NOTES

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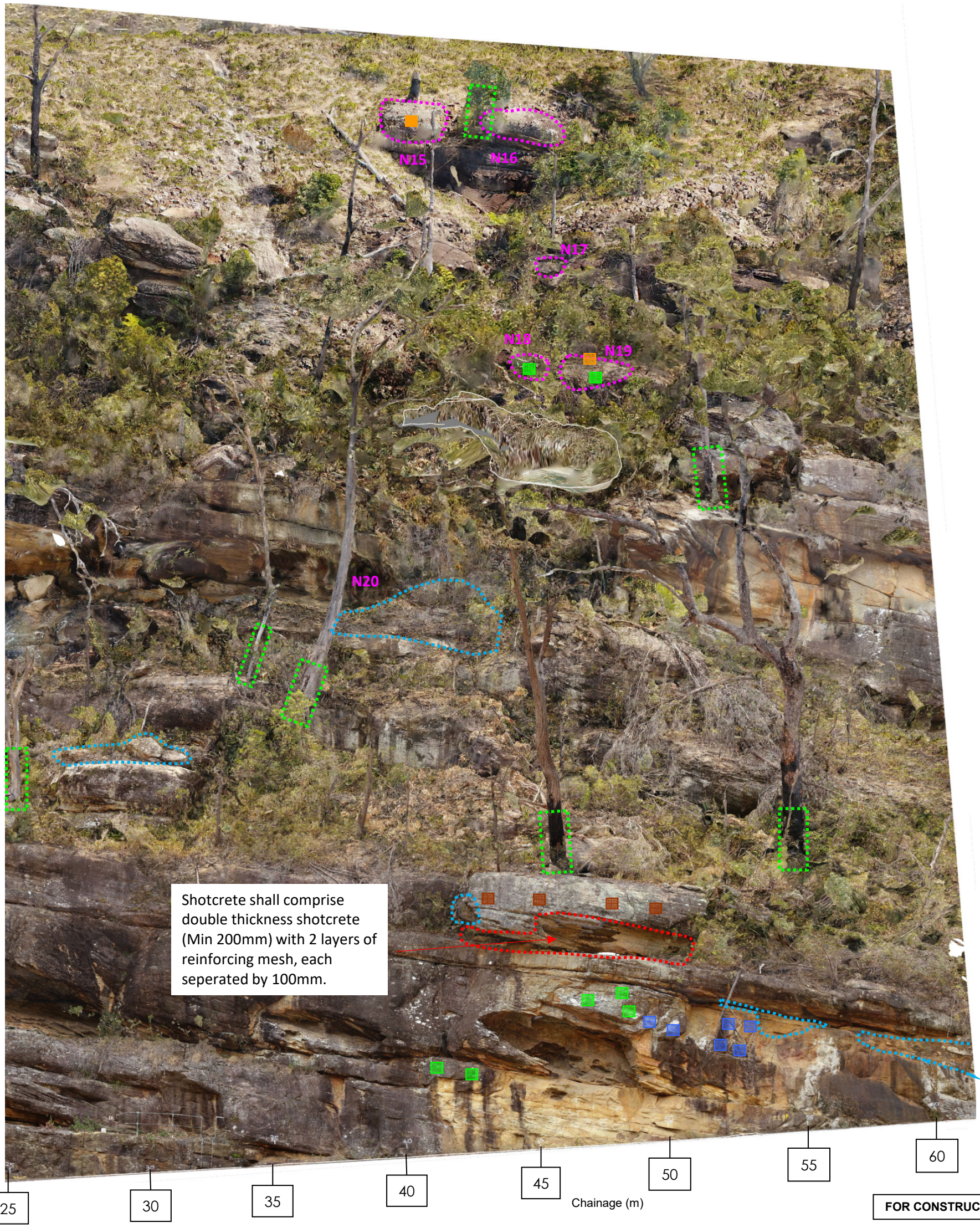
2	Issued for Construction	24/08/22	DF	AH

Client: **WaterNSW**
Project: **Greater Sydney Rockfall Stabilisation Project**
Location: **Site 005D - Nepean Dam**
Slope: **CH 0 - 30m**

Title: **Slope Stabilisation Treatment Photomosaic**
Sheet 3 of 10

Mapped by: DW, KD & AH
Figure No. 12519708 - N005D - 05
Checked by: DF
Date 24/08/22

GHD



FOR CONSTRUCTION

TARGETED SCALING, TREE-LOPPING, SHOTCRETE & MESH CONSTRUCTION

N01 **Rockfall Hazard Feature ID**
Refer hazard feature ID description sheets for details

Scaling and Grooming **Tree-lopping/ Devegetation**
Areas requiring selective scaling and grooming as directed to remove loose or detached rock masses or soil accumulations.

Shotcrete (structural)
Locations requiring application of mesh reinforced shotcrete

Pinned Rock Fall Mesh
Selected boulder and block wall hazards requiring in-situ support via pinned mesh

ROCK BOLTS
(approx. locations shown)

- 2m long rock bolt
- 3m long rock bolt
- 4m long rock bolt
- 6m long rock bolt

GENERAL NOTES

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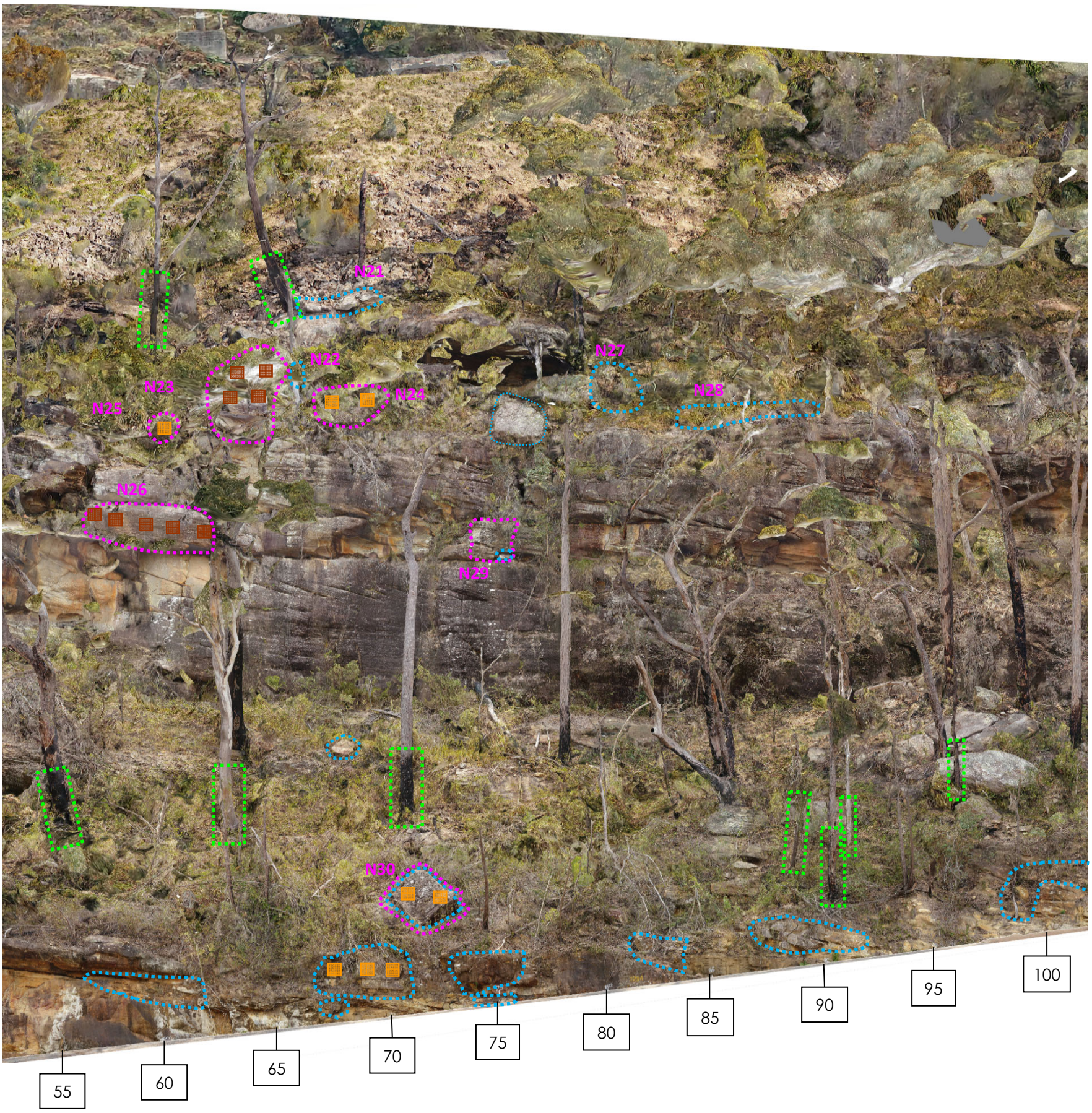
2	Issued for Construction	24/08/22	DF	AH

Client: **WaterNSW**
Project: **Greater Sydney Rockfall Stabilisation Project**
Location: **Site 005D - Nepean Dam**
Slope: **CH 25 - 60m**

Title: **Slope Stabilisation Treatment Photomosaic**
Sheet 4 of 10

Mapped by: DW, KD & AH
Figure No. 12519708 - N005D - 06
Checked by: DF
Date 24/08/22

GHD



FOR CONSTRUCTION

TARGETED SCALING, TREE-LOPPING, SHOTCRETE & MESHING WORKS

N01 **Rockfall Hazard Feature ID**

Refer hazard feature ID description sheets for details

Scaling and Grooming

Tree-lopping/ Devegetation

Areas requiring selective scaling and grooming as directed to remove loose or detached rock masses or soil accumulations.

Shotcrete (structural)

Locations requiring application of mesh reinforced shotcrete

Pinned Rock Fall Mesh

Selected boulder and block wall hazards requiring in-situ support via pinned mesh

ROCK BOLTS

(approx. locations shown)

- 2m long rock bolt
- 3m long rock bolt
- 4m long rock bolt
- 6m long rock bolt

GENERAL NOTES

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2	Issued for Construction	24/08/22	DF	AH

Client: **WaterNSW**

Project: **Greater Sydney Rockfall Stabilisation Project**

Location: **Site 005D - Nepean Dam**

Slope: **CH 60 - 100m**

Title: **Slope Stabilisation Treatment Photomosaic**
Sheet 5 of 10

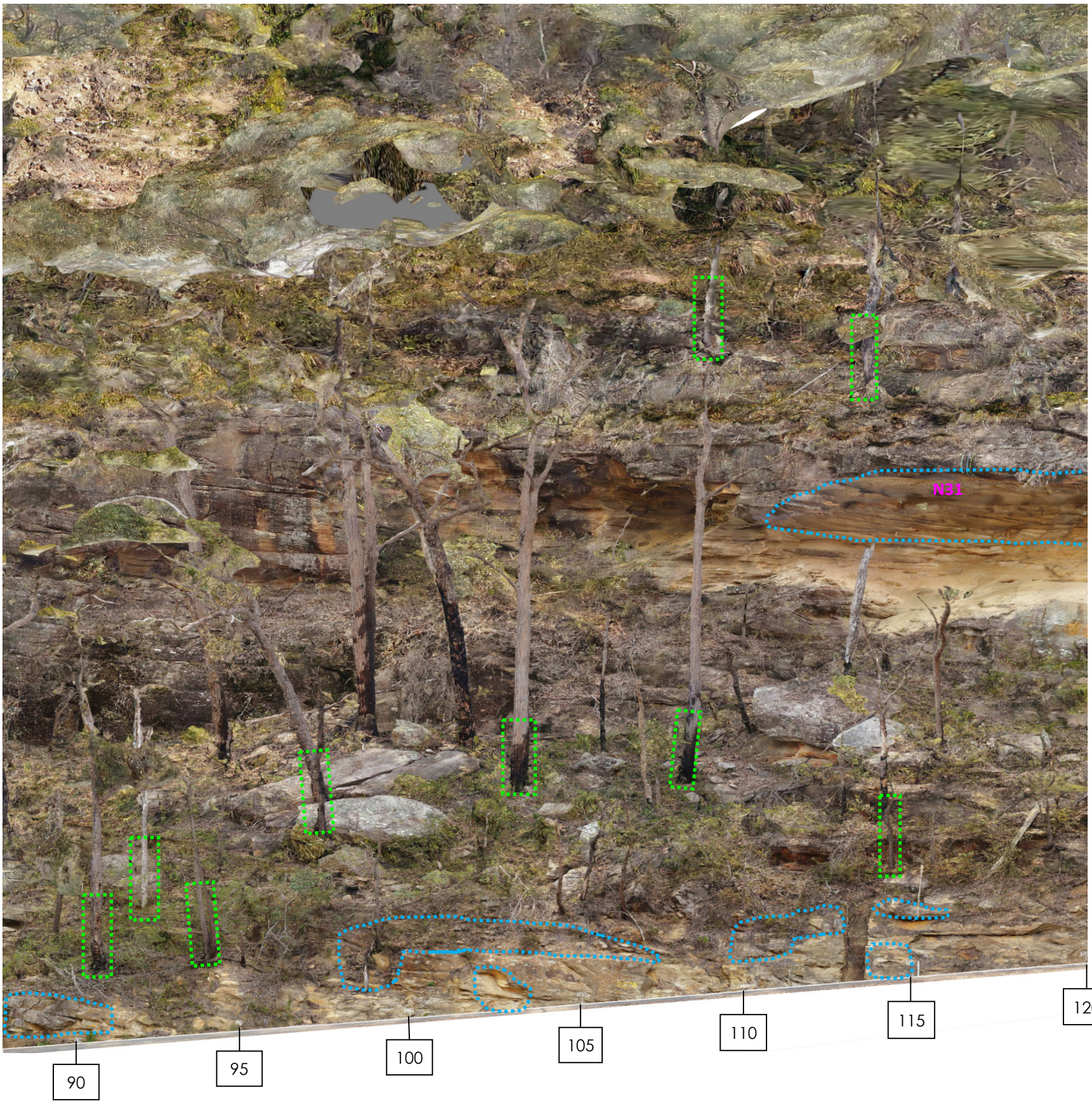
Mapped by: DW, KD & AH

Figure No. 12519708 - N005D - 07

Checked by: DF

Date 24/08/22

GHD



FOR CONSTRUCTION

TARGETED SCALING, TREE-LOPPING, SHOTCRETE & MESHING WORKS

N01 **Rockfall Hazard Feature ID**

Refer hazard feature ID description sheets for details

Scaling and Grooming **Tree-lopping/ Devegetation**

Areas requiring selective scaling and grooming as directed to remove loose or detached rock masses or soil accumulations.

Shotcrete (structural)

Locations requiring application of mesh reinforced shotcrete

Pinned Rock Fall Mesh

Selected boulder and block wall hazards requiring in-situ support via pinned mesh

ROCK BOLTS

(approx. locations shown)

- 2m long rock bolt
- 3m long rock bolt
- 4m long rock bolt
- 6m long rock bolt

GENERAL NOTES

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6. Locations of specialist treatment (rock bolts/ shotcrete/ mesh) to be confirmed by GHD representative, installation as per Project Specification).

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1	Issued for Construction	15/08/22	DF	AH
2	Issued for Construction	24/08/22	DF	AH

Client: **WaterNSW**

Project: **Greater Sydney Rockfall Stabilisation Project**

Location: **Site 005D - Nepean Dam**

Slope: **CH 90 - 120m**

Title: **Slope Stabilisation Treatment Photomosaic Sheet 6 of 10**

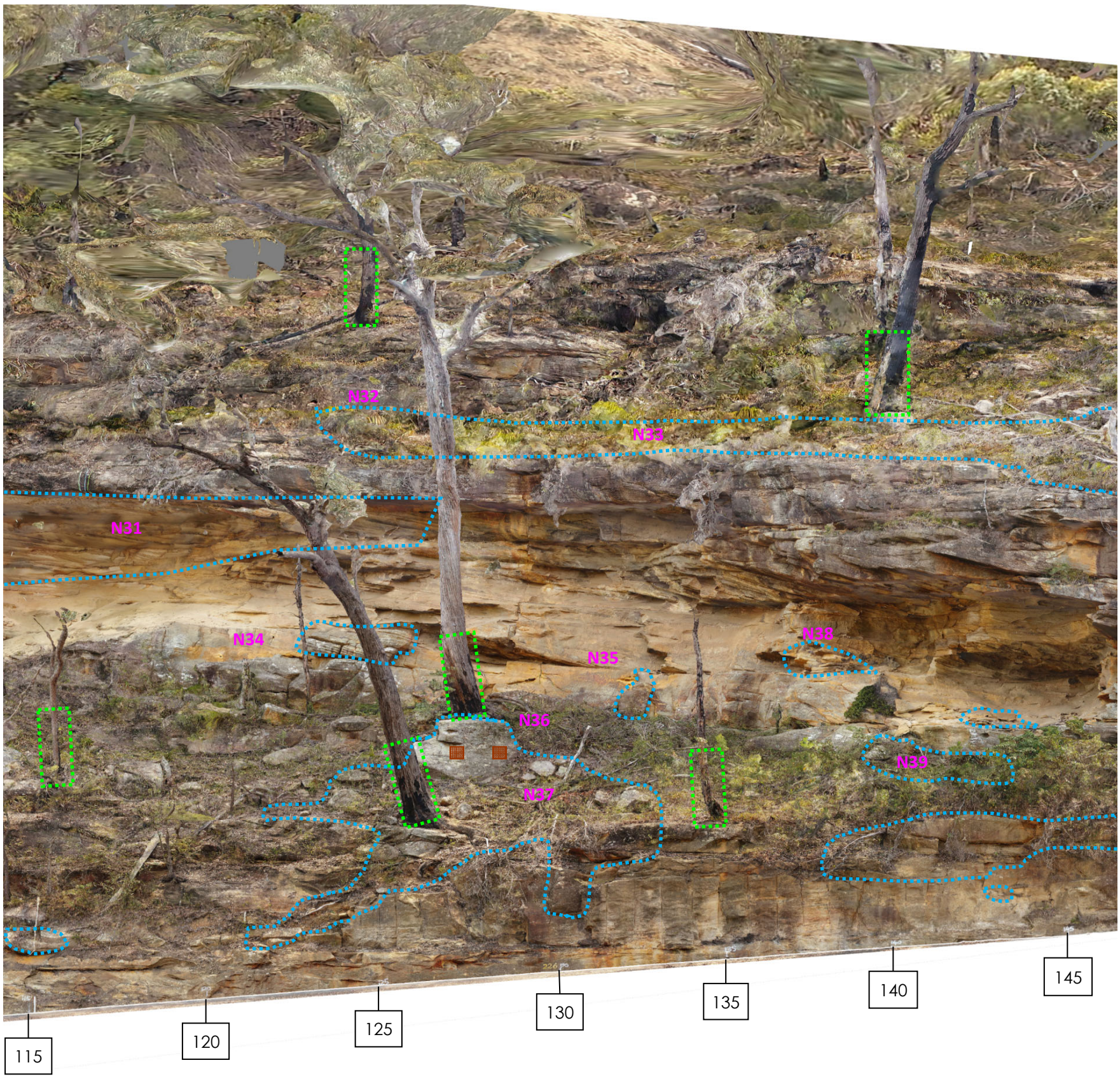
Mapped by: DW, KD & AH

Figure No. 12519708 - N005D - 08

Checked by: DF

Date 24/08/22

GHD



FOR CONSTRUCTION

TARGETED SCALING, TREE-LOPPING, SHOTCRETE & MESHING WORKS

N01 **Rockfall Hazard Feature ID**
Refer hazard feature ID description sheets for details

Scaling and Grooming

Tree-lopping/ Devegetation
Areas requiring selective scaling and grooming as directed to remove loose or detached rock masses or soil accumulations.

Shotcrete (structural)
Locations requiring application of mesh reinforced shotcrete

Pinned Rock Fall Mesh
Selected boulder and block wall hazards requiring in-situ support via pinned mesh

ROCK BOLTS
(approx. locations shown)

- 2m long rock bolt
- 3m long rock bolt
- 4m long rock bolt
- 6m long rock bolt

GENERAL NOTES

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6. Locations of specialist treatment (rock bolts/ shotcrete/ mesh) to be confirmed by GHD representative, installation as per Project Specification).

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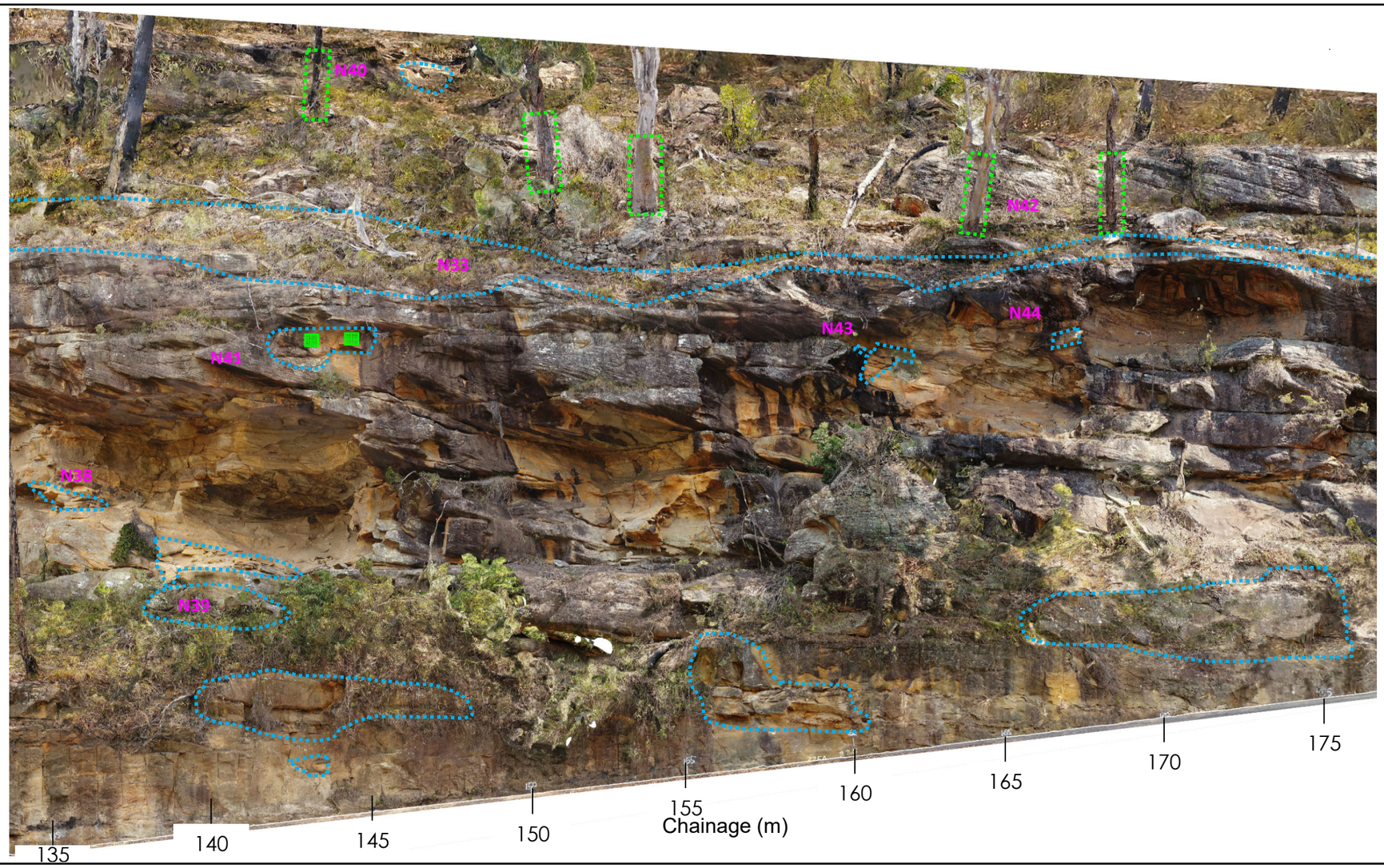
2	Issued for Construction	24/08/22	DF	AH

Client: **WaterNSW**
Project: **Greater Sydney Rockfall Stabilisation Project**
Location: **Site 005D - Nepean Dam**
Slope: **CH 115 - 145m**

Title: **Slope Stabilisation Treatment Photomosaic**
Sheet 7 of 10

Mapped by: DW, KD & AH
Figure No. 12519708 - N005D - 09
Checked by: DF
Date 24/08/22

GHD



FOR CONSTRUCTION

TARGETED SCALING, TREE-LOPPING, SHOTCRETE & MESHING WORKS

N01 **Rockfall Hazard Feature ID**
Refer hazard feature ID description sheets for details

Scaling and Grooming **Tree-lopping/ Devegetation**
Areas requiring selective scaling and grooming as directed to remove loose or detached rock masses or soil accumulations.

Shotcrete (structural)
Locations requiring application of mesh reinforced shotcrete

Pinned Rock Fall Mesh
Selected boulder and block wall hazards requiring in-situ support via pinned mesh

ROCK BOLTS
(approx. locations shown)
(approx. locations shown)
- 2m long rock bolt
- 3m long rock bolt
- 4m long rock bolt
- 6m long rock bolt

GENERAL NOTES
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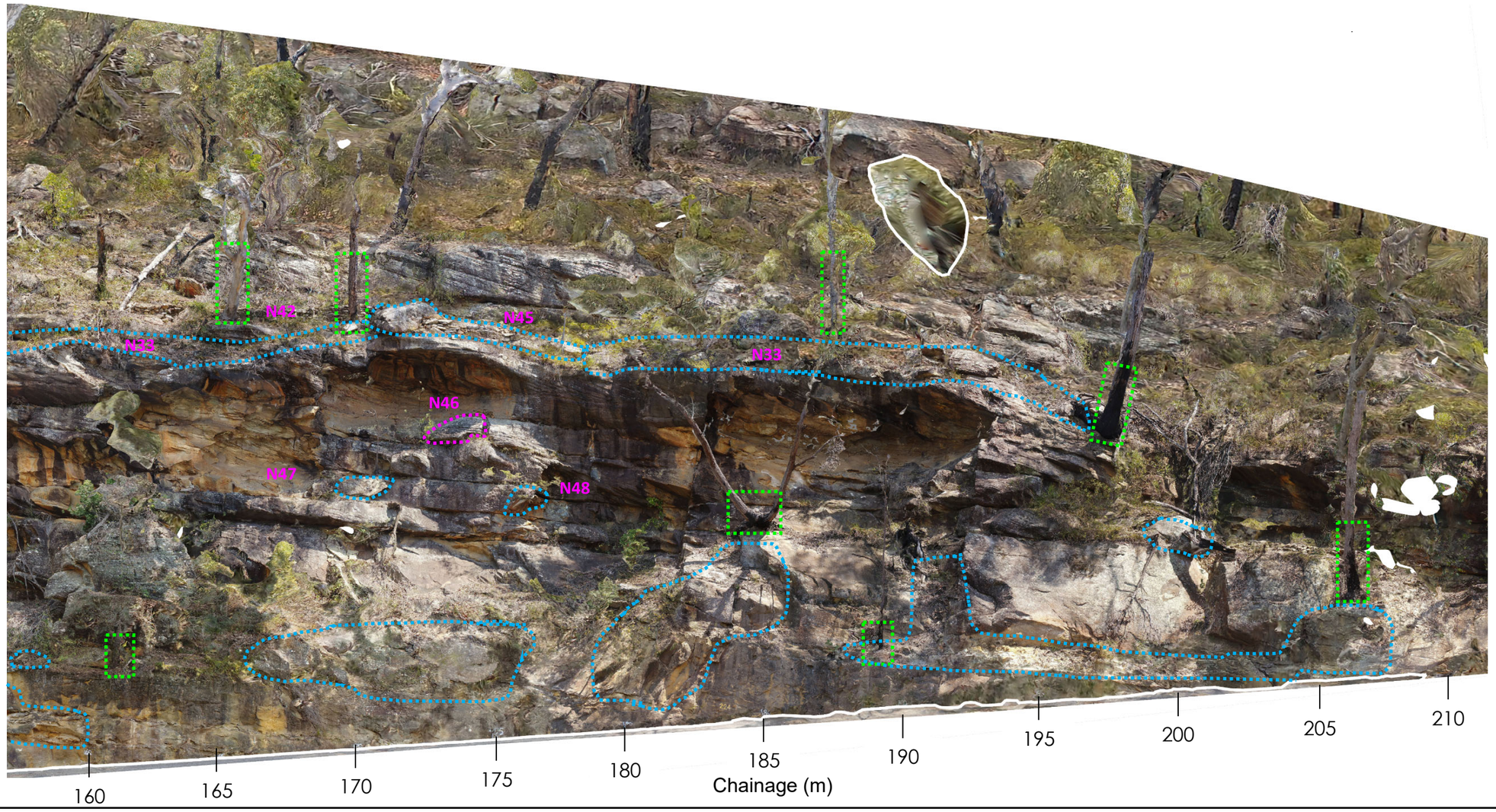
2	Issued for Construction	24/08/22	DF	AH

GHD

Client: **WaterNSW**
Project: **Greater Sydney Rockfall Stabilisation Project**
Location: **Site 005D - Nepean Dam**
Slope: **CH 135-175m**

Title: **Slope Stabilisation Treatment Photomosaic**
Sheet 8 of 10
Mapped By: DF, KD & AH Checked By: DF Date: 24/08/2022
Figure No. 12519708 - N005D - 10



FOR CONSTRUCTION

TARGETED SCALING, TREE-LOPPING, SHOTCRETE & MESHING WORKS

N01 **Rockfall Hazard Feature ID**
Refer hazard feature ID description sheets for details

Scaling and Grooming **Tree-lopping/ Devegetation**
Areas requiring selective scaling and grooming as directed to remove loose or detached rock masses or soil accumulations.

Shotcrete (structural)
Locations requiring application of mesh reinforced shotcrete

Pinned Rock Fall Mesh
Selected boulder and block wall hazards requiring in-situ support via pinned mesh

ROCK BOLTS
(approx. locations shown)
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- 3m long rock bolt
- 4m long rock bolt
- 6m long rock bolt

GENERAL NOTES
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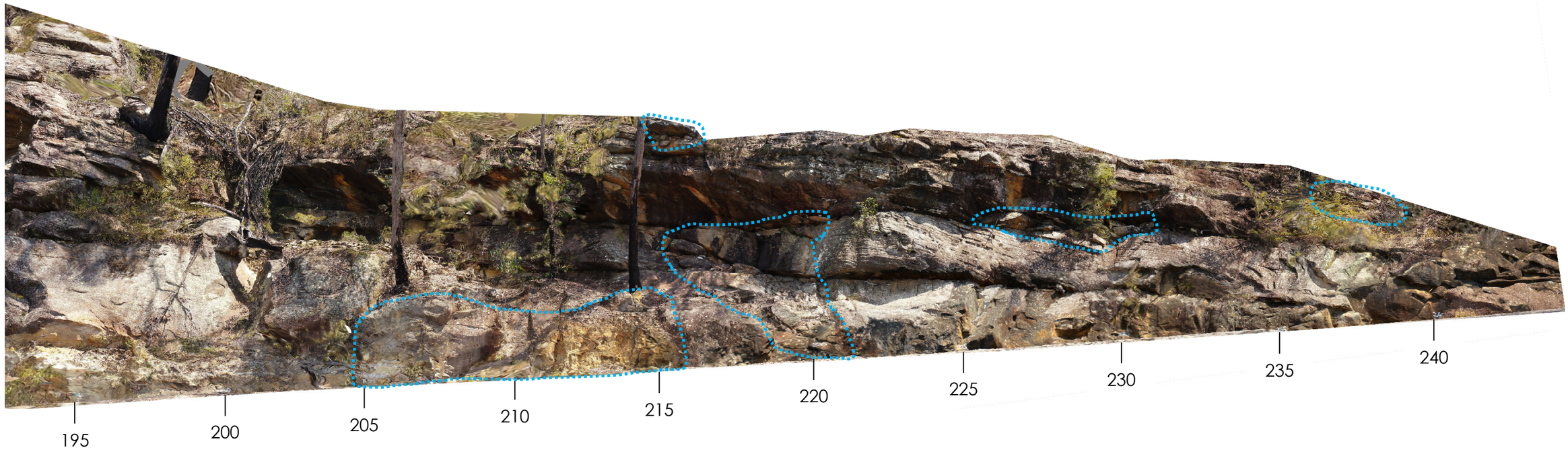
GHD

Client: **WaterNSW**
Project: **Greater Sydney Rockfall Stabilisation Project**
Location: **Site 005D - Nepean Dam**
Slope: **CH 160-205m**

Title: **Slope Stabilisation Treatment Photomosaic**
Sheet 9 of 10
Mapped By: DW, KD & AH Checked By: DF Date: 24/08/2022
Figure No. 12519708 - N005D - 11

24/08/2022



Chainage (m)

FOR CONSTRUCTION

TARGETED SCALING, TREE-LOPPING, SHOTCRETE & MESHING WORKS

N01 **Rockfall Hazard Feature ID**

Refer hazard feature ID description sheets for details

Scaling and Grooming **Tree-lopping/ Devegetation**

Areas requiring selective scaling and grooming as directed to remove loose or detached rock masses or soil accumulations.

Shotcrete (structural)

Locations requiring application of mesh reinforced shotcrete

Pinned Rock Fall Mesh

Selected boulder and block wall hazards requiring in-situ support via pinned mesh

ROCK BOLTS

(approx. locations shown)

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- 4m long rock bolt
- 6m long rock bolt

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GHD

Client: **WaterNSW**
Project: **Greater Sydney Rockfall Stabilisation Project**
Location: **Site 005D - Nepean Dam**
Slope: **CH 200-240m**

Title: **Slope Stabilisation Treatment Photomosaic**
Sheet 10 of 10
Mapped By: DW, KD & AH Checked By: DF Date: 24/08/2022
Figure No. 12519708 - N005D - 12

24/08/2022

Appendix B

Assessments of Significance

Section 7.3 of the Biodiversity Conservation Act 2016 and section 1.7 of the EP&A Act list five factors that must be taken into account in the determination of the significance of potential impacts of an activity on 'threatened species', populations or ecological communities (or their habitats) listed under the BC Act.

The '5-part test' is used to determine whether an activity is 'likely' to impose 'a significant effect' on threatened biota and thus whether a species impact statement (SIS) is required. Should the 5-part test conclude that a significant effect is likely, an SIS or Biodiversity Development Assessment Report (BDAR) must be prepared.

Five part tests have been provided for threatened biota which were recorded or have a high or moderate likelihood of occurrence and could potentially be impacted by the proposal.

The following threatened biota and potential threatened biota, are included in these have been assessed:

– *Leucopogon exolasius* – see Table B.1
– *Chalinolobus dwyeri* – see Table B.2
– *Phascolarctos cinereus* – see Table B.3
– Hollow-roosting microbats – See Table B.4
– Large forest owls – See Table B.5

Table B.1 5 part test - Leucopogon exolasius

***Leucopogon exolasius* (Woronora Beard-heath) – Vulnerable under BC Act and EPBC Act**
a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;
The factors that could potentially disrupt the life cycle of *Leucopogon exolasius* are: loss of habitat; loss of individuals from a potentially occurring population; loss of reproductive ability and loss of an ecologically important portion of a potentially occurring local population. A total of 118 individuals were reported at Site 005D with 83 individuals recorded in and in the vicinity of proposed works. The largest cluster of 39 individuals was located outside of the proposed works areas. Given that vegetation clearance is limited to the removal of trees and stags, the largest threat to the individuals in works areas is disturbance/trampling while accessing areas for remediation and completing the remediation works. Impacts relevant to the population would be mitigated during construction via the implementation of safeguards outlined in Section 6.2. Further threats to remaining populations relevant to the proposal include weed invasion and site erosion. Impacts of this relevant to the population would be mitigated during construction via the implementation of safeguards outlined in Section 6.2. Given the above, and given that the *Leucopogon exolasius* is recorded in populations of greater numbers nearby, the potential removal of *Leucopogon exolasius*, for the reasons discussed above, is unlikely to significantly impact the species to an extent that a locally viable population of the species would be at risk of extinction. Individuals present represent a precarious and potentially unviable population given their presence on a rock face at risk of rock fall or similar that may result in the loss of all individuals, if the proposed works are not undertaken.
b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: **(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
N/A to this threatened species
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;
N/A to this threatened species
c) In relation to the habitat of a threatened species or ecological community: **(i) The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
The vegetation proposed to be removed as a part of remediation works is minimal, and is largely limited to the removal of trees, stumps or stages that may further destabilise the site. No gross clearing of vegetation anywhere on the Site 005D is proposed. Additionally, the proposed works focus mainly on selected localised areas of loose and unstable rock, as opposed to areas of vegetation, further reducing the potential to modify or remove *Leucopogon exolasius* individuals. The proposed impact mitigation and environmental management measures are likely to mitigate against erosion, sedimentation, weed invasion or any other indirect effects on areas of potential habitat for the *Leucopogon exolasius* during construction and operation. As outlined above, without the proposed works taking place, the population of *Leucopogon*

***Leucopogon exolasius (*Woronora Beard-heath) – Vulnerable under BC Act and EPBC Act**
exolasius within the site may not be viable, as there is an ongoing risk of rock fall or similar, that may result in the loss of all individuals.
(ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
Given that the proposed works do not involve broad-scale vegetation clearing and is limited to the removal of trees and stags alone, it is highly unlikely that any incidental clearance of individuals of *Leucopogon exolasius* will result in fragmentation or isolation of the local population. Works will be completed on a very steep rock face, with the only potential seed dispersal occurring downslope, into an area of disturbed land and waterway. The individuals outside the area of proposed works would not be impacted by the proposal, and the proposal would not result in the creation of any barriers to movement of pollinators or seed dispersal for retained individuals.
(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,
As stated above, given that the removal of vegetation is limited to the removal of trees and stags, and given that populations of the species are present nearby, any *Leucopogon exolasius* potentially removed as a part of the proposal is highly unlikely to impact the long-term survival of the species. There are known populations of the species outside the area of proposed works, in areas that are not as unstable as the proposed area of works. Without the proposed works, it is possible that all individuals within the site may be lost, if the slope was to fail and a serious rock fall ensued.
d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),
The proposal would not affect any habitat of outstanding biodiversity value.
e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposal would directly contribute to the operation of the following KTPs: — Clearing of native vegetation – up to 37 trees (including stags) are proposed to be removed. Some incidental damage or potential loss of shrub vegetation is possible during accessing the remediation locations. Other KTPs which require consideration, include: — Invasion and establishment of exotic vines and scramblers, invasion and establishment of Lantana camara – the proposal has the potential to increase the incidence of weeds through ground disturbance and potentially spread of propagules on plant and vehicles during construction. Establishment of exotic vines and scrambles has the potential to affect the condition of habitat for these species; — Infection of native plants by *Phytophthora cinnamomi* and Myrtle Rust – the proposal would disturb soil within and adjoining native vegetation and potentially transfer or introduce pathogens via infected boots, equipment and machinery during excavation. Mitigation measures are recommended to limit the potential for the proposal to result in a substantial increase to any of these KTPs.
Conclusion of the assessment of significance
Based on consideration of the above criteria, the proposal is unlikely to have a significant effect on the population of the *Leucopogon exolasius* at Site 005D, given: – The proposal is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction. – The proposal would require impacts to areas of potential habitat for the species, to stablise a larger area of land. Without the proposed works, the long-term viability of the population is uncertain, as there would be an ongoing risk of rockfall that may destroy the population. – The proposal would not result in any areas of habitat becoming fragmented or isolated from other areas of habitat. – Habitat that may be impacted is unlikely to be important to the long-term survival of the species or ecological community in the locality, as there are other known populations within the locality as well as within areas immediately outside the area of proposed works that would not be impacted. – The proposa would not have an adverse effect on any declared area of outstanding biodiversity value. – The proposal is unlikely to result in a substantial increase to the impact of any key threatening processes of relevance to the species. Mitigation measures including measures to avoid unnecessary damage or death of the *Leucopogon exolasius* during remediation works is recommended.

Table B.2 5 part test - Chalinolobus dwyeri

***Chalinolobus dwyeri* (Large-eared Pied Bat) – Vulnerable under BC Act and EPBC Act**
a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;
The Large-eared Pied Bat has been recorded in at the honeycombed overhangs at Site 005D via Anabat, and also within the wider locality. The honeycombed overhangs at Site 005D comprise suitable roosting habitat for the species, however, based on the results of Anabat analysis, while the species is known to occur, it appears that the species visits the site intermittently, and not necessarily for roosting. Additionally, given that the removal of the overhangs and surrounding vegetation is not proposed, and given that suitable alternative habitat is present in the vicinity, any potentially disturbance to the species is likely to be minimal. Furthermore, any disturbance or disruption to the overhangs in the case of potential roosting habitat can also be managed by avoiding any works in the area during the roosting period of October to March. Without implementation of the proposed works, the long-term viability of the site is uncertain; stabilisation works are required to prevent future rock falls, that may destroy all available habitat for this species within the site. In this context, the proposed works are necessary to preserve as much available habitat for the species as possible within the site. Therefore, the proposal is unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction. Mitigation measures including measures to avoid mortality of bats during construction and avoiding construction during the roosting period are recommended.
b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: **(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
N/A to this threatened species
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;
N/A to this threatened species
c) In relation to the habitat of a threatened species or ecological community: **(i) The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
While the exact amount of rock to be removed from the overhangs is as yet unknown, as noted in Section 5.2.3, the amount of habitat to be removed is minimal (i.e. only loose rock along the fringe of the overhangs), and may be able to be avoided completely if deemed a necessary mitigation measure to avoid disturbance to any roosting habitat. It is noted that unless proven otherwise by additional survey efforts during the roosting period (i.e. October to March), it is assumed that the overhangs do comprise roosting sites for the Large-eared Pied Bat. Notwithstanding, the small amounts of potential habitat to be removed represents a minor proportion of available habitat within the locality.
(ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
Given the highly mobile nature of the Large-eared Pied Bat, and the potential removal of very small amounts of potential roosting habitat from along the edges of the honeycombed overhangs, the proposal will result in a small reduction in the extent of available habitat but will not result in a substantial increase in fragmentation and no areas of habitat will be isolated from any other areas of habitat as a result of the proposal.
(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,
The proposal would remove only very small amounts of potential roosting habitat for these species from the edges of the honeycombed overhangs. The small amounts of habitat to be removed are not likely to be important to the long-term survival of the species in the locality, especially when considered in the context of the long-term viability of the habitat itself, should the proposed works not be completed. As noted above, mitigation measures to avoid disturbance to potential roosting habitat is to avoid the roosting period of October to March.
d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),
The proposal would not affect any habitat of outstanding biodiversity value.

***Chalinolobus dwyeri* (Large-eared Pied Bat) – Vulnerable under BC Act and EPBC Act**
e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposal would directly contribute to the operation of the following KTP: — Bushrock removal – small amounts of rock from the honeycombed overhangs are proposed to be removed from Site 005D Other KTPs which require consideration, include: — the introduction and distribution of invasive weed species – the proposal has the potential to increase the incidence of weeds through ground disturbance and potentially spread of propagules on clothing/boots and vehicles during remediation works. — Infection of native plants by Phytophthora cinnamomi and Myrtle Rust – the proposal would disturb soil within and adjoining native vegetation and potentially transfer or introduce pathogens via infected boots, equipment and machinery during excavation.
Conclusion of the assessment of significance
Based on consideration of the above criteria, the proposal is unlikely to have a significant impact on the local population of the Large-eared Pied Bat, given: — Limited potential roosting habitat would be removed or disturbed — No areas of habitat would become isolated as a result of the proposal. Consequently, a species impact statement is not required for the Large-eared Pied Bat. Mitigation measures including measures to avoid mortality of bats during remediation are recommended.

Table B.3 5 part test - Phascolarctos cinereus

***Phascolarctos cinereus* (Koala) – Endangered under BC Act and EPBC Act**
a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;
The Koala has not been recorded in Site 005D, however, feed trees are present on site (i.e. *Eucalyptus punctata*) and there has been a recorded sighting approximately 200 m from Site 005D. Notwithstanding, it is considered that Site 005D generally comprises unsuitable habitat given that it's located along a steep escarpment. The Koala is an easily identifiable species and it has never been recorded on the rock face in question. Additionally, there are extensive areas of suitable habitat in adjoining areas and the broader locality that are on gentler topography and which would enable easier travel by Koalas throughout the locality. It is therefore considered that the proposed works would be unlikely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: **(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
N/A to this threatened species
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;
N/A to this threatened species
c) In relation to the habitat of a threatened species or ecological community: **(i) The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
The proposal will remove up to 37 trees (including stags) from Site 005D, including the potential to remove some feed trees the species prefers. This represents a very small percent of the total estimated extent of native vegetation in the locality. Removal of up to 37 trees from a very steep rock face, represents a minor reduction in the extent of habitat for the species in the locality, particularly in the context of the long-term viability of the rock face should the proposed works not be completed.
(ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

***Phascolarctos cinereus* (Koala) – Endangered under BC Act and EPBC Act**
Native vegetation a Site 005D is part of an extensive patch of mostly continuous native vegetation that extends throughout the locality. Any potential fragmentation resulting from the removal of up to 37 trees is considered highly unlikely to prevent the Koala from utilising habitat in the vicinity of Site 005D given its highly mobile nature. Connectivity would be maintained with adjoining habitat and there would not be complete isolation of any stands of habitat. Given the above, the proposal is unlikely to affect the connectivity of habitat to the extent that any habitat for the Koala would be isolated.
(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,
The proposal would result in the removal of up to 37 trees habitat for the Koala, containing eucalypt species known to be preferred feed trees for the species. The trees proposed to be removed represents a very small percent of the total estimated extent of native woodland in the locality. The species has never been recorded on the rock face, and given the steep topography of the rock face, is unlikely to rely on vegetation growing on it to traverse the local area. The proposed should be viewed in the context of the long-term viability of the rock face, if the proposed works are not implemented. There is the potential that the rock face could fail or there could be rock falls that destroy larger areas of native vegetation, resulting in a greater impact on potential habitat for this species. Taking the above into account, impacts to a small area of potential habitat within Site 005D is highly unlikely to be important to the long-term survival the species in the context of the extent of potential habitat in Site 005D, the surrounding area and the locality.
d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),
The proposal would not affect any habitat of outstanding biodiversity value.
e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposal would contribute to the operation of the following Key Threatening Processes (KTPs) of relevance to the Koala: – Clearing of native vegetation The proposal would directly contribute to the operation of this KTP through the removal of up to 37 native trees of native vegetation which may provide foraging habitat for the species as described above As described 7.2 the proposal would remove or modify a very minor proportion of the habitat resources that may support a potential local population of this threatened species through the operation of this KTP.
Conclusion of the assessment of significance
Based on consideration of the above criteria, the proposal is unlikely to have a significant effect on any potential population of the Koala that may utilise Site 005D given: – Site 005D comprises marginal habitat at best given that it is located along a steep escarpment that would be difficult to traverse for the Koala – There are extensive areas of suitable habitat in adjoining areas and the broader locality. – The small area of potential habitat within Site 005D is highly unlikely to be important to the long-term survival the species Consequently, a species impact statement is not required for the Koala. Mitigation measures including measures to avoid mortality of Koalas that might be present on Site 005D are recommended.

Table B.4 5 part test - Hollow-roosting microbats

***Hollow roosting microbats* - Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, Golden-tipped Bat, Southern Myotis, eastern false Pipistrelle, Eastern Coastal Free-tailed Bat and the Yellow-bellied Sheathtail-bat – Vulnerable under BC Act**
a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;
The Eastern Coastal Free-tailed Bat is predicted to occur at Site 005D based on the results of Anabat analysis, and this species has also been recorded in the locality. The Little Bent-winged Bat, Golden-tipped Bat, Southern Myotis, Eastern False Pipistrelle, Eastern Coastal Free-tailed Bat and the Yellow-bellied Sheathtail-bat have not been recorded at Site 005D but are known to occur in the locality. These species may forage at Site 005D and may roost within crevices or under exfoliating tree bark on occasion.

***Hollow roosting microbats* - Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, Golden-tipped Bat, Southern Myotis, eastern false Pipistrelle, Eastern Coastal Free-tailed Bat and the Yellow-bellied Sheathtail-bat – Vulnerable under BC Act**
Five known hollow-bearing trees are present at Site 005D, with four of a suitable size (i.e. 5 cm to 10 cm) as roosting habitat for the species. However, there are extensive areas of suitable habitat in adjoining areas and the broader locality. The proposal should be considered in the context of the risk of future land falls or rock face failure; any such impact may result in the loss of a larger area of potential habitat for these species. It is not known whether all hollow-bearing trees within the site would be removed to complete the proposed works, and mitigation measures would be adopted to try to avoid clearing unless necessary from a safety perspective. Taking the above into account, along with the presence of vast areas of suitable habitat available in adjacent areas as well as elsewhere in the locality the proposed works are unlikely to have an adverse effect on the life cycle of the species such that a viable local population of any of these species is likely to be placed at risk of extinction.
b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: **(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
N/A to these threatened species
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;
N/A to these threatened species
c) In relation to the habitat of a threatened species or ecological community: **(i) The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
The proposed remediation works would result in the removal of up to 37 trees, including up to five hollows. The trees to be removed represents potential foraging habitat and roosting habitat for these species. The vegetation to be removed may provide potential roost and/or breeding resources for these species, should they utilise crevices or exfoliating bark. Large areas of intact habitat exist elsewhere adjacent to Site 005D as well as in the locality. Therefore, the removal of up to 37 trees and five hollows represents a small reduction to the total extent of available habitat for these species.
(ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
Given the highly mobile nature of the species, and the availability of good quality habitat in the vicinity and wider locality of Site 005D, the proposal will result in a small reduction in the extent of available habitat but will not result in a substantial increase in fragmentation and no areas of habitat will be isolated from any other areas of habitat as a result of the proposal.
(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,
The proposal would remove up to 37 trees and five hollows from Site 005D. The amount of habitat to be removed are not likely to be important to the long-term survival of the species in the locality given the prevalence of suitable habitat nearby.
d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),
The proposal would not affect any habitat of outstanding biodiversity value.
e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposal would directly contribute to the operation of the following KTP: — Removal of fauna habitat – up to 37 trees and five hollows are proposed to be removed from Site 005D Other KTPs which require consideration, include: — Invasion and establishment of exotic vines and scramblers, invasion and establishment of Lantana camara – the proposal has the potential to increase the incidence of weeds through ground disturbance and potentially spread of propagules on plant and vehicles during construction. Establishment of exotic vines and scramblers has the potential to affect the condition of habitat for these species. — Infection of native plants by *Phytophthora cinnamomi* and Myrtle Rust – the proposal would disturb soil within and adjoining native vegetation and potentially transfer or introduce pathogens via infected boots, equipment and machinery during excavation.
Conclusion of the assessment of significance

***Hollow roosting microbats* - Eastern Coastal Free-tailed Bat, Little Bent-winged Bat, Golden-tipped Bat, Southern Myotis, eastern false Pipistrelle, Eastern Coastal Free-tailed Bat and the Yellow-bellied Sheathtail-bat – Vulnerable under BC Act**
Based on consideration of the above criteria, the proposal is unlikely to have a significant impact on the local population of hollow roosting microbats, given: – Large areas of suitable habitat are located nearby to Site 005D and in the wider locality – No areas of habitat would become isolated as a result of the proposal. – The small area of potential habitat within Site 005D is highly unlikely to be important to the long-term survival the species Consequently, a species impact statement is not required for hollow-roosting microbats. Mitigation measures including measures to avoid mortality of bats, and the relocation of hollows, during remediation are recommended.

Table B.5 5 part test – Large forest owls

Large forest owls – Powerful Owl and Barking Owl – Vulnerable under BC Act
a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction;
No large forest owl species were recorded in Site 005D but are known to occur in similar habitats in the locality and may occur in Site 005D on occasion. The proposed works would remove at least 37 trees and one large hollow of a size suitable for use by large forest owls from Site 005D, which may provide breeding and foraging habitat for these species. Large areas of equivalent, suitable foraging and nesting habitat exist adjacent to Site 05D and in the locality. Noise and vibration during the treatment of hazards have the potential to disturb individuals, if nesting in areas adjacent to Site 056D and may result in individuals foraging elsewhere. Additional noise and vibration impacts resulting from the proposed works would be temporary in nature. However, any individuals using habitats within and around the site would be habituated to some degree of disturbance from noise given existing background levels associated with dam activities and management. The proposal is not likely to place the local population at risk of extinction
b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: **(i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
N/A to these threatened species
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;
N/A to these threatened species
c) In relation to the habitat of a threatened species or ecological community: **(i) The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**
Up to 37 trees and one large hollow suitable for breeding and nesting could be removed from Site 005D. The trees may provide habitat for prey species, as well as be utilised as perches during hunting. Yet large areas of suitable foraging and nesting habitat exist adjacent to Site 05D and in the locality. Noise and vibration during the treatment of hazards may affect the quality or occupation of habitat adjoining Site 005D. Additional noise and vibration impacts resulting from the proposal would be temporary in nature.
(ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and
The removal of up 37 trees that could take place as part of the proposed works are unlikely to create a barrier to movement for these highly mobile species and would not isolate any habitat for these species. Continuous patches of native vegetation are present around Site 005D. Large hollows are rare, so the removal of the large hollow could impact individuals breeding in that hollow. Mitigation measures including measures to avoid the removal of hollows where possible, impacts to any species that use that hollow, and the relocation of hollows that are removed, are recommended. Based on the above, the

Large forest owls – Powerful Owl and Barking Owl – Vulnerable under BC Act
proposed works would not create any significant gaps in habitat or create any barriers that would tangibly increase the risk or energy cost of movement for these species.
(iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,
The removal of up 37 trees from Site 005D would comprise a very small portion of the available foraging habitat for these species. The removal of the hollow bearing and stag trees would reduce the total amount of available potential nesting resources for these species in the locality, but only marginally. Given the mobility of these bird species, this would comprise a minor reduction in available resources and the degree of fragmentation of habitat in the locality. The habitat to be removed is unlikely to be important to the long-term survival of these species in the locality.
d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),
The proposal would not affect any habitat of outstanding biodiversity value.
e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposed works would directly contribute to the operation of the following KTPs of relevance to these species: – Removal of hollow-bearing trees – up to 5 hollow-bearing trees would be removed, including one that comprises potential roosting or nesting habitat for these species. – Removal of dead wood and dead trees – up to nine stag trees would be removed from the proposal footprint, which may provide potential roosting or nesting habitat for these species. The proposal has the potential to introduce or increase the operation of the following KTPs of relevance to these species through soil disturbance and increased visitation to the area: – Invasion of native plant communities by exotic perennial grasses. – Invasion and establishment of exotic vines and scramblers – Invasion, establishment and spread of Lantana – Infection of native plants by *Phytophthora cinnamomi* and Myrtle Rust Habitat for these species within Site 005D to edge effects, weed invasion and disturbance from surrounding land uses. The proposal has the potential to further spread weeds that already occur, or introduce new species of weeds that are not already present. Mitigation measures to minimise indirect impacts, including avoiding removal of hollow-bearing trees where possible, would be included in the CEMP (see Section 6.2).
Conclusion of the assessment of significance
Conclusion: Based on consideration of the above criteria, the proposal is unlikely to have a significant effect on a local population of potential threatened large forest owls, as: – Only a small area of habitat would be removed or fragmented, which represents a small proportion of the available resources for these species within the locality. – The proposal is unlikely to have an adverse effect on the life cycle of these species such that a viable local population is likely to be placed at risk of extinction. – The proposal will only result in a minor increase in the degree of fragmentation between retained areas of habitat for these species, and will not result in any isolation of habitat. – The habitats to be removed are unlikely to be important to the long-term survival of the species in the locality. The proposal will not result in any adverse effects on any declared area of outstanding biodiversity value (either directly or indirectly). Consequently, a species impact statement is not required for large forest owls.

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