

APPENDIX N

Preliminary Site Investigation



Clarrie Hall Dam Raising EIS

Contamination Preliminary Site Investigation

Prepared for Tweed Shire Council

September 2024

Clarrie Hall Dam Raising EIS Contamination Preliminary Site Investigation

Tweed Shire Council

E230041 DUN-EMM-EN-RPT-006

September 2024

Version	Date	Prepared by	Approved by	Comments
1	22 December 2023	Amy Hughes	Alex Latham	Draft
2	23 January 2024	Amy Hughes	Alex Latham	Draft
3	9 February 2024	Amy Hughes	Alex Latham	Draft
4	12 March 2024	Amy Hughes	Alex Latham	Draft
5	5 September 2024	Amy Hughes	Lachlan Lewis	Final

Approved by



Lachlan Lewis

Senior Environmental Scientist

5 September 2024

Ground floor 20 Chandos
Street St Leonards NSW 2065
ABN: 28 141 736 558

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Executive Summary

ES1 Introduction

Tweed Shire Council proposes to raise the wall of Clarrie Hall Dam by 8.5 metres (m), thereby increasing the capacity of the dam from 16,000 megalitres (ML) to approximately 42,300 ML. In 2018, a detailed concept design was prepared by NSW Public Works Advisory (PWA). The options assessment and concept design for the raised dam and its components were based on hydrological studies, geotechnical investigations, and seismic and structural assessments. The preferred option for the dam raising incorporates increasing the height of the existing concrete faced rockfill embankment and constructing a new concrete lined spillway higher up in the west abutment. The existing intake tower and access bridge would also be raised.

The optimum size of the proposed raised Clarrie Hall Dam is 42,300 ML, based on raising the dam wall height by 8.5 m to a height of RL 70 m Australian Height Datum (AHD). The operational footprint of the upgraded dam would increase the area of inundation to below the RL 70 m contour, which is the waterline boundary at full supply level (FSL).

EMM Consulting Pty Limited (EMM) was commissioned by KBR to undertake a Stage 1 preliminary site investigation (PSI) to assess potential contamination risks for the Clarrie Hall Dam Proposal. The objective of the PSI was to assess whether historical or present activities have the potential to cause, or have caused, contamination that may impact on the land use suitability for the proposed footprint.

ES2 Scope of work

EMM's scope of services for this PSI comprised:

- desktop review of:
 - available drawings/plans/reports relating to project footprint, and nearby associated properties
 - New South Wales Environment Protection Authority contaminated site database and registers
 - historic aerial photographs
 - published maps of the area to gain an understanding of expected surface and subsurface conditions (e.g. geology, hydrogeology, soil, acid sulfate soils and topography)
- site inspection involving:
 - physical walk-over of the site to undertake inspections of the proposed footprint, focussing on proposed construction staging and laydown areas and other areas of proposed construction disturbance
 - photography of the general site setting and features of interest.

ES3 Findings

The PSI identified the following:

- Areas of potential environmental concern (AEC) associated with fuel and/or chemical storage. These areas are not located within the proposed construction disturbance footprint or within the FSL. Based on evaluation of source-pathway-receptor linkages, the risk was assessed to be low.

- Household/building waste observed in the potential stockpile area at 511 Doon Doon Road. It is recommended that these areas be assessed and/or remediated prior to the commencement of stockpiling activities associated with construction works.
- Four cattle dips were identified. One dip (Gilmore's Dip), within the existing full supply level (FSL), was demolished, removed, and inundated as part of the original Clarrie Hall Dam construction in 1979. The three remaining dips are understood to be located outside the proposed construction disturbance footprint and outside the FSL.

Based on evaluation of source-pathway-receptor linkages, the risk was assessed to be low. Assessment and remediation (or management) of the Doon Doon dip site would be required if proposed road up-grade works disturb the dip site.

- Asbestos containing material (ACM) is present in some building structures. Asbestos must be managed in accordance with prevailing legislative requirements.

Based on the conceptual site model and tier 1 preliminary risk assessment, the contamination sources were identified as low risk and could be managed in accordance with the recommendations outlined in this report.

ES4 Recommendations

The key management measures recommended for the construction and/or ongoing operation of the Proposal comprise development of appropriate project documentation (e.g. Construction Environmental Management Plan (CEMP), Contaminated Land Management Plan (CLMP), Construction Soil and Water Management Plan (CSWMP), Asbestos Management Plan (AMP), Operational Environmental Management Plan (OEMP)) to manage contamination during the construction and operation of the Proposal.

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1 Introduction

1.1 The Proposal

Due to increasing demand for water as a result of projected population growth and the increasing uncertainty of water supply yield associated with climate change, there is a requirement to augment the Tweed Shire district water supply by 2028.

Clarrie Hall Dam was constructed in 1983 by the NSW Department of Public Works and is owned and operated by Tweed Shire Council for the primary purpose of providing a drinking water supply to the Tweed Shire area. Tweed Shire Council proposes to raise the wall of Clarrie Hall Dam by 8.5 metres (m) to a height of 70 m Australian Height Datum (AHD) (RL 70 m). This will increase the capacity of the dam from 16,000 megalitres (ML) to approximately 42,300 ML (the Proposal).

The purpose of the Proposal is to ensure water security for the Tweed Shire Council region until at least 2065.

The former Department of Planning and Environment (DPE), now referred to as the Department of Climate Change, Energy, the Environment and Water (DCCEEW) and the Department of Planning, Housing and Infrastructure (DPHI) released the Far North Coast Regional Water Strategy (FNCRWS) (DPE 2023), which provides a 20-year Far North Coast region-specific strategy to improve the security and certainty of water resources. The raising of Clarrie Hall Dam would assist Council to achieve the objectives of the FNCRWS.

1.2 Project location

Clarrie Hall Dam is located on Doon Doon Creek, a third-order stream forming a tributary of the south arm of the Tweed River. The dam is located in Doon Doon, approximately 15 kilometres (km) south-west of Murwillumbah and 4 km south-west of Uki in the Tweed Shire Local Government Area (LGA). The dam has a catchment area of approximately 60 square kilometres and a storage capacity of 16,000 ML. Water is released down Doon Doon Creek via release valves in the outlet structure within the dam, to the Tweed River, where it is subsequently harvested at the Bray Park Weir.

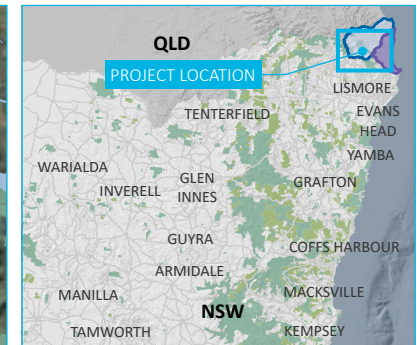
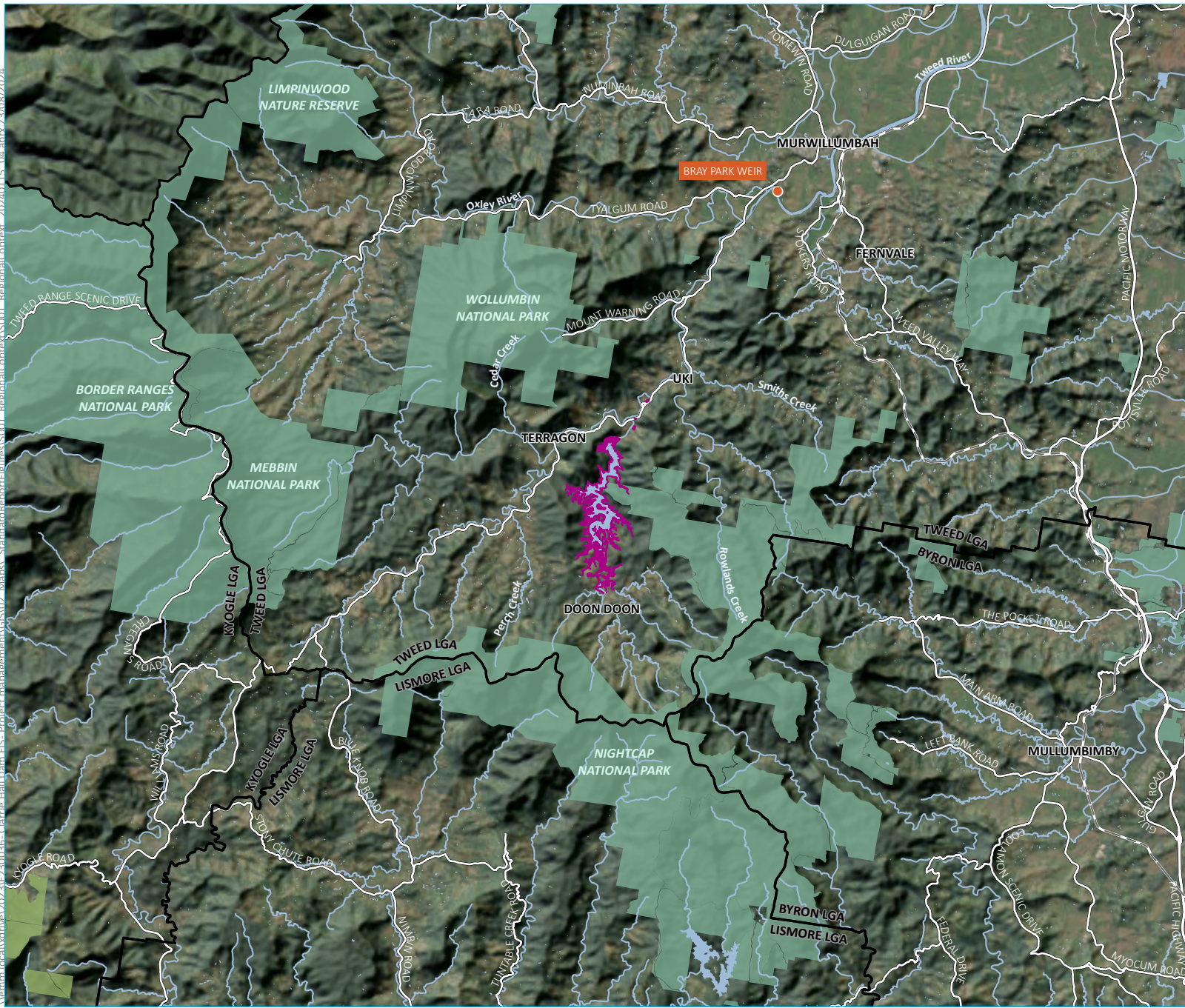
Access to the dam wall and spillway area is from Clarrie Hall Dam Road, which runs south from Kyogle Road. The southern extent of Clarrie Hall Dam is accessed from Crams Farm, located off Commissioners Creek Road.

Most of the Doon Doon sub-catchment of the Tweed River Catchment comprises rural and agricultural land uses (more than 70% of land is zoned 1a Rural).

Locations of disturbance associated with the Proposal include the main construction disturbance footprint (CDF), ancillary works areas, full supply level (FSL) and areas where potential changes in upstream and downstream hydrology may occur, including the probable maximum flood (PMF) area.

The regional setting of the Proposal, FSL and CDF are shown on Figure 1.1.

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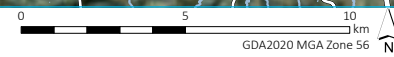


- KEY**
- Construction disturbance footprint
 - Bray Park weir
 - Existing environment
 - Rail line
 - Major road
 - Named watercourse
 - Waterbody
 - NPWS reserve
 - State forest
 - Local government area
- INSET KEY**
- Major road
 - NPWS reserve
 - State forest
 - Brunswick catchment
 - Tweed catchment

Regional setting

Clarrie Hall Dam EIS
 Contamination Preliminary Site Investigation
 Figure 1.1

Source: EMM (2024); KBR (2024); ABS (2021); DCSSS (2023); ESRI (2024); GA (2009)



1.2.1 Proposal disturbance areas

The extent of the proposed disturbance area includes all areas where direct impacts may occur due to construction and/or operation, as follows:

- Construction activities disturbance area comprising:
 - the raised dam wall, spillway, road realignments/upgrades, quarry, stockpile sites and construction compounds, intake tower and bridge, recreational areas
 - upgrading the Kyogle Road and Clarrie Hall Dam Road intersection
 - replacement of McCabes Bridge and realignment of Commissioners Creek Road
 - workers accommodation
 - removing or reconstructing impacted infrastructure and facilities at Crams Farm
 - utilities relocations
 - new recreation and operational facilities including an amenities block, public shelters, viewing areas, interpretation signage, paths, car parks, landscaping, security fences, lighting, monitoring equipment and boat ramp.
- Operational disturbance areas include the:
 - raised inundation area (RL70 m contour), the waterline boundary at FSL
 - area between FSL and PMF
 - downstream areas due to changes in flow (it is noted in EMM 2024 that this disturbance is considered to be minimal, if any).

The activities and disturbance area footprints of the Proposal provide the basis for assessing the extent of direct environmental impacts. Refer to Figure 1.2.

1.2.2 Construction disturbance footprint

The CDF and associated activities include the dam wall area and ancillary areas. The CDF is estimated to be approximately 49.6 hectares (ha) and consists of the following.

i Dam wall area

The dam wall construction disturbance areas comprise the following activities:

- increasing the height of the existing concrete faced rockfill dam embankment
- constructing a new intake tower and bridge
- constructing a new concrete lined spillway higher up in the west abutment
- excavating the quarry and haul roads
- establishing construction compounds and stockpile sites

- realigning Clarrie Hall Dam Road
- establishing new recreational areas, boat ramp, operational facilities and amenities.

Downstream of the current dam embankment wall and stockpile areas, a temporary crossing at Doon Doon Creek is proposed to support the construction activities. The temporary crossing would be developed using rockfill material to enable construction equipment to travel between the dam wall construction site and the quarry.

The construction disturbance area also includes the following, potentially located a short distance from the dam wall area:

- workers accommodation
- concrete batching plant.

ii Raised embankment

Raising of the concrete face rockfill embankment is proposed. The concept design indicates the re-use of the existing precast concrete parapet walls. These would be removed and stored for later re-use. Additional wall units may be required and are anticipated to be fabricated offsite. They can be delivered to site as needed, therefore requiring no additional storage.

The new top of the parapet walls on the embankment wave wall crest would be at RL 77.0 m AHD to match the PMF level. The crest pavement level behind the parapet wall would be at RL 75.5 m AHD, and the crest pavement width would be 5 m.

The embankment upstream and downstream slopes would be 1.3H to 1V, matching the existing embankment slopes.

iii Intake tower, access bridge and hoist house

The intake tower is used to select water to discharge through the outlet pipe into Doon Doon Creek. The existing intake tower with a vertical reinforced concrete circular shaft is proposed to be raised by 8.5 m, resulting in the total height of the proposed intake tower to be 42.15 m. The raised tower would incorporate three additional water inlet ports, for a new total of eleven water inlet ports, to facilitate selective water withdrawal, supporting a series of trash racks and shutters with a crane over the tower deck.

The access bridge enables safe access to the intake tower. The current intake tower access bridge consists of two unequal spans 16 m and 28 m long, supported by a reinforced concrete pier and abutment block. The existing bridge is to be dismantled, reused if possible or disposed offsite and replaced with a new bridge to match the raised height of the intake tower.

A new hoist house similar to the existing hoist house is proposed to be constructed on top of the raised intake tower. The raised intake tower would have the radial beams built into its wall and a peripheral beam running on the outer edge of the radial beams (similar to the existing configuration) to support the floor and super structure. The existing compressed asbestos cement cladding would be replaced with other suitable material in the new hoist house.

iv Spillway

The existing spillway would be covered over by the raised embankment. To ensure the spillway has suitable discharge capacity, a new spillway channel has been designed to pass the PMF. The new spillway is proposed to be located higher in the left (western) abutment. The new spillway crest is designed at RL 70.0 m AHD, which corresponds to the FSL of the raised dam. The spillway crest design is 40 m wide, and the spillway channel would reduce to 15 m wide at the downstream end, with a flip bucket as the terminal structure.

The new spillway channel concept design is for a fully concrete lined structure.

v [Clarrie Hall Dam Road realignment](#)

A section of Clarrie Hall Dam Road would be upgraded to ensure alignment of the road with the new FSL, higher in the landscape. A vertical cut 8–10 m high, adjacent to the existing road, would be required. The boat ramp for operations and maintenance personnel would be relocated as part of the access road upgrade.

vi [Quarry and haul road](#)

A quarry was established during construction of Clarrie Hall Dam to supply the required volume of suitable rockfill material. The quarry is located approximately 400 m upstream of the existing dam wall. The quarry would be re-established and expanded to supply material required for the Proposal.

Material sourced through the quarry expansion would be used in construction of the raised dam wall, new spillway, new access road and potentially McCabes Bridge works. The expanded quarry footprint would include an area required for the topsoil, overburden and rockfill stockpiles needed during the construction phase. Waste rock material from the spillway construction area would be used to backfill the quarry void and develop the final landform. Haul roads suitable for heavy vehicles would be required to transport rockfill material between the quarry site and the dam wall embankment.

vii [Construction compounds and stockpile sites](#)

The construction compound area downstream of the embankment, is a key access point to all the construction work sites. However, it is also the location of critical dam operational assets including the outlet tunnel, outlet control valves and discharge valves.

This location requires most of the area to be cleared and graded to support siting of office accommodation and welfare facilities (toilets, canteens, storerooms).

viii [Concrete batching plant](#)

Several options are proposed for the location of a concrete batching plant. The batching plant requires a minimum area of 5,000 square metres. This includes areas for the batching plant, silos, conveyors, material bins, offices, material stockpiles and yard, delivery and concrete truck movement and circulation. Additional buffer areas for environmental controls would also be required.

Because the concrete materials, sands and other cement components are coming from external sources, there will be truck movements related to external deliveries. Having a location just outside of the main site allows these vehicles to deliver without needing to access the main works site.

Of the concrete produced, 70% would be used for the spillway, 25% for the raised embankment, 2% for the intake tower and 3% for McCabes Bridge.

Concrete supply will also require over 3 ML of water for concrete mix alone. Proximity to a suitable water source and approval for extraction are key considerations.

ix [Recreational facilities](#)

The existing recreational infrastructure located in downstream construction areas would be relocated or removed. Upon completion of the dam raising, the rockfill stockpile would no longer be required. Therefore, the area could be developed into a new recreational and operational facilities area including amenities facility, public shelters, viewing areas, interpretation signage, pathways, car parking, landscaping, security fencing and lighting. Dam operations monitoring equipment would be installed, and the boat ramp would be relocated to align with the new access road.

x Site-office accommodation

The main site office complex can be located as one complex or as multiple discrete elements. Each work zone would likely have its own satellite offices and facilities in addition to the main office complex. Several options are proposed for the locations of the main site office.

xi Workforce accommodation

The number of workers per activity based on the concept design construction schedule was assessed, and that information was used to estimate a peak workforce of around 180 persons at the main dam site.

The local town of Murwillumbah, 20 minutes from Clarrie Hall Dam, does not have enough hotels or other accommodation that could allow for temporary worker accommodation. Tweed Heads and other coastal areas would offer suitable accommodation options; however, a minimum of 50 minutes travel time to and from site may be considered excessive and may potentially lead to fatigue and safety issues both onsite and whilst travelling. A shuttle bus service is a potential option. However, the logistics of these services are complex and often not fully utilised by workers.

Therefore, the option for onsite temporary workforce accommodation has been included. It is estimated that an accommodation facility for 100 to 120 personnel would be required during construction. An area of approximately 12,000 square metres would be required for cabins, facilities and a car parking area. Several options are proposed for the location of workforce accommodation.

1.2.3 Ancillary infrastructure

i Upgrade to Kyogle Road and Clarrie Hall Dam Road intersection

The Kyogle Road and Clarrie Hall Dam Road intersection is the primary access road to the Proposal construction site. An assessment of the intersection to accommodate access for the construction workforce and the transport of rockfill material required for the McCabes Bridge upgrade from the quarry has been conducted as part of the transport and traffic assessment.

ii Recreational facilities – Crams Farm

The proposed FSL would inundate areas of Crams Farm. It is proposed to either remove or relocate various infrastructure, such as the boat ramp, pontoon, signage and access roads. The access road at Crams Farm would be inundated at PMF.

No changes to the amenity facilities, the old dairy or Doon Doon Hall would occur.

iii Existing property fences

Existing property fences located within the proposed FSL would be removed and replaced above FSL, where required.

iv McCabes Bridge and Commissioners Creek Road realignment

The existing McCabes Bridge is approximately 20 m long and 4 m wide. It is of a concrete girder/deck type and consists of three spans. The existing bridge would be inundated by the proposed FSL.

The proposed replacement bridge and realignment of Commissioners Creek Road would include:

- a two-lane reinforced concrete bridge raised approximately 5.5 m above the existing bridge level
- three 18 m spans

- a width of 8.4 m
- a length of 50 m.

The entire realignment is approximately 1,000 m to account for gullies and to reach the design level of RL 72.5 m. There are 2 land parcels that could be used for construction compounds, laydown areas and stockpile locations close to the proposed new McCabes Bridge and road realignment.

These are:

- Lot 2 DP838936 – this site is located at the southern end of the McCabes Bridge alignment works, with access off Doon Doon Road.
- Crams Farm Reserve – Lot 1 DP716151, which is located approximately 700 m north of the northern end of the McCabes Bridge alignment works, with sealed access from Commissioners Creek Road.

Both of these sites are relatively flat and have open areas of grassland.

v Utilities

Utilities to the dam construction area may require upgrading.

Relocation of the water supply to public toilets and other facilities may also be required.

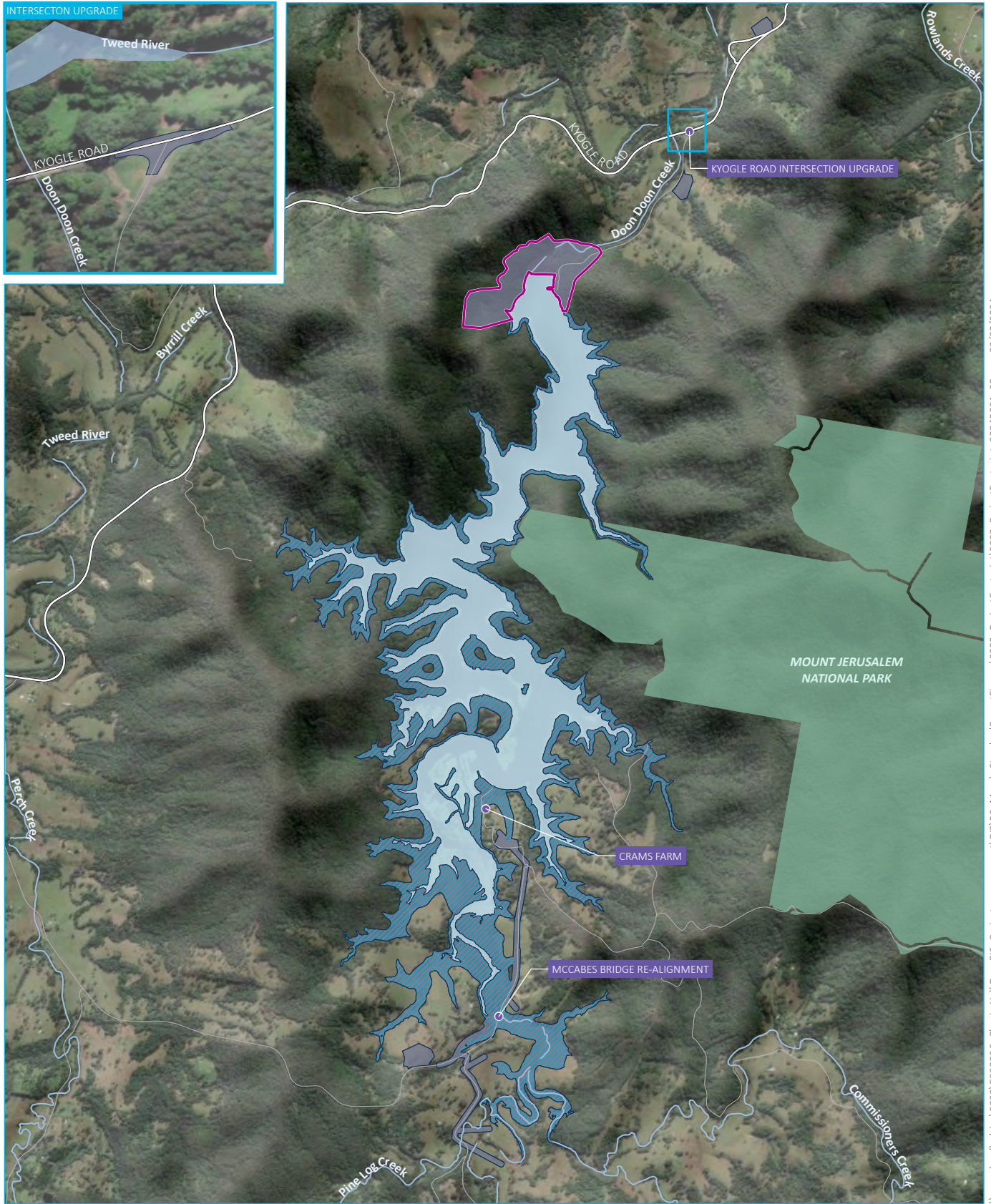
At the southern end of the dam, some existing service provision assets are located within the FSL area. These structures must be realigned to ensure continued power supply to local residents. New poles and connections would be required along the roadside for sections of Doon Doon Road and Commissioners Creek Road for sections of the network located within or near the FSL area. Telstra assets would require relocation.

vi Timber harvesting and areas of deeper water around the FSL

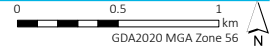
Timber harvesting of some existing plantation areas and possibly some select trees for fencing or other uses may occur in areas that would be inundated. Creating areas of deeper water around the new FSL to assist in algae growth mitigation is also proposed.

vii Decommissioning and rehabilitation

Decommissioning of existing assets would be required.



Source: EMM (2024); KBS (2024); DCSSS (2023); ESRI (2024); GA (2011)



KEY

- | | |
|------------------------------------|----------------------|
| Construction disturbance footprint | Existing environment |
| Development site | Major road |
| Existing inundation | Minor road |
| Inundation to FSL (61.5- 70 m AHD) | Named watercourse |
| Infrastructure upgrade location | NPWS reserve |

Proposal footprint

Clarrie Hall Dam EIS
Contamination Preliminary Site Investigation
Figure 1.2



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1.3 Purpose of this report

This Contamination Preliminary Site Investigation (PSI) supports the Environmental Impact Statement (EIS) for the Proposal. It documents the contamination assessment methods and results, the measures built into the Proposal design to avoid and minimise impacts to human health and the environment, and the mitigation, and management measures, proposed to address any contamination impacts.

The specific objectives of this assessment are to inform the EIS and address the Secretary’s Environment Assessment Requirements (SEARs) by:

- completing desktop PSI works to inform the understanding of contamination conditions within the Proposal footprint
- identifying and assessing potential areas and contaminants of potential concern within the Proposal footprint
- providing a preliminary qualitative assessment, and desktop review of available quantitative data, in relation to contamination risk posed during construction and operation of the Proposal
- assessing where further investigation should be undertaken, or appropriate management procedures should be implemented for the construction and operational phases of the Proposal
- assessing whether the land may be contaminated and if so, whether remediation may be required including confirmation that future assessment and/or remediation would be undertaken in accordance with the current guidelines.

1.3.1 Assessment guidelines and requirements

This Contamination PSI has been prepared in accordance with the SEARs (issued 31 May 2024) for the Clarrie Hall Dam Raising proposal, as well as relevant government assessment requirements, guidelines and policies, and in consultation with the relevant government agencies.

The SEARs must be addressed in the EIS. Table 1.1 lists the matters relevant to this assessment and where they are addressed in this report.

Table 1.1 Relevant matters raised in SEARs

Requirement	Chapter/Section addressed
3. The Proponent must assess whether the land is likely to be contaminated and identify if remediation of the land is required, having regard to the ecological and human health risks posed by the contamination in the context of past, existing and future land uses. Where assessment and/or remediation is required, the Proponent must document how the assessment and/or remediation would be undertaken in accordance with current guidelines.	Chapter 5

To inform preparation of the SEARs, DPHI invited relevant government agencies to advise on matters to be addressed in the EIS. These matters were taken into account by the Secretary for DPHI when preparing the SEARs.

2 Description of the Proposal

This chapter provides a summary of the Clarrie Hall Dam Raising Proposal. It outlines the permanent infrastructure required to operate the Proposal, as well as the key construction elements and activities required to construct the Proposal. A comprehensive and detailed description of the Proposal is provided in the EIS, which has been relied upon for the basis of this technical assessment.

2.1 Proposal overview

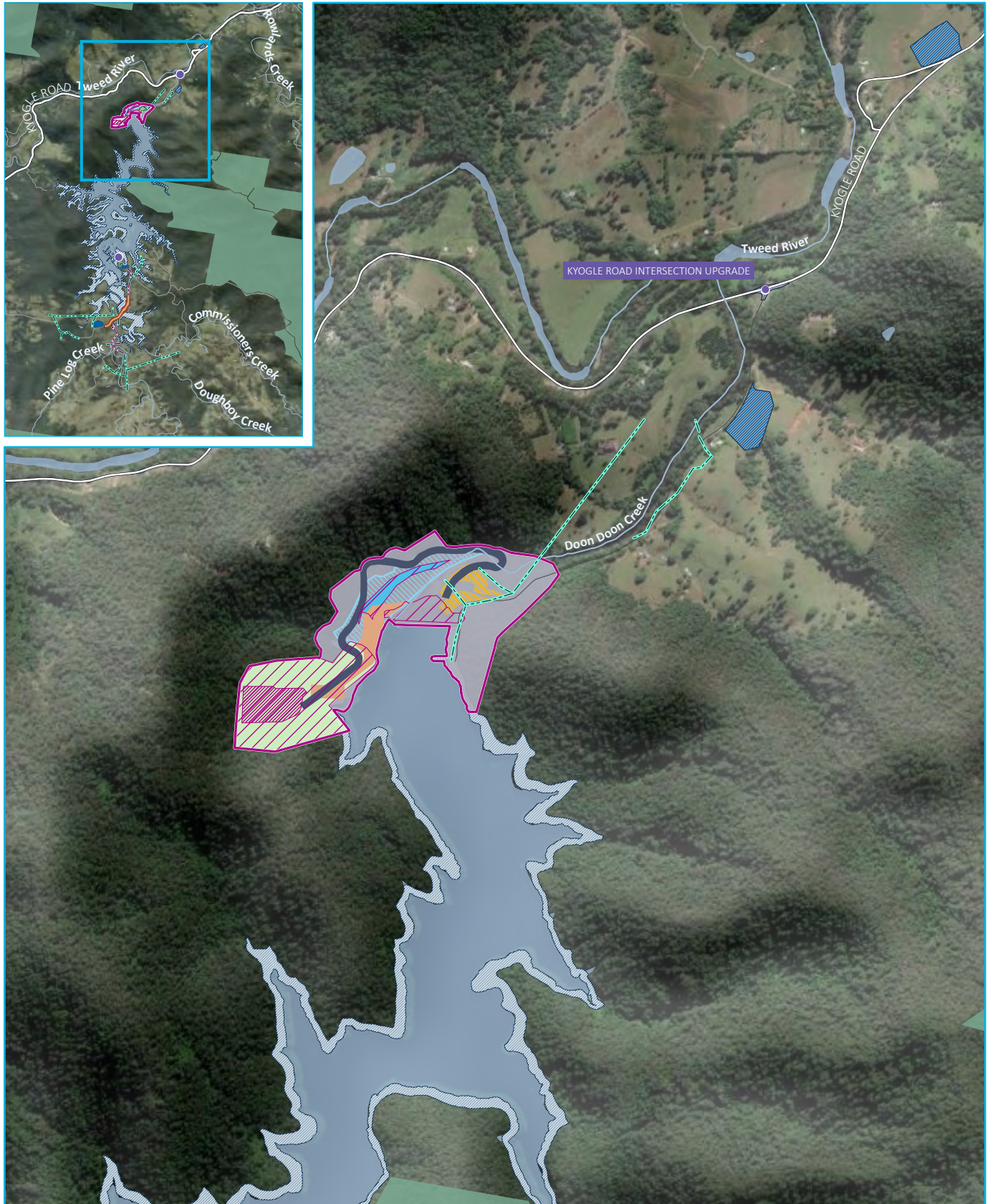
In 2018, a detailed concept design was prepared by NSW Public Works Advisory (PWA). The options assessment and concept design for the raised dam and its components were based on hydrological studies, geotechnical investigations, and seismic and structural assessments. The preferred option for the dam raising incorporates increasing the height of the existing concrete faced rockfill embankment and constructing a new concrete lined spillway higher up in the left abutment. The existing intake tower and access bridge would also be raised.

The optimum size of the proposed raised Clarrie Hall Dam is 42,300 ML, based on raising the dam wall height by 8.5 m to a height of RL 70 m AHD. The raised dam would, as a result, provide adequate water supply to the Tweed Shire until at least 2065.

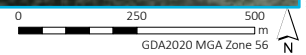
The Proposal would include:

- raising the dam wall by 8.5 m
- a new spillway channel constructed higher in the left abutment with a flip bucket at the downstream end
- re-establishment of the quarry used to construct the existing dam for the purpose of sourcing rock material to raise the dam wall
- construction of associated haul roads to transport quarry material for the proposed raising of the dam wall
- establishment of a construction area for plant, equipment, storage, material handling and offices
- establishment of stockpile sites associated with construction
- construction of work compounds and site offices
- establishment of materials storage and handling facilities
- construction of workers accommodation
- construction of a concrete batching plant
- realignment of Clarrie Hall Dam Road higher in the right abutment
- raising of the existing intake tower and bridge
- decommissioning of existing recreational facilities at the dam wall area
- construction of new dam operational facilities including signage, car parking, security fences, lighting, monitoring equipment and a boat ramp
- construction of new recreation facilities including an amenities block, public shelters, viewing areas, interpretation signage, paths, car parks, and landscaping.

The Proposal overview can be seen in Figure 2.1.



Source: EMM (2024); KBS (2024); DCSSS (2023); ESRI (2024)



KEY

- | | | |
|---|--|---|
| <ul style="list-style-type: none"> ● Infrastructure upgrade location ■ Construction disturbance footprint ■ Development site ■ Full supply level- proposed Proposed layout ■ Haul Road- option 1 ■ Haul Road- option 2 ■ Construction compound ■ Potential McCabes Bridge stockpile and construction office | <ul style="list-style-type: none"> ■ Quarry site- impact zone ■ Spillway ■ Spillway impact area ■ Concrete batching plant or workers accommodation ■ Direct disturbance area ■ Quarry extraction area ■ McCabes Bridge proposed realignment | <ul style="list-style-type: none"> Transmission line — Existing — New Existing environment — Rail line — Major road — Minor road — Named watercourse ■ Waterbody ■ NPWS reserve |
|---|--|---|

Proposal overview

Clarrie Hall Dam EIS
Contamination Preliminary Site Investigation
Figure 2.1



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The upgraded dam operational footprint would increase the area of inundation to below the RL 70 m contour, which is the waterline boundary at full supply level (FSL).

Ancillary works would also be required to support the Proposal, including:

- upgrading the Kyogle Road and Clarrie Hall Dam Road intersection
- replacing McCabes Bridge and realigning Commissioners Creek Road
- removing or reconstructing impacted recreational infrastructure and facilities at Crams Farm
- relocating existing power and telecommunications utilities

Two options for locating staff accommodation, the concrete batching plant and site offices during construction have been identified. These include the following scenarios:

1. Accommodation at site 1, concrete batching plant at site 2 and site compound at the dam wall.
2. Accommodation at site 2, concrete batching plant at site 1 and site compound at the dam wall.

A summary of the main elements of the Proposal is shown in Table 2.1.

Table 2.1 Proposal summary

Proposal element	Summary of the Proposal
Operations	
Description	Raising the embankment wall of Clarrie Hall Dam by 8.5 m.
Operational footprint	Approximately 207 ha
Dam wall infrastructure	<ul style="list-style-type: none"> • Increasing the base width of the valley-side abutment and raising the crest of the concrete faced rockfill embankment to RL 70 m. • Constructing a new concrete lined spillway higher on the west abutment. • Extending the upstream concrete face to the new crest height. • Raising the intake tower and access bridge. • Constructing a new section of the Clarrie Hall Dam Road to provide access to the east abutment of the dam wall. • Establishing new recreation and operational facilities including an amenities block, public shelters, viewing areas, interpretation signage, paths, car parks, landscaping, security fences, lighting, monitoring equipment and boat ramp.
Ancillary facilities	<ul style="list-style-type: none"> • Upgrading the intersection of Clarrie Hall Dam Road and Kyogle Road. • Replacing McCabes Bridge over Doon Doon Creek. • Realigning an approximately 1,000 metre section of Commissioners Creek Road. • Removing or reconstructing impacted infrastructure and facilities at Crams Farm. • Realigning overhead power lines and Telstra assets.
Construction	
Construction impact area	Approximately 49.6 ha, consisting of 26.2 ha at the dam wall, 6.6 ha of construction compound and workforce accommodation areas and 16.8 ha of ancillary sites for road realignments and relocating overhead power lines. The removal of the existing overhead power line is not included in the impact area.
Workforce	Estimated peak of 180 persons at the main dam wall site.

Proposal element	Summary of the Proposal
Cut/fill	Approximately 100,000 m ³ deficit of fill material will be derived from the quarry located 400 m from the existing dam.
Ancillary facilities	<ul style="list-style-type: none"> • Constructing access roads to construction areas and establishing the construction site. • Re-establishing the quarry used to construct the existing dam. • Establishing a concrete batching plant and materials stockpiling areas. • Establishing construction compounds including site offices, compounds and workforce accommodation.
Dewatering	Dam storage would be lowered below FSL during construction.
Property	Permanent and temporary property adjustments and property access refinements.

The raising of the Clarrie Hall Dam would result in the disturbance and excavation of surface and subsurface soils and rock. Other construction activities that would create surface disturbance are:

- the raising of the intake tower and access bridge
- the development of construction sites and temporary and permanent access roads
- the upgrade of the Clarrie Hall Dam and Kyogle Road intersection
- the establishment of a new recreation area and operational facilities, including an amenities facility, public shelters, viewing areas, interpretation signage, pathways, car parking, landscaping, security fencing and lighting, monitoring equipment and boat ramp
- the transport and storage of excavated soil and rock
- the removal and relocation of various infrastructure elements at Cram Farm, including the boat ramp, pontoon, signage, and access roads
- replacing McCabes Bridge and realigning Commissioners Creek Road.

3 PSI Methodology

3.1 Statutory context, policy and guidelines

The relevant legislation and policies for contaminated land that have been considered during the preparation of this report include Commonwealth and NSW legislation detailed below.

3.1.1 Commonwealth regulatory and policy framework

The following Commonwealth legislation, policies and guidelines have been considered during the preparation of this report:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- National Environment Protection Council (NEPC) 1999. National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (ASC NEPM 2013)
- *Workplace Health and Safety Act 2011*.

3.1.2 New South Wales regulatory and policy framework

The following NSW legislation, policies and guidelines have been considered during the preparation of this report:

- *Protection of the Environment Operations Act 1997* (NSW) (POEO Act)
- *Contaminated Land Management Act 1997* (NSW) (CLM Act)
- *Environmentally Hazardous Chemicals Act 1985* (NSW) (EHC Act)
- State Environmental Planning Policy (Resilience and Hazards) 2021
- NSW Environment Protection Authority (NSW EPA 2015). Guidelines on the Duty to Report Contamination under the *Contaminated Land Management Act 1997*
- NSW Environment Protection Authority (NSW EPA 2017). Contaminated Land Management Guidelines for the Site Auditor Scheme (3rd Edition)
- NSW EPA (2016). Environmental Guidelines: Solid Waste Landfills, Second Edition
- NSW EPA (2020). Guidelines for the Consultants Reporting on Contaminated Land
- NSW DEC (2007). Guidelines for the Assessment and Management of Groundwater Contamination.

3.2 Methodology

The methodology adopted for the assessment of potential contamination issues associated with the Proposal is summarised below:

- desktop review:
 - a review of available drawings/plans/reports relating to the proposed footprint, and associated properties

- incorporation of data obtained from previous contamination investigations conducted within proximity to the Proposal, including an assessment in relation to the full supply level (FSL) and probable maximum flood (PMF) level and mitigation measures
- identification of contaminated sites in the proposed footprint recorded on the NSW Environment Protection Authority (EPA) register of contaminated sites
- identification of current or historical land uses located along or nearby the proposed footprint that are likely to have caused contamination
- a review of historic aerial photographs to assess land use changes within or in proximity to the proposed footprint
- a review of published maps of the area to gain an understanding of surface and subsurface conditions (e.g. geology, hydrogeology, soil, acid sulfate soils and topography)
- a search/review of information readily available through the internet (e.g. historic parish maps, NSW Office of Water [NOW] registered groundwater bore database within identified areas of concern etc)
- site inspection:
 - physical walk-over of the site to undertake inspections of the proposed footprint, focusing on proposed construction staging and laydown areas and other areas of disturbance where the potential for encountering contaminated material during construction is highest based on the findings of the desktop review
 - photography of the general site setting and features of interest.

Information about potential contamination sources was also collected through interviews with relevant personnel relating to properties along the Proposal.

3.3 Information sources

A search of various databases was undertaken by Land Insight Pty Ltd (LI), refer to Appendix A and associated maps can be found in Appendix B. A review of historical aerials was also conducted, refer to Appendix C.

3.4 Conceptual site model and qualitative risk assessment

Potentially contaminated material (e.g. soil, sediment) has the potential to adversely impact human health and ecological receptors if not managed appropriately. A conceptual site model (CSM) is used to present and assess the linkage between potential contamination sources, exposure pathways¹, and receptors. As detailed in the ASC NEPM (2013), the development of a CSM is a key component of contaminated site assessments and provides the framework for identifying how potential receptors may be exposed to contamination.

A risk is considered to be posed to a receptor when the pathway between the receptor and a contamination source is 'complete' and the contamination is present at concentrations that could have a negative impact on the health of the receptor. Where there is no or insufficient quantitative analytical data to assess whether concentrations of contamination pose a risk, a qualitative risk assessment is used.

¹ An exposure pathway is the link from the source of contamination to the exposed population or environment eg direct contact, inhalation or ingestion by human receptors, transport in wind or groundwater migration (NEPC 1999).

To assess the relative risk of existing (if any) and potential contamination during proposed construction and operation, a qualitative risk assessment was undertaken for the study area (detailed in Section 5.3.1). The methodology for the risk assessment is detailed in Table 3.1.

Table 3.1 Preliminary qualitative risk assessment methodology

Identification of areas and contaminants of concern	
Identified using the methodology outlined in Section 3.2	
Likelihood of contamination to be present and likely extent of impacts	
Identified by review of information presented in Section 4	
Potential migration pathways	
Construction	Operation
<ul style="list-style-type: none"> Dust generation. Excavation and disposal or reuse of spoil. Extraction and disposal or reuse of groundwater from dewatering or drainage. Migration of groundwater via preferential pathways. Surface water erosion. Management of wastewater. Storage, use and management of fuels, chemicals etc. 	<ul style="list-style-type: none"> Migration of groundwater via preferential pathways. Surface water erosion and sedimentation.
Potential receptors	
Construction	Operation
<ul style="list-style-type: none"> Proposed construction workers and visitors. Surrounding land users such as the general public and nearby residents and commercial workers. Agricultural land, irrigators. Receiving water bodies. Ecological receptors. 	<ul style="list-style-type: none"> Intrusive maintenance workers. Future site users of final land use such as commercial, open space, residential or agricultural. Agricultural land, irrigators. Ecological receptors. Receiving water bodies.
Potential exposure pathways	
Construction	Operation
<ul style="list-style-type: none"> Direct contact, ingestion or inhalation by human receptors and fauna. Uptake by terrestrial and aquatic flora and intake by aquatic fauna. 	<ul style="list-style-type: none"> Direct contact, ingestion or inhalation by human receptors and fauna. Uptake by terrestrial and aquatic flora and intake by aquatic fauna.

To identify the risk rating, the preliminary qualitative contamination risk assessment matrix in Table 3.2 was used. The matrix was used to assign the risk in assuming the absence of appropriate controls and mitigation measures. This site conceptual model and risk assessment is included in Figure 5.2.

Table 3.2 Preliminary qualitative risk assessment matrix

Likelihood	Significance				
	Negligible	Minor	Moderate	High	Severe
Rare	Low	Low	Low	Medium	Significant
Unlikely	Low	Low	Medium	Significant	High
Possible	Low	Medium	Significant	High	High
Likely	Low	Medium	Significant	High	Extreme
Almost Certain	Medium	Significant	High	Extreme	Extreme

Table 3.3 Classification of Significance

Significance	Description
Severe	<p>The impact is considered critical to the decision-making process. Impacts tend to be permanent or irreversible or otherwise long-term and can occur over large areas. Very high sensitivity of environmental receptors to impact.</p> <p>Contamination is known to be present at concentrations above the relevant.</p>
High	<p>The impact is considered likely to be important to decision-making. Impacts tend to be permanent or irreversible or otherwise long-term (>5 year recovery period). Impacts can occur over large or medium size areas. High to moderate sensitivity of environmental receptors to impact.</p> <p>Contamination is most likely present at concentrations above the relevant assessment criteria and widespread.</p>
Moderate	<p>The effects of the impact are relevant to decision-making including the development of environmental mitigation measures. Impacts can range from long-term to short-term in duration (1 to 4 year recovery period). Impacts occur mostly near the source, which is apparent and requires mitigation to be within limits of acceptability. Moderate sensitivity of environmental receptors to impact.</p> <p>Contamination is potentially present at concentrations above the relevant assessment criteria and widespread.</p>
Minor	<p>Impacts are recognisable/detectable but acceptable and may be contained on-site. These impacts are unlikely to be of importance in the decision-making process but are relevant in the consideration of standard mitigation measures. Impacts tend to be short-term (<12 month recovery period) or temporary and/or occur at a local scale.</p> <p>Contamination is potentially present at concentrations above the relevant assessment criteria and limited in extent.</p>
Negligible	<p>Minimal change to the existing situation. This could include for example impacts which are beneath the levels of detection, impacts that are within the normal bounds of variation or impacts that are within the margin of forecasting error.</p> <p>Very unlikely for contamination to be present at concentrations above the relevant assessment criteria and limited in extent.</p>

Table 3.4 Classification of likelihood

Likelihood category	Description	Annual probability of occurrence
Almost Certain	A recurring event during the lifetime of an operation or project. Exposure pathway for human or ecological receptors present and are complete either now, during or post construction.*	More than two occurrences per year.
Likely	An event that will probably occur during the lifetime of an operation or project. Exposure pathway for human or ecological receptors likely to be present and complete either now, during or post construction.*	Around one occurrence per year.
Possible	An event that may occur during the lifetime of an operation or project. Exposure pathway for human or ecological receptors possible to be present and complete either now, during or post construction.*	More than 10% annual probability of occurrence.
Unlikely	An event that is unlikely to occur during the lifetime of an operation or project. Unlikely exposure pathway for human or ecological receptors either now or during or post construction.*	More than 1% annual probability of occurrence.
Rare	An event with a low probability to occur during the lifetime of an operation or project. Highly unlikely exposure pathway for human or ecological receptors either now or during or post construction.*	Less than 1% annual probability of occurrence.

Note: *Without implementation of appropriate controls or remediation as recommended in the management of construction and operational impacts – Chapter 6.

4 Existing environment

4.1 Site identification

Site identification details are presented in Table 4.1 below.

Table 4.1 Site description

Site description	<p>Clarrie Hall Dam is located on Doon Doon Creek, part of the Tweed River catchment, and is the primary water supply to the Tweed Shire.</p> <p>The CDF, FSL and PMF collectively define the site. The CDF, FSL and PMF comprise the Lots and Plans listed below:</p> <ul style="list-style-type: none"> • CDF: <ul style="list-style-type: none"> – Lot 1/DP260821, Lot 2/DP260821, Lot 2/DP126035, Lot 6/DP260821, Lot 14/DP260821 and Lot 1/DP44745. • FSL: <ul style="list-style-type: none"> – Lot 1/DP260821; Lot 6/DP260821; Lot 1/DP44745; Lot 74/DP755743; Lot 6/DP261570; Lot 2/DP716151; Lot 2/DP261582; Lot 3/DP605354; Lot 4/DP605354; Lot 32/DP755743; Lot 6/DP261681; Lot 1/DP624073; Lot 2/DP631489; Lot 1/DP261582; Lot 5/DP261582; Lot 1/DP261681; Lot 2/DP261681; Lot 3/DP261681; Lot 1/DP261700; Lot 4/DP261700; Lot 1/DP716151; Lot 1/DP749031; Lot 107/DP755730; Lot 156/DP755730; Lot 2/DP814563; Lot 1/DP814563; Lot 2/DP838936; Lot 1/DP877100; Lot 1/DP628704; Lot 2/DP628704; Lot 3/DP240856; Lot 5/DP240856; Lot 6/DP240856; Lot 330/DP1190205; Lot 7/DP240856; Lot 2/DP1243701; Lot 3/DP1243701; Lot 4/DP1243701; Lot 2/DP1246411; Lot 2/DP1257191; Lot 1/DP1260635; Lot 8/DP260821; Lot 9/DP260821; Lot 10/DP260821; Lot 11/DP260821; Lot 12/DP260821; Lot 13/DP260821; Lot 1/DP778141; Lot 2/DP778141; Lot 10/DP1139798; Lot 13/DP1266531. • PMF: <ul style="list-style-type: none"> – Lot 7003/DP1052525; Lot 2/DP776507; Lot 7004/DP1052525; Lot 5/DP1024097; Lot 21/DP840278; Lot 1/DP1243701; Lot 1/DP1246411; Lot 1/DP1257191; Lot 33/DP755743. • Ancillary works: <ul style="list-style-type: none"> – Lot 76/DP755730; Lot 8/DP46078; Lot 10/DP46078; Lot 10/DP 46078; Lot 9/DP 46078; Lot 29/DP755730; Lot 5/DP1130130; Lot 1/DP877100; Lot 1/DP749031; Lot 2/DP778141; Lot 2/DP261681; Lot 3/DP261681; Lot 2/DP838936; Lot 2/DP 631489; Lot 2/DP229800; Lot 1/DP1257191; Lot 1/DP716151.
Site location	Clarrie Hall Dam Road, Uki NSW 2484
Site layout	Refer to Figure 1.2.
Area	Clarrie Hall Dam has a catchment area of approximately 60 km ² . The CDF includes the dam, quarry, access roads, spillway and intake tower. The FSL and PMF includes upstream locations (rural residential, farmland and Cram’s Farm Reserve). Ancillary works include downstream locations (Kyogle Road and Clarrie Hall Dam Road intersection and locations for workers accommodation and concrete batching plant areas).
Site features	<p>The following site features were observed by EMM during an inspection on 26–27 April 2023.</p> <p>The quarry, dam wall, spillway, intake tower, control room, toilets, and picnic area within the CDF were visually inspected.</p> <p>Rural residential properties and Crams Farm Reserve that were visited were within or in proximity to the PMF. The remaining PMF is made up of grazing land and bushland.</p> <p>A photographic log is provided in Appendix D.</p>
Local government area	Tweed Shire Council.
Land use and zoning	<p>Currently in use as a Water Supply Dam.</p> <p>RU2: Rural landscape, SP2: Infrastructure, W1: Natural Waterways, and DM: Deferred Matter are all onsite.</p>

Surrounding land use

Most of the surrounding area is within RU2: Rural landscape.

The extent of the current dam is within SP2: Infrastructure. To the east there is a small pocket that is within C1: National Parks and Nature Reserves, and to the north-east, Doon Doon Creek is within W1: Natural Waterways.

4.2 Site history

A review of previous investigations, historical aerial photographs, historical topographic maps, and other readily available information (where relevant) for the site was undertaken.

The PSI completed by Coffey Services Australia Pty Ltd (Coffey) in September 2021 was reviewed. Consultation held with local landowners also provided information regarding potential sources of contamination. This is discussed further in Section 4.13.

4.2.1 Previous investigations

i Coffey PSI

It is noted that the PSI did not include the Kyogle Road and Clarrie Hall Dam Road intersection, possible concrete batching plant areas and workers accommodation, McCabes Bridge and realigning Commissioners Creek Road areas or the new power and telecommunications utilities locations.

The results of a desktop study and history review showed that the site (investigated by Coffey) was not listed on the NSW EPA contaminated land register or Protection of the Environment Operations public register. There was a low risk associated with nearby properties. The site was not identified within an area of potential acid sulfate soils and no salinity issues were found, which was supported by the Land, Soil and Erosion Assessment (EMM 2024).

Review of historical land titles records provided in the PSI indicated the site comprised crown land to the 1920s to 1950s, then was owned by individuals noted to be farmers and sawmill employees etc (i.e. rural and residential land use). Land transferred to the Public Works Service in 1982 and were transferred to Tweed Shire Council in 1998.

The following Areas of Environmental Concern (AEC) and Contaminants of Potential Concern (CoPC) were identified to be:

- asbestos in site structures
- minor dumping of rubbish/waste
- some areas of potential fill material of unknown quality
- potential for storage of herbicides, pesticides and fertilisers within upstream rural properties
- cattle dip sites in proximity to the PMF level.

The PSI identified that the site activities had minimal contribution to contamination within the CDF and those that were observed could be managed. This would allow the Council to go ahead with the proposed works if there are ongoing identification, assessment and management procedures in place.

Some properties associated with the FSL and PMF in the upstream reaches of the dam were investigated and AEC and CoPC were identified. The AEC were related to historic farming activities and cattle dip operations (cattle dips were located outside of the PMF). A further assessment of contamination risk on the full catalogue of properties was recommended in order for construction to commence. If contamination was identified by further assessment, then remediation to a suitable level was recommended.

The implementation of the following was recommended:

- preparation of a Contaminated Materials Management Plan
- a Hazardous Building Materials Survey and Asbestos Register update
- further assessment of upstream properties located within the FSL and PMF.

ii [Asbestos inspection report \(Josh Leipper 2020\)](#)

The Dairy building at Crams Farm was visually inspected for asbestos in 2020 and found that there is presumed ACM that has not been confirmed present within interior walls, ceilings and ceiling space.

iii [Asbestos inspection report \(Josh Leipper 2021a\)](#)

The public toilet block at Crams Farm was visually inspected for asbestos in 2021 and found that there is presumed ACM that has not been confirmed present within the Soffit sheeting around the entire building, ceiling sheeting, tile adhesive and ACM fibres in the ceiling space.

iv [Asbestos inspection report \(Josh Leipper 2021b\)](#)

The Doon Doon Hall at Crams Farm was visually inspected for asbestos in 2021 and found that there is presumed ACM that has not been confirmed present within the interior walls, ceilings and ACM fibres within the ceiling space.

v [Asbestos inspection report \(P. Boyd 2015\)](#)

The intake tower roof and cladding, intake tower switchboard in the carpark, public toilet storeroom and valve control house roof sheets were visually inspected for asbestos in 2015 and found that there was a very high likelihood of friable asbestos within interior walls, ceilings and meter box.

4.2.2 Historical imagery review

A summary of the aerial photograph review undertaken by EMM is presented in Table 4.2. Refer to Appendix C for the historical aerials.

Table 4.2 Historical Imagery Review

Year/image type	CDF site	Surrounding area
1962 aerial imagery, black and white	CDF is dominated by natural bushland. Doon Doon Creek runs through the middle.	500 m radius: There are no properties visible. Agricultural land is seen to the north and north-east where the topographic variation decreases. The PMF area consists of natural bushland and agricultural land. Various farmhouses and sheds exist within the southern area. The potential stockpile area to the north is cleared unused land. The land around the intersection of Kyogle Road and Clarrie Hall Dam Road is also unused. Tweed River is seen adjacent to Kyogle Road.
1971 aerial imagery, black and white	CDF is consistent with the previous aerial image.	500 m radius: Farmhouses and sheds have been built to the north of the CDF. The FSL area is consistent with the previous aerial image.

Year/image type	CDF site	Surrounding area
1987 aerial imagery, black and white	The dam site and the quarry have been cleared of vegetation. The dam wall has been constructed and the creek valley is now inundated with water. The intake tower on the eastern side of the dam has been constructed and the vegetation surrounding Clarrie Hall Dam Road has increased.	500 m radius: To the north, an area of bushland has been cleared and replaced with agricultural land. The PMF consists of inundated areas of land upstream from the dam. South of Crams Farm Reserve new farmhouses, roads and agricultural land have been established. To the north Doon Doon cattle dip has been constructed.
1991 aerial imagery, colour	CDF is consistent with the previous aerial image.	Two more agricultural activities have been established near the Crams Farm Reserve within the PMF area. The northern area is consistent with the previous aerial image.
1997 aerial imagery, colour	Clearing of trees within the CDF has occurred. The quarry has increased in vegetation and weeds have grown around the edge of the dam.	The surrounding area is consistent with the previous aerial image. The northern area is consistent with the previous aerial image.
2004 aerial imagery, colour	The cleared areas in the previous image have revegetated. More vegetation has been established within the quarry area.	Generally consistent with the previous aerial image.
2009 aerial imagery, colour	CDF is consistent with the previous aerial image.	500 m radius: To the north-west, on top of the hill above the spillway, trees have been cleared and a new building (residential house) has been constructed. To the north, new agricultural land exists as well as a new residential house.
2013 aerial imagery, colour	CDF is consistent with the previous aerial image.	Generally consistent with the previous aerial image.
2017 aerial imagery, colour	The quarry has increased in vegetation.	Generally consistent with the previous aerial image, however vegetation has been established around the house on the hill to the north-west of the CDF.
2022 aerial imagery, colour	CDF is consistent with the previous aerial image.	500 m radius: Water levels within the dam are much higher than previous years. Flooding has occurred in some areas.
1969-1991 Topographic Map	Map showing the topography of the CDF and surrounding areas. Spillway is denoted on the map. The quarry appears to be cleared of vegetation.	500 m radius: Clarrie Hall Dam Road, Tweed River, Doon Doon Creek and Kyogle Rd exist.

4.2.3 Mining activity

Clarrie Hall Dam quarry is situated within the CDF and was used during the initial construction of Clarrie Hall Dam in 1983.

Nullum pit is located 357.2 m west of Kyogle Road and Clarrie Hall Dam intersection. Pit 16 in Gs1972/396 was mined for construction materials, Chillingham Volcanics. The current status is unknown however, the mine is not in close proximity to the disturbance footprint and is unlikely to be a contamination risk.

An unnamed pit is located 409.6 m north-east of the potential location for workers accommodation. The pit was also mined for construction materials. The status is unknown however, the pit is not in close proximity to the disturbance footprint and is unlikely to be a contamination risk.

No current or historical mining activities were found within the CDF or PMF area.

4.2.4 Cattle dip sites

A cattle dip site search was conducted by Coffey as part of their PSI. The search identified three dips in proximity to the PMF and one dip located adjacent to ancillary infrastructure. These are summarised below:

- Gilmore's Dip, within the existing FSL, was demolished, removed, and inundated as part of the original Clarrie Hall Dam construction in 1979. Chemicals historically used were noted to include arsenic, DDT (an organochlorine pesticide (OCP)), dioxathion, chlorpyrifos and ethion chlordimeform (organophosphorus pesticides (OPP)) and armitraz (a non-systemic acaricide and insecticide).
- Fogarty's Dip, in proximity to the PMF, remains in place however, is currently listed as active with a lapsed lease/licence. Chemicals noted to be used were consistent with Gilmore's dip.
- Lower Commissioner's Creek Dip, in proximity to the PMF, is listed as decommissioned with lapsed licence and has been dismantled and capped. The bath was demolished and either removed or buried. Chemicals noted to be used were consistent with Gilmore's dip.
- Doon Doon Dip, in proximity to the Clarrie Hall Dam Road and Kyogle Road Intersection, is listed as active with lapsed licence. It is understood to be still standing, capable of dipping operations either immediately or with some minor upgrades. Chemicals noted to be used were consistent with Gilmore's dip.

No additional cattle dips were identified by EMM during the site inspection.

4.2.5 Naturally occurring asbestos material

No potential for naturally occurring asbestos was found within a 1 km radius of the CDF or PMF according to the DCCEEW.

4.3 Heritage

No Australian state, or local heritage registered items were identified within a 200 m radius of the CDF.

It was reported in the EMM Historical Archaeological Assessment (EMM 2024) that 'High Conservation Value Old Growth Forest' is located 500 m east of the proposed FSL on from the vicinity of MacDonald Road in the north to Commissioners Creek Road in the south.

4.4 Soil

Well-drained brown and red podzolic soils, brown earths and red clays are expected within the CDF and potential stockpile area to the north, which is associated with steep hills (relief of 250–300 m, slopes of 40–>50% and elevation of 300–400 m). The limitations of these areas are steep slopes with erodible soils and mass movement hazards (Appendix B).

Yellow and red podzolic soils, red earths and poorly drained gleyed soils are expected within the central areas of the PMF, which is associated with undulating and rolling hills (reliefs of 100–150 m, slopes of 5–30%, and elevations from 100–300 m) and narrow ridges that have common rock outcrop. The limitations of these areas are the steep slopes, localised rock outcrops and mass movement hazards. The soils are hard setting, erodible, moderately dispersive and with highly acid soils in areas (Appendix B).

Well-drained soils of no suitable group, dark alluvial clays, weissenboden and black earths that line the channels are expected within the southern areas of the PMF, which is associated with gently undulating alluvial plains (a relief of <5 m, slopes of 0–3%). The limitations of these areas are severe bank erosion and high flood hazard with highly erodible, seasonally waterlogged, stony soils of low fertility and low available water-holding capacity (Appendix B).

Imperfectly drained alluvial soils and/or minimal prairie soils on floodplain/bar plan are expected within the area of Kyogle Road and Clarrie Hall Dam intersection and the potential location for workers accommodation to the north. It is associated with undulating alluvial plains of the mid Oxley and Tweed catchments (relief of <9 m, slopes of <2% and plain width of 250–1,000 m).

4.4.1 Borehole lithology

Available borehole lithological data (Appendix A) indicates the subsurface conditions comprise:

- North-west of the CDF: generally consists of (in order of depth) soil, clay, and greywacke.
- West of the CDF: generally consists of topsoil, clay, shale and basalt.
- West of the PMF: generally consists of soil, clay, gravel and sandstone.
- Southwest of the PMF: generally consists of soil, clay and basalt.
- Southeast of the PMF: generally consists of soil, gravel, shale and sandstone.
- North of the CDF: generally consists of topsoil, mudstone, and shale.

4.4.2 Acid sulfate soil (ASS)

Data provided by Land Insight Pty Ltd indicated moderate to severe limitations for inland ASS within the CDF and PMF. The National ASS register indicates high, low, and extremely low probability of occurrence generally within the upper 1 m of wet/riparian areas in both the CDF and PMF. High probability was identified to be within the dam and along the water's edge.

The Land, Soil and Erosion Assessment report conducted by EMM 2024 stated that ASS risk mapping indicated that the proposed study area is not located in or in proximity to areas mapped with ASS risk as per the NSW OEH Acids Sulphate Risk Map (OEH 2018) and are Bn(p4). Low Probability of Occurrence with moderate confidence per the Atlas of Australian ASS mapping (Fitzpatrick et al. 2011).

Due to the relatively high elevation of the area, it is considered that ASS would not be disturbed as part of the works and therefore not impacted. Considering the EMM and Coffey reports, the likelihood of ASS within the area is considered to be low. Should ASS be discovered onsite during construction, processing would cease, and the material would be managed according to the relevant guidelines, such as the NSW Acid Sulfate Soil Manual (Stone et al. 1998).

4.4.3 Soil salinity

Soil salinity hazards were not identified within a 500 m radius of the CDF or the PMF according to the Office of Environment and Heritage (OEH).

4.5 Geology

Bedrock is mapped to comprise Chillingham Volcanics, comprising quartzite with rhyolite, lithic rhyolitic tuff, shale, basal cobble conglomerate within the northern portion of the PMF. Bedrock to the northeast of the CDF, is expected to comprise Neranleigh-Fernvale beds, mostly sandstone with feldspathic and lithic meta-arenite (Appendix A).

The existing dam area within the PMF is expected to comprise thinly laminated muds and silts with humic to biogenic debris. Further south is expected to comprise alluvium floodplain deposits that are mostly silt, lithic to quartz-rich sand, and clay.

Bedrock to either side of the dam is expected to comprise the Ripley Road Sandstone and Gatton Sandstone from the Bundamba Group. Ripley Road Sandstone comprises mostly quartz-rich sandstone and quartz-rich granule conglomerate with grey clay matrix. Gatton Sandstone comprises mostly feldspathic to lithic feldspathic sandstone with a clay matrix.

Bedrock further south the PMF is expected to comprise Ma Ma Creek Sandstone Member and Heifer Creek Sandstone Member from the Bundamba Group consisting of flaggy lithic sandstone and quartz rich to quartz-lithic sandstone.

Bedrock to the north of the CDF and within the potential stockpile area is expected to comprise Neranleigh--Fernvale beds, mostly sandstone with feldspathic and lithic meta-arenite (Appendix A).

Bedrock in the area of the Kyogle Road and Clarrie Hall Dam Road intersection and potential accommodation is expected to comprise alluvial floodplain deposits, comprising silt, lithic to quartz-rich sand, and clay.

4.6 Topography

CDF elevation is approximately 30 m AHD and rises in the north-west to an elevation of approximately 120 m AHD. Within a 500 m radius the highest elevation is approximately 290 m AHD north-west of the CDF (Appendix A).

The elevation within the PMF area is approximately 77 m AHD within the highest reaches and approximately 40 m AHD at the lowest points. The lowest elevations are found around the dam and south of the dam. The highest elevations are in the north-east of the PMF.

North of the CDF elevation is approximately 30 m AHD with the exception of the potential stockpile area which is approximately 40 m AHD.

4.7 Hydrology and hydrogeology

It was reported in the EMM Groundwater Impact Assessment that the groundwater systems comprise:

- minor local, shallow groundwater associated with alluvial deposits
- local, groundwater systems associated with the Tertiary volcanic caps
- local to regional groundwater systems associated with the porous and fractured rock units within the Clarence-Moreton Basin
- local to regional groundwater systems associated with the fractured rock units of the New England Fold Belt (NEFB).

These groundwater systems have different hydrogeological properties due to their depositional environment. Generally, this is a low yielding region with no highly productive aquifer systems.

Hawke's (1979) groundwater level measurements indicate groundwater elevations on the left abutment (in the west) were approximately 13 m higher than the FSL, and thus groundwater was most likely discharging to Doon Doon Creek at the dam site. Groundwater elevations on the right abutment (in the east) were only slightly higher than Doon Doon Creek level, by approximately 2–3 m. Public Works Advisory (2018) hypothesise the dam storage may have raised the regional water table to the storage level on the right abutment.

There is a steeper hydraulic gradient on the left abutment in the west compared to the right, although this is expected to change with topography. On the mountain peaks the depth to groundwater is approximately 20 metres below ground level (mbgl), closer to Doon Doon Creek the depth to groundwater is much shallower, closer to 1 mbgl or less (Hawke 1979).

Upstream of Doon Doon Creek where the valley widens the measured depth to groundwater in the deeper fractured rock is approximately 3.6 mbgl, below the minor local alluvium, recorded from two borehole locations (GW065390 and GW065508). Groundwater depths for the remainder of the boreholes vary considerably, owing to topography.

Groundwater flow follows a muted reflection of topography, however there is insufficient recent information to draw groundwater flow contours around the dam, Doon Doon Creek and downstream areas. Local groundwater flow near the dam wall is expected to be towards the dam on the western flank and flat or away from the dam on the eastern flank.

The bore search completed for this PSI identified 18 registered groundwater bores within a 2 km radius of the PMF and eight of those are within a 2 km radius of the CDF. The following characteristics were reported:

- the predominant authorised purpose of the groundwater bores is for household, irrigated agriculture, monitoring and unknown use
- no registered groundwater bore is located within the CDF
- the final installed depth of the groundwater bores ranged from 8 to 59 m
- the standing water level within the groundwater bores ranged from 3 to 21 m.

Available information on these monitoring wells is provided in Appendix A.

The area directly surrounding Doon Doon Creek and Tweed River to the north of the CDF has a high potential for terrestrial groundwater dependant ecosystems (GDE). The potential disturbance areas to the north are not within these high potential zones, with the exception of the northern tip of the potential stockpile. All other areas were identified to have low to moderate potential for terrestrial GDE. Terrestrial GDE rely on the subsurface expression of groundwater.

No potential for aquatic GDE was identified within the CDF or PMF area. To the north of the CDF within the Tweed River, a high potential for aquatic GDE was identified however, no northern disturbance areas are within these zones.

The CDF and PMF are situated within the Tweed River underground petroleum storage system (UPSS) sensitive zone.

It was reported in the EMM (2024) Groundwater Impact Assessment that the principal instruments for the management of rivers within NSW, under the WMA, are management plans that are developed and implemented for particular water sources (one or more rivers or creeks that have been grouped together for management purposes). This includes water sharing plans (WSPs), which are the primary instruments that set out water-sharing arrangements within NSW.

4.8 Ecology

Clarrie Hall Dam is located in the Scenic Rim Interim Biogeographic Regionalisation of Australia (IBRA) subregion within the south-eastern Queensland IBRA bioregion, and on the Mount Warning Exhumed Slopes Mitchell landscape.

No mapped wetlands occur within the PMF. Downstream of Clarrie Hall Dam, the Tweed River contains areas of floodplain and estuarine wetlands (DPE 2010). Stott's Island Nature Reserve, located approximately 33 km downstream of Clarrie Hall Dam, is mapped as an Estuarine Wetland and is included on the register of Areas of Outstanding Biodiversity Value (AOBV) in NSW and as critical habitat for Mitchell's Rainforest Snail (*Thersites mitchellae*) (DPE 2010; DCCEEW 2022). No AOBV occur within the proposed inundation area (DCCEEW 2022).

Within the PMF, the predominant vegetation is wet sclerophyll forest with smaller patches of lowland rainforest. Historically, the vegetation surrounding the dam has been subject to vegetation clearance and forestry activities. At the southern end of the dam, much of the vegetation is highly modified with areas of maintained pasture, patches of regrowth forest as well as the presence of historic tree plantations. To the north-west of the dam, a large extent of vegetation was subject to a wildfire in 2019, from which the vegetation has largely recovered. The remaining extents of vegetation around the dam occur in a mostly intact to moderate condition.

4.9 Natural hazards

A Vegetation Category 1 (highest bushfire risk) was identified for the majority of the PMF and surrounding areas. A Vegetation Buffer was identified within areas closest to the dam and a Vegetation Category 2 (lower bush fire risk) was identified in the southern areas of the PMF. The northern areas are within the Vegetation Buffer with the surrounding areas in Vegetation category 1 (Appendix A).

Three wildfire events occurred in 1986–87, 1992–93 and 2007–08 east of the dam and four wildfires have occurred within the surrounding areas of the PMF. The northern areas were also part of the 1986–87 and 1992–93 wildfire events as well as having experienced a wildfire in 2002–03.

It was reported in the EMM Land, Soil and Erosion Assessment (EMM 2024) that Clarrie Hall Dam is categorised by the NSW Dams Safety Committee guidelines as a High C category dam. The spillway is required to have the capacity to pass at least a 1:100,000 Annual Exceedance Probability (AEP) flood. The spillway at Clarrie Hall Dam was originally designed to pass a 1:1,000 AEP flood; consequently, the spillway was upgraded in 2014 to comply with flood security requirements in the short term.

The erosion potential for soils within the study area, expressed as K-factor, is moderate. Assessment of rainfall erosivity indicates the erosion hazard will be high for areas of the Proposal where slopes exceed 5%. This aligns with the assessment of soil loss classes (SLCs), which identifies a change from moderate erosion risk (SLC 4) at gradients of 6–7% to high erosion (SLC 5) at slopes between 8–9.5%. Beyond approximately 17% slopes and lengths of 18 m, erosion hazard during construction disturbance activities should be considered extreme and appropriate strategies and mitigations be adopted.

Average gradients within the quarry, office buildings/recreation area footprint and raised dam wall and spillway embankment are the highest in the Proposal area and likely to be the areas with the greatest susceptibility to erosion and sediment loss.

4.10 Climate

The region is classed as subtropical experiencing warm, humid summers and mild winters with high rainfall. The average summer temperature is between 24°C to 26°C and the average winter temperatures are between 14°C to 16°C. There is significant variability in rainfall within the region however the average annual rainfall is over 1600 mm (OEH 2014).

4.11 NSW EPA records and other potential regulatory contamination issues

There were no identified records within a minimum 500 m radius of the proposed footprint for the following searches undertaken (Appendix A):

- NSW EPA register of contaminated sites
- The NSW Government Per- and Polyfluorinated Substances (PFAS) Investigation Program.

4.11.1 Environmental planning instruments

The following environmental planning instruments were identified within a 500 m radius of the proposed footprint:

- existing and future water storage facilities
- drinking water catchment
- minimum lot size
- maximum building height
- biophysical strategic agricultural land
- buffer area (coal seam gas exclusions).

4.11.2 Licenced activities under the POEO Act 1997

Delicensed activities include logging operations conducted by the Forestry Corporation of NSW within the Lower North East Region (LNER) and the upper north-east region (UNER). The Integrated Forestry Operations Approval (IFOA) has since been revoked and renewed as the Coastal IFOA.

4.11.3 Audits

There are no identified contaminated land audits currently being carried out under the *Contaminated Land Management Act 1997* within the CDF or the PMF.

4.11.4 Penalty notices, clean up, and orders

Forestry Corporation of NSW (Forestry Corporation) has previously been issued seven penalty notices within former plantation areas in proximity to the project. Six of the penalty notices were issued for the activity of water pollution in 2013, 2018 and two unknown dates. A further penalty notice was issued to the Forestry Corporation for contravening licence conditions in 2018.

Forestry Corporation was also issued with s.91 clean up notices in 2003, 2005, 2008 and 2016 in the LNER and during 2002, 2011, and 2020 in the UNER.

Information regarding the exact location(s) where penalty notices were issued is not available in the database search results. These license condition contraventions are considered unlikely to cause a significant contamination issue at the site (given they were pollution offences and presumably not at the location of proposed disturbance works).

4.11.5 Sites regulated by other jurisdictional bodies

There are no known contaminated legacy areas, Defence sites, military sites, Unexploded Explosive Ordnance (UXO) areas, former gasworks sites or PFAS sites within a 2 km radius of the CDF or PMF according to various government sources and the Department of Defence (Appendix A).

4.11.6 Other potential pollution sources

Clarrie Hall Dam quarry is located within the CDF and was used for the initial construction of Clarrie Hall Dam in 1983.

There are no known derelict mines, historical landfills or national pollutant inventory (NPI) sites within a 500 m radius of the CDF or PMF.

4.11.7 Potentially contaminating activities (PCA)

No liquid fuel facilities, waste management facilities or recycling centres were identified within the PMF or surrounding areas.

4.11.8 Historical business directories

A wholesale nursery called Budding Plants was located north of the PMF, and downstream of the dam in the suburb of Doon Doon.

Mount Warning Spring Water Company was located at 2574 Kyogle Road and incorporated springwater supplies and accessories.

4.12 Site inspection

An inspection was undertaken by EMM environmental scientists between 26-27 April 2023 to evaluate areas of potential contamination, including the proposed disturbance footprint, Kyogle Road and Clarrie Hall Dam Road intersection, and upstream surrounding areas. The remaining construction areas including the possible locations for workers accommodation and concrete batching plant area, were evaluated by desktop assessment. The key outcomes of the site inspection are summarised below. A photographic log is provided in Appendix D.

4.12.1 General observations

The CDF consists of the quarry, old haul road, dam wall, spillway, intake tower, control room, toilet block and picnic area. No vegetation stress was observed during the site inspection. There was newly eroded material near the quarry which appeared consistent with the geology of the area. No visible algal bloom was observed on or in the dam water. Minor dumped household general solid waste was found near the picnic area.

The PMF is made up of rural residential properties, grazing land, bushland and Crams Farm Reserve. Cattle were observed in proximity to the dam.

The possible locations for workers accommodation and concrete batching plant area consist of farmland.

4.12.2 Areas of interest

The following features were observed:

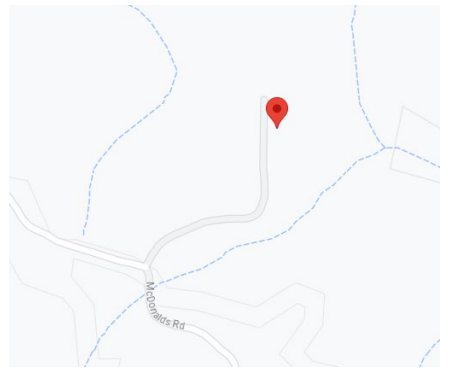
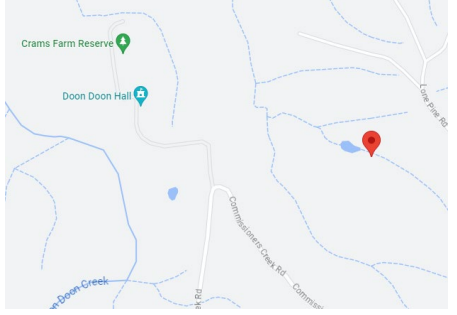
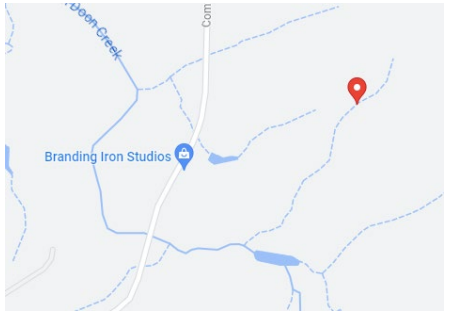
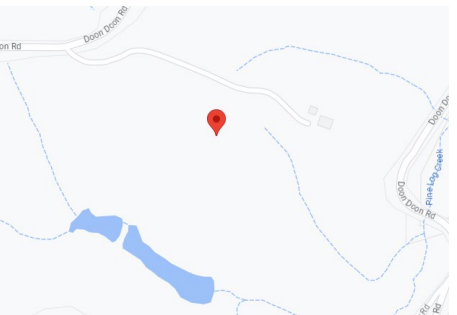
- The quarry and old haul road that links the central area of the quarry east to the current FSL, had a small watercourse flowing downstream to the dam. Some orange/brown algae were observed in the watercourse.
- The likely presence of asbestos containing material (ACM) in the intake tower and the toilet blocks in the CDF picnic area, based on asbestos warning signs on buildings.
- Small quantity of dumped general household waste near the CDF picnic area.
- Potential ACM in the toilet block, shelter, and Doon Doon Hall at Crams Farm Reserve, based on asbestos warning signs on buildings.

- Observations were made of many intermediate bulk containers (IBC) with unknown liquids, spray containers, an above ground storage tank (AST) of diesel with stained ground underneath and chemical containers at 269 Doon Doon Road property.
- Observations were made of three IBCs with unknown liquids and mixed solid building and household waste at 511 Doon Doon Road property.
- Doon Doon cattle Dip, in proximity to the Clarrie Hall Dam Road and Kyogle Road Intersection.
- The abandoned Fogartys cattle dip was observed to be not completely decommissioned with leftover fencing still in place and in proximity to the PMF.
- Observations were made of a small, abandoned diesel AST and a stain on the ground under the tank at 571 Doon Doon Road property.
- Observations were made of a potential stock treatment area at 60 Commissioners Creek Road. The area comprised a wooden frame/gate with a hanging boom. The boom contains the treatment, which is applied to the back of the cattle as they pass through the gate. The potential for significant contamination is considered to be low.

4.13 Interviews with Local Landowners

Interviews were held with landholders of four properties, 97 McDonalds Road, 79 Lone Pine Road, 60 Commissioner Creek Road, and 484 Doon Doon Road. Each property is within, or in close proximity to, the PMF. Information obtained from the interviews is provided in Table 4.3.

Table 4.3 Resident interview regarding potential contamination issues

Address	Response	Location (if applicable)
97 McDonalds Road, Terragon	<p>A cattle dip is located near the Tweed River to the west of the property but not within or near the PMF.</p> <p>Occasional use of Roundup™ occurs on the property for specific application to a weed outbreak.</p> <p>A serviced septic tank is located on the property. Discharged to ground away from dam.</p> <p>Not aware of any past waste disposal on the land.</p>	
79 Lone Pine Road, Doon Doon	<p>A drum of diesel is located on the property along with empty diesel drums.</p> <p>Occasional use of Roundup™ occurs along the driveway.</p>	
60 Commissioner Creek Road, Doon Doon	<p>Landholder noted that there is a potential car and caravan disposal site to the north-east of the property which has been covered and revegetated, however they are not aware of the exact landfill burial location. This area is not in close proximity for the PMF and is not considered to be a contamination risk.</p> <p>Occasional use of Roundup™ occurs on the property.</p>	
484 Doon Doon Road, Doon Doon	<p>An abandoned diesel above ground storage tank (AST) is located on the property and hasn't been used in approximately 10 years. There is a stain on the ground under the diesel tank.</p> <p>Doon Doon Hall used to be located at the end of the driveway but was relocated to Crams Farm Reserve more than 10 years ago.</p>	

5 Potential impacts

5.1 Construction impacts

Construction phase impacts relate to the excavation and surface disturbance areas associated with the Proposal. The following sections outline potential contamination impacts of construction activities from both existing sources and sources introduced as a result of construction activities.

5.1.1 Existing sources

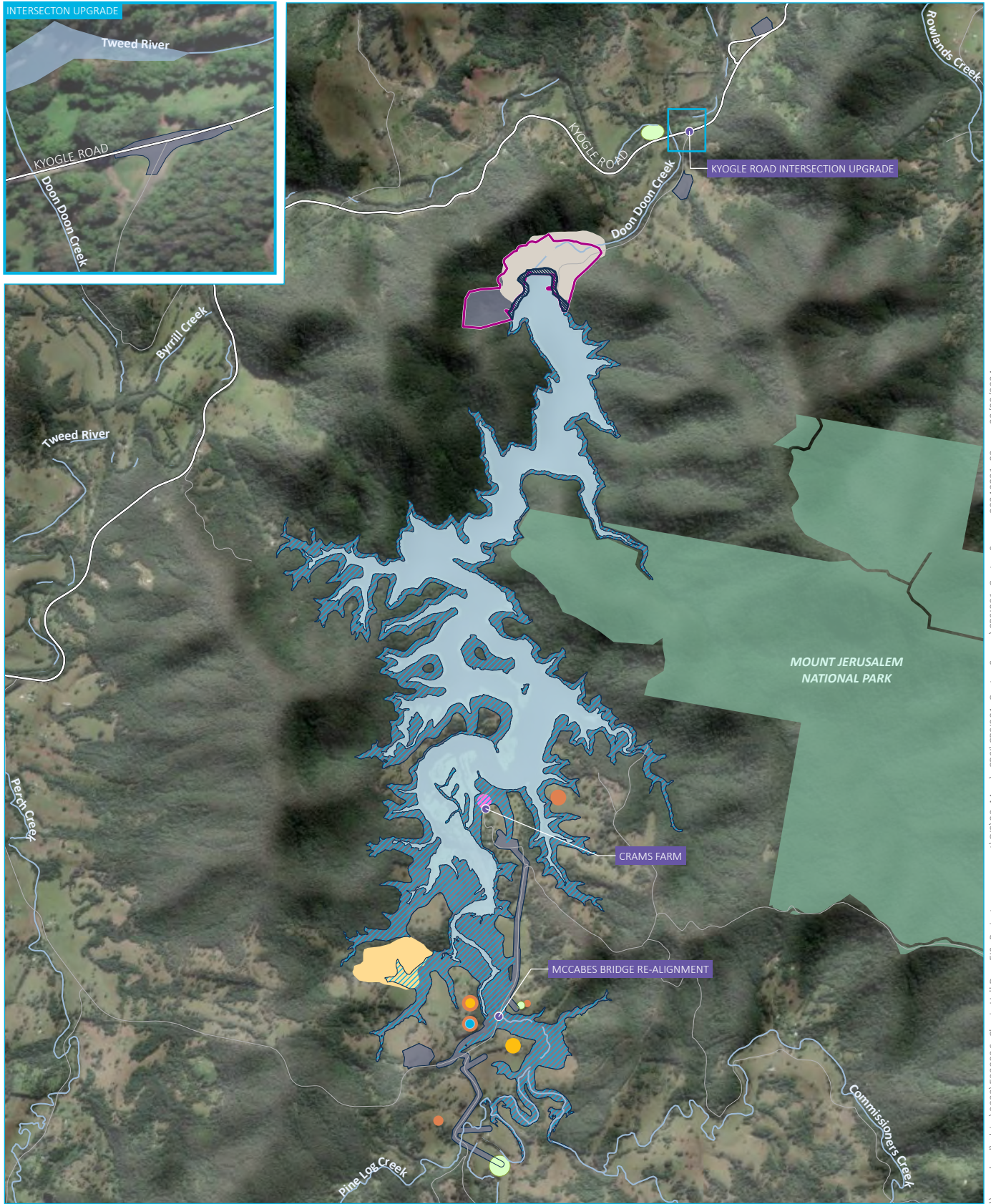
The potential contamination impacts from existing sources are described in Table 5.1 below (refer to Figure 5.1).

Table 5.1 Potential existing source areas and CoPC

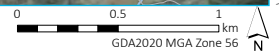
Source type and CoPC	Identified source area
Uncontrolled fill/demolished buildings – ⁵ ACM, ⁸ PHCs, ⁷ PCB, metals, ¹ OCP/OPP.	<ul style="list-style-type: none"> The potential for uncontrolled fill material across the CDF is considered to be low to negligible.
Historical application of herbicides and pesticides on agricultural land – ¹ OCP/OPP.	<ul style="list-style-type: none"> The title search conducted by Coffey along with aerial photographs indicate low intensity agriculture (grazing) with no obvious cropping or market garden activities. Widespread spraying of OCP and/or OPP is considered unlikely.
Cattle dips – ¹ OCP/OPP, arsenic.	<ul style="list-style-type: none"> The Doon Doon cattle dip located adjacent to Kyogle Road and Clarrie Hall Dam Road was observed to be abandoned with signage indicating the presence of hazardous chemicals that restricts soil disturbance. The abandoned Fogartys cattle dip located in proximity to the southern end of the PMF was observed to be not completely decommissioned or remediated.
Soil stockpile – ⁷ PCBs, ¹ OCPs, metals, ² TRH, ³ BTEXN, ⁵ ACM.	<ul style="list-style-type: none"> A small stockpile of soil material (approximately 5 m³) was identified near the intersection of Kyogle Road and Clarrie Hall Dam Road. Considering its small size, it is unlikely to be a contamination risk.
Fuel/chemical storage areas – ² TRH, ³ BTEXN, ⁴ PAH, metals.	<ul style="list-style-type: none"> Many empty or partially full IBCs were observed at 269 Doon Doon Road. A suspected molasses and waste oil IBCs were identified. A spray unit (appeared empty) along with various other chemical containers were also found. Two IBCs were observed at 511 Doon Doon Road containing unknown liquids however one was suspected to contain molasses. A firefighting unit and assumed empty spray unit were also observed. A chemical storage area exists at 484 Doon Doon Road, 60 Commissioners Creek, and 79 Lone Pine Road. A stock treatment area was observed at 60 Commissioners Creek Road. A 20L container of paraffin oil was attached to the gate and boom.
Above ground storage tank (AST) – ⁸ PHCs.	<ul style="list-style-type: none"> A raised AST with an approximate capacity of 2,000 L was observed at 269 Doon Doon Road with a stained area on the ground underneath the tank. An abandoned AST with unknown volume was observed at 571 Doon Doon Road with a strained area on the ground under the tank.
Mixed solid building/household waste – ⁷ PCBs, ¹ OCPs, metals, ² TRH, ³ BTEXN, ⁵ ACM.	<ul style="list-style-type: none"> Two areas of mixed solid building and household waste was observed at 511 Doon Doon Road. Materials such as wood, concrete, metal, brick, plastic, tin, electrical and white goods were amongst the waste.

Source type and CoPC	Identified source area
⁵ ACM/potential ACM	<ul style="list-style-type: none"> • Potential ACM was identified within the wall cladding/lining of the Intake Tower. It appeared to be not labelled however, Coffey reported the Intake Tower contained asbestos warning signs. The building appeared to be in good condition. • ACM warning signs were observed on the toilet block adjacent to the septic tanks within the CDF. • ACM warning signs were observed on the toilet block, shelter and Doon Doon Hall buildings at Crams Farm Reserve.

- Notes:
1. OCP/OPP – Organochlorine Pesticides/Organophosphorus Pesticides.
 2. TRH – Total Recoverable Hydrocarbons.
 3. BTEXN – Benzene, Toluene, Ethylene, Xylene and Naphthalene.
 4. PAHs – Polyaromatic Hydrocarbons.
 5. ACM – Asbestos Containing Material.
 6. VOC – Volatile Organic Compounds.
 7. PCBs – Polychlorinated Biphenyls.
 - 8 PHCs – Petroleum Hydrocarbons 4. PAHs – Polyaromatic Hydrocarbons.



Source: EMM (2024); KBS (2024); DCSSS (2023); ESRI (2024); GA (2011)



KEY

- | | |
|---------------------------------------|---|
| Construction disturbance footprint | High probability of ASS occurrence area |
| Development site | Mixed solid building/household waste |
| Existing inundation | Potential ACM |
| Inundation to FSL (61.5- 70 m AHD) | Potential uncontrolled fill material |
| Infrastructure upgrade location | Existing environment |
| Potential contamination source | Major road |
| AST | Minor road |
| Former agricultural land | Named watercourse |
| Former cattle dip | NPWS reserve |
| Fuel/chemical storage area | |

Potential contamination sources

Clarrie Hall Dam EIS
 Contamination Preliminary Site Investigation
 Figure 5.1



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5.1.2 Potential impacts on existing sources from proposed construction activities

Potential impacts on existing sources from proposed construction related activities are limited to a proposed construction related stockpile area located at 511 Doon Doon Road. It is noted that the waste was observed in proximity to, but not within the proposed stockpile area (refer Table 5.2). It is recommended that these areas be assessed through a targeted intrusive investigation and remediated (if required) prior to stockpiling activities associated with construction works.

Excavated material would be transported, reused where possible and likely disposed of offsite if contamination is identified. Rockfill would be stockpiled on the site and any excess rockfill from the spillway excavation disposed of on or offsite.

Construction activities which require consideration of potential contamination, such as the upgrade of the intersection of Kyogle Road and Clarrie Hall Dam Road, removal and relocation of various infrastructure at Crams Farm, replacing McCabes Bridge and realigning Commissioners Creek Road, and may include:

- temporary and permanent stockpiling of spoil on land
- cut and fill for site establishment, spillway and embankment
- laydown and storage of materials (including dangerous goods)
- delivery of materials, plant and equipment
- excavating, filling and rehabilitation of disturbed areas to the final approved landform.

The preparation of, and adherence to, appropriate management plans such as Construction Environmental Management Plan (CEMP), Contaminated Land Management Plan (CLMP), Construction Soil and Water Management Plan (CSWMP), Asbestos Management Plan (AMP), Operational Environmental Management Plan (OEMP) is required. Refer to Chapter 6.

5.1.3 Potential introduced sources from Proposed activities during construction

New sources of contamination may be introduced through construction. These include and are not limited to spills/leaks of chemicals or waste generation associated with:

- ancillary utility works
- storage of petroleum, diesel, and chemicals
- establishment of site offices, amenities and temporary infrastructure
- construction of permanent operational infrastructure.

There is the potential for exposure of human and ecological receptors to contamination arising from the inappropriate management of waste, including potential leaks and spills from equipment and plant (generated by construction activities). Typical examples would include spills of hydrocarbons while refuelling or lubricants used by machinery, and generation of construction waste. However, these impacts can be managed with the implementation of suitable management measures.

5.1.4 Potential exposure pathways and receptors

If not managed appropriately, there would be potentially complete human exposure pathways from contamination sources to receptors (where identified). These may include:

- direct dermal contact and incidental ingestion of contaminated soil by construction workers during excavation and stockpiling of potentially impacted spoil where present
- inhalation of fibres or dust from soil by construction workers
- direct dermal contact and incidental ingestion of contaminated surface water by construction workers
- exposure of ecological receptors via plant uptake and/or animal ingestion.

5.2 Operational impacts

5.2.1 Impacts from existing potential sources of contamination during operation

Potential impacts from existing contamination during operation of the Proposal are primarily associated with the reuse or disturbance of contaminated soil (refer to Section 5.3.1 for a preliminary risk assessment). The implementation of management protocols is required (refer to Chapter 6).

5.2.2 Impacts to the environment from proposed activities during operation

For the purposes of this contamination assessment, identified operational impacts primarily relate to the low potential for contamination of soil, surface water and groundwater arising from maintenance incidents, leaks and spills associated with the operation of the Proposal. Maintenance activities would include minor servicing of pumps, valves and other mechanical infrastructure in the dam and pipeline elements, with only minor quantities of oils and greases expected to be used. The risk of contamination events occurring during operation is considered low.

To manage spills and leaks during the operation of the Proposal, spill containment facilities would be in permanent operational facilities where there is a risk of impact from spills. Site management activities would be documented in an OEMP prepared to inform the operation of the Proposal.

5.3 Preliminary conceptual site model

5.3.1 Sources and preliminary risk assessment

Several sources of potential contamination have been identified (refer to Section 5.1.1) however, all are located outside of the PMF and CDF. A tier 1 preliminary risk assessment of these sources is presented in Table 5.2 below. The risk assessment framework is outlined in Section 3.4.

It is considered that any potential issues can be managed with the implementation of management plans.

Table 5.2 Potential sources – tier 1 preliminary risk assessment

Source type and CoPC	Identified source area	Tier 1 preliminary risk assessment
Uncontrolled fill/demolished buildings – ACM, PHCs, PCB, metals, OCPs/OPP.	<ul style="list-style-type: none"> The potential for uncontrolled fill material across the CDF is considered low to negligible. Interview with landowners indicate the potential for localised unregulated burials to be present, however none identified during the site inspections or desktop review and remain well outside of the PMF. 	<ul style="list-style-type: none"> Low. Intensive human development and land uses have not occurred across the site, therefore, widespread or significant contamination resulting from fill material and/or demolition waste is considered unlikely to be present at concentrations above the relevant assessment criteria.
Historical application of herbicides and pesticides on agricultural land – OCPs/OPP.	<ul style="list-style-type: none"> The title search conducted by Coffey along with aerial photographs indicate only low intensity agriculture (grazing) with no obvious cropping or market garden activities. Spraying of OCP and/or OPP is considered unlikely. 	<ul style="list-style-type: none"> Low. The agricultural activities observed in general across the site and surrounds appeared non-intensive and thus frequent and widespread application of pesticides and/or herbicides across a large area is considered unlikely.
AST – PHCs.	<ul style="list-style-type: none"> A diesel AST was identified at 269 Doon Doon Road, Lot 1 DP1246411. The storage capacity was visually estimated to be approximately 2,000 L. There was a stained area on the ground underneath the tank, limited in extent. A small abandoned diesel AST was observed at 571 Doon Doon Road, Lot 1 DP1256191. There was a stained area on the ground underneath the tank, limited in extent. 	<ul style="list-style-type: none"> Low. The ASTs were located outside the PMF. Runoff and groundwater contamination could be a risk.
Cattle dips – OCP/OPP, arsenic.	<ul style="list-style-type: none"> Gilmore’s dip and Lower Commissioners Creek dip are both decommissioned and do not pose a contamination risk. The Doon Doon cattle dip located adjacent to Kyogle Road and Clarrie Hall Dam Road was observed to be abandoned with signage indicating hazardous chemicals that restrict soil disturbance. The abandoned Fogartys cattle dip located in proximity to the southern end of the PMF has not been completely decommissioned or remediated. 	<ul style="list-style-type: none"> Low. Doon Doon cattle dip is outside of the PMF however, it is near the proposed disturbance footprint as the Kyogle Road and Clarrie Hall Dam Road may be upgraded (subject to the transport and traffic assessment). Should this dip be subject to disturbance during construction works, assessment and remediation and/or management would be required. Fogartys cattle dip is outside of the PMF.
Fuel/chemical storage areas – TRH, BTEXN, PAH, metals.	<ul style="list-style-type: none"> Many empty or partially full IBCs were observed at 269 Doon Doon Road, Lot 1 DP1246411. The contents were unable to be determined but it was noted that some contained suspected molasses and waste oil. A spray unit (assumed empty) along with various other chemical containers (unknown contents) were also found. Two IBCs of unknown content were observed at 511 Doon Doon Road, Lot 2 DP838936. One IBC was suspected to contain molasses. A firefighting unit and assumed empty spray unit were also observed. A chemical storage area was observed at 484 Doon Doon Road, Lot 21 DP840278, 60 Commissioners Creek Road, Lot 1 DP877100, and 79 Lone Pine Road, Lot 1, DP1243701. A stock treatment area was observed at 60 Commissioners Creek Road, Lot 1 DP877100. 	<ul style="list-style-type: none"> Low. Storage areas were outside of the PMF. The storage areas were small scale and unlikely to affect the dam. The stock treatment area is outside the PMF area and small in scale. It is unlikely to affect the dam.

Source type and CoPC	Identified source area	Tier 1 preliminary risk assessment
Dumped building/household waste –metals, ACM.	<ul style="list-style-type: none"> Two areas of mixed solid building and household waste was observed at 511 Doon Doon Road, Lot 2 DP838936. Materials such as wood, concrete, metal, brick, plastic, tin, electrical and white goods were amongst the waste. 	<ul style="list-style-type: none"> Low. The waste is outside the PMF however, 511 Doon Doon Road is a potential stockpile area. It is noted that the waste was not observed within the potential stockpile area, however, it is recommended that this property be further assessed before being used for construction related activities.
Potential ⁵ ACM.	<ul style="list-style-type: none"> Potential ACM was identified within the wall cladding/lining of the Intake Tower. This should be confirmed against the asbestos register. ACM warning signs were observed on the toilet block within the CDF. ACM warning signs were observed on the toilet block, shelter and Doon Doon Hall buildings at Crams Farm Reserve. 	<ul style="list-style-type: none"> Low. Most asbestos is labelled and in good condition. If buildings are modified or demolished there is a risk of disturbing the ACM. Management as per the register and legislative requirements would mitigate this risk.

5.3.2 Pathways

The following transport mechanisms may apply at the site:

- surface run-off of CoPC into the dam
- excavation and re-location of soil during construction activities
- vertical seepage of CoPC into the underlying soils
- atmospheric dispersion (aeolian transport) of dust, derived from contaminated soil or hazardous building materials (asbestos).

Identified potential exposure pathways for the nominated CoPC include:

- dermal contact and incidental ingestion of soil
- inhalation of dust (including soil derived) or fibres
- dermal contact and incidental ingestion of groundwater/surface water
- plant uptake and/or ingestion by animals.

Based on the physical and chemical features of the CoPC identified, the exposure pathways that may be applicable to each CoPC at the site are presented in Table 5.3.

Table 5.3 CoPC and applicable exposure pathways

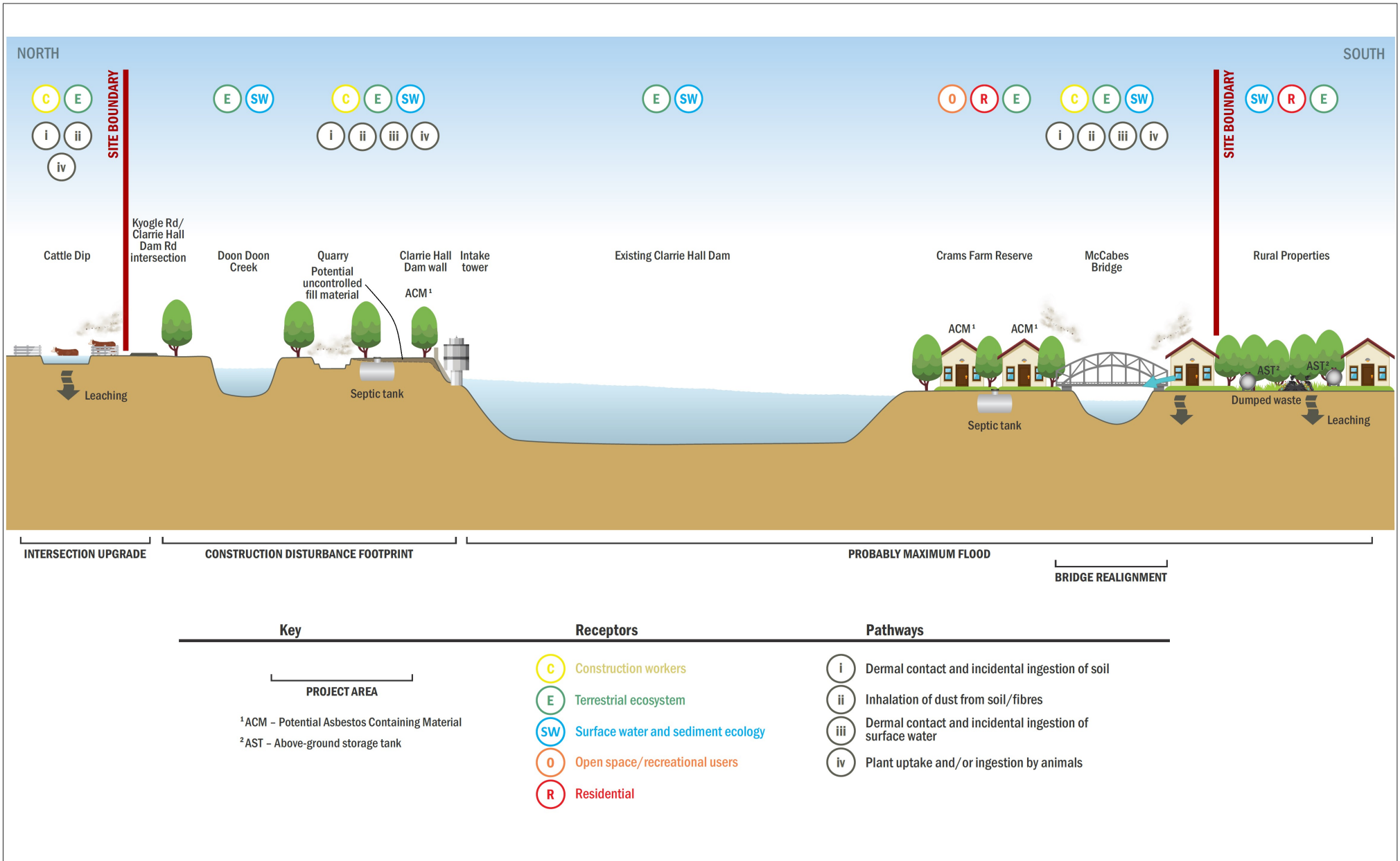
CoPC	Applicable pathways
Asbestos	ii
TRH/BTEX	i, ii, iii
PAH	i, ii, iii
Metals (eg arsenic, lead, etc)	i, ii, iii
OPP, OCP	i, ii

5.3.3 Receptors

The CSM has been developed to identify existing sources and areas of contamination, associated potential impacts to human health and ecological receptors and to identify exposure source, pathway and receptor linkages. Typical receptors during the construction phase include:

- proposed construction workers
- surrounding human users (although access would be restricted from construction areas) such as residents and/or agricultural workers
- ecological receptors, including terrestrial and aquatic ecosystems in receiving surface water bodies.

The preliminary CSM for the construction works is presented in Figure 5.2 below.



6 Management and mitigation measures

6.1 Management objectives

The key objectives of the contamination management are to:

- demonstrate that the proposed construction works would be undertaken in accordance with relevant requirements of the CLM Act, POEO Act, EHC Act and Workplace Health and Safety
- minimise risk to proposed workers and surrounding human receptors from the disturbance of CoPC identified during this assessment
- minimise significant impacts to surrounding watercourses and ecological receptors from CoPC
- formally record the actions taken to identify and control exposure to workplace hazardous substances, as well as their use and transport.

6.2 Management of impacts

The management and mitigation measures that should be undertaken during the proposed works to manage potential contamination issues are presented in the following sections.

6.2.1 Assessment of the Proposed disturbance areas

Based on the tier 1 preliminary risk assessment completed (refer to Table 5.2), areas within the proposed footprint that have been assessed as low risk do not require further assessment or remediation and would be managed by the implementation of the CEMP for the proposed works and would include management of contamination.

6.2.2 Contaminated soil and water management during construction

Protocols for the management of contaminated soil and water during construction would be included in the CEMP for all construction works of the Proposal. The CEMP would:

- detail requirements for safety controls including but not limited to the following:
 - air/dust monitoring
 - exclusion zones and decontamination
 - excavation ventilation
 - dust suppression and containment
 - personnel protective equipment
 - training and supervision
- detail requirements for environmental controls including:
 - erosion and sediment control
 - management of surface water runoff around the excavation/tunnelling/blast areas and prevention of surface water entering excavations

- stockpile management procedures for segregating materials and preventing cross contamination of clean material with contaminated material
- materials tracking and records
- management of liquid and solid waste arising from construction and blasting activities (e.g. during excavation of the diversion tunnel), including mitigation of blasting residues.

6.2.3 Asbestos management

A site-specific AMP is required under Part 8.4 of the NSW *Work Health and Safety Regulation 2017* where there is potential for ACM to be encountered. This would relate to works that may intersect, excavate or otherwise encounter areas with potential, likely and confirmed ACM. Based on information supplied by Tweed Shire Council to EMM, areas where ACM has been identified as being present include the Clarrie Hall Dam intake tower, toilet block and control room (P.Boyd 2015) and the dairy building (Leipper, Asbestos inspection 2020), toilet block (Leipper 2021a) and Doon Doon Hall (Leiper 2021b) at Crams Farm. ACM may also be encountered throughout the project footprint (e.g. areas of disturbed land, former buildings).

Tweed Shire Council (or the appointed principal contractor) would be required to ensure human exposure to ACM is below the guideline limits outlined in Workplace Exposure Standards for Airborne Contaminants (Safe Work Australia 2018). All ACM that requires offsite disposal must be managed, transported and disposed in accordance with *Protection of the Environment Operations (Waste) Regulation 2014*. Where more than 100 kg of asbestos waste or more than 10 m² of asbestos sheeting is transported, the NSW EPA online tool WasteLocate would be used. The handling and disposal of asbestos waste would be tracked and recorded.

Specific protocols would be stipulated for separation, monitoring, validation and clearance of asbestos.

The AMP and associated Standard Work Procedures would satisfy the relevant requirements of:

- *Work Health and Safety Regulation 2017*
- the Safe Work Australia Asbestos Codes of Practice and Guidance Notes.

All persons performing the works would be required to undertake a suitable risk assessment and develop a Safe Work Method Statement (SWMS) for all work activities prior to commencing work in potential or actual asbestos impacted areas.

6.2.4 Waste management and transport

As part of the CSWMP, waste management plans would include procedures for handling and storing excavated rock and/or stockpiled materials, including potentially or known contaminated soil/fill in accordance with the POEO Act.

Material that has been assessed as not suitable for re-use or management (e.g. via encapsulation or treatment) would be appropriately characterised prior to offsite disposal.

The following material handling requirements would be implemented for trucks transporting materials offsite:

- Where required, a licensed transporter would be used to transport material to an appropriately licensed disposal location or waste facility.
- All truck loads would be filled to the correct level and not over-filled.
- Trucks carrying spoil materials would be covered prior to exiting the work site and would remain covered until authorised to unload at the receiving destination.

- Trucks transporting saturated materials would be fitted with seals to ensure that the movement of potentially saturated materials is undertaken appropriately. The integrity of the seals would be inspected and tested at regular intervals as prescribed in the CEMP.
- If construction materials are tracked or spilt, leaks and spills would be cleaned up in a manner that prevents contamination of land and waterways.
- All truckloads and waste material contents and volumes would be described and tracked, and a register completed to reconcile and check material has been lawfully and appropriately disposed in accordance with the Proposal's approvals and relevant legislation.

Temporary excavated rock stockpiles may be stored at select locations within the proposed footprint. All stockpiled material would be tracked in accordance with protocols outlined within the CEMP for material tracking.

6.2.5 Assessment of imported Virgin Excavated Natural Material (VENM)

Prior to the importation of any virgin excavated natural material (VENM) during construction, the VENM source(s) would be identified and assessed against the definition of VENM in the Waste Classification Guidelines (NSW EPA 2014) and POEO Act. The VENM source(s) would be assessed by an appropriately qualified environmental consultant.

6.2.6 Unexpected finds

An unexpected finds protocol (UFP) would be included in the CEMP for use during construction and operation of the Proposal. An unexpected find is potential contamination that was not previously identified during this contamination assessment or other investigations conducted for the Proposal. Proposed workers would be trained in identifying:

- soil that appears to be contaminated based on visual and olfactory (odour) assessment
- ACM (i.e. either bonded or friable asbestos)
- evidence of sheep/cattle dips
- groundwater or surface water that appears to be contaminated based on visual and olfactory (odour) assessment (including sheens or abnormal discolouration on the water surface, free phase liquids such as petroleum fuel, etc)
- potentially contaminating infrastructure (such as historical building structures potentially containing hazardous materials)
- fill containing wastes (e.g. residual mine waste and tailings, refuse).

In the event of an unexpected contamination find:

- excavation works would temporarily be suspended at the location of the unexpected find, the environment manager contacted and the area of concern appropriately isolated
- the area would be inspected by a contaminated land consultant and if required, appropriate sampling and analysis would be undertaken with the sampling activities documented in a report
- workplace health and safety and environmental protection requirements would be reviewed, depending on the type of unexpected finds encountered.

6.2.7 Summary of construction mitigation measures

Measures that would be implemented to mitigate potential contamination impacts identified during construction are outlined in Table 6.1 below.

Table 6.1 Mitigation measures-- contamination

Impact	Ref#	Mitigation measure	Timing
Contaminated Lands	SC_01	<p>A CLMP would be prepared and implemented as part of the CEMP. The plan would include, but not be limited to consideration of the following:</p> <ul style="list-style-type: none"> capture and management of any surface runoff contaminated by exposure to the contaminated land further investigations required to determine the extent, concentration, and type of contamination, as identified in the site investigations management of the remediation and subsequent validation of the contaminated land, including any certification required measures to ensure the safety of site personnel and local communities during construction complete pre- and post-construction site assessments in areas to be used for project office compounds, depots or laydown areas in accordance with the ASC NEPM process for tracking excavated material and waste. 	Pre-construction Construction
Contaminated Lands	SC_02	<p>Potentially contaminated areas directly affected by the Proposal would be investigated and managed in accordance with the requirements of guidance endorsed under section 105 of the <i>Contaminated Land Management Act 1997</i>. This includes further investigations in areas of potential contamination identified in the proposed footprint. If contamination is posing a risk to human or ecological receptors is identified, a Remediation Action Plan would be prepared and implemented.</p>	Pre-construction Construction
Contaminated Lands	SC_03	<p>The CLMP would include procedures to manage potentially contaminated stormwater runoff.</p>	Pre-construction Construction
Unexpected Finds	SC_04	<p>The discovery of previously unidentified contaminated material would be managed in accordance with an unexpected contaminated lands discovery procedure. The procedure would include:</p> <ul style="list-style-type: none"> cease work in the vicinity initial assessment by an appropriately qualified environmental consultant further assessment and management of contamination, if confirmed, in accordance with section 105 of the CLM Act. 	Pre-construction Construction
Handling of Hazardous Materials	SC_05	<p>Asbestos handling and management would be undertaken in accordance with an AMP (as part of the Work Health and Safety Plan).</p>	Pre-construction Construction
Accidental spill	SC_06	<p>A site-specific emergency spill plan would be developed, and include spill management measures in accordance with relevant EPA guidelines. The plan would address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities.</p>	Pre-construction Construction
Spill management	SC_07	<p>Activities with the potential for spillage of hydrocarbon and other chemicals (such as refuelling and washing down of plant and equipment) would be undertaken away from water courses or in any location which drains directly to waters with appropriate temporary bunding.</p> <p>Storage of fuels, oils and chemicals would be stored in suitably bunded areas in accordance with relevant legislation and Australian standards. Refuelling operations would not be left unattended.</p>	Pre-construction Construction

Impact	Ref#	Mitigation measure	Timing
Use of hazardous materials	SC08	The use of hazardous materials would be undertaken following a risk assessment in accordance with the Proposal Construction Hazard and Risk Management Plan. Risk assessments would include an environmental assessment to determine whether it is practical to use a chemical with a lower hazard level and the key controls to be implemented prior to use.	Pre-construction Construction

6.2.8 Operational environmental management plan (OEMP)

An OEMP would be developed to manage potential impacts to the surrounding environment during operation of the raised dam after the proposed works are complete. The OEMP would be a 'live' document with the capacity to be updated if conditions are different to those expected and would include provision for the management of leaks and spills, which may occur during operation of Clarrie Hall Dam.

7 Conclusions

Areas of potential contamination were identified by reviewing historical information, the environmental setting and the site inspection. This information was used to assess potential contaminants, exposure mechanisms, pathways and potentially affected media as outlined in the conceptual site model.

The data reviewed and site inspection observations indicated a low potential for the presence of significant widespread contamination in disturbance areas within the proposed footprint. The PSI data indicated the following:

- The observed agricultural activities across the PMF and surrounds appeared non-intensive and thus frequent and widespread application of pesticides/herbicides and/or fill material causing widespread contamination is considered unlikely.
- Based on the review of the available data, there is a potential that construction works may encounter ACM in building structures. Asbestos must be managed in accordance with prevailing legislative requirements and management measures in Table 6.1.
- Doon Doon cattle dip is adjacent to the Kyogle Road and Clarrie Hall Dam Road intersection. Should this dip site be subject to disturbance during construction works, an intrusive investigation and remediation and/or management would be required.
- Two potentially contaminated sites at 269 and 571 Doon Doon Road both contained a diesel AST and evidence of surface spills. These areas are not located within the proposed construction disturbance footprint or within the FSL or PMF. Based on evaluation of source-pathway-receptor linkages, the risk was assessed to be low.
- Chemical storage areas were identified at a number of properties however, all areas were not located within the proposed construction disturbance footprint or within the FSL or PMF. Based on evaluation of source-pathway-receptor linkages the risk was assessed to be low.
- Household/building waste observed in the potential stockpile area at 511 Doon Doon Road are located further north of the proposed stockpile area however, it is recommended that this location be assessed through a targeted intrusive investigation and/or remediated prior to stockpile activities associated with construction works.

The key management measures for the construction and/or ongoing operation of the Proposal include:

- Development of appropriate project documentation (e.g. CEMP, CLMP, CSWMP, AMP, OEMP) to manage contamination identified during the construction and operation of the project.

Temporary construction laydown areas would be required to store materials, spoil and equipment as well as provide space for other ancillary facilities such as site offices. The laydown areas would be used to stockpile material from excavation activities. Stockpiling would be ongoing for the duration of the excavation works. Stockpiling activities would be managed by adopting appropriate erosion and sediment controls in accordance with Managing Urban Stormwater: Soils and Construction (Landcom 2004) (The Blue Book). Operational impacts associated with the Proposal are not considered to present a significant risk, however would be outlined in the OEMP to ensure appropriate management actions are documented in the event of an incidence of environmental harm occurring.

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Acronyms

List of Acronyms

Term	Definition
ACM	Asbestos containing material
AHD	Australian height datum
AMP	Asbestos management plan
AS	Australian standard
ASC NEPM	National Environmental Protection (Assessment of Site Contamination) Measure, as amended (2013)
ASS	Acid sulfate soils
AST	Above-ground storage tank
CDF	Construction Disturbance Footprint
CEMP	Construction environmental management plan
CLM Act	<i>Contaminated Land Management Act 1997 (NSW)</i>
CLMP	Contamination Land Management Plan
CoPC	Contaminants of potential concern
CSM	Conceptual site model
CSWMP	Construction Soil and Water Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water (NSW)
DPHI	Department of Planning, Housing and Infrastructure (NSW)
DQI	Data quality indicators
DQO	Data quality objectives
DUAP	NSW Department of Urban Affairs and Planning
EHC Act	<i>Environmentally Hazardous Chemicals Act 1985 (NSW)</i>
EIS	Environmental impact statement
EMM	EMM Consulting Pty Ltd
EPA	Environment Protection Authority
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
FSL	Full supply level
GDE	Groundwater dependant ecosystem
LGA	Local government area
NEFB	New England Fold Belt
NEPC	National Environment Protection Council
NOA	Naturally Occurring Asbestos

Term	Definition
NSW	New South Wales
OEH	Office of Environment and Heritage
OEMP	Operational environmental management plan
PAF	Potentially acid forming
PASS	Potential acid sulfate soils
PFAS	Per- and polyfluoroalkyl substances
PMF	Probable maximum flood
POEO Act	<i>Protection of the Environment Operations Act 1997 (NSW)</i>
PSI	Preliminary site investigation
SAQP	Sampling analysis and quality control plan
SEARs	Secretary's environment assessment requirements
SPOCAS	Suspension peroxide oxidation combined acidity and sulfur
UPSS	Underground petroleum storage system
UST	Underground storage tank
VENM	Virgin excavated natural material

Appendix A

Database search results

Product Guide

NEW SOUTH WALES

About this Report

Your Report has been produced by Land Insight and Resources (LI Resources).

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Soil, Acid Sulfate Soil & Salinity – © State Government of New South Wales and Office of Environment and Heritage (OEH) (Creative Commons Attribution 4.0 <https://creativecommons.org/licenses/by/4.0/deed.en>) and Commonwealth Scientific and Industrial Research Organisation (CSIRO) Australian Soil Resource Information System (ASRIS).

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Geology - NSW Planning & Environment – Resources & Energy: © State of New South Wales through NSW Department of Industry.

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Other Known Borehole Investigations - © Land Insight & Resources.

The NSW Government PFAS Investigation Program - © State of NSW Environment Protection Authority.

Contaminated Land Record of Notices, Sites Notified as Contaminated to the NSW EPA, Former Gasworks and PFAS investigation program - © State of NSW Environment Protection Authority.

Licensing Under the POEO Act 1997 - State of New South Wales through the EPA.

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UXO and Military Facilities- Australian Government - Various sources and Department of Defence © Commonwealth of Australia, 2017-2019. *The data supplied is based on Defence's assessment of information obtained from a variety of sources. It does not reflect any UXO remediation conducted on behalf of any person or organisation other than Defence. While Defence makes all reasonable efforts to ensure that the information provided is accurate, complete and up-to-date, there may be limitations to the sources available to Defence and the information may be subject to change. The information relating to a specific parcel of land should not be relied upon without additional checks and/or verification from the relevant state, territory or local government. Further information as to Defence's UXO categorisation criteria; along with Defence's recommendations to state and local authorities, is available on the Defence internet.*

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Historical Commercial & Trade Directory Data –

Sydney

1932-1933 John Sands Sydney Trades Directory – Copyright Expired

1940 & 1950 Commonwealth of Australia Telephone Directory Sydney – Copyright Expired

1960-1961 Telecom Australia Pink Pages Sydney – Permission for use Sensis, 2017.

1970-1971 United Business Directories Sydney – Licenced under Hardie Grant, 2017.

1974-1975 NSW Post Office Yellow Pages Sydney Buying Guide and Commercial/Industrial Directories – Permission for use Sensis, 2017.

1980-1981 & 1990-1991 Telecom Australia Yellow Pages Sydney – Permission for use Sensis, 2017.

2005 - 2015 Datajet.com.au - Permission for Use, 2022.

Regional NSW

1971, 1981 & 1991 Telecom Australia Yellow Pages Country NSW Directories – Permission for use Sensis, 2017.

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Glossary

AVIATION RESCUE FIRE FIGHTING FACILITIES (ARFF); LIQUID FUEL & AVIATION FUEL DEPOTS/TERMINALS; POWER STATIONS; TELEPHONE EXCHANGES & WASTEWATER TREATMENT FACILITIES

These facilities may be associated with the use, storage, treatment and disposal of a range of chemicals and products such as PFAS (Per- and poly-fluoroalkyl substances), solvents, petroleum products, asbestos, PCBs (polychlorinated biphenyls) and others.

BUSHFIRE PRONE LAND

This data may assist environmental consultants, developers and others understand whether any bushfire risk is present in the area that may require specific management and/or restrict site investigations and development works.

COAL SEAM GAS, PETROLEUM WELLS AND BOREHOLES

This data may assist environmental consultants during investigations as to previous resource exploration with an area, resources present (i.e. coal, gas and petroleum), lithological data and potential for environmental contamination.

DEPARTMENT OF DEFENCE UNEXPLODED ORDNANCE (UXO) SITES

UXO is any sort of military ammunition or explosive ordnance which has failed to function as intended. It includes a range of ammunition used by the Navy, Army and Air Force; and many other types of ammunition and explosives including training munitions. UXO contamination has arisen mainly as a result of military training activities, since European settlement. In the past large numbers of ranges and training areas were approved for use in many areas of Australia. As a result, there are now a number of sites around Australia which are affected by UXO. For more information see www.defence.gov.au/UXO

DERELICT MINES AND QUARRIES

Outstanding legacy issues surrounding derelict mines and quarries have the potential to cause safety and environmental impacts and may also be an indicator of the presence of unregulated landfill.

DRY CLEANERS (CURRENT)

Dry cleaners often use or have used hazardous and flammable chemicals in their operations. Incorrect storage and disposal of these chemicals may result in fire/explosion risks or contamination of soil and groundwater or result in human health risks.

GROUNDWATER EXCLUSION ZONES

Groundwater exclusion zones are present in certain areas where aquifers are known to be contaminated or where past activities may have affected groundwater quality. Restrictions on the use of groundwater in those areas are in place and differ between the various management/exclusion zones.

HERITAGE – FEDERAL, STATE AND LOCAL

This data may assist environmental consultants, developers and others understand whether any heritage items are present on the site that may require specific management and/or restrict site investigations and development works.

HISTORICAL COMMERCIAL & TRADE DIRECTORY DATABASE (1932, 1940, 1950, 1960, 1970; 1974, 1980 and 1990)

An LI Resources proprietary database of historical potentially contaminating activities previously listed as having been undertaken on the property or surrounding area. Activities have been catalogued based on 'low to high risk activities' either known to cause potential contamination risk (based on Managing Land Contamination Planning Guidelines, SEPP 55 remediation of land, 1998) or to assist in guidance for sampling and remediation programs by environmental consultants.

HISTORICAL (LEGACY) LANDFILLS

An LI Resources proprietary dataset containing the location of former legacy landfills. Legacy landfills are widely present across the country, with many locations unknown. Most of these landfills were created prior to current environmental guidelines (i.e. remain unlined and uncapped) resulting in the potential for leaching of hazardous substances into waterways, production of odours, migration of landfill gas and stability issues.

HYDROGEOLOGY

This data includes information for environmental consultants on aquifer properties, the presence of wetlands and groundwater monitoring bores. This information can assist in the understanding of contaminant pathways and receptors.

Groundwater monitoring bores are primarily needed to assess changes to water table levels, groundwater quality and to assess groundwater flow direction. Impacts on groundwater result from contaminated water movement, leaching of surface pollutants caused by rainfall or irrigation water percolation, leakage of stored matter or the disposal of wastes. The presence of a monitoring bore may indicate that a site has been or is being investigated.

LICENSING UNDER THE POEO ACT 1997

The POEO public register includes a range of specified information on environment protection licences issued under the POEO Act to regulate air, noise, water and waste pollution and impacts. The licences and notices provide information on the type of industrial activities undertaken in an area and if any clean-up and preventative action notices have been issued under that licence.

MILITARY FACILITIES

Military practices at certain facilities may cause potential contamination through the use of chemicals ranging from cleaning solvents and paints to ammunition, explosives and firefighting foam. These chemicals can cause human and ecological health risks.

NATURALLY OCCURRING ASBESTOS

Asbestos is found as a naturally occurring mineral in many areas of regional NSW and may occur in veins within rock formations. Naturally occurring asbestos is generally found when building roads, working on construction sites and undertaking excavation activities. This data provides information on the areas identified with a low to high probability of naturally occurring.

NPI INDUSTRIAL FACILITIES

Industrial facilities that trigger a defined threshold(s) for the emission of pollutants identified in the National Pollution Inventory (NPI), must estimate and report their emissions. The pollutants identified under the NPI are those that are known to have possible effects on human health and the environment.

NSW EPA CONTAMINATED LAND RECORD OF NOTICES ISSUED UNDER THE CLM Act 1997

The EPA is required by law to maintain a record of notices relating to contaminated land, including notices declaring land to be 'Significantly Contaminated Land' under the Contaminated Land Management Act 1997. The EPA record of notices provides information on all sites that have been declared significantly contaminated.

NSW EPA FORMER GASWORKS SITES

Former gasworks often leave a legacy of soil and groundwater contamination. The major contaminants in these instances include tars, oils, hydrocarbon sludges, spent oxide wastes, ash and ammoniacal recovery wastes. Some of these contaminants are carcinogenic to humans and toxic to aquatic ecosystems and therefore may pose a risk to human health and the environment.

NSW EPA FORMER URANIUM PROCESSING SITE AT HUNTERS HILL

In 2008 a Parliamentary Inquiry held into the former uranium processing site at Hunters Hill, Sydney, found radiation levels were too low to require site remediation. During the investigation it became evident that there were two separate causes of gamma radiation in the vicinity of Nelson Parade (7-9 Nelson Parade – former uranium processing plant and Kelly's Bush – former tin smelter). The investigations found that levels of radiation on properties surrounding 7-9 Nelson Parade, at Kelly's Bush and in nearby areas of Hunters Hill were below relevant national and international guidelines for the protection of health and therefore remediation was not warranted. Further information can be found at www.epa.nsw.gov.au

NSW EPA JAMES HARDIE ASBESTOS WASTE CONTAMINATION LEGACY

During the 1960s and 70s, bulk asbestos waste associated with manufacturing and waste disposal by the former James Hardie Industries was delivered as fill to areas targeted because of their low-lying geography. Between December 2007 and February 2008, the Department of Environment Climate Change and Water conducted site inspections of those disposal sites. None of the inspected sites were found to be a significant risk to human health or the environment, provided the sites remained sealed or undisturbed. Further information can be found at www.epa.nsw.gov.au

NSW EPA SITES NOTIFIED AS CONTAMINATED TO THE NSW EPA

The EPA maintains a record of all sites notified to it by owners or occupiers of sites believed to be significantly contaminated.

NSW EPA PFAS INVESTIGATION PROGRAM

The NSW EPA is investigating particular sites to better understand the extent of PFAS use and contamination in NSW. PFAS are a group of chemicals that include perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA).

They have many specialty applications and are widely used in a range of products in Australia and internationally. PFAS are an emerging contaminant, which means that their ecological and/or human health effects are unclear. Further information can be found at www.epa.nsw.gov.au

OTHER POTENTIALLY CONTAMINATED SITES

An LI Resources proprietary database of recent potentially contaminating activities previously listed as having been undertaken on the property or surrounding area. Activities have been catalogued based on 'moderate to high risk activities' either known to cause potential contamination risk or to assist in guidance for sampling and remediation programs by environmental consultants. Please note this database is not exhaustive and may not list all activities in the area.

PARRAMATTA RIVER CATCHMENT LAND USE AREAS

An LI Resources proprietary dataset containing land use changes around the Parramatta River catchment area. Details include land reclamation areas, loss of foreshore and major land use changes (i.e. industrial to residential land). These changes may indicate presence of unregulated landfill and potential contamination associated with former industrial land use.

PUBLIC REGISTER OF PROPERTIES AFFECTED BY LOOSE-FILL ASBESTOS INSULATION

The NSW Government is required to maintain a register of residential properties that contain loose-fill asbestos insulation. This assists members of the wider community to be informed about any risks associated with a specific property and to take any appropriate safety measures. For more information see www.fairtrading.nsw.gov.au

SENSITIVE RECEPTORS

This data may assist environmental consultants during investigations as to the location and proximity of any sensitive receptors in the area, such as aged care, child care, community and religious facilities; sports grounds; national and state parks etc.

COASTAL MANAGEMENT (STATE ENVIRONMENTAL PLANNING POLICY)

The aim of this Policy is to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the Coastal Management Act 2016, including the management objectives for each coastal management area, by

- (a) managing development in the coastal zone and protecting the environmental assets of the coast, and
- (b) establishing a framework for land use planning to guide decision-making in the coastal zone, and
- (c) mapping the 4 coastal management areas that comprise the NSW coastal zone for the purpose of the definitions in the Coastal Management Act 2016.

SOIL LANDSCAPE AND GEOLOGY

This data may assist environmental consultants during investigations as to the physical site properties that could govern potential contaminant retention or migration.

SERVICE STATIONS (CURRENT)

Service stations may contain leaking tanks which can result in petroleum products migrating into, and contaminating, the soil or groundwater or other pathways to human and biological contact.

UNDERGROUND PETROLEUM STORAGE SYSTEMS (UPSS) ENVIRONMENTALLY SENSITIVE ZONES

UPSS environmentally sensitive zones represent a conservative assessment of areas likely to be vulnerable to contamination from leaking UPSS. This information can assist environmental consultants on the risk a UPSS site poses to a recognised environmentally sensitive receptor.

WASTE MANAGEMENT FACILITIES

A waste facility is a premises used for the storage, treatment, processing, sorting or disposal of waste. These include landfills, waste transfer stations and waste reprocessing facilities. Waste facilities emit regulated substances to air and water, such as methane gas, and can produce odours, dust and noise.

Terms and Conditions

Terms and Conditions

1. Land Insight and Resources (LI Resources) will perform the Services in accordance with these terms and conditions
2. By submitting the Application Form, the User acknowledges that it has read and understood these terms and conditions and agrees to be bound by them.
3. LI Resources reserves the right to change these terms and conditions. Any change shall be effective upon notice, which may be given by LI Resources posting such change on the Website, or by direct communication with the User.

Services

4. LI Resources agrees to undertake the Services using due skill, care and diligence.
5. The User assumes the sole risk of making use of, and/or relying on, the Report and the Services. LI Resources makes no representations about the suitability, completeness, timeliness, reliability, legality, or accuracy of the Services.
6. Unless LI Resources agrees expressly otherwise:
 - (A) The Services are solely for the use and benefit of the User; and
 - (B) LI Resources does not accept any liability, whether directly or indirectly, for any liability or loss suffered or incurred by any third party placing any reliance on the performance of the Services or any Documents or material arising from or in connection with the Services.
7. The User warrants to LI Resources that it will not use the Services for any purpose that is unlawful or is otherwise inconsistent with these terms and conditions.
8. The User will not alter in any way or provide a copy of the Report or any Document prepared by LI Resources to any other person without LI Resources's prior written consent.

Payment Terms

9. The Fee will be payable at the time of submitting the Application Form unless invoicing payment terms have been negotiated prior to purchase with LI Resources.
10. The User and LI Resources may agree in writing to vary the Services. The fee for each variation shall be agreed between LI Resources and the User.
11. The User agrees to pay LI Resources the Fee, including the fee for any variation requested in accordance with clause 12.
12. If the User's rights are terminated and the User has made an advance payment, LI Resources will refund the User a reasonable proportion of the balance as determined by LI Resources in relation to the value of Services already provided.
13. GST at the prevailing rate is payable in addition to the Fee. The User agrees to pay any other applicable taxes, duties or government imposed fees related to the User's use of the Services.

Intellectual Property

14. LI Resources owns all intellectual property in the Report and arising from or in connection with the Services.
15. LI Resources grants the User a royalty free licence to use LI Resources's intellectual property for that User's personal assessment of its Property(s) only.

Privacy Policy

16. Upon submitting the Application Form the User consents to LI Resources's use of the personal data provided by the User for the purposes of providing the Services.
17. The Reliance on the Report, the use of the Services and the use of LI Resources's Website is at the User's own risk. The User accepts that LI Resources does not guarantee the confidentiality of any communication or information transmitted through the use of the Website.
18. LI Resources will not provide to any third party any personal data provided by a User without the User's permission.
19. The User acknowledges that any feedback provided to LI Resources over the Website is not confidential and that LI Resources has the right to publish, reproduce, disseminate, transmit, distribute and copy (in whole or in part) any such feedback without the approval of the User.
20. LI Resources assumes no responsibility or liability for any content, communications or feedback submitted by a User over the Website. If a User has submitted objectionable content, communications or Feedback, LI Resources may, in its sole discretion, terminate that User's account, take legal action, or notify the appropriate authorities or parties, without prior notice.

Third Party Services

21. The User accepts that, although the Website may contain or provide information regarding applications, products and/or services provided or offered by third parties, LI Resources does not recommend or endorse any such third party applications, products and/or services.
22. The report contains content provided to LI Resources by other parties (Third Party Content). LI Resources is not responsible for, does not endorse and makes no representations either expressly or impliedly concerning the accuracy or completeness of any Third Party Content. You rely on the Third Party Content completely at your own risk.

Limit and Extent of Liability

23. LI Resources's liability is limited to the amount of the Fee. Liability arising in the provision of the Services is reduced to the extent that it arises out of or in connection with any negligent act or omission by the User.
24. Neither party is liable to the other for loss of actual or anticipated revenue or profits, increased capital or financing costs, increased operational or borrowing costs, pure economic loss, exemplary or punitive damages or indirect or consequential damages or loss.
25. In no event shall LI Resources or any directors, officers, employees or agents be liable for any indirect, punitive, incidental, special, or consequential damages arising out of or in any way connected with the use of the Website, any delay or inability to use the Website, any information available on the Website, or otherwise arising out of the utilisation of the Website, whether based in contract, tort, strict liability, or otherwise, even if LI Resources has been advised of the possibility of such damages. The negation of damages set forth herein is a fundamental element of the basis of the bargain between LI Resources and the User. The Services would not be provided without such limitations.

Property Verification

26. The User accepts that the Services provided do not take into account any information relating to the actual state or condition of the Property.
27. The User acknowledges that the Services are not to be interpreted as commenting on the physical characteristics or condition of the Property, any particular purpose or use of that Property or the saleability or value of the Property.

Termination and Modification

28. LI Resources reserves the right in its sole discretion to terminate, block or restrict the User's use of the Services or any portion thereof, for any reason, and without notice. In addition, LI Resources reserves the right in its sole discretion to terminate or modify any part of the Website without notice, for any reason.

Anti-Hacking

29. The User agrees not to directly or indirectly, attempt to or disrupt, impair, interfere with, alter or modify the Website or any of its content.
30. The User agrees not to allow, aid or abet third parties to directly or indirectly, attempt to or disrupt, impair, interfere with, alter or modify the Website or any of its content, or obtain access to any information regarding any User or any other Report issued to a User.

Complaints

31. Any complaints in relation to the Services should, in the first instance, be in writing and addressed to LI Resources Customer Service at: info@liresources.com.au. LI Resources will respond to any such complaints in writing as soon as practicably possible.

General Matters

32. These terms and conditions are governed by and will be construed and enforced in accordance with the laws of the State of New South Wales, Australia. If any dispute, controversy or claim arises out of or relating to these terms and conditions, whether sounding in contract, tort or otherwise, it shall be resolved by use of an alternative dispute resolution procedure acceptable to both parties with the assistance of a mediator. If the dispute has not been resolved to the satisfaction of either party within 60 days of initiation of the procedure or if either party fails or refuses to participate in or withdraws from participating in the procedure, then either party may refer the dispute to the court.
33. These terms and conditions apply to all Services provided by LI Resources.
34. If there is any inconsistency between these terms and conditions and any other document or agreement between the parties, these terms and conditions will prevail.
35. These terms and conditions represent the entire agreement between the parties.
36. The User authorises LI Resources to destroy Documents which LI Resources has prepared or holds in connection with the Services 7 years after the last date on which the Services were provided.
37. If any of the terms of the Application Form or the terms and conditions are invalid, unenforceable or void, the relevant term must be read down to the maximum extent possible or severed from the rest of the Application Form or these terms and conditions.

-
38. These terms and conditions can only be amended or varied by a written document signed by both parties.
39. Neither party may assign or transfer any rights or obligations arising in the provision of the Services or these terms and conditions without the other party's written consent.

Defined Terms

Application Form	Means the form and accompanying information provided on the Website, completed and submitted by the User to request the Services.
Document	Includes a report, and any other written or electronic document.
Fee	Means the amount set out in the Application Form or confirmed via an invoice.
Property	Means the property to which the Services and the Report relate.
Report	Means the Document prepared by LI Resources and provided to the User which contains the environmental and development data which is relevant to the Property.
Services	Means the review of data and information on which the Report is based, and the preparation and provision to the User of the Report.
Website	Means LI Resources's online site, that is: www.liresources.com.au
User	Means the person(s) set out in the Application Form including that person's permitted successors.



Tower Three, Level 24
300 Barangaroo Avenue
Sydney NSW 2000 Australia
02 8067 8870
info@liresources.com.au
www.liresources.com.au

Due Diligence Insight Report

Clarrie Hall Dam,
Terragon, NSW

15 March 2023






Report n°:
LI-3236 DDR

Understanding your report

Thank you for ordering your report from Land Insight. If you have any feedback, questions or queries, please get in touch with us at orders@landinsight.co.au.

Your Report has been produced by Land Insight and contains information related to current and historical land use information, environmental risks and hazards.

The information presented in this report includes Land Insights' comprehensive research into current and historical land use derived from Land Insight's proprietary National Land Use Atlas (NLUA), environmental risk information and data available from public databases, third party providers, local and state authorities. The report also includes detailed property and soil setting information, hydrogeology, identification of potential pollution and contamination along with ground and natural hazards. The records identified are presented within a 200 to 2000m radius (buffer zone) from the boundaries of the Property searched, depending on the screened constraint. The report is separated and grouped into easy to navigate sections as per Summary below:

	Section 1	PROPERTY SETTING	Sensitive Receptors, Planning Controls, Zoning, Heritage, Soil and Land Information, Geology and Topography
	Section 2	HYDROGEOLOGY	Groundwater Bores and Other Borehole investigations, Groundwater Dependent Ecosystems (GDE), Aquifer and Wetland, Other Hydrogeology information.
	Section 3	ENVIRONMENTAL REGISTERS, LICENCES AND INCIDENTS	Contaminated Land Public Register, Licences, Audits and Orders, Sites Regulated by Other Jurisdictional Body (Former Gaswork sites / PFAS sites, UXO Areas), Historical Landfills, Derelict Mines and National Pollutant Inventory (NPI).
	Section 4	POTENTIALLY CONTAMINATED AREAS	Potentially Contaminating activities (Industries, businesses and activities that may cause contamination), Historical Potentially Contaminating activities and Historical Land Use.
	Section 5	NATURAL HAZARDS	Erosion hazard, Flood hazards, Bushfire prone land and Bushfire history.

This report includes data listed on page 4 (table of contents). All sources of data and definitions are provided in the Product Guide (Attached). For a full list of references, metadata, publications or additional information not provided in this report, please contact orders@landinsight.co.au.

This report does not include information derived from a physical inspection. It is important to note that a site inspection can present information relevant to other risks and hazards that may not be identified by this Report.

Due to the ongoing nature of database development and frequency of updates provided by various state government regulators and data sources, the data displayed within this report is only current from date of production. While every effort is made to ensure the details in your Report are correct, Land Insight cannot guarantee the accuracy or completeness of the information and/or data provided.

This Report, and your use of it, is regulated by Land Insight's Terms and Conditions. For more information, see Land Insight's Product Guide.

Data maintenance schedule

Dataset name	Update frequency	Dataset buffer
Section 1 - Property Setting		
Sensitive Receptors	Quarterly	200m
Planning Controls (<i>Zoning, Planning Instruments, Other planning information</i>)	Quarterly	500m
State and Local Heritage	Quarterly	200m
Commonwealth, National and World Heritage Areas	Annually	200m
Soil Landscape and Land Use Information	Annually	500m
Salinity Hazard	Annually	500m
Radon Level	Annually	500m
State, Local and National Acid Sulfate Soil (ASS)	Annually	500m
Geology	Annually	500m
Naturally Occurring Asbestos Potential	Annually	500m
Topography	As required	500m
Section 2 - Hydrogeology		
Groundwater Aquifers	Annually	2000m
Wetlands	Annually	2000m
Groundwater Bores	Annually	2000m
Drinking Water Catchments	Annually	500m
Groundwater Prohibition/Restricted Use/Exclusion Zones	Annually	500m
Hydrogeologic Units	Annually	500m
Groundwater Dependent Ecosystems	Annually	500m
Other Borehole Locations (<i>Coal Seam Gas, Petroleum Wells, other boreholes</i>)	Annually	500m
Section 3 - Environmental Registers, Licences and Incidents		
Contaminated Land Public Register	Monthly	1000m
Licences, Approvals, Audits, Authorisations & Assessments		
Licences	Monthly	1000m
Surrendered Licences	Monthly	1000m
Clean Up Notices, Penalty Notices and Orders	Monthly	1000m
Permissions	Monthly	1000m
Audits	Monthly	1000m
Authorisations	Monthly	1000m
Sites Regulated by other Jurisdictional Body		
Contaminated Legacy Areas (<i>James Hardies Asbestos, Pasminco Smelter and Uranium sites</i>)	Quarterly	2000m
Defence 3 Year Regional Contamination Investigation Program (RCIP)	Quarterly	2000m
Defence Sites - Current and Former	Ongoing	2000m
Unexploded Ordnance (UXO) Sites - Department of Defence (DoD)	Annually	2000m
Former Gasworks Sites	Ongoing	2000m
PFAS Investigation Sites (<i>EPA PFAS Investigation Program/s, AirServices Australia etc.</i>)	Monthly	2000m
NPI Industrial Facilities	Annually	2000m
Section 4 - Potentially Contaminated Areas		
Potentially Contaminating Activities (PCA) (<i>Petrol Stations, Dry cleaners, Waste sites etc</i>)	Ongoing	500m
Historical Business Directory (<i>Commercial and Trade Directory Data from 1990-2020</i>)	Not required	200m
Section 5 - Natural Hazards		
Bushfire Prone Areas	Bi-annual	500m
Bushfire History	Bi-annual	500m
Erosion Hazard	Bi-annual	500m
Flood Hazard	Ongoing	500m

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Land Insight Product Guide and Terms and Conditions



Section 1 Property Setting

1.1 SENSITIVE RECEPTORS

Map 1.1 (200m Buffer)

Sensitive receptor	Type	Distance (m)	Direction
-	-	-	-

1.2a PLANNING CONTROLS

Map 1.2a (500m Buffer)

Zoning

Zoning	Type	Details	Distance (m)	Direction
RU2	Rural Landscape	Tweed Local Environmental Plan 2014	0.0	Onsite
SP2	Infrastructure		0.0	Onsite
DM	Deferred Matter		0.0	Onsite
W1	Natural Waterways		248.3	North-east

1.2b PLANNING OVERLAYS

Map 1.2b (500m Buffer)

Environmental Planning Instruments

Name	Type	Details	Distance (m)	Direction
Local Provisions	Existing and Future Water Storage Facilities Map	Tweed Local Environmental Plan 2014	0.0	Onsite
Drinking Water Catchment	Drinking Water Catchment Map		0.0	Onsite
Lot Size	Lot Size Map		0.0	Onsite
Height of Building	Height of Buildings Map		0.0	Onsite

Other Planning Information

Name	Category	Details	Distance (m)	Direction
-	-	-	-	-

1.3 HERITAGE

Map 1.3 (200m Buffer)

State and Local Heritage Registers

Site ID	Site Name	Type	Details	Distance (m)	Direction
Not identified	-	-	-	-	-

Australian Heritage Database Register

Site ID	Site Name	Type	Details	Distance (m)	Direction
Not identified	-	-	-	-	-

Commonwealth Heritage List, National Heritage List and World Heritage Area.

1.4a SOIL AND LAND USE INFORMATION

Map 1.4a (500m Buffer)

Soil Landscape

Code	Name	Soil Group	Description	Distance (m)	Direction
ERfh	Frogs Hollow	Erosional	Landscape—steep hills on Chillingham Volcanics. Relief is 250–300 m, slopes are 40–>50%. Elevation is 300–400 m. Partially cleared open-forest (wet sclerophyll). Soils—moderately deep to deep (100–200 cm), moderately well-drained Brown Podzolic Soils and Brown Earths (Db3.51) on ridges and upper slopes and deep (>200 cm), moderately well-drained Red Podzolic Soils (Dr4.21, Dr2.21, Gn3.14) and Red Clays (Uf6.31, Uf4.41) elsewhere. Limitations—very steep slopes, mass movement hazard, erodible soils.	0.0	Onsite
WATER	Water	Water	N/A	0.0	Onsite

Soil Salinity

Salinity Hazard	Type	Details	Distance (m)	Direction
-	-	-	-	-

Radon

Radon Level (Bq/m ³)	Distance (m)	Direction
6	0.0	Onsite

Typical radon levels in Australia are low and the values shown are the average values for each census district. For specific location, factors such as the local geology and house type could lead to different values. (ARPANSA).

1.4b ACID SULFATE SOIL

Map 1.4b (500m Buffer)

State and Local Acid Sulfate Soil Registers

Name	Classification	Description	Distance (m)	Direction
Soil Acidification Hazard	Moderate to severe limitations	Inland Acid Sulfate Soils	0.0	Onsite
Soil Acidification Hazard	Water	Inland Acid Sulfate Soils	0.0	Onsite

To ensure that development does not disturb, expose or drain acid sulfate soils and cause environmental damage, development consent may be required for the carrying out of works within areas and land shown on the Acid Sulfate Soils Map.

National Acid Sulfate Soil Register

Name	Classification	Description	Distance (m)	Direction
Atlas of Australian Acid Sulfate Soils	High Probability of occurrence	Acid sulfate soil generally within upper 1m in wet / riparian areas.	0.0	Onsite
Atlas of Australian Acid Sulfate Soils	Low Probability of occurrence	Acid sulfate soil generally within upper 1m in wet / riparian areas.	0.0	Onsite
Atlas of Australian Acid Sulfate Soils	Extremely low probability of occurrence	Acid sulfate soil generally within upper 1m in wet / riparian areas.	0.0	Onsite

Source: ASRIS Atlas of Australian Sulfate Soils (CSIRO). Acid Sulfate Soils (ASS) are all those soils in which sulfuric acid may be produced, is being produced, or has been produced in amounts that have a lasting effect on main soil characteristics.

1.5 GEOLOGY AND TOPOGRAPHY

Map 1.5 (500m Buffer)

Geology

Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
NSW Seamless Geology version 2.2 May2022	Tutc	Chillingham Volcanics	Early Triassic (base) to Late Triassic (top)	Ungrouped Triassic units	Quartzite	Rhyolite, lithic rhyolitic tuff, shale, basal cobble conglomerate.	0.0	Onsite
	Q_hw	Anthropogenic stored water, pondage, reservoirs, canals	Quaternary (base) to Now (top)	Anthropogenic deposits	Anthropogenic Material	Thinly laminated muds and silts with humic to biogenic debris (as bottom sediment to the overlying stored waters).	0.0	Onsite
	C__n	Neranleigh-Fernvale beds	Late Devonian (base) to Carboniferous (Mississippian) (top)	<Null>	Sandstone	Feldspathic and lithic meta-arenite, metasiltstone and conglomerate proximal turbidite, with structurally intercalated or stratigraphically underlying chert, jasper and mafic meta-volcanics.	19.2	East

Naturally Occurring Asbestos Potential (NOA)

Category	On the Property?	Within Buffer?
Not identified	-	-

Topography

Topography (onsite)	30 - 140 mAHD
------------------------	---------------



Section 2 Hydrogeology



2.1 HYDROGEOLOGY AND GROUNDWATER BORES

Map 2.1 (2000m Buffer)

	On the Property?	Within Buffer?
Aquifer Type	Porous, extensive highly productive aquifers	Fractured or fissured, extensive aquifers of low to moderate productivity Porous, extensive highly productive aquifers
Drinking Water Catchments	Tweed Local Environmental Plan 2014	Tweed Local Environmental Plan 2014
Protected Riparian Corridor	Doon Doon Creek	Doon Doon Creek Tweed River Byrill Creek
UPSS Environmentally Sensitive Zone	Tweed River	Tweed River
Wetlands	Clarrie Hall Dam Upland Lakes & Lagoons Tweed Brunswick River catchment Wetlands Inventory	Tweed River Clarrie Hall Dam Upland Lakes & Lagoons Tweed Brunswick River catchment Wetlands Inventory

Groundwater Bores

Map ID	Groundwater Bore ID	Authorised Purpose	Completion Date	Drilled Depth (m)	Final Depth (m)	SWL (m)	Salinity (mg/l)	Yield (L/s)	Distance (m)	Direction
4	201011	Unknown	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	436.5	South
2	GW302589	Monitoring	18/06/2001	16.0	16.0	4.9	<Null>	0.6	784.6	North-west
5	201013	Unknown	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	797.2	North-east
6	201015	Unknown	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	1030.5	North-west

Map ID	Groundwater Bore ID	Authorised Purpose	Completion Date	Drilled Depth (m)	Final Depth (m)	SWL (m)	Salinity (mg/l)	Yield (L/s)	Distance (m)	Direction
3	GW303305	Household	8/06/2002	51.0	51.0	<Null>	<Null>	0.22	1108.4	North-west
8	GW302075	Household	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	1481.4	North-east
1	GW300506	Household	3/11/1994	36.0	36.0	20	Good	0.354	1522.4	West
7	20110025	Unknown	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	1895.1	West

Note: The use of the symbol "-" or N/A indicates that no records were found.

Groundwater Bores Driller Lithology Details

Groundwater Bore ID	From Depth - To Depth (m)	Lithology	Distance (m)	Direction
201011	#N/A		436.5	South
GW302589	0m-4m Soil 4m-8.5m Yellow clay 8.5m-16m Grey wacky		784.6	North-west
201013	#N/A		797.2	North-east
201015	#N/A		1030.5	North-west
GW303305	0m-3m Clay 3m-8m Weathered rock and boulders 8m-20m Firm greywacke 20m-21m Soft fractured greywacke 21m-24m Firm fractured greywacke 24m-30m Soft well fractured greywacke 30m-42m Greywacke 42m-51m Hard greywacke		1108.4	North-west
GW302075	#N/A		1481.4	North-east
GW300506	0m-1m Top soil 1m-2m Clay 2m-30m Hand brown shale 30m-33m Soft shale 33m-36m Basalt		1522.4	West
20110025	#N/A		1895.1	West

Note: The use of the symbol "-" or N/A indicates that no records were found.

2.2 HYDROGEOLOGY AND OTHER BOREHOLES

Map 2.2 (500m Buffer)

	On the Property?	Within Buffer?
Groundwater Vulnerability	Not identified	Not identified
Groundwater Exclusion Zones ^{1,2}	Not identified	Not identified
Hydrogeologic Unit	Late Permian/Triassic sediments (porous media - consolidated)	Late Permian/Triassic sediments (porous media - consolidated)

¹ - Botany Groundwater Management Zones (BGMZ): Zone 1 - the use of groundwater remains banned; Zones 2 to 4 - domestic groundwater use is banned, especially for drinking water, watering gardens, washing windows and cars, bathing, or to fill swimming pools.

² - Williamstown Groundwater Management Zones (WGMZ): Primary Management Zone - this area has significantly higher levels of PFAS detected and therefore, the strongest advice applies. Secondary Management Zone - this area has some detected levels of PFAS; Broader Management Zone - the topography and hydrology of the area means PFAS detections could occur now and into the future.

Groundwater Dependent Ecosystems (GDE)

	On the Property?	Within Buffer?
Aquatic (Surface)	Not identified	Not identified
Terrestrial (Subsurface)	High potential GDE - from regional studies Moderate potential GDE - from regional studies Low potential GDE - from regional studies	High potential GDE - from regional studies Moderate potential GDE - from regional studies Low potential GDE - from regional studies

Aquatic - Ecosystems that rely on the Surface expression of groundwater.

Terrestrial - Ecosystems that rely on the Subsurface expression of groundwater.

Other Known Borehole Investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes)

Borehole ID	Purpose	Project	Client/ Licence	Date Drilled	Depth (m)	Distance (m)	Direction
Not identified	-	-	-	-	-	-	-

Note: The use of the symbol "-" or N/A indicates that no records were found.



Section 3 Environmental Registers, Licences and Incidents



3.1 CONTAMINATED LAND PUBLIC REGISTER

Map 3.1 (1000m Buffer)

Contaminated Sites

Register Type	Site Name	Address	Description	Details	Distance (m)	Direction
Not identified	-	-	-	-	-	-

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

Table 3.1.1 Contaminated Land Public Register		
State	Regulatory Body	Information included in this search (by state)
ACT	EPA (Environment Protection Authority)	Contaminated Land Search Register of Contaminated Sites
NSW	EPA (Environment Protection Authority)	Sites Notified as Contaminated Records of Notices
NT	EPA (Environment Protection Authority)	Contaminated Land Audit Pollution Abatement Notice
QLD	DES (Department of Environment and Science)	Environmental Management Register (EMR) Contaminated Land Register (CLR)
SA	EPA (Environment Protection Authority)	Site Contamination Index
TAS	EPA (Environment Protection Authority)	Regulated Sites and Premises Lutana and Parts of Hobarts Eastern Shore
VIC	EPA (Environment Protection Authority)	Priority Sites Register Pollution Abatement Notice

Table 3.1.1 Contaminated Land Public Register		
WA	DWER (Department of Water and Environmental Regulation)	Contaminated Sites Database

This search contains information retrieved from the relevant state authority, agency/department, or government authority that notifies and identifies contaminated land. The list only contains contaminated sites that the regulatory body is aware of or that have been notified by owners or occupiers as contaminated land. The sites are recorded on the register at various stages of the assessment and/or remediation process. If a site is not on the list, it does not necessarily mean the site is not contaminated.

3.2 LICENCES, APPROVALS & ASSESSMENTS

Map 3.2 (1000m Buffer)

Licences

Licence No	Type	Licence holder	Location Name	Premise Address	Activity	Dist. (m)*	Direct
3957	No longer in force	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown - Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW 2440	Logging operations	Not mapped	Not mapped
4017	No longer in force	Forestry Corporation Of New South Wales	Upper North East Region (L.N.E.R) Means State Forests And Crown - Timber Lands (Ex. Plantations)	Within The U.N.E.R. Shown On Map 1 To The NSW U.N.E.R. Forest Agreement Granted On The 5 March 1999., Coffs Harbour, NSW 2450	Logging operations	Not mapped	Not mapped

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

* Not mapped - Licences that are applied to larger areas and/or without specific definition; such as waterways, forests etc will still be identified in the search results but will not be show within the map.

Audits

No	Type	Licence holder	Location Name	Premise Address	Activity	Dist. (m)*	Direction
-	Not identified	-	-	-	-	-	-

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

Clean Up, Penalty Notices and Orders

No	Type	Licence holder	Location Name	Premise Address	Activity/Details	Dist. (m)*	Direction
1512244	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement	Pollute waters - Corporation	Not mapped	Not mapped

N°	Type	Licence holder	Location Name	Premise Address	Activity/Details	Dist. (m)*	Direction
			Lands (Ex. Plantations)	Granted On The 5 March 1999, Kempsey, NSW, 2440			
1512245	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	Pollute waters - Corporation	Not mapped	Not mapped
1512247	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	Pollute waters - Corporation	Not mapped	Not mapped
1566080	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	Contravene condition of licence - Corporation	Not mapped	Not mapped
1566081	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	Pollute waters - other officer - Corporation	Not mapped	Not mapped
<Null>	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	Pollute waters - Corporation	Not mapped	Not mapped
<Null>	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The	Pollute waters - Corporation	Not mapped	Not mapped

Nº	Type	Licence holder	Location Name	Premise Address	Activity/Details	Dist. (m)*	Direction
			Lands (Ex. Plantations)	5 March 1999, Kempsey, NSW, 2440			
1024530	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1024598	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1028085	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1051696	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1087543	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1090202	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999,	s.91 Clean Up Notice	Not mapped	Not mapped

N°	Type	Licence holder	Location Name	Premise Address	Activity/Details	Dist. (m)*	Direction
				Kempsey, NSW, 2440			
1543465	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1014573	Clean Up Notice	Forestry Corporation Of New South Wales	Upper North East Region (Uner) Means The State Forests And Crown -Timber Lands (Ex. Plantations) .	Within The U.N.E.R. Shown On Map 1 To The NSW U.N.E.R. Forest Agreement Granted On The 5 March 1999., Coffs Harbour, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped
1501931	Clean Up Notice	Forestry Corporation Of New South Wales	Upper North East Region (Uner) Means The State Forests And Crown -Timber Lands (Ex. Plantations) .	Within The U.N.E.R. Shown On Map 1 To The NSW U.N.E.R. Forest Agreement Granted On The 5 March 1999., Coffs Harbour, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped
1590696	Clean Up Notice	Forestry Corporation Of New South Wales	Upper North East Region (Uner) Means The State Forests And Crown -Timber Lands (Ex. Plantations) .	Within The U.N.E.R. Shown On Map 1 To The NSW U.N.E.R. Forest Agreement Granted On The 5 March 1999., Coffs Harbour, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped
1593530	Clean Up Notice	Forestry Corporation Of New South Wales	Upper North East Region (Uner) Means The State Forests And Crown -Timber Lands (Ex. Plantations) .	Within The U.N.E.R. Shown On Map 1 To The NSW U.N.E.R. Forest Agreement Granted On The 5 March 1999., Coffs Harbour, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

3.3a SITES REGULATED BY OTHER JURISDICTIONAL BODY

Map 3.3a (2000m Buffer)

Contaminated Legacy Areas

Site Name	Description	Distance (m)	Direction
Not identified	-	-	-

Includes known contaminated areas such as James Hardies Asbestos waste legacy areas, Pasmenco Smelter and Uranium processing site.

Defence, Military Sites and UXO Areas

Site name	Type*	Details	Distance (m)	Direction
Not identified	-	-	-	-

*RCIP (Regional Contamination Investigation Program). UXO (Unexploded Ordnance Areas)

Former Gasworks Sites

Site name	Description	Distance (m)	Direction
Not identified	-	-	-

PFAS Sites

Site name	Description	Source	Distance (m) *	Direction
Not identified	-	-	-	-

3.3b OTHER POTENTIAL POLLUTION SOURCES

Map 3.3b (500m Buffer)

Derelict Mines and Quarries

Site name	Description	Distance (m)	Direction
Clarrie Hall Dam Quarry	This quarry was used for the initial construction of Clarrie Hall Dam in 1983. (Source: Clarrie Hall Dam Raising State Significant Infrastructure Application - Preliminary Environmental Assessment, July 2018 - Tweed Shire Council)	0.0	Onsite

Historical Landfills

Site name	Description	Distance (m)	Direction
Not identified	-	-	-

National Pollutant Inventory (NPI)

Facility name	Address	Primary ANZSIC Class	Latest report	Distance (m)	Direction
Not identified	-	-	-	-	-



Section 4 Potentially Contaminated Areas



4.1 POTENTIALLY CONTAMINATING ACTIVITIES (PCA)

Map 4.1 (200m Buffer)

Industries, businesses and activities that may cause contamination

Map ID	Site name	Category	Location	Status*	Distance (m)	Direction
Not identified	-	-	-	-	-	-

***Status:**

Data is current as when this report was created.

The operational status of the business is determined using the available data sources and does not indicate real-time conditions at the site.

Current: business is operating on the day this report was issued.

Former: business that have been closed or discontinued within 2 years from the date of this report.

Categories included in this search. (Notifiable activities)

Abattoirs	Explosives and Dangerous Goods	Paint Industries
Abrasive Blasting	Extractive Industries	Petrol Stations
Agriculture / Horticulture	Fire and Rescue	Pharmaceuticals
Airports	Food Manufacturing	Port and Marina Operations
Asbestos	Foundry, Smelting or Refining	Power Plants
Asphalt or Bitumen	Fuel Terminals & Depots	Printing and Photography
Batteries	Glass, Ceramics and Plastic	Rail Industry and Associated Activities
Breweries / Distilleries	Gun, Pistol or Rifle Ranges	Rubber and Tyre
Cement, Concrete or Lime	Hospitals and Research Facilities	Storage Tanks
Cemeteries	Landfill Sites	Substations and Switching Stations
Chemicals	Livestock Dips	Textiles and Tannery
Coal Yards	Mechanical and Automotive	Timber, Pulp and Paper Works
Depots and Storage Yards	Metal Fabrication and Treatments	Waste and Recycling Facilities
Dry Cleaners	Oil and Gas	Wastewater Treatment Facilities
Electrical or Electrical Components	Other Infrastructure Facilities	-

Industries, businesses, and activities identified as having an increased likelihood of causing contamination.

The industries and business activities listed above have been identified as having an increased likelihood of causing contamination and have been identified through published state and national guidelines and regulations. These industries are noted due to their potential to store or use substances that could cause contamination to the surrounding environment if not managed appropriately. The identification of these activities does not imply the presence of contamination at the site.

The records identified are based on the reported business activity and have not been assessed based on any current or previous site inspection. Please note that records not identified within this section (due to error or unforeseen omission) does not necessarily mean that the screened area is not potentially contaminated or free of any risks.

4.2 HISTORICAL BUSINESS DIRECTORIES

(not mapped)

Year	Activity	Name	Address	Positional accuracy ¹	Distance (m)	Direction
1985	Nurserymen Wholesale	Budding Plants	Doon Doon Rd Uki Doon Doon QLD AUSTRALIA	Suburb		-

Land Insight uses a number of address geocoding techniques and has characterised them based on completeness (match rates) and positional accuracy. When a historical street address is incomplete or a match is not found, a record identified as being in the surrounding area will be included for reference and the accuracy of the data is approximate only. An explanation of the positional accuracy records is defined in the table below.

Historical data positional accuracy and georeferencing results explanation		
Positional accuracy	Georeferenced	Description
Address	Located to the address level	<i>When street address and names fully match.</i>
Street	Located to the street centroid	<i>When street names match but no exact address was found. Location is approximate.</i>
Place	Located to the structure, building or complex	<i>When building, residential complex or structure name match but no exact address was found. Location is approximate.</i>
Suburb	Located to the suburb area	<i>When suburb name match but no exact address was found. Location is approximate.</i>

The data used in this section was extracted from range of historical commercial trade directories and business listings. The business addresses were geocoded using historical information and the accuracy of the data may vary due to changes to the physical address at a given locality over time or the quality of the original records. From 2005, the historical business records in this section are considered more accurate as information was extracted from digital directories with geographic coordinate location information available. On this basis, reliance on the historic listing data should be considered when assessing the risk of contamination from an activity at the site. The presence of a business listing does not definitively confirm the actual activity that has occurred at the site. For more information on how these records were geocoded and the methodology used by Land Insight, contact us at info@landinsight.co.

Historical business directory listings have been filtered to match activities and industries identified as PCAs in Section 4.2. Please note that any record not identified within this section (due to error or unforeseen omission) does not necessarily mean that the screened area is not potentially contaminated or free of any risks.



Section 5 Natural Hazards



5.1 Fire Hazard

Map 5.1 (500m Buffer)

Bushfire Prone Areas

Category	Type	Details	Distance (m)	Direction
Bushfire Prone Land	Vegetation Buffer	Potential Impact Area	0.0	Onsite
	Vegetation Category 1	High Risk Area	0.0	Onsite

Bushfire History

Type	Season	Details	Distance (m)	Direction
Wildfire	Gumboot	2007-08	0.0	Onsite
		1986-87	0.0	Onsite
		1992-93	377.1	East

5.2 Flood and Erosion Hazards

Map 5.2 (500m Buffer)

Erosion Hazard

Category	Type	Details	Distance (m)	Direction
Landslip Erosion Risk	Extreme limitations	Very High	0.0	Onsite
Water Erosion Risk	Extreme limitations	Very High	0.0	Onsite
Wind Erosion Risk	Slight but significant limitations	Low	0.0	Onsite

Flood Hazard

Category	Type	Details	Distance (m)	Direction
Flood extent	Inundation	Clarrie Hall Dam Raising State Significant Infrastructure Application - Preliminary Environmental Assessment, July 2018 - Tweed Shire Council	0.0	Onsite

Generalised flood information definitions and explanations

Annual Exceedance Probability (AEP) - The probability of a flood event of a given size occurring in any one year, usually expressed as a percentage annual chance

0.2%AEP	A flood event of this size is considered rare but may still occur. A flood of size or larger has a 1 in 500 chance or a 0.2% probability of occurring in any year
1% AEP	A flood of this size or larger has a 1 in 100 chance or a 1% probability of occurring in any year
2% AEP	A flood of this size or larger has a 1 in 50 chance or a 2% probability of occurring in any year.
5% AEP	A flood of this size or larger has a 1 in 20 chance or a 5% probability of occurring in any year
20%AEP	A flood of this size or larger has a 1 in 5 chance or a 20% probability of occurring in any year.

Average Recurrence Interval (ARI). The long-term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods reaching a height as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years

Flood Liable Land - Synonymous with flood prone land, i.e. land susceptible to flooding by the Probable Maximum Flood (PMF) event. Note that the term flood liable land covers the whole floodplain, not just the part below the flood planning level

Flood Planning Area (FPA) - Councils develop Flood Planning Areas (FPAs) as part of Flood Overlay mapping to guide future building and development in flood prone areas. The FPAs are designed to recognise the flood hazard for different flooding types.

Flood Hazard - Flood hazard is a combination of frequency of flooding, the flood depth, and the speed or velocity at which the water can travel.

Probable Maximum Flood (PMF) - The largest flood that could conceivably be expected to occur at a particular location, usually estimated from probable maximum precipitation. The PMF defines the maximum extent of flood prone land, that is, the floodplain. It is difficult to define a meaningful Annual Exceedance Probability for the PMF, but it is commonly assumed to be of the order of 10^4 to 10^7 (once in 10,000 to 10,000,000 years)



The Commons
388 George Street
Sydney NSW 2000 Australia
info@landinsight.co
www.landinsight.co

Enviro-Screen Report

Clarrie Hall Dam
Terragon, NSW

23 March 2023

Report n°:
LI-3251 ESR

Understanding your report

Thank you for ordering your report from Land Insight. If you have any feedback, questions or queries, please get in touch with us at orders@landinsight.co.au.

Your Report has been produced by Land Insight and contains information related to current and historical land use information, environmental risks and hazards.

The information presented in this report includes Land Insights' comprehensive research into current and historical land use derived from Land Insight's proprietary National Land Use Atlas (NLUA), environmental risk information and data available from public databases, third party providers, local and state authorities. The report also includes detailed property and soil setting information, hydrogeology, identification of potential pollution and contamination along with ground and natural hazards. The records identified are presented within a 200 to 2000m radius (buffer zone) from the boundaries of the Property searched, depending on the screened constraint. The report is separated and grouped into easy to navigate sections as per Summary below:

	Section 1 PROPERTY SETTING	Sensitive Receptors, Planning Controls, Zoning, Heritage, Soil and Land Information, Geology and Topography
	Section 2 HYDROGEOLOGY	Groundwater Bores and Other Borehole investigations, Groundwater Dependent Ecosystems (GDE), Aquifer and Wetland, Other Hydrogeology information.
	Section 3 ENVIRONMENTAL REGISTERS, LICENCES AND INCIDENTS	Contaminated Land Public Register, Licences, Audits and Orders, Sites Regulated by Other Jurisdictional Body (Former Gaswork sites / PFAS sites, UXO Areas), Historical Landfills, Derelict Mines and National Pollutant Inventory (NPI).
	Section 4 POTENTIALLY CONTAMINATED AREAS	Potentially Contaminating activities (Industries, businesses and activities that may cause contamination), Historical Potentially Contaminating activities and Historical Land Use.
	Section 5 NATURAL HAZARDS	Erosion hazard, Flood hazards, Bushfire prone land and Bushfire history.

This report includes data listed on page 4 (table of contents). All sources of data and definitions are provided in the Product Guide (Attached). For a full list of references, metadata, publications or additional information not provided in this report, please contact orders@landinsight.co.au.

This report does not include information derived from a physical inspection. It is important to note that a site inspection can present information relevant to other risks and hazards that may not be identified by this Report.

Due to the ongoing nature of database development and frequency of updates provided by various state government regulators and data sources, the data displayed within this report is only current from date of production. While every effort is made to ensure the details in your Report are correct, Land Insight cannot guarantee the accuracy or completeness of the information and/or data provided.

This Report, and your use of it, is regulated by Land Insight's Terms and Conditions. For more information, see Land Insight's Product Guide.

Data maintenance schedule

Dataset name	Update frequency	Dataset buffer
Section 1 - Property Setting		
Sensitive Receptors	Quarterly	200m
Planning Controls (<i>Zoning, Planning Instruments, Other planning information</i>)	Quarterly	500m
State and Local Heritage	Quarterly	200m
Commonwealth, National and World Heritage Areas	Annually	200m
Soil Landscape and Land Use Information	Annually	500m
Salinity Hazard	Annually	500m
Radon Level	Annually	500m
State, Local and National Acid Sulfate Soil (ASS)	Annually	500m
Geology	Annually	500m
Naturally Occurring Asbestos Potential	Annually	500m
Topography	As required	500m
Section 2 - Hydrogeology		
Groundwater Aquifers	Annually	2000m
Wetlands	Annually	2000m
Groundwater Bores	Annually	2000m
Drinking Water Catchments	Annually	500m
Groundwater Prohibition/Restricted Use/Exclusion Zones	Annually	500m
Hydrogeologic Units	Annually	500m
Groundwater Dependent Ecosystems	Annually	500m
Other Borehole Locations (<i>Coal Seam Gas, Petroleum Wells, other boreholes</i>)	Annually	500m
Section 3 - Environmental Registers, Licences and Incidents		
Contaminated Land Public Register	Monthly	1000m
Licences, Approvals, Audits, Authorisations & Assessments		
Licences	Monthly	1000m
Surrendered Licences	Monthly	1000m
Clean Up Notices, Penalty Notices and Orders	Monthly	1000m
Permissions	Monthly	1000m
Audits	Monthly	1000m
Authorisations	Monthly	1000m
Sites Regulated by other Jurisdictional Body		
Contaminated Legacy Areas (<i>James Hardies Asbestos, Pasmenco Smelter and Uranium sites</i>)	Quarterly	2000m
Defence 3 Year Regional Contamination Investigation Program (RCIP)	Quarterly	2000m
Defence Sites - Current and Former	Ongoing	2000m
Unexploded Ordnance (UXO) Sites - Department of Defence (DoD)	Annually	2000m
Former Gasworks Sites	Ongoing	2000m
PFAS Investigation Sites (<i>EPA PFAS Investigation Program/s, AirServices Australia etc.</i>)	Monthly	2000m
NPI Industrial Facilities	Annually	2000m
Section 4 - Potentially Contaminated Areas		
Potentially Contaminating Activities (PCA) (<i>Petrol Stations, Dry cleaners, Waste sites etc</i>)	Ongoing	500m
Historical Business Directory (<i>Commercial and Trade Directory Data from 1990-2020</i>)	Not required	200m
Section 5 - Natural Hazards		
Bushfire Prone Areas	Bi-annual	500m
Bushfire History	Bi-annual	500m
Erosion Hazard	Bi-annual	500m
Flood Hazard	Ongoing	500m

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Land Insight Product Guide and Terms and Conditions



Section 1 Property Setting

1.1 SENSITIVE RECEPTORS

Map 1.1 (200m Buffer)

Sensitive receptor	Type	Distance (m)	Direction
Crams Farm Reserve	Parks	69.6	South-east

1.2a PLANNING CONTROLS

Map 1.2a (500m Buffer)

Zoning

Zoning	Type	Details	Distance (m)	Direction
C1	National Parks and Nature Reserves	Tweed Local Environmental Plan 2014	0.0	Onsite
RU2	Rural Landscape		0.0	Onsite
SP2	Infrastructure		0.0	Onsite
DM	Deferred Matter		16.6	North-west

1.2b PLANNING OVERLAYS

Map 1.2b (500m Buffer)

Environmental Planning Instruments

Name	Type	Details	Distance (m)	Direction
Local Provisions	Existing and Future Water Storage Facilities Map	Tweed Local Environmental Plan 2014	0.0	Onsite
Drinking Water Catchment	Drinking Water Catchment Map		0.0	Onsite
Lot Size	Lot Size Map		0.0	Onsite
Strategic Agricultural Land	SEPP (Mining, Petroleum Production and Extractive	State Environmental Planning Policy (Resources and Energy) 2021	0.0	Onsite

Name	Type	Details	Distance (m)	Direction
	Industries) 2007 Strategic Agricultural Land Map			
Height of Building	Height of Buildings Map	Tweed Local Environmental Plan 2014	0.0	Onsite

Other Planning Information

Name	Category	Details	Distance (m)	Direction
-	-	-	-	-

1.3 HERITAGE

Map 1.3 (200m Buffer)

State and Local Heritage Registers

Site ID	Site Name	Type	Details	Distance (m)	Direction
1487	High Conservation Value Old Growth Forest	State Heritage Register	Landscape	0.0	Adjacent
1101	High Conservation Value Old Growth Forest	Heritage Register	Item - General. Significance is State.	0.0	Adjacent

Australian Heritage Database Register

Site ID	Site Name	Type	Details	Distance (m)	Direction
Not identified	-	-	-	-	-

Commonwealth Heritage List, National Heritage List and World Heritage Area.

1.4a SOIL AND LAND USE INFORMATION

Map 1.4a (500m Buffer)

Soil Landscape

Code	Name	Soil Group	Description	Distance (m)	Direction
ERfh	Frogs Hollow	Erosional	Landscape—steep hills on Chillingham Volcanics. Relief is 250–300 m, slopes are 40–>50%. Elevation is 300–400 m. Partially cleared open-forest (wet sclerophyll). Soils—moderately deep to deep (100–200 cm), moderately well-drained Brown Podzolic Soils and Brown Earths (Db3.51) on ridges and upper slopes and deep (>200 cm), moderately well-drained Red Podzolic Soils (Dr4.21, Dr2.21, Gn3.14) and Red Clays (Uf6.31, Uf4.41) elsewhere. Limitations—very steep slopes, mass movement hazard, erodible soils.	0.0	Onsite
ERkub	Kunghur Variant B	Erosional	Landscape—undulating and rolling hills on Bundamba Group sediments. Relief is 100–150 m and slopes are 5–30%. Elevation is 100–300 m. Ridges are narrow (50–100 m) and have common rock outcrop. Partially (in places extensively) cleared tall openforest (wet sclerophyll, some dry sclerophyll). Landscape Variant—kua—steep hills, slopes 15–40% with localised steeper areas. Landscape Variant—kub—undulating rises, slopes 5–10%, relief 20–30 m. Soils—shallow to deep (50–>150 cm), well-drained Yellow Podzolic Soils (Dy5.61, Dy3.81) on ridges and upper slopes. Deep (>100 cm), moderately well-drained Yellow Podzolic Soils (Dy5.21), Red Podzolic Soils (Dr5.21, Gn3.14, Gn2.14) and Red Earths (Uf6.71) on slopes. Moderately deep (100–150 cm), poorly drained	0.0	Onsite

Code	Name	Soil Group	Description	Distance (m)	Direction
			Gleyed Podzolic Soils (Dg4.11, Dg4.21) and Yellow Podzolic Soils (Dy5.11, Dy5.21) on lower slopes and poorly drained areas. Limitations—steep slopes, localised rock outcrop and mass movement hazard. Hardsetting, erodible, moderately dispersive and highly acid soils that are occasionally shallow and non-cohesive with localised waterlogging.		
ERkua	Kunghur Variant A	Erosional	Landscape—undulating and rolling hills on Bundamba Group sediments. Relief is 100–150 m and slopes are 5–30%. Elevation is 100–300 m. Ridges are narrow (50–100 m) and have common rock outcrop. Partially (in places extensively) cleared tall openforest (wet sclerophyll, some dry sclerophyll). Landscape Variant—kua—steep hills, slopes 15–40% with localised steeper areas. Landscape Variant—kub—undulating rises, slopes 5–10%, relief 20–30 m. Soils—shallow to deep (50–>150 cm), well-drained Yellow Podzolic Soils (Dy5.61, Dy3.81) on ridges and upper slopes. Deep (>100 cm), moderately welldrained Yellow Podzolic Soils (Dy5.21), Red Podzolic Soils (Dr5.21, Gn3.14, Gn2.14) and Red Earths (Uf6.71) on slopes. Moderately deep (100–150 cm), poorly drained Gleyed Podzolic Soils (Dg4.11, Dg4.21) and Yellow Podzolic Soils (Dy5.11, Dy5.21) on lower slopes and poorly drained areas. Limitations—steep slopes, localised rock outcrop and mass movement hazard. Hardsetting, erodible, moderately dispersive and highly acid soils that are occasionally shallow and non-cohesive with localised waterlogging.	0.0	Onsite
ALte	Terania	Alluvial	Landscape—level to gently undulating alluvial plains of mid to upper reaches of main Richmond River tributaries draining basalt, rhyolitic and sandstone areas. Relief <5 m, slopes 0–3%. Ox-bows and inset terracing are common features. Extensively cleared closed- and open-forest. Soils—deep (>300 cm), well-drained soils of no suitable Group and dark Alluvial Clays (Uf6, Uf1, Gn2). Near sandstone areas deep (>300 cm), welldrained soils of no suitable Group and brown Alluvial Clays (Db3, Db4). Deep (>200 cm), poorly-drained Weisenboden and Black Earths (Ug5.15, Ug5.17, Uf6) on more recent floodplains. Deep, rapidly drained Earthy Sands (Uc5.21) line channels. Limitations—highly erodible, seasonally waterlogged, stony soils of low fertility and low available water-holding capacity. High flood hazard and severe bank erosion.	0.0	Onsite
ERku	Kunghur	Erosional	Landscape—moderately inclined hills on Bundamba Group sediments. Relief is 100–150 m and slopes are 15–40%. Elevation is 100–300 m. Ridges are narrow (50–100 m) and have common rock outcrop. Partially (in places extensively) cleared open (wet sclerophyll) forest. Soils—shallow to deep (50–>150 cm), well-drained Yellow Podzolic Soils (Dy5.61, Dy3.81) on ridges and upper slopes. Deep (>100 cm), moderately welldrained Yellow Podzolic Soils (Dy5.21), Red Podzolic Soils (Dr5.21, Gn3.14, Gn2.14) and Red Earths (Uf6.71) on slopes. Moderately deep (100–150 cm), poorly drained Gleyed Podzolic Soils (Dg4.11, Dg4.21) and Yellow Podzolic Soils (Dy5.11, Dy5.21) on lower slopes and poorly drained areas. Limitations—hardsetting, erodible, highly acid soils that are occasionally shallow and non-cohesive with localised waterlogging. Steep slopes, rock outcrop and mass movement hazard.	0.0	Onsite
WATER	Water	Water	N/A	0.0	Onsite

Salinity

Salinity Hazard	Type	Details	Distance (m)	Direction
-	-	-	-	-

Radon

Radon Level (Bq/m ³)	Distance (m)	Direction
6	0.0	Onsite

Typical radon levels in Australia are low and the values shown are the average values for each census district. For specific location, factors such as the local geology and house type could lead to different values. (ARPANSA).

1.4b ACID SULFATE SOIL

Map 1.4b (500m Buffer)

State and Local Acid Sulfate Soil Registers

Name	Classification	Description	Distance (m)	Direction
Soil Acidification Hazard	Moderate limitations	Inland Acid Sulfate Soils	0.0	Onsite
Soil Acidification Hazard	Moderate to severe limitations	Inland Acid Sulfate Soils	0.0	Onsite
Soil Acidification Hazard	Water	Inland Acid Sulfate Soils	0.0	Onsite

To ensure that development does not disturb, expose or drain acid sulfate soils and cause environmental damage, development consent may be required for the carrying out of works within areas and land shown on the Acid Sulfate Soils Map.

National Acid Sulfate Soil Register

Name	Classification	Description	Distance (m)	Direction
Atlas of Australian Acid Sulfate Soils	High Probability of occurrence	Acid sulfate soil generally within upper 1m in wet / riparian areas.	0.0	Onsite
Atlas of Australian Acid Sulfate Soils	Low Probability of occurrence	Acid sulfate soil generally within upper 1m in wet / riparian areas.	0.0	Onsite
Atlas of Australian Acid Sulfate Soils	Extremely low probability of occurrence	Acid sulfate soil generally within upper 1m in wet / riparian areas.	0.0	Onsite

Source: ASRIS Atlas of Australian Sulfate Soils (CSIRO). Acid Sulfate Soils (ASS) are all those soils in which sulfuric acid may be produced, is being produced, or has been produced in amounts that have a lasting effect on main soil characteristics.

1.5 GEOLOGY AND TOPOGRAPHY

Map 1.5 (500m Buffer)

Geology

Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
NSW Seamless Geology version 2.2 May2022	Tbwi	Ripley Road Sandstone	Late Triassic (base) to Early Jurassic (top)	Bundamba Group	Sandstone	Thick-bedded, fine-to medium- to very coarse-grained quartz-rich sandstone and quartz-rich granule conglomerate. A grey clay matrix is characteristic of fresh rock.	0.0	Onsite
	Tutc	Chillingham Volcanics	Early Triassic (base) to Late Triassic (top)	Ungrouped Triassic units	Quartzite	Rhyolite, lithic rhyolitic tuff, shale,	0.0	Onsite

Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
						basal cobble conglomerate.		
	Tbmw	Gatton Sandstone	Early Jurassic (base) to Early Jurassic (top)	Bundamba Group	Sandstone	Thin- to thick-bedded, coarse- to medium-grained, feldspathic to lithic feldspathic sandstone with clay matrix; subordinate intervals of granule, pebble and minor cobble polymictic conglomerate, with abundant ferruginised fossil wood logs and fragments.	0.0	Onsite
	Tbmkm	Ma Ma Creek Member	Early Jurassic (base) to Early Jurassic (top)	Bundamba Group	Sandstone	Flaggy lithic sandstone, shale and siltstone with minor fossil wood conglomerate bands and rare thin coal interbeds.	0.0	Onsite
	Tbmkh	Heifer Creek Sandstone Member	Early Jurassic (base) to Early Jurassic (top)	Bundamba Group	Sandstone	Quartz rich to quartz-lithic medium- to very coarse-grained sandstone in thick fining upward sequences from granule conglomerate to siltstone.	0.0	Onsite
	QH_af	Alluvial floodplain deposits	Holocene (base) to Now (top)	Alluvium	Clastic sediment	Silt, very fine- to medium-grained lithic to quartz-rich sand, clay.	0.0	Onsite
	Q_hw	Anthropogenic stored water, pondage, reservoirs, canals	Quaternary (base) to Now (top)	Anthropogenic deposits	Anthropogenic material	Thinly laminated muds and silts with humic to biogenic debris (as bottom sediment to the overlying stored waters).	0.0	Onsite
	C__n	Neranleigh-Fernvale beds	Late Devonian (base) to Carboniferous (Mississippian) (top)	<Null>	Sandstone	Feldspathic and lithic meta-arenite, metasiltstone and conglomerate proximal turbidite, with structurally intercalated or stratigraphically underlying chert, jasper and mafic meta-volcanics.	341.9	North-east

Naturally Occurring Asbestos Potential (NOA)

Category	On the Property?	Within Buffer?
Not identified	-	-

Topography

Topography (Onsite)	40 – 90 mAHD
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Section 2 Hydrogeology



2.1 HYDROGEOLOGY AND GROUNDWATER BORES

Map 2.1 (2000m Buffer)

	On the Property?	Within Buffer?
Aquifer Type	Fractured or fissured, extensive aquifers of low to moderate productivity Porous, extensive highly productive aquifers	Fractured or fissured, extensive aquifers of low to moderate productivity Porous, extensive highly productive aquifers
Drinking Water Catchments	Tweed Local Environmental Plan 2014	Tweed Local Environmental Plan 2014
Protected Riparian Corridor	Doon Doon Creek Commissioners Creek	Doon Doon Creek Commissioners Creek Tweed River Pine Log Creek Griers Creek Doughboy Creek Byrrell Creek
UPSS Environmentally Sensitive Zone	Tweed River	Tweed River
Wetlands	Clarrie Hall Dam Doon Doon Creek Tweed River Tweed Brunswick River catchment Wetlands Inventory Upland Lakes & Lagoons	Clarrie Hall Dam Doon Doon Creek Tweed River Tweed Brunswick River catchment Wetlands Inventory Upland Lakes & Lagoons

Groundwater Bores

Map ID	Groundwater Bore ID	Authorised Purpose	Completion Date	Drilled Depth (m)	Final Depth (m)	SWL (m)	Salinity (mg/l)	Yield (L/s)	Distance (m)	Direction
10	201011	Unknown	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	0.0	Onsite
14	20110030	Unknown	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	0.0	Onsite
12	201014	Unknown	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	76.3	West
18	GW065390	Irrigated agriculture	27/11/1988	<Null>	30.0	<Null>	Good	1.7	152.3	South
17	GW065508	Irrigated agriculture	30/06/1988	<Null>	8.0	3	Good	0.5	249.3	South-west
6	GW303144	Household	15/02/2002	55.0	55.0	<Null>	<Null>	<Null>	883.1	West
4	GW302589	Monitoring	18/06/2001	16.0	16.0	4.9	<Null>	0.6	896.9	North-west
11	201013	Unknown	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	1121.9	North-east
1	GW073044	Household	17/08/1994	15.0	15.0	3	Good	0.2	1140.7	East
8	GW303097	Household	23/01/2002	26.0	26.0	<Null>	<Null>	<Null>	1150.5	West
13	201015	Unknown	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	1188.1	North-west
7	GW303305	Household	8/06/2002	51.0	51.0	<Null>	<Null>	0.22	1296.6	West
2	GW300506	Household	3/11/1994	36.0	36.0	20	Good	0.354	1542.0	North
3	GW301128	Irrigated agriculture	23/02/1998	51.0	51.0	<Null>	Good	1.7	1684.0	South-west
5	GW301129	Household	4/03/1998	59.0	59.0	21	Good	3.79	1695.8	West
16	GW302075	Household	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	1804.8	North-east
15	20110025	Unknown	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	1867.5	North
9	GW305947	Monitoring	13/05/2004	42.0	42.0	5.7	<Null>	5	1907.7	West

Note: The use of the symbol "<Null>" or N/A indicates that no records were found.

Groundwater Bores Driller Lithology Details

Groundwater Bore ID	From Depth - To Depth (m)	Lithology	Distance (m)	Direction
201011	#N/A		0.0	Onsite
20110030	#N/A		0.0	Onsite
201014	#N/A		76.3	West
GW065390	#N/A		152.3	South
GW065508	#N/A		249.3	South-west
GW303144	0m-5m Brown sandstone 5m-55m Grey sandstone		883.1	West
GW302589	0m-4m Soil 4m-8.5m Yellow clay 8.5m-16m Grey wacky		896.9	North-west
201013	#N/A		1121.9	North-east
GW073044	0m-3m Topsoil 3m-8m Gravel 8m-12m Shale 12m-15m Sandstone		1140.7	East
GW303097	0m-3m Brown sandstone 3m-26m Grey sandstone		1150.5	West

Groundwater Bore ID	From Depth - To Depth (m)	Lithology	Distance (m)	Direction
201015	#N/A		1188.1	North-west
GW303305	0m-3m Clay 3m-8m Weathered rock and boulders 8m-20m Firm greywacke 20m-21m Soft fractured greywacke 21m-24m Firm fractured greywacke 24m-30m Soft well fractured greywacke 30m-42m Greywacke 42m-51m Hard greywacke		1296.6	West
GW300506	0m-1m Top soil 1m-2m Clay 2m-30m Hand brown shale 30m-33m Soft shale 33m-36m Basalt		1542.0	North
GW301128	0m-3m Top soil and clay 3m-10m Brown shale 10m-47m Soft blue grey sandstone 47m-49m Water bearing seam of sandstone and quartz 49m-51m Hard light grey sandstone		1684.0	South-west
GW301129	0m-0.5m Top soil 0.5m-3m Brown clay 3m-13m Red clay 13m-29m Basalt 29m-36m Soft basalt 36m-50m Basalt 50m-51m Broken basalt 51m-56m Basalt 56m-57m Broken basalt 57m-59m Basalt		1695.8	West
GW302075	#N/A		1804.8	North-east
20110025	#N/A		1867.5	North
GW305947	0m-0.5m Soil, black 0.5m-3m Clay, red moist 3m-12.5m Clay, orange grey 12.5m-18m Gravel, weathered rock 18m-30m Sandstone, porous rock, green, grey hard & soft 30m-36m Sandstone, coarse 36m-42m Sandstone with some clay layers, grey		1907.7	West

Note: The use of the symbol "-" or N/A indicates that no records were found.

2.2 HYDROGEOLOGY AND OTHER BOREHOLES

Map 2.2 (500m Buffer)

	On the Property?	Within Buffer?
Groundwater Vulnerability	Not identified	Not identified
Groundwater Exclusion Zones ^{1,2}	Not identified	Not identified
Hydrogeologic Unit	Late Permian/Triassic sediments (porous media - consolidated)	Late Permian/Triassic sediments (porous media - consolidated)

¹ - Botany Groundwater Management Zones (BGMZ): Zone 1 – the use of groundwater remains banned; Zones 2 to 4 – domestic groundwater use is banned, especially for drinking water, watering gardens, washing windows and cars, bathing, or to fill swimming pools.

² - Williamstown Groundwater Management Zones (WGMZ): Primary Management Zone – this area has significantly higher levels of PFAS detected and therefore, the strongest advice applies. Secondary Management Zone – this area has some detected levels of PFAS; Broader Management Zone – the topography and hydrology of the area means PFAS detections could occur now and into the future.

Groundwater Dependent Ecosystems (GDE)

	On the Property?	Within Buffer?
Aquatic	Not identified	Not identified
Terrestrial	High potential GDE - from regional studies Moderate potential GDE - from regional studies Low potential GDE - from regional studies	High potential GDE - from regional studies Moderate potential GDE - from regional studies Low potential GDE - from regional studies

Aquatic - Ecosystems that rely on the Surface expression of groundwater.

Terrestrial - Ecosystems that rely on the Subsurface expression of groundwater.

Other Known Borehole Investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes)

Borehole ID	Purpose	Project	Client/ Licence	Date Drilled	Depth (m)	Distance (m)	Direction
Not identified	-	-	-	-	-	-	-

Note: The use of the symbol "-" or N/A indicates that no records were found.



Section 3 Environmental Registers, Licences and Incidents



3.1 CONTAMINATED LAND PUBLIC REGISTER

Map 3.1 (1000m Buffer)

Contaminated Sites

Register Type	Site Name	Address	Description	Details	Distance (m)	Direction
-	-	-	-	-	-	-

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

Table 3.1.1 Contaminated Land Public Register		
State	Regulatory Body	Information included in this search (by state)
ACT	EPA (Environment Protection Authority)	Contaminated Land Search Register of Contaminated Sites
NSW	EPA (Environment Protection Authority)	Sites Notified as Contaminated Records of Notices
NT	EPA (Environment Protection Authority)	Contaminated Land Audit Pollution Abatement Notice
QLD	DES (Department of Environment and Science)	Environmental Management Register (EMR) Contaminated Land Register (CLR)
SA	EPA (Environment Protection Authority)	Site Contamination Index
TAS	EPA (Environment Protection Authority)	Regulated Sites and Premises Lutana and Parts of Hobarts Eastern Shore
VIC	EPA (Environment Protection Authority)	Priority Sites Register Pollution Abatement Notice

Table 3.1.1 Contaminated Land Public Register		
WA	DWER (Department of Water and Environmental Regulation)	Contaminated Sites Database

This search contains information retrieved from the relevant state authority, agency/department, or government authority that notifies and identifies contaminated land. The list only contains contaminated sites that the regulatory body is aware of or that have been notified by owners or occupiers as contaminated land. The sites are recorded on the register at various stages of the assessment and/or remediation process. If a site is not on the list, it does not necessarily mean the site is not contaminated.

3.2 LICENCES, APPROVALS & ASSESSMENTS

Map 3.2 (500m Buffer)

Licences

Licence No	Type	Licence holder	Location Name	Premise Address	Activity	Dist. (m)*	Direct
3957	No longer in force	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown - Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW 2440	Logging operations	Not mapped	Not mapped
4017	No longer in force	Forestry Corporation Of New South Wales	Upper North East Region (L.N.E.R) Means State Forests And Crown - Timber Lands (Ex. Plantations)	Within The U.N.E.R. Shown On Map 1 To The NSW U.N.E.R. Forest Agreement Granted On The 5 March 1999., Coffs Harbour, NSW 2450	Logging operations	Not mapped	Not mapped

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

* Not mapped – Licences that are applied to larger areas and/or without specific definition; such as waterways, forests etc will still be identified in the search results but will not be show within the map.

Audits

No	Type	Licence holder	Location Name	Premise Address	Activity	Dist. (m)*	Direction
-	Not identified	-	-	-	-	-	-

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

Clean Up, Penalty Notices and Orders

No	Type	Licence holder	Location Name	Premise Address	Activity/ Details	Dist. (m)*	Direction
1512244	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement	Pollute waters - Corporation	Not mapped	Not mapped

N°	Type	Licence holder	Location Name	Premise Address	Activity/Details	Dist. (m)*	Direction
			Lands (Ex. Plantations)	Granted On The 5 March 1999, Kempsey, NSW, 2440			
1512245	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	Pollute waters - Corporation	Not mapped	Not mapped
1512247	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	Pollute waters - Corporation	Not mapped	Not mapped
1566080	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	Contravene condition of licence - Corporation	Not mapped	Not mapped
1566081	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	Pollute waters - other officer - Corporation	Not mapped	Not mapped
<Null>	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	Pollute waters - Corporation	Not mapped	Not mapped
<Null>	Penalty Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The	Pollute waters - Corporation	Not mapped	Not mapped

Nº	Type	Licence holder	Location Name	Premise Address	Activity/Details	Dist. (m)*	Direction
			Lands (Ex. Plantations)	5 March 1999, Kempsey, NSW, 2440			
1024530	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1024598	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1028085	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1051696	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1087543	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1090202	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999,	s.91 Clean Up Notice	Not mapped	Not mapped

N°	Type	Licence holder	Location Name	Premise Address	Activity/Details	Dist. (m)*	Direction
				Kempsey, NSW, 2440			
1543465	Clean Up Notice	Forestry Corporation Of New South Wales	Lower North East Region (L.N.E.R) Means State Forests And Crown -Timber Lands (Ex. Plantations)	Within The L.N.E.R. Shown On Map 1 To The NSW L.N.E.R. Forest Agreement Granted On The 5 March 1999, Kempsey, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1014573	Clean Up Notice	Forestry Corporation Of New South Wales	Upper North East Region (Uner) Means The State Forests And Crown -Timber Lands (Ex. Plantations) .	Within The U.N.E.R. Shown On Map 1 To The NSW U.N.E.R. Forest Agreement Granted On The 5 March 1999., Coffs Harbour, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped
1501931	Clean Up Notice	Forestry Corporation Of New South Wales	Upper North East Region (Uner) Means The State Forests And Crown -Timber Lands (Ex. Plantations) .	Within The U.N.E.R. Shown On Map 1 To The NSW U.N.E.R. Forest Agreement Granted On The 5 March 1999., Coffs Harbour, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped
1590696	Clean Up Notice	Forestry Corporation Of New South Wales	Upper North East Region (Uner) Means The State Forests And Crown -Timber Lands (Ex. Plantations) .	Within The U.N.E.R. Shown On Map 1 To The NSW U.N.E.R. Forest Agreement Granted On The 5 March 1999., Coffs Harbour, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped
1593530	Clean Up Notice	Forestry Corporation Of New South Wales	Upper North East Region (Uner) Means The State Forests And Crown -Timber Lands (Ex. Plantations) .	Within The U.N.E.R. Shown On Map 1 To The NSW U.N.E.R. Forest Agreement Granted On The 5 March 1999., Coffs Harbour, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

3.3a SITES REGULATED BY OTHER JURISDICTIONAL BODY

Map 3.3a (2000m Buffer)

Contaminated Legacy Areas

Site Name	Description	Distance (m)	Direction
Not identified	-	-	-

Includes known contaminated areas such as James Hardies Asbestos waste legacy areas, Pasmenco Smelter and Uranium processing site.

Defence, Military Sites and UXO Areas

Site name	Type*	Details	Distance (m)	Direction
Not identified	-	-	-	-

*RCIP (Regional Contamination Investigation Program). UXO (Unexploded Ordnance Areas)

Former Gasworks Sites

Site name	Description	Distance (m)	Direction
Not identified	-	-	-

PFAS Sites

Site name	Description	Source	Distance (m) *	Direction
Not identified	-	-	-	-

3.3b OTHER POTENTIAL POLLUTION SOURCES

Map 3.3b (500m Buffer)

Derelict Mines and Quarries

Site name	Description	Distance (m)	Direction
Clarrie Hall Dam Quarry	This quarry was used for the initial construction of Clarrie Hall Dam in 1983. (Source: Clarrie Hall Dam Raising State Significant Infrastructure Application - Preliminary Environmental Assessment, July 2018 - Tweed Shire Council)	2.7	West

Historical Landfills

Site name	Description	Distance (m)	Direction
Not identified	-	-	-

National Pollutant Inventory (NPI)

Facility name	Address	Primary ANZSIC Class	Latest report	Distance (m)	Direction
Not identified	-	-	-	-	-



Section 4 Potentially Contaminated Areas



4.1 POTENTIALLY CONTAMINATING ACTIVITIES

Map 4.1 (200m Buffer)

Liquid Fuel Facilities

Site name	Category	Location	Status*	Distance (m)	Direction
Not identified	-	-	-	-	-

Waste Management Facilities & Recycling Centres

Site name	Category	Location	Status*	Distance (m)	Direction
Not identified	-	-	-	-	-

***Status:** Data is current as when this report was created.

The operational status of the business is determined using the available data sources and does not indicate real-time conditions at the site.

Current: business is operating on the day this report was issued.

Former: business that have been closed or discontinued within 2 years from the date of this report.

Liquid Fuel Facilities Datasets, representing the spatial locations of liquid fuel depots, refineries, terminals and petrol stations present in the Australian Government National Liquid Fuel Facilities Dataset and Petrol stations identified by Land Insights. Waste Management Facilities, representing the spatial locations of reprocessing facilities, transfer stations and landfills present in the Australian Government National Waste Management Facilities Dataset and Waste/Recycling facilities identified by Land Insights.

A more comprehensive list of all Potentially Contaminating Activities is available in the Due Diligence Insight report.

4.2 HISTORICAL BUSINESS DIRECTORIES

(not mapped)

Year	Activity	Name	Address	Positional accuracy ¹	Distance (m)	Direction
1985	Nurserymen Wholesale	Budding Plants	Doon Doon Rd Uki Doon Doon QLD AUSTRALIA	Street		North

Land Insight uses a number of address geocoding techniques and has characterised them based on completeness (match rates) and positional accuracy. When a historical street address is incomplete or a match is not found, a record identified as being in the surrounding area will be included for reference and the accuracy of the data is approximate only. An explanation of the positional accuracy records is defined in the table below.

Historical data positional accuracy and georeferencing results explanation		
Positional accuracy	Georeferenced	Description
Address	Located to the address level	<i>When street address and names fully match.</i>
Street	Located to the street centroid	<i>When street names match but no exact address was found. Location is approximate.</i>
Place	Located to the structure, building or complex	<i>When building, residential complex or structure name match but no exact address was found. Location is approximate.</i>
Suburb	Located to the suburb area	<i>When suburb name match but no exact address was found. Location is approximate.</i>

The data used in this section was extracted from range of historical commercial trade directories and business listings. The business addresses were geocoded using historical information and the accuracy of the data may vary due to changes to the physical address at a given locality over time or the quality of the original records. From 2005, the historical business records in this section are considered more accurate as information was extracted from digital directories with geographic coordinate location information available. On this basis, reliance on the historic listing data should be considered when assessing the risk of contamination from an activity at the site. The presence of a business listing does not definitively confirm the actual activity that has occurred at the site. For more information on how these records were geocoded and the methodology used by Land Insight, contact us at info@landinsight.co.

Historical business directory listings have been filtered to match activities and industries identified as PCAs in Section 4.1. Please note that any record not identified within this section (due to error or unforeseen omission) does not necessarily mean that the screened area is not potentially contaminated or free of any risks.



Section 5 Natural Hazards



5.1 Fire Hazard

Map 5.1 (500m Buffer)

Bushfire Prone Areas

Category	Type	Details	Distance (m)	Direction
Bushfire Prone Area	Vegetation Buffer	Vegetation Buffer - Bush Fire Prone is an area of land that can support a bush fire or is likely to be subject to bush fire attack. Bush Fire Prone Land areas becomes the trigger for planning for bush fire protection.	0.0	Onsite
Bushfire Prone Area	Vegetation Category 1	Bushfire Prone Area - Vegetation Category 1 is considered to be the highest risk for bush fire. Bush Fire Prone Areas becomes the trigger for planning for bush fire protection.	0.0	Onsite
Bushfire Prone Area	Vegetation Category 2	Bushfire Prone Area - Vegetation Category 2 is considered to be a lower bush fire risk. Bush Fire Prone Areas becomes the trigger for planning for bush fire protection.	0.0	Onsite

Bushfire History

Type	Season	Details	Distance (m)	Direction
Wildfire	Gumboot	1971-72	0	Onsite
		1974-75	0	Onsite
		1980-81	0	Onsite
		1986-87	0	Onsite
		1991-92	0	Onsite
		1992-93	0	Onsite
		2007-08	0	Onsite

5.2 Flood and Erosion Hazards

Map 5.2 (500m Buffer)

Erosion Hazard

Category	Type	Details	Distance (m)	Direction
Landslip Erosion Risk	Very slight to negligible limitations	Very Low	0.0	Onsite
	Extreme limitations	Very High	0.0	Onsite
Water Erosion Risk	Slight but significant limitations	Low	0.0	Onsite
	Moderate limitations	Moderate	0.0	Onsite
	Very severe limitations	Very High	0.0	Onsite
Wind Erosion Risk	Slight but significant limitations	Low	0.0	Onsite

Flood Hazard

Category	Type	Details	Distance (m)	Direction
Flood extent	Inundation	Clarrie Hall Dam Raising State Significant Infrastructure Application - Preliminary Environmental Assessment, July 2018 - Tweed Shire Council	0.0	Onsite

Generalised flood information definitions and explanations

Annual Exceedance Probability (AEP) - The probability of a flood event of a given size occurring in any one year, usually expressed as a percentage annual chance

0.2%AEP	A flood event of this size is considered rare but may still occur. A flood of size or larger has a 1 in 500 chance or a 0.2% probability of occurring in any year
1% AEP	A flood of this size or larger has a 1 in 100 chance or a 1% probability of occurring in any year
2% AEP	A flood of this size or larger has a 1 in 50 chance or a 2% probability of occurring in any year.

Generalised flood information definitions and explanations

5% AEP	A flood of this size or larger has a 1 in 20 chance or a 5% probability of occurring in any year
20%AEP	A flood of this size or larger has a 1 in 5 chance or a 20% probability of occurring in any year.
Average Recurrence Interval (ARI). The long-term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods reaching a height as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years	
Flood Liable Land - Synonymous with flood prone land, i.e. land susceptible to flooding by the Probable Maximum Flood (PMF) event. Note that the term flood liable land covers the whole floodplain, not just the part below the flood planning level	
Flood Planning Area (FPA) – Councils develop Flood Planning Areas (FPAs) as part of Flood Overlay mapping to guide future building and development in flood prone areas. The FPAs are designed to recognise the flood hazard for different flooding types.	
Flood Hazard - Flood hazard is a combination of frequency of flooding, the flood depth, and the speed or velocity at which the water can travel.	
Probable Maximum Flood (PMF) - The largest flood that could conceivably be expected to occur at a particular location, usually estimated from probable maximum precipitation. The PMF defines the maximum extent of flood prone land, that is, the floodplain. It is difficult to define a meaningful Annual Exceedance Probability for the PMF, but it is commonly assumed to be of the order of 10^4 to 10^7 (once in 10,000 to 10,000,000 years)	



The Commons
388 George Street
Sydney NSW 2000 Australia
info@landinsight.co
www.landinsight.co

Enviro-Screen Report

Clarrie Hall Dam Extension Works
Terragon, NSW

12 Dec 2023






Report n°:
LI-3931 ESR

Understanding your report

Thank you for ordering your report from Land Insight. If you have any feedback, questions or queries, please get in touch with us at orders@landinsight.co.au.

Your Report has been produced by Land Insight and contains information related to current and historical land use information, environmental risks and hazards.

The information presented in this report includes Land Insights' comprehensive research into current and historical land use derived from Land Insight's proprietary National Land Use Atlas (NLUA), environmental risk information and data available from public databases, third party providers, local and state authorities. The report also includes detailed property and soil setting information, hydrogeology, identification of potential pollution and contamination along with ground and natural hazards. The records identified are presented within a 200 to 2000m radius (buffer zone) from the boundaries of the Property searched, depending on the screened constraint. The report is separated and grouped into easy to navigate sections as per Summary below:

	Section 1 PROPERTY SETTING	Sensitive Receptors, Planning Controls, Zoning, Heritage, Soil and Land Information, Geology and Topography
	Section 2 HYDROGEOLOGY	Groundwater Bores and Other Borehole investigations, Groundwater Dependent Ecosystems (GDE), Aquifer and Wetland, Other Hydrogeology information.
	Section 3 ENVIRONMENTAL REGISTERS, LICENCES AND INCIDENTS	Contaminated Land Public Register, Licences, Audits and Orders, Sites Regulated by Other Jurisdictional Body (Former Gaswork sites / PFAS sites, UXO Areas), Historical Landfills, Derelict Mines and National Pollutant Inventory (NPI).
	Section 4 POTENTIALLY CONTAMINATED AREAS	Potentially Contaminating activities (Industries, businesses and activities that may cause contamination), Historical Potentially Contaminating activities and Historical Land Use.
	Section 5 NATURAL HAZARDS	Erosion hazard, Flood hazards, Bushfire prone land and Bushfire history.

This report includes data listed on page 4 (table of contents). All sources of data and definitions are provided in the Product Guide (Attached). For a full list of references, metadata, publications or additional information not provided in this report, please contact orders@landinsight.co.au.

This report does not include information derived from a physical inspection. It is important to note that a site inspection can present information relevant to other risks and hazards that may not be identified by this Report.

Due to the ongoing nature of database development and frequency of updates provided by various state government regulators and data sources, the data displayed within this report is only current from date of production. While every effort is made to ensure the details in your Report are correct, Land Insight cannot guarantee the accuracy or completeness of the information and/or data provided.

This Report, and your use of it, is regulated by Land Insight's Terms and Conditions. For more information, see Land Insight's Product Guide.

Data maintenance schedule

Dataset name	Update frequency	Dataset buffer
Section 1 - Property Setting		
Sensitive Receptors	Quarterly	200m
Planning Controls (<i>Zoning, Planning Instruments, Other planning information</i>)	Quarterly	500m
State and Local Heritage	Quarterly	200m
Commonwealth, National and World Heritage Areas	Annually	200m
Soil Landscape and Land Use Information	Annually	500m
Salinity Hazard	Annually	500m
Radon Level	Annually	500m
State, Local and National Acid Sulfate Soil (ASS)	Annually	500m
Geology	Annually	500m
Naturally Occurring Asbestos Potential	Annually	500m
Topography	As required	500m
Section 2 - Hydrogeology		
Groundwater Aquifers	Annually	2000m
Wetlands	Annually	2000m
Groundwater Bores	Annually	2000m
Drinking Water Catchments	Annually	500m
Groundwater Prohibition/Restricted Use/Exclusion Zones	Annually	500m
Hydrogeologic Units	Annually	500m
Groundwater Dependent Ecosystems	Annually	500m
Other Borehole Locations (<i>Coal Seam Gas, Petroleum Wells, other boreholes</i>)	Annually	500m
Section 3 - Environmental Registers, Licences and Incidents		
Contaminated Land Public Register	Monthly	1000m
Licences, Approvals, Audits, Authorisations & Assessments		
Licences	Monthly	1000m
Surrendered Licences	Monthly	1000m
Clean Up Notices, Penalty Notices and Orders	Monthly	1000m
Permissions	Monthly	1000m
Audits	Monthly	1000m
Authorisations	Monthly	1000m
Sites Regulated by other Jurisdictional Body		
Contaminated Legacy Areas (<i>James Hardies Asbestos, Pasminco Smelter and Uranium sites</i>)	Quarterly	2000m
Defence 3 Year Regional Contamination Investigation Program (RCIP)	Quarterly	2000m
Defence Sites - Current and Former	Ongoing	2000m
Unexploded Ordnance (UXO) Sites - Department of Defence (DoD)	Annually	2000m
Former Gasworks Sites	Ongoing	2000m
PFAS Investigation Sites (<i>EPA PFAS Investigation Program/s, AirServices Australia etc.</i>)	Monthly	2000m
NPI Industrial Facilities	Annually	2000m
Section 4 - Potentially Contaminated Areas		
Potentially Contaminating Activities (PCA) (<i>Petrol Stations, Dry cleaners, Waste sites etc</i>)	Ongoing	500m
Historical Business Directory (<i>Commercial and Trade Directory Data from 1990-2020</i>)	Not required	200m
Section 5 - Natural Hazards		
Bushfire Prone Areas	Bi-annual	500m
Bushfire History	Bi-annual	500m
Erosion Hazard	Bi-annual	500m
Flood Hazard	Ongoing	500m

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ATTACHMENTS

Attachment A - Report Maps

Attachment B - Historical Imagery

Land Insight Product Guide and Terms and Conditions



Section 1 Property Setting

1.1 SENSITIVE RECEPTORS

Map 1.1 (200m Buffer)

Sensitive receptor	Type	Distance (m)	Direction
Doon Doon Creek	Minor Water	34.2	North-west
Tweed River	Major Water	75.3	North

1.2a PLANNING CONTROLS

Map 1.2a (500m Buffer)

Zoning

Zoning	Type	Details	Distance (m)	Direction
RU2	Rural Landscape	Tweed Local Environmental Plan 2014	0.0	Onsite
W1	Natural Waterways	Tweed Local Environmental Plan 2014	26.4	North-west
SP2	Infrastructure	Tweed Local Environmental Plan 2014	395.7	South-west

1.2b PLANNING OVERLAYS

Map 1.2b (500m Buffer)

Environmental Planning Instruments

Name	Type	Details	Distance (m)	Direction
Biophysical Strategic Agricultural Land	Strategic Agricultural Land	State Environmental Planning Policy (Resources and Energy) 2021	0.0	Onsite
Maximum Building Height (m): 10-10.9	Height of Building	Tweed Local Environmental Plan 2014	0.0	Onsite
Minimum Lot Size (sqm): 10-49.9	Lot Size	Tweed Local Environmental Plan 2014	0.0	Onsite
Buffer Area	Coal Seam Gas Exclusions	State Environmental Planning Policy (Resources and Energy) 2021	0.0	Onsite
Drinking Water Catchment	Drinking Water Catchment	Tweed Local Environmental Plan 2014	0.0	Onsite
Existing and Future Water Storage Facilities, Existing and Future Water Storage Facilities	Local Provisions	Tweed Local Environmental Plan 2014	391.2	South-west

Other Planning Information

Name	Category	Details	Distance (m)	Direction
-	-	-	-	-

1.3 HERITAGE

Map 1.3 (200m Buffer)

State and Local Heritage Registers

Site ID	Site Name	Type	Details	Distance (m)	Direction
Not identified	-	-	-	-	-

Australian Heritage Database Register

Site ID	Site Name	Type	Details	Distance (m)	Direction
Not identified	-	-	-	-	-

Commonwealth Heritage List, National Heritage List and World Heritage Area.

Soil Landscape

Code	Name	Soil Group	Description	Distance (m)	Direction
ERfh	Frogs Hollow	Erosional	Landscape—steep hills on Chillingham Volcanics. Relief is 250–300 m, slopes are 40–>50%. Elevation is 300–400 m. Partially cleared open-forest (wet sclerophyll). Soils—moderately deep to deep (100–200 cm), moderately well-drained Brown Podzolic Soils and Brown Earths (Db3.51) on ridges and upper slopes and deep (>200 cm), moderately well-drained Red Podzolic Soils (Dr4.21, Dr2.21, Gn3.14) and Red Clays (Uf6.31, Uf4.41) elsewhere. Limitations—very steep slopes, mass movement hazard, erodible soils.	0.0	Onsite
ALox	Oxley	Alluvial	Landscape—level to gently undulating alluvial plains of the mid Oxley and Tweed catchments. Slopes <2%, local relief <9 m, plain width 250 – 1 000 m. Inset terraces are common. Extensively cleared closed-forest (rainforest). Landscape Variant—oxa—poorly drained backswamps. Soils—shallow to moderately deep (up to 100 cm), imperfectly drained Alluvial Soils and/or minimal Prairie Soils (Um5.51) on floodplain/bar plain. Deep (>200 cm), moderately well-drained minimal Prairie Soils and dark Alluvial Clays (Uf6.32, Uf6.31, Um6.41) on alluvial plain. Limitations—flood hazard, stream bank erosion hazard, highly erodible soils, localised waterlogging, localised permanently high watertables, stoniness.	0.0	Onsite
ERbu	Burringbar	Erosional	Landscape—high rolling hills on metamorphics of the Neranleigh-Fernvale Group. Relief 100–200 m, slopes 15–>33%. Slopes are generally long (400–750 m) and waning or simple. Ridges and crests are narrow to moderately broad (<100–200 m). Streams are erosional. Open-forest with partial to extensive clearing. Soils—shallow (<50 cm), poorly drained Lithosols and localised shallow (50–100 cm), poorly drained Yellow Podzolic Soils (Gn2.34, Dy3.21) on quartzites and phyllites. Moderately deep (100–150 cm), moderately well-drained Red Podzolic Soils (Dr2.31, Dr3.21, Gn3.74) with Yellow Podzolic Soils (Dy2.51, Dy3.21) on fine-grained sediments. Deep (>150 cm), moderately well-drained Red Earths (Uf4, Uf6) and Red Podzolic Soils (Dr2.21) on lower slopes. Limitations—hardsetting, erodible, shallow, stony, sodic soils of low fertility with high erosion hazard. Steep slopes and high mass movement hazard.	16.3	South
ERbic	Billinudgel Variant C	Erosional	Landscape—rolling hills on metamorphics of the Neranleigh-Fernvale Group. Relief is 50–100 m, slopes 10–20% but may be >33% in places. Slopes moderately long (200–300 m); ridges and crests are narrow (100–150 m). Partly to extensively cleared open-forest (wet sclerophyll). Landscape Variant—bia—very low hills often forming footslopes. Relief 10–30 m, slopes up to 10%. Landscape Variant—bib—headlands. Landscape Variant—bic—contact metamorphosed zone. Landscape Variant—bid—areas of rock protruding through Tweed (tw) soil landscape. Soils—deep (>100 cm), moderately well-drained Red Podzolic Soils (Dr2.21, Dr4.21) on crests; moderately deep (70–100 cm), moderately well-drained Yellow Earths (Gn3.74, Uf6.33) and Yellow Podzolic Soils (Dy3.11, Dy2.11) on slopes; better-drained areas; moderately deep (50–150 cm), moderately well-drained Prairie Soils (Uf6.11) on bib; deep (200 cm), moderately well-drained Red Podzolic Soils (Gn3.14, Dr2.21, Dr2.11) within bic. Limitations—localised steep slopes and mass movement (slump) hazard. Hardsetting, strongly acid, stony soils, with	301.4	North

Code	Name	Soil Group	Description	Distance (m)	Direction
			high erodibility, low fertility and high aluminium toxicity potential and some sporadic shallow soils.		

Salinity

Salinity Hazard	Type	Details	Distance (m)	Direction
Not identified	-	-	-	-

Radon

Radon Level (Bq/m ³)	Distance (m)	Direction
6	0.0	Onsite

Typical radon levels in Australia are low and the values shown are the average values for each census district. For specific location, factors such as the local geology and house type could lead to different values. (ARPANSA).

1.4b ACID SULFATE SOIL

Map 1.4b (500m Buffer)

State and Local Acid Sulfate Soil Registers

Name	Classification	Description	Distance (m)	Direction
Not identified	-	-	-	-

To ensure that development does not disturb, expose or drain acid sulfate soils and cause environmental damage, development consent may be required for the carrying out of works within areas and land shown on the Acid Sulfate Soils Map.

National Acid Sulfate Soil Register

Name	Classification	Description	Distance (m)	Direction
Atlas of Australian Acid Sulfate Soils	Low Probability of occurrence	Acid sulfate soil generally within upper 1m in wet / riparian areas.	0.0	Onsite

Source: ASRIS Atlas of Australian Sulfate Soils (CSIRO). Acid Sulfate Soils (ASS) are all those soils in which sulfuric acid may be produced, is being produced, or has been produced in amounts that have a lasting effect on main soil characteristics.

1.5 GEOLOGY AND TOPOGRAPHY

Map 1.5 (500m Buffer)

Geology

Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
NSW Seamless Geology version 2.2 May2022	C__n	Neranleigh-Fernvale beds	Late Devonian (base) to Carboniferous (Mississippian) (top)	Null	Sandstone	Feldspathic and lithic meta-arenite, metasilstone and conglomerate proximal turbidite, with structurally intercalated or stratigraphically underlying chert, jasper and mafic meta-volcanics.	0.0	Onsite

Map Sheet	Code	Formation	Age	Group	Dominant Lithology	Description	Distance (m)	Direction
NSW Seamless Geology version 2.2 May2022	QH_af	Alluvial floodplain deposits	Holocene (base) to Now (top)	Alluvium	Clastic sediment	Silt, very fine-to medium-grained lithic to quartz-rich sand, clay.	0.0	Onsite
NSW Seamless Geology version 2.2 May2022	Tutc	Chillingham Volcanics	Early Triassic (base) to Late Triassic (top)	Ungrouped Triassic units	Quartzite	Rhyolite, lithic rhyolitic tuff, shale, basal cobble conglomerate.	486.6	West

Naturally Occurring Asbestos Potential (NOA)

Category	On the Property?	Within Buffer?
Not identified	-	-

Topography

Topography (Onsite)	30 - 50 mAHD
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Section 2 Hydrogeology



2.1 GDE & HYDROGEOLOGY CONSTRAINTS

Map 2.1 (2000m Buffer)

Aquifer Type

Type	Distance (m)	Direction
Fractured or fissured, extensive aquifers of low to moderate productivity	0.0	Onsite
Porous, extensive highly productive aquifers	0.0	Onsite

Groundwater Protection Areas

Name	Water Plan Area	Distance (m)	Direction
Not identified	-	-	-

Wetlands

Name	Description	Distance (m)	Direction
Null	River	21.3	North-west
Tweed River	Floodplain water body	234.1	North-east
Clarrie Hall Dam	Reservoir	965.5	South-west
Null	Upland Lakes & Lagoons	1050.3	South-west
Rolands Creek	Floodplain water body	1920.6	South-east

Groundwater Dependent Ecosystems (GDE) - Aquatic (Surface)

Potential	Distance (m)	Direction
High potential GDE - from national assessment	53.6	North
Moderate potential GDE - from national assessment	234.1	North-east
Low potential GDE - from national assessment	1400.9	North-east

Aquatic - Ecosystems that rely on the Surface expression of groundwater.

Groundwater Dependent Ecosystems (GDE) - Terrestrial (Subsurface)

Potential	Distance (m)	Direction
Low potential GDE - from regional studies	0.0	Onsite
High potential GDE - from regional studies	0.0	Onsite
Moderate potential GDE - from regional studies	563.8	South

Terrestrial - Ecosystems that rely on the Subsurface expression of groundwater.

Groundwater Licences (Western Australia)

Map ID	WRI number	Allocation (KL)	Address	All Parties	Distance (m)	Direction
Not identified	-	-	-	-	-	-

Groundwater Bores

Map ID	Groundwater Bore ID	Authorised Purpose	Completion Date	Drilled Depth (m)	Final Depth (m)	SWL (m)	Salinity (mg/l)	Yield (L/s)	Distance (m)	Direction
8	201013	Unknown	Null	Null	Null	Null	Null	Null	21.0	North-west
5	GW306456	Household	12/12/2008	79.0	79.0	45.0	Null	0.5	200.0	East
10	GW302075	Household	Null	Null	Null	Null	Null	Null	414.3	North-east
2	GW301695	Household	10/12/1998	33.0	33.0	Null	Null	Null	951.6	East
7	201011	Unknown	Null	Null	Null	Null	Null	Null	1390.5	South-west
9	201900	Unknown	Null	Null	Null	Null	Null	Null	1662.4	North-east
1	GW302589	Monitoring	18/06/2001	16.0	16.0	4.9	Null	0.6	1667.6	West
4	GW301388	Household	12/10/1995	28.0	28.0	15.0	Good	0.4	1756.2	South-east
11	GW065593	Household	31/10/1988	Null	48.0	26.7	Good	0.2	1774.9	North-east
6	201009	Unknown	Null	Null	Null	Null	Null	Null	1859.0	South-east
3	GW070304	Unknown	23/10/1992	36.0	36.0	Null	Null	0.4	1920.6	South-east

Note: The use of the symbol "-" or "Null" indicates that no records were found.

Groundwater Bores Driller Lithology Details

Groundwater Bore ID	From Depth – To Depth (m)	Lithology	Distance (m)	Direction
201013	Null		21.0	North-west
GW306456	0m-0.3m Topsoil, black 0.3m-36m Mudstone, weathered 36m-48m Shale, grey, weathered 48m-54m Slate, black 54m-58m Slate, cracky, black, water bearing 58m-63m Slate, black 63m-67m Slate, cracky, black, water bearing 67m-72m Slate, black 72m-76m Slate, cracky, black, water bearing 76m-79m Slate, black		200.0	East
GW302075	Null		414.3	North-east
GW301695	0m-0.5m Top soil 0.5m-1m Clay 1m-33m Basalt		951.6	East
201011	Null		1390.5	South-west
201900	Null		1662.4	North-east
GW302589	0m-4m Soil 4m-8.5m Yellow clay 8.5m-16m Grey wacky		1667.6	West
GW301388	0m-1m Top soil 1m-3m Clay 3m-23m Decomposed rock 23m-24m Shale 24m-28m Bassalt		1756.2	South-east
GW065593	Null		1774.9	North-east
201009	Null		1859.0	South-east
GW070304	0m-6m Clay 6m-7m Greywacke 7m-18m Shale (weathered) 18m-36m Greywacke		1920.6	South-east

Note: The use of the symbol "-" or "Null" indicates that no records were found.

2.2 GROUNDWATER AND OTHER BORES

Map 2.2 (2000m Buffer)

Groundwater Restricted Use Zones

Name / Number	Address	Site History	Description	Distance (m)	Direction
Not identified	-	-	-	-	-

Groundwater Salinity

Class	Salinity Value	Source	Distance (m)	Direction
No Data	No Data	Sinclair Knight Merz	0.0	Onsite

Other Known Borehole Investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes)

Borehole ID	Purpose	Project	Client/ License	Date Drilled	Depth (m)	Distance (m)	Direction
Not identified	-	-	-	-	-	-	-

Note: The use of the symbol "-" or "Null" indicates that no records were found.



Section 3 Environmental Registers, Licences and Incidents



3.1 CONTAMINATED LAND PUBLIC REGISTER

Map 3.1 (1000m Buffer)

Contaminated Sites

Register Type	Site Name	Address	Description	Details	Distance (m)	Direction
Not identified	-	-	-	-	-	-

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

Table 3.1.1 Contaminated Land Public Register		
State	Regulatory Body	Information included in this search (by state)
ACT	EPA (Environment Protection Authority)	Contaminated Land Search Register of Contaminated Sites
NSW	EPA (Environment Protection Authority)	Sites Notified as Contaminated Records of Notices
NT	EPA (Environment Protection Authority)	Contaminated Land Audit Pollution Abatement Notice
QLD	DES (Department of Environment and Science)	Contaminated Land Search (Environmental Management and Contaminated Land Registers)
SA	EPA (Environment Protection Authority)	Site Contamination Index
TAS	EPA (Environment Protection Authority)	Regulated Sites and Premises Lutana and Parts of Hobarts Eastern Shore
VIC	EPA (Environment Protection Authority)	Priority Sites Register Pollution Abatement Notice

Table 3.1.1 Contaminated Land Public Register		
WA	DWER (Department of Water and Environmental Regulation)	Contaminated Sites Database

This search contains information retrieved from the relevant state authority, agency/department, or government authority that notifies and identifies contaminated land. The list only contains contaminated sites that the regulatory body is aware of or that have been notified by owners or occupiers as contaminated land. The sites are recorded on the register at various stages of the assessment and/or remediation process. If a site is not on the list, it does not necessarily mean the site is not contaminated.

3.2 LICENCES, APPROVALS & ASSESSMENTS

Map 3.2 (500m Buffer)

Licences

Licence N°	Type	Licence holder	Location Name	Premise Address	Activity	Dist. (m)*	Direct
3957	No longer in force	FORESTRY CORPORATION OF NEW SOUTH WALES	Lower North East Region (L.N.E.R) Means State Forests And Crown - Timber Lands (ex. Plantations)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW 2440	Logging operations	Not mapped	Not mapped
4017	No longer in force	FORESTRY CORPORATION OF NEW SOUTH WALES	Upper North East Region (L.N.E.R) Means State Forests And Crown - Timber Lands (ex. Plantations)	WITHIN THE U.N.E.R. SHOWN ON MAP 1 TO THE NSW U.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999., COFFS HARBOUR, NSW 2450	Logging operations	Not mapped	Not mapped

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

* Not mapped - Licences that are applied to larger areas and/or without specific definition; such as waterways, forests etc will still be identified in the search results but will not be show within the map.

Audits

N°	Type	Licence holder	Location Name	Premise Address	Activity	Dist. (m)*	Direction
Not identified	-	-	-	-	-	-	-

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

Clean Up, Penalty Notices and Orders

N°	Type	Licence holder	Location Name	Premise Address	Details	Dist. (m)*	Direction
1512244	Penalty Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	Pollute waters - Corporation	Not mapped	Not mapped
1512245	Penalty Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	Pollute waters - Corporation	Not mapped	Not mapped
1512247	Penalty Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	Pollute waters - Corporation	Not mapped	Not mapped
1566080	Penalty Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	Contravene condition of licence - Corporation	Not mapped	Not mapped
1566081	Penalty Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	Pollute waters - other officer - Corporation	Not mapped	Not mapped
3085775780	Penalty Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	Pollute waters - Corporation	Not mapped	Not mapped

N°	Type	Licence holder	Location Name	Premise Address	Details	Dist. (m)*	Direction
3085775799	Penalty Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	Pollute waters - Corporation	Not mapped	Not mapped
1024530	Clean Up Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1024598	Clean Up Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1028085	Clean Up Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1051696	Clean Up Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1087543	Clean Up Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped

N°	Type	Licence holder	Location Name	Premise Address	Details	Dist. (m)*	Direction
1090202	Clean Up Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1543465	Clean Up Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	LOWER NORTH EAST REGION (L.N.E.R) MEANS STATE FORESTS AND CROWN - TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE L.N.E.R. SHOWN ON MAP 1 TO THE NSW L.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999, KEMPSEY, NSW, 2440	s.91 Clean Up Notice	Not mapped	Not mapped
1014573	Clean Up Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	UPPER NORTH EAST REGION (UNER) MEANS THE STATE FORESTS AND CROWN -TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE U.N.E.R. SHOWN ON MAP 1 TO THE NSW U.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999., COFFS HARBOUR, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped
1501931	Clean Up Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	UPPER NORTH EAST REGION (UNER) MEANS THE STATE FORESTS AND CROWN -TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE U.N.E.R. SHOWN ON MAP 1 TO THE NSW U.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999., COFFS HARBOUR, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped
1590696	Clean Up Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	UPPER NORTH EAST REGION (UNER) MEANS THE STATE FORESTS AND CROWN -TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE U.N.E.R. SHOWN ON MAP 1 TO THE NSW U.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999., COFFS HARBOUR, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped
1593530	Clean Up Notice	FORESTRY CORPORATION OF NEW SOUTH WALES	UPPER NORTH EAST REGION (UNER) MEANS THE STATE FORESTS AND CROWN -TIMBER LANDS (EX. PLANTATIONS)	WITHIN THE U.N.E.R. SHOWN ON MAP 1 TO THE NSW U.N.E.R. FOREST AGREEMENT GRANTED ON THE 5 MARCH 1999., COFFS HARBOUR, NSW, 2450	s.91 Clean Up Notice	Not mapped	Not mapped

If the record does not contain a complete street address and/or cannot be located, the records' geographic location will be approximated and reported as being within the surrounding area.

3.3a SITES REGULATED BY OTHER JURISDICTIONAL BODY

Map 3.3a (2000m Buffer)

Contaminated Legacy Areas

Site Name	Description	Distance (m)	Direction
Not identified	-	-	-

Includes known contaminated areas such as James Hardies Asbestos waste legacy areas, Pasmenco Smelter and Uranium processing site.

Defence, Military Sites and UXO Areas

Site name	Type*	Details	Distance (m)	Direction
Not identified	-	-	-	-

*RCIP (Regional Contamination Investigation Program). UXO (Unexploded Ordnance Areas)

Former Gasworks Sites

Site name	Description	Distance (m)	Direction
Not identified	-	-	-

PFAS Sites

Site name	Type	Details	Distance (m) *	Direction
Not identified	-	-	-	-

3.3b OTHER POTENTIAL HAZARD SOURCES

Map 3.3b (500m Buffer)

Mines and Quarries (current and historical)

Site name	Description	Status	Distance (m)	Direction
Nullum Pit	Construction Materials - Chillingham Volcanics. Pit 26 in GS1972/396. Major commodities: unprocessed construction (Source: Monash / The Geological Survey of New South Wales, Department of Primary Industries (Mineral Resources))	Unknown	357.2	West
Unnamed	Construction Materials - River terrace on W side of Tweed River. Major commodities: unprocessed construction (Source: Monash / The Geological Survey of New South Wales, Department of Primary Industries (Mineral Resources))	Unknown	409.6	North-east

Landfills (current and historical)

Site name	Description	Status	Distance (m)	Direction
Not identified	-	-	-	-

National Pollutant Inventory (NPI)

Facility name	Address	Primary ANZSIC Class	Latest report	Distance (m)	Direction
Not identified	-	-	-	-	-



Section 4 Potentially Contaminated Areas



4.1 POTENTIALLY CONTAMINATING ACTIVITIES

Map 4.1 (200m Buffer)

Liquid Fuel Facilities

Site name	Category	Description	Address	Status*	Dist. (m)*	Direction
Not identified	-	-	-	-	-	-

Waste Management Facilities & Recycling Centres

Site name	Category	Description	Address	Status*	Dist. (m)*	Direction
Not identified	-	-	-	-	-	-

***Status:** Information is current as when this report was created.

The operational status of the business is determined using the available data sources and does not indicate real-time conditions at the site.

Current: business is operating on the day this report was issued.

Former: business that have been closed or discontinued within 2 years from the date of this report.

Liquid Fuel Facilities Datasets, representing the spatial locations of liquid fuel depots, refineries, terminals and petrol stations present in the Australian Government National Liquid Fuel Facilities Dataset and Petrol stations identified by Land Insights. Waste Management Facilities, representing the spatial locations of reprocessing facilities, transfer stations and landfills present in the Australian Government National Waste Management Facilities Dataset and Waste/Recycling facilities identified by Land Insights.

A more comprehensive list of all Potentially Contaminating Activities is available in the Due Diligence Insight report.

4.2 HISTORICAL BUSINESS DIRECTORIES

(not mapped)

YEAR	Activity	Name	Address	Positional accuracy	Distance (m)	Direction
2015	Water - Springwater Supplies & Accessories	Mount Warning Spring Water	2574 Kyogle Rd Uki NSW 2484	Address	0.0	Onsite
2005	Fencing Contractors	North East Rural Fencing Contractors	Clary Hall Dam Rd, UKI, NSW, 2484	Street		South-west

Land Insight uses a number of address geocoding techniques and has characterised them based on completeness (match rates) and positional accuracy. When a historical street address is incomplete or a match is not found, a record identified as being in the surrounding area will be included for reference and the accuracy of the data is approximate only. An explanation of the positional accuracy records is defined in the table below.

Historical data positional accuracy and georeferencing results explanation		
Positional accuracy	Georeferenced	Description
Address	Located to the address level	<i>When street address and names fully match.</i>
Street	Located to the street centroid	<i>When street names match but no exact address was found. Location is approximate.</i>
Place	Located to the structure, building or complex	<i>When building, residential complex or structure name match but no exact address was found. Location is approximate.</i>
Suburb	Located to the suburb area	<i>When suburb name match but no exact address was found. Location is approximate.</i>

The data used in this section was extracted from range of historical commercial trade directories and business listings. The business addresses were geocoded using historical information and the accuracy of the data may vary due to changes to the physical address at a given locality over time or the quality of the original records. From 2005, the historical business records in this section are considered more accurate as information was extracted from digital directories with geographic coordinate location information available. On this basis, reliance on the historic listing data should be considered when assessing the risk of contamination from an activity at the site. The presence of a business listing does not definitively confirm the actual activity that has occurred at the site. For more information on how these records were geocoded and the methodology used by Land Insight, contact us at info@landinsight.co.

Historical business directory listings have been filtered to match activities and industries identified as PCAs in Section 4.1. Please note that any record not identified within this section (due to error or unforeseen omission) does not necessarily mean that the screened area is not potentially contaminated or free of any risks.



Section 5 Natural Hazards



5.1 Fire Hazard

Map 5.1 (500m Buffer)

Bushfire Prone Areas

Category	Type	Details	Distance (m)	Direction
Bushfire Prone Area	Vegetation Buffer	Vegetation Buffer - Bush Fire Prone is an area of land that can support a bush fire or is likely to be subject to bush fire attack. Bush Fire Prone Land areas becomes the trigger for planning for bush fire protection.	0.0	Onsite
Bushfire Prone Area	Vegetation Category 2	Bushfire Prone Area - Vegetation Category 2 is considered to be a lower bush fire risk. Bush Fire Prone Areas becomes the trigger for planning for bush fire protection.	0.0	Onsite
Bushfire Prone Area	Vegetation Category 1	Bushfire Prone Area - Vegetation Category 1 is considered to be the highest risk for bush fire. Bush Fire Prone Areas becomes the trigger for planning for bush fire protection.	0.0	Onsite

Bushfire History

Type	Season	Details	Distance (m)	Direction
Wildfire	2002-03	Tarcoola	0.0	Onsite
Wildfire	1986-87		64.0	East
Wildfire	1992-93		116.3	South-east

5.2 Flood Hazard

Map 5.2 (500m Buffer)

Flood Planning Area

Category	Type	Details	Distance (m)	Direction
Not identified	-	-	-	-

Other Flood Studies

Category	Type	Details	Distance (m)	Direction
Not identified	-	-	-	-

Flood History

Type	Season	Details	Distance (m)	Direction
Not identified	-	-	-	-

The list provided is not comprehensive and does not consider all flood history. It only includes the information that is currently available.

5.3 Erosion Hazard

Map 5.3 (500m Buffer)

Erosion Hazard

Category	Type	Details	Distance (m)	Direction
Landslip Erosion Risk	Very slight to negligible limitations	Very Low	0.0	Onsite
	Extremely severe limitations	Very High	0.0	Onsite
	Extreme limitations	Very High	0.0	Onsite
Water Erosion Risk	Slight but significant limitations	Low	0.0	Onsite
	Extremely severe limitations	Very High	0.0	Onsite
	Extreme limitations	Very High	0.0	Onsite
	Moderate to severe limitations	Moderate	301.4	North
Wind Erosion Risk	Very slight to negligible limitations	Very Low	0.0	Onsite
	Slight but significant limitations	Low	0.0	Onsite

Table 5.2.1 – Flood Hazard definitions and explanations

Annual Exceedance Probability (AEP) - The probability of a flood event of a given size occurring in any one year, usually expressed as a percentage annual chance

0.2% AEP	A flood event of this size is considered rare but may still occur. A flood of size or larger has a 1 in 500 chance or a 0.2% probability of occurring in any year
1% AEP	A flood of this size or larger has a 1 in 100 chance or a 1% probability of occurring in any year
2% AEP	A flood of this size or larger has a 1 in 50 chance or a 2% probability of occurring in any year.
5% AEP	A flood of this size or larger has a 1 in 20 chance or a 5% probability of occurring in any year

Table 5.2.1 – Flood Hazard definitions and explanations

20%AEP	A flood of this size or larger has a 1 in 5 chance or a 20% probability of occurring in any year.
Average Recurrence Interval (ARI). The long-term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods reaching a height as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years	
Flood Liable Land - Synonymous with flood prone land, i.e. land susceptible to flooding by the Probable Maximum Flood (PMF) event. Note that the term flood liable land covers the whole floodplain, not just the part below the flood planning level	
Flood Planning Area (FPA) – Councils develop Flood Planning Areas (FPAs) as part of Flood Overlay mapping to guide future building and development in flood prone areas. The FPAs are designed to recognise the flood hazard for different flooding types.	
Flood Hazard - Flood hazard is a combination of frequency of flooding, the flood depth, and the speed or velocity at which the water can travel.	
Probable Maximum Flood (PMF) - The largest flood that could conceivably be expected to occur at a particular location, usually estimated from probable maximum precipitation. The PMF defines the maximum extent of flood prone land, that is, the floodplain. It is difficult to define a meaningful Annual Exceedance Probability for the PMF, but it is commonly assumed to be of the order of 10^4 to 10^7 (once in 10,000 to 10,000,000 years)	



The Commons
388 George Street
Sydney NSW 2000 Australia
info@landinsight.co
www.landinsight.co

Appendix B

Environmental mapping



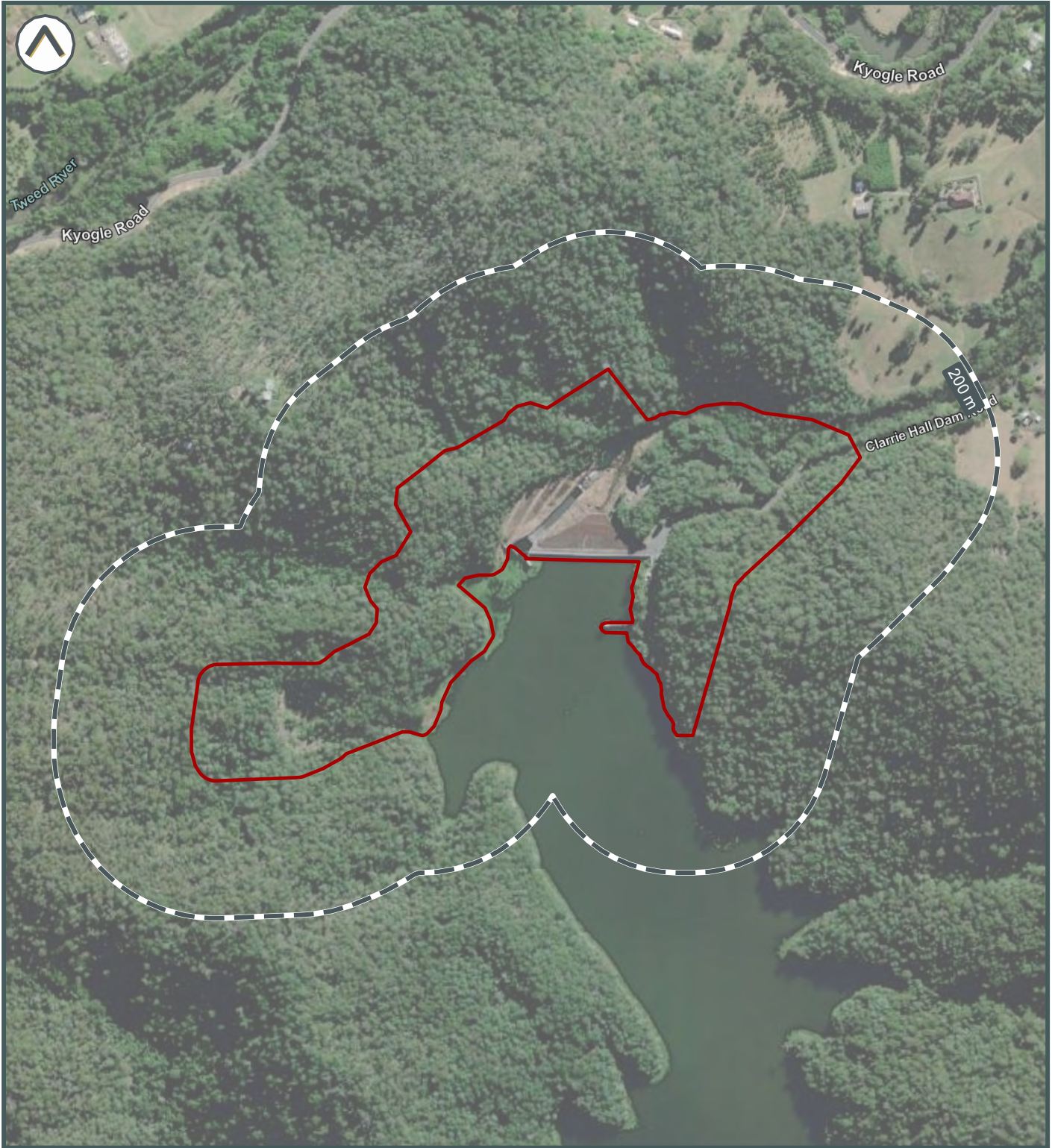
Appendix A

REPORT MAPS

Clarrie Hall Dam,
Terragon, NSW



Subject Area and Sensitive Receptors



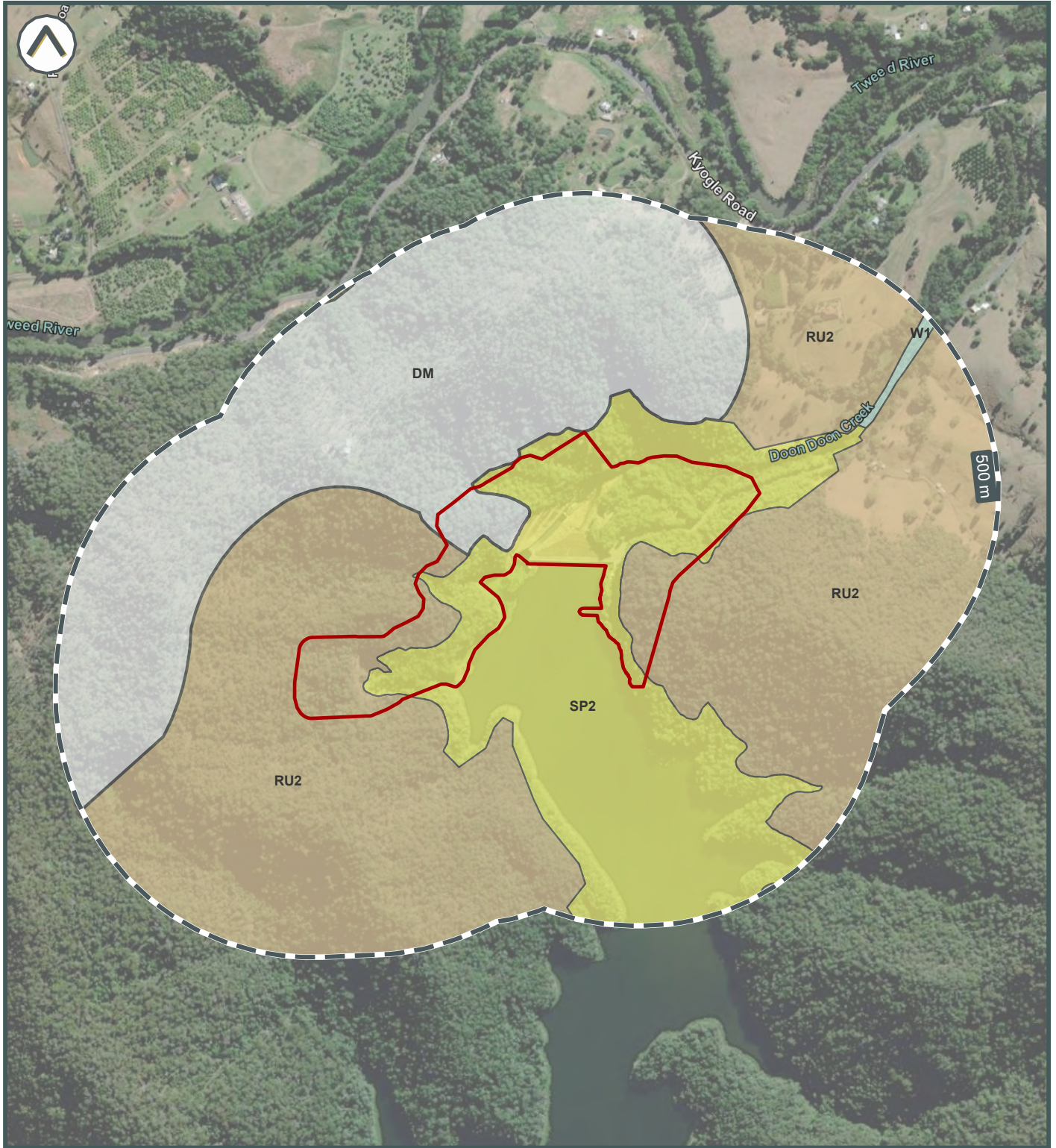
©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

Subject area



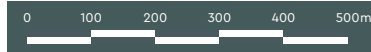


Zoning



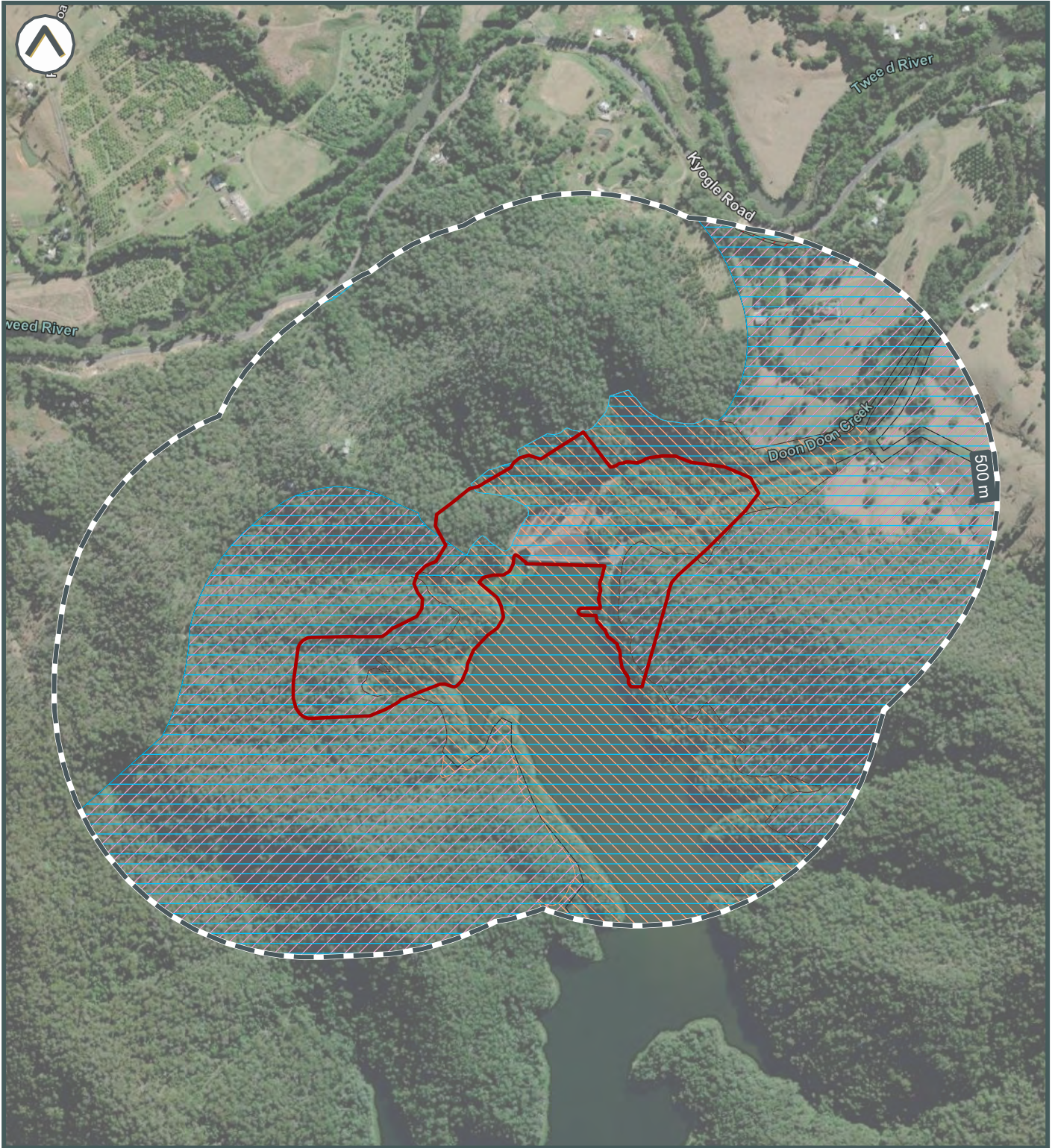
©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- DM | Deferred Matter
- SP2 | Special Purposes Zone - Infrastructure
- RU2 | Rural Landscape Zone
- W1 | Natural Waterways



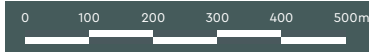


Planning Overlays



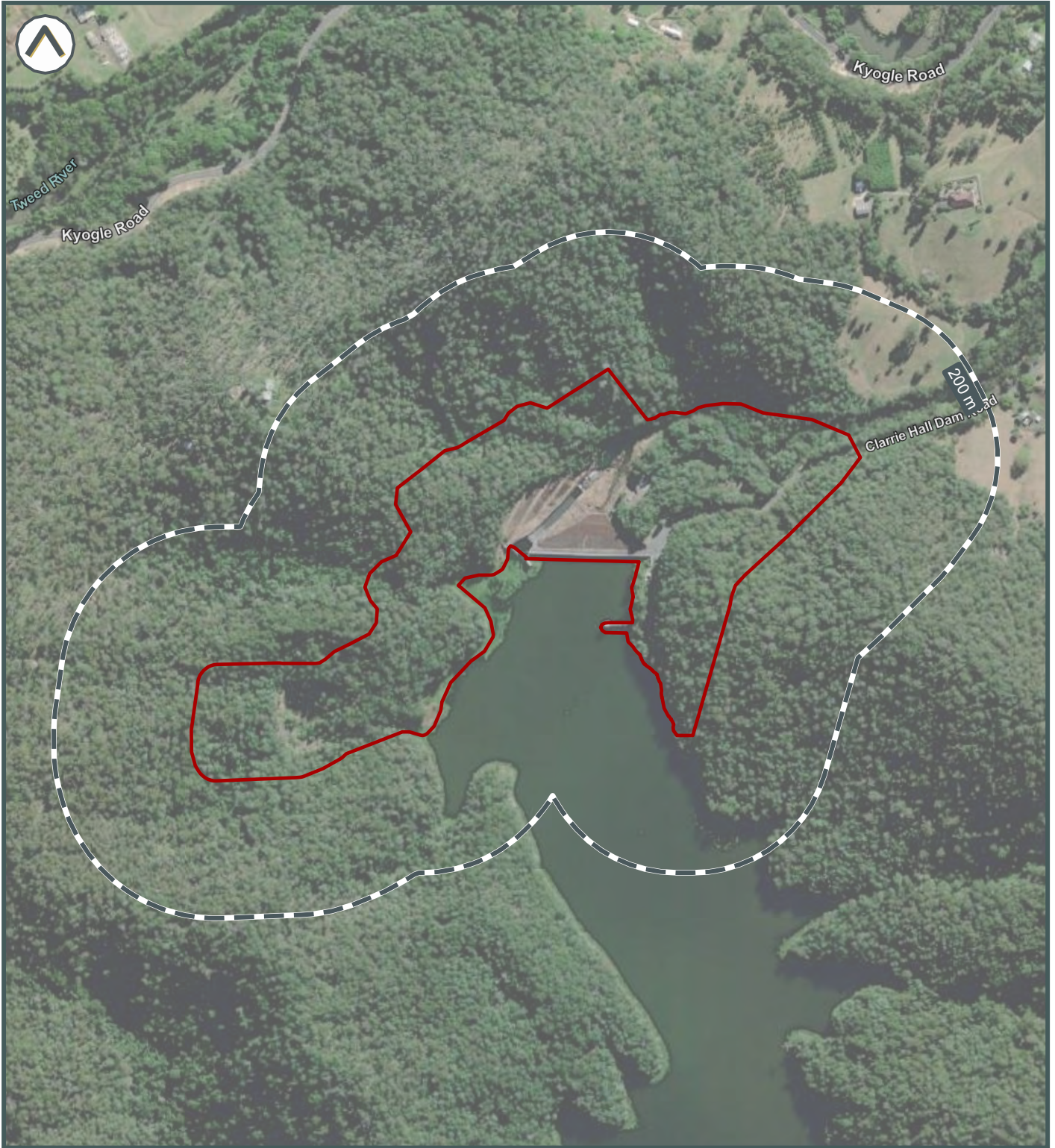
©2023 Land Insight (LI) www.landinsight.co | R:\LI\3236 DPR Terragon NSW Working\GIS\Project\LI-XXXXX XXXX_A4P Layouts\15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Drinking Water Catchment
- Local Provisions
- Height of Building
- Lot Size



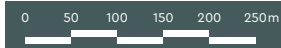


Heritage



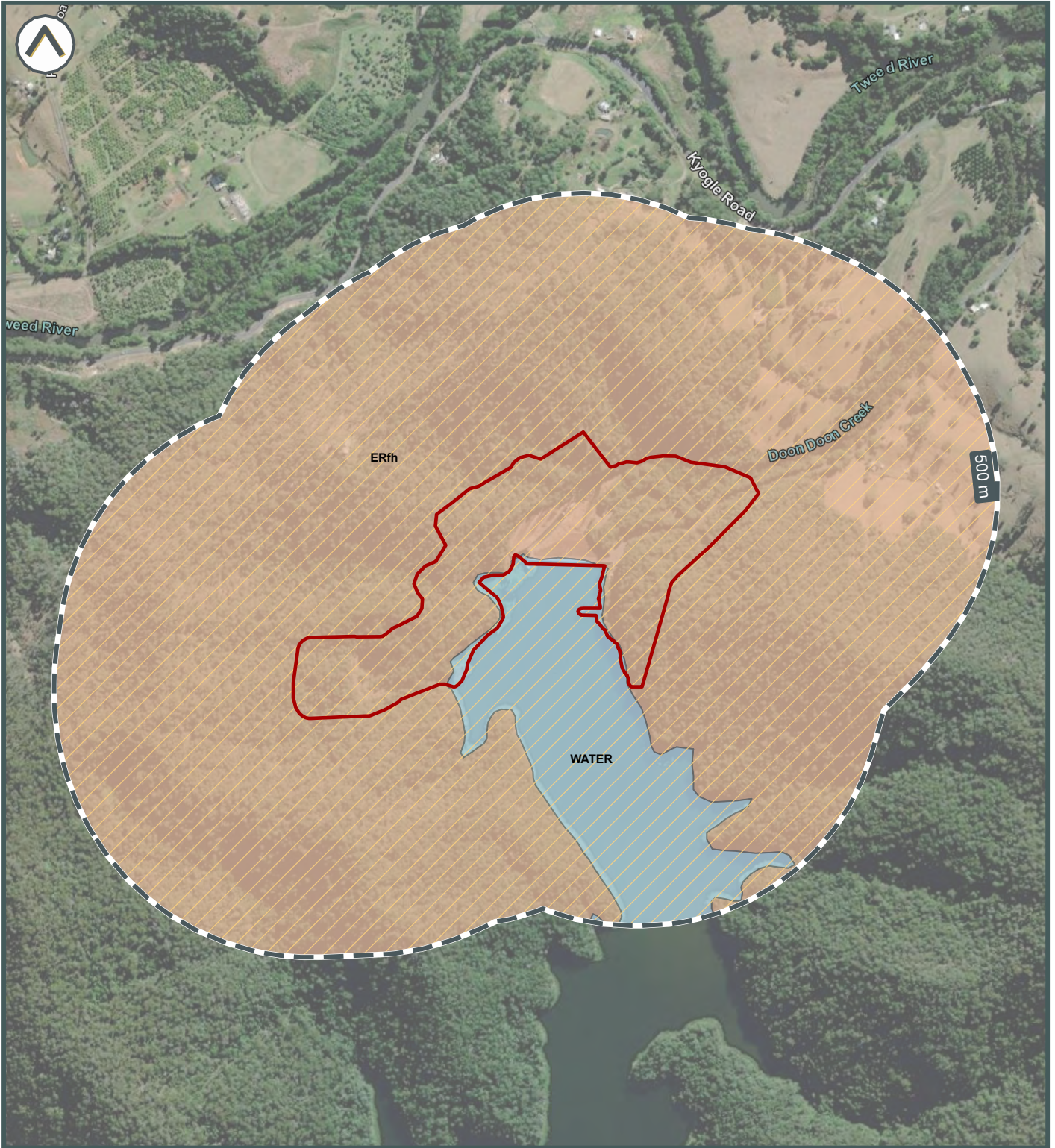
©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

Subject area



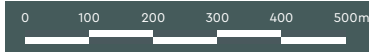


Soil Landscape and Salinity



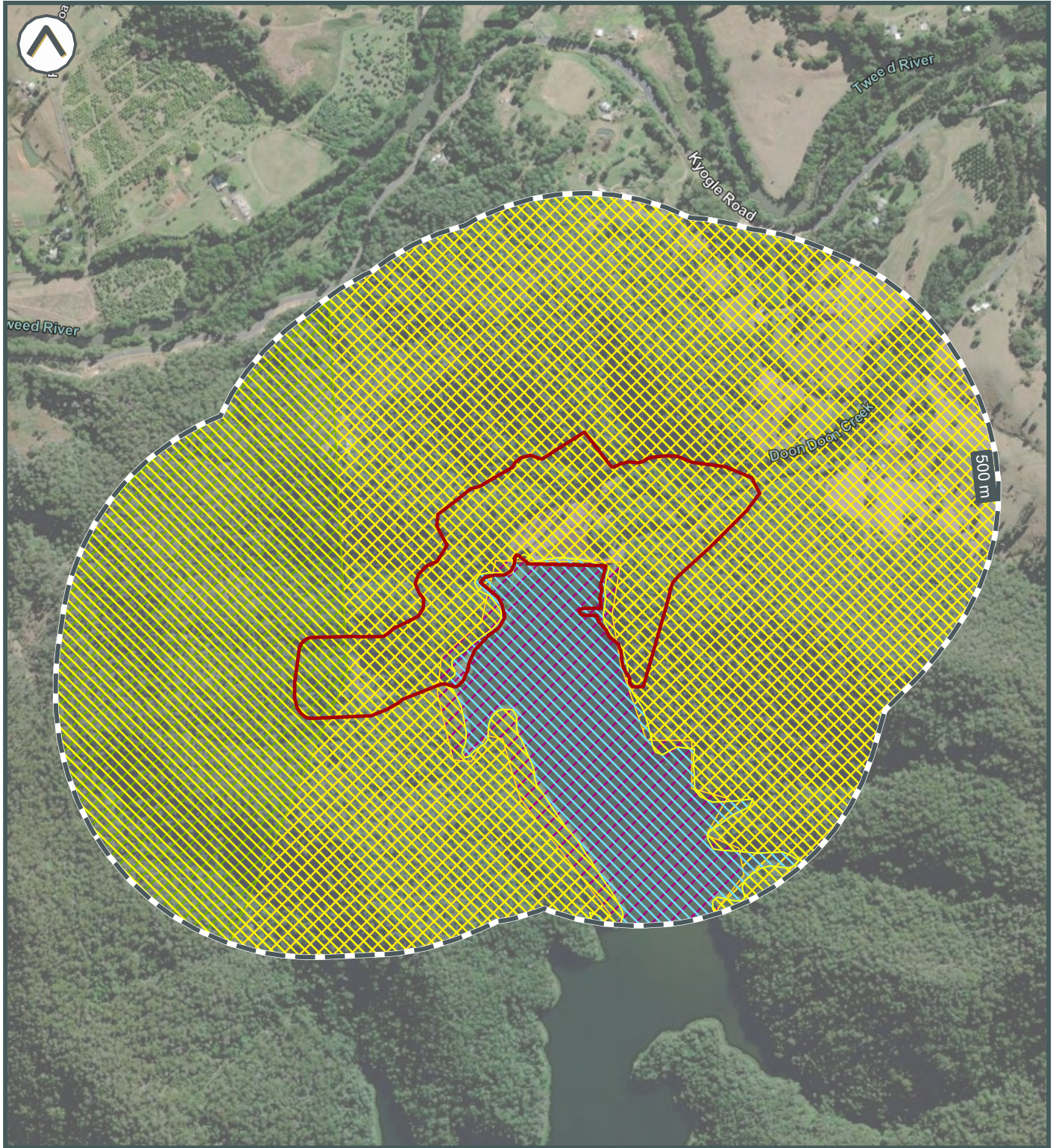
©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Radon Level (Bq/m³) 5-19
- Soil Landscape ERfh
- WATER



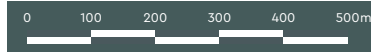


Acid Sulfate Soils



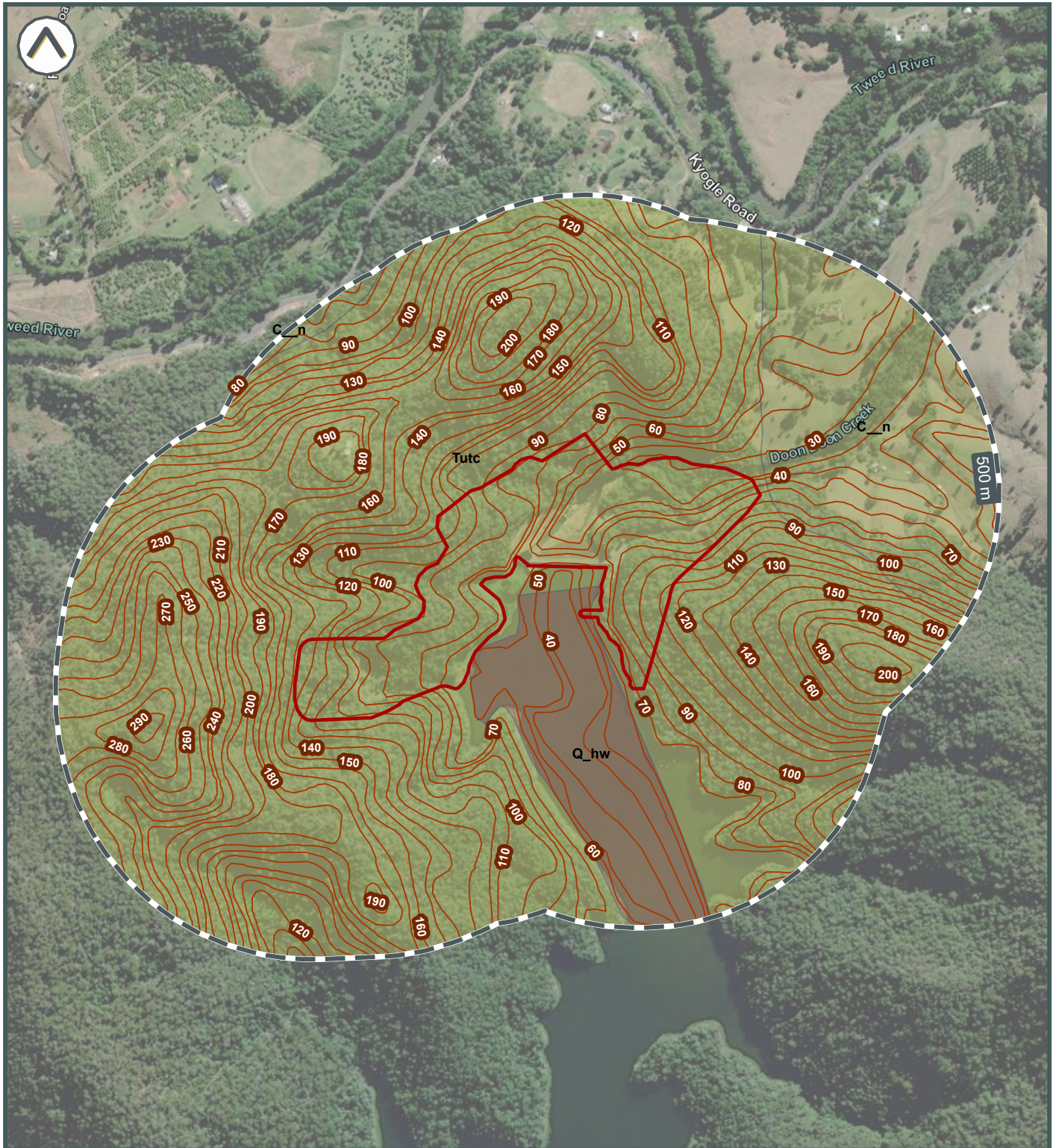
©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Extremely low probability of occurrence
- Inland Acid Sulfate Soils
- Atlas of Australian Acid Sulfate Soils
- High Probability of occurrence
- Moderate to severe limitations
- Low Probability of occurrence
- Water



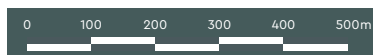


Geology and Topography



©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Topographic contour (m)
- Geology Unit C_n
- Geology Unit Tutc
- Geology Unit Q_hw

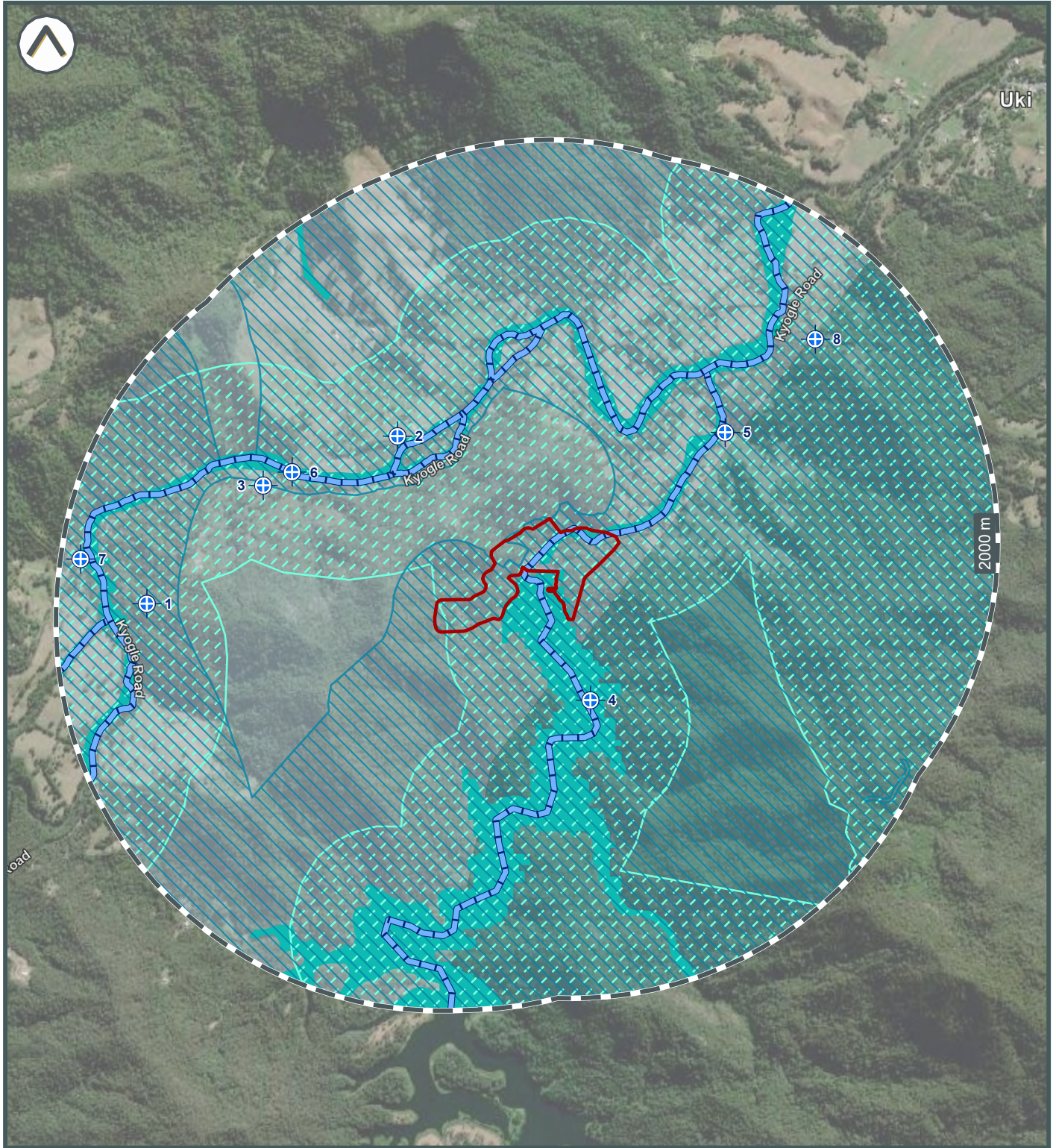




Hydrogeology and Groundwater Boreholes



Uki



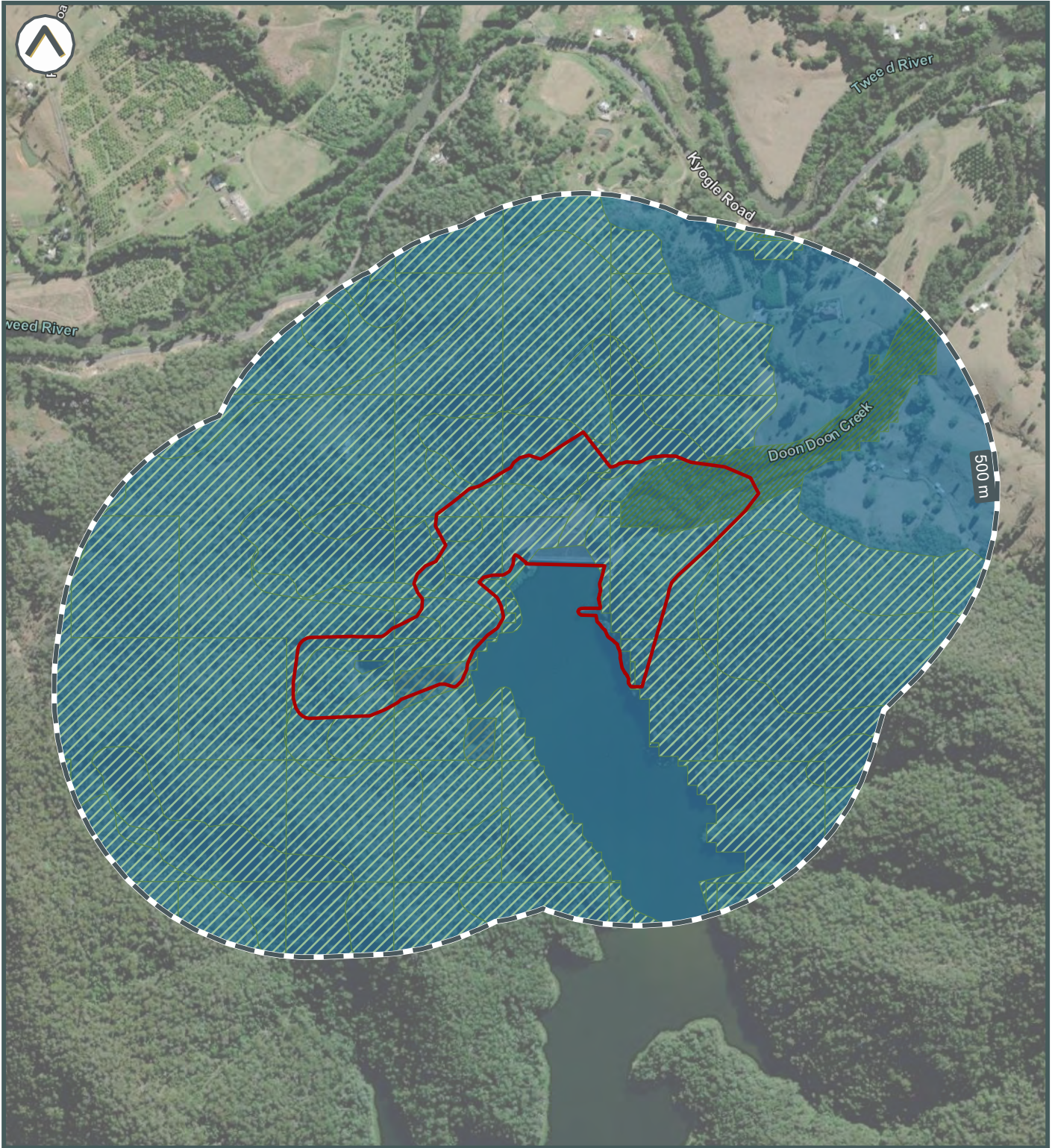
©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Groundwater bores
- Protected Riparian Corridor
- Drinking Water Catchments
- UPSS Environmentally Sensitive Zone
- Wetlands
- Aquifer type**
- Fractured or fissured, extensive aquifers of low to moderate productivity
- Porous, extensive highly productive aquifers





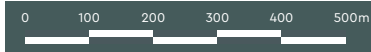
Hydrogeology and Other Boreholes



©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

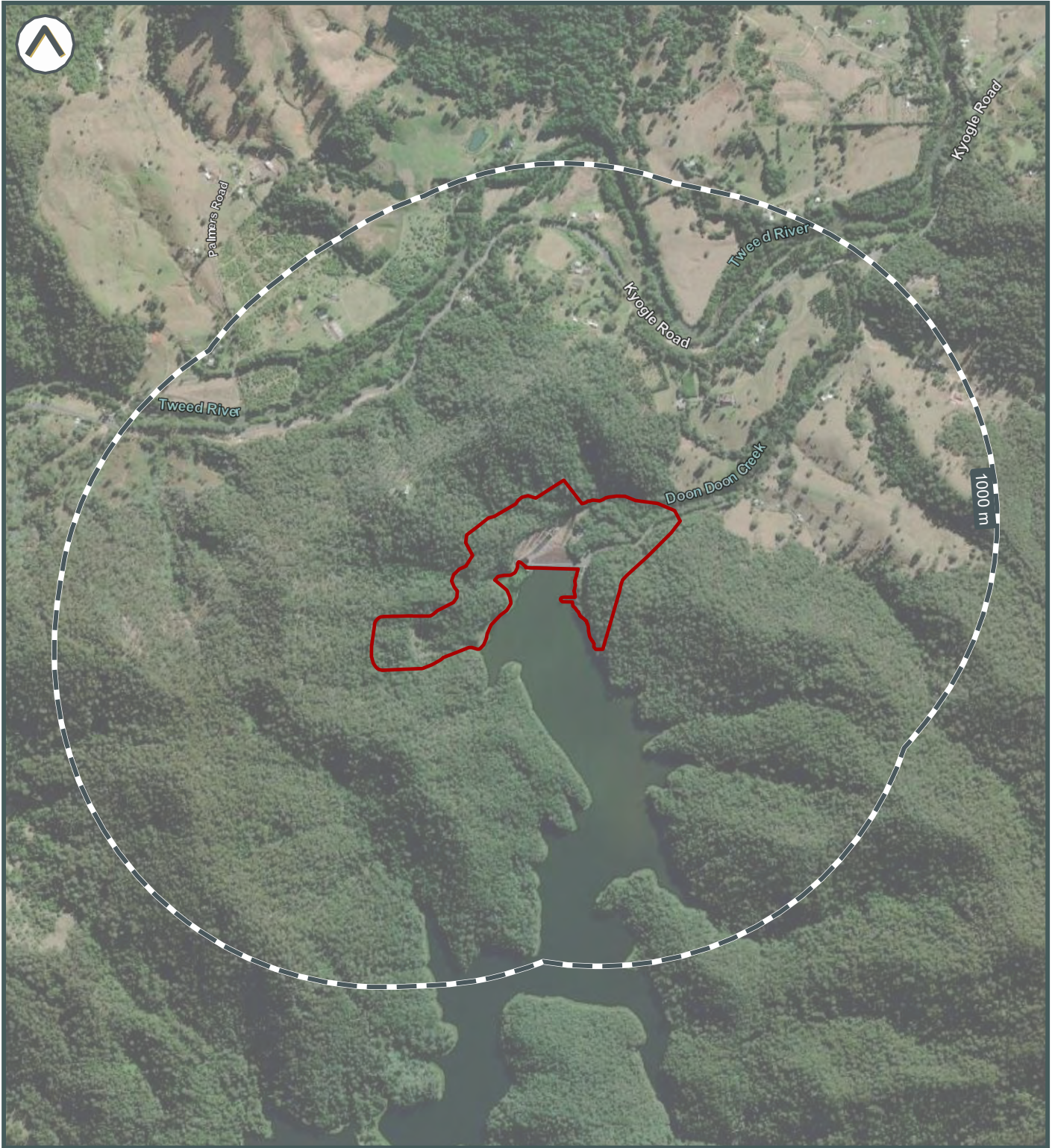
- Subject area
- Other borehole/monitoring well location
- Hydrogeologic Unit**
- Late Permian/Triassic sediments (porous media – consolidated)

- Ecosystems that rely on Subsurface presence of Groundwater**
- High potential GDE – from regional studies
 - Moderate potential GDE – from regional studies
 - Low potential GDE – from regional studies






Contaminated Land Public Register



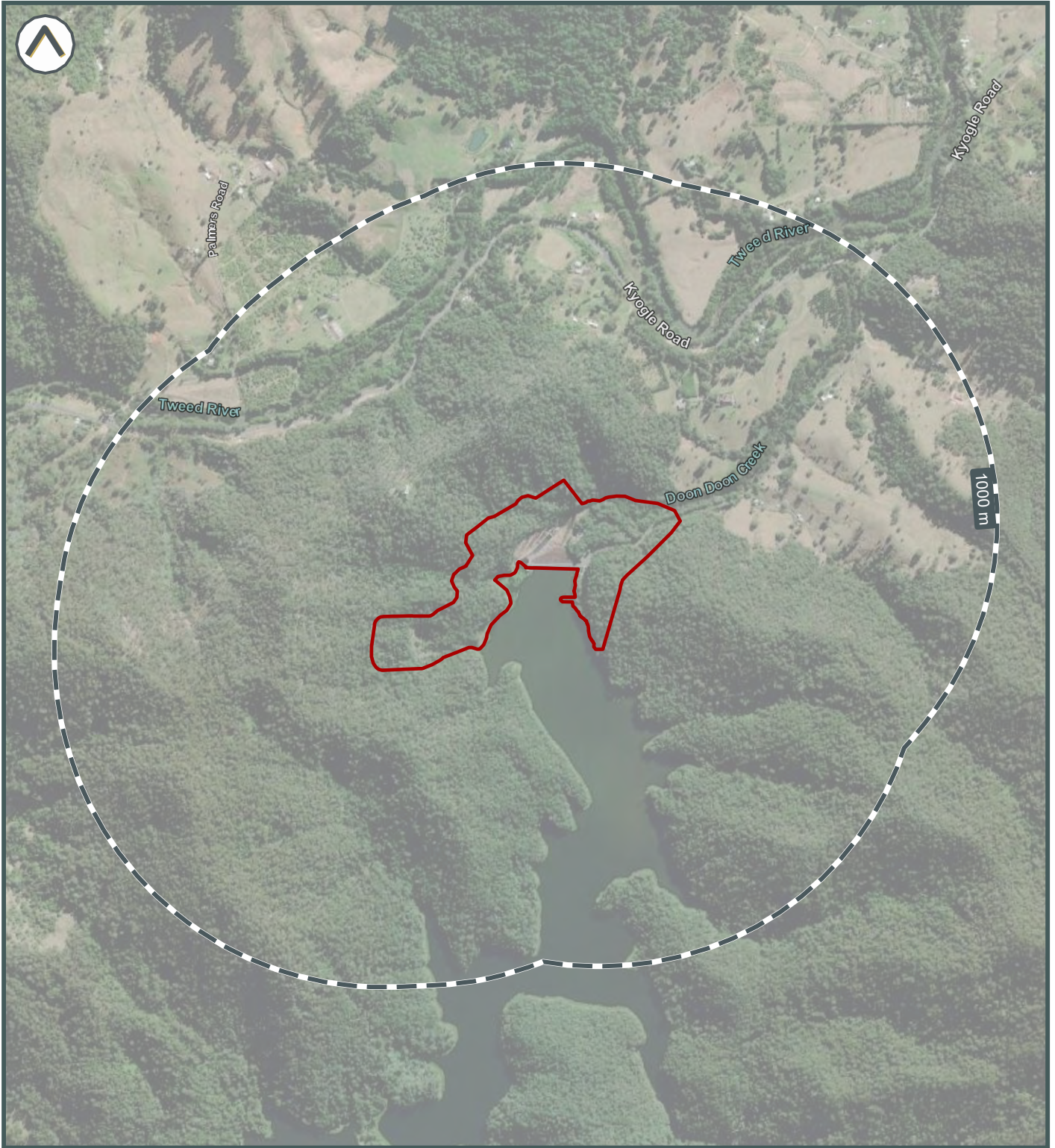
©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

 Subject area






Licences, Approvals & Assessments



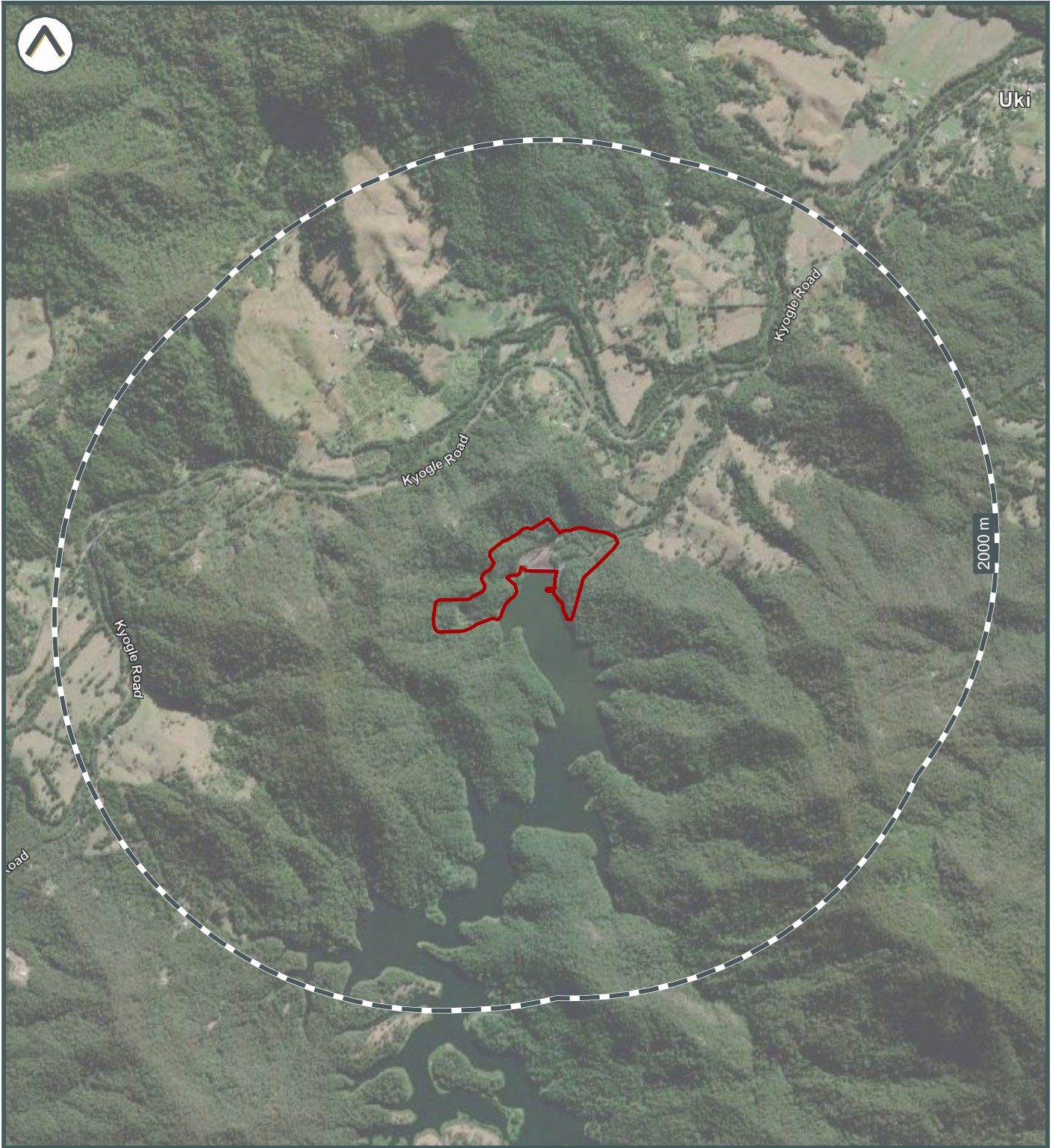
©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

 Subject area




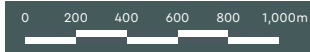


Sites Regulated by Other Jurisdictional Body



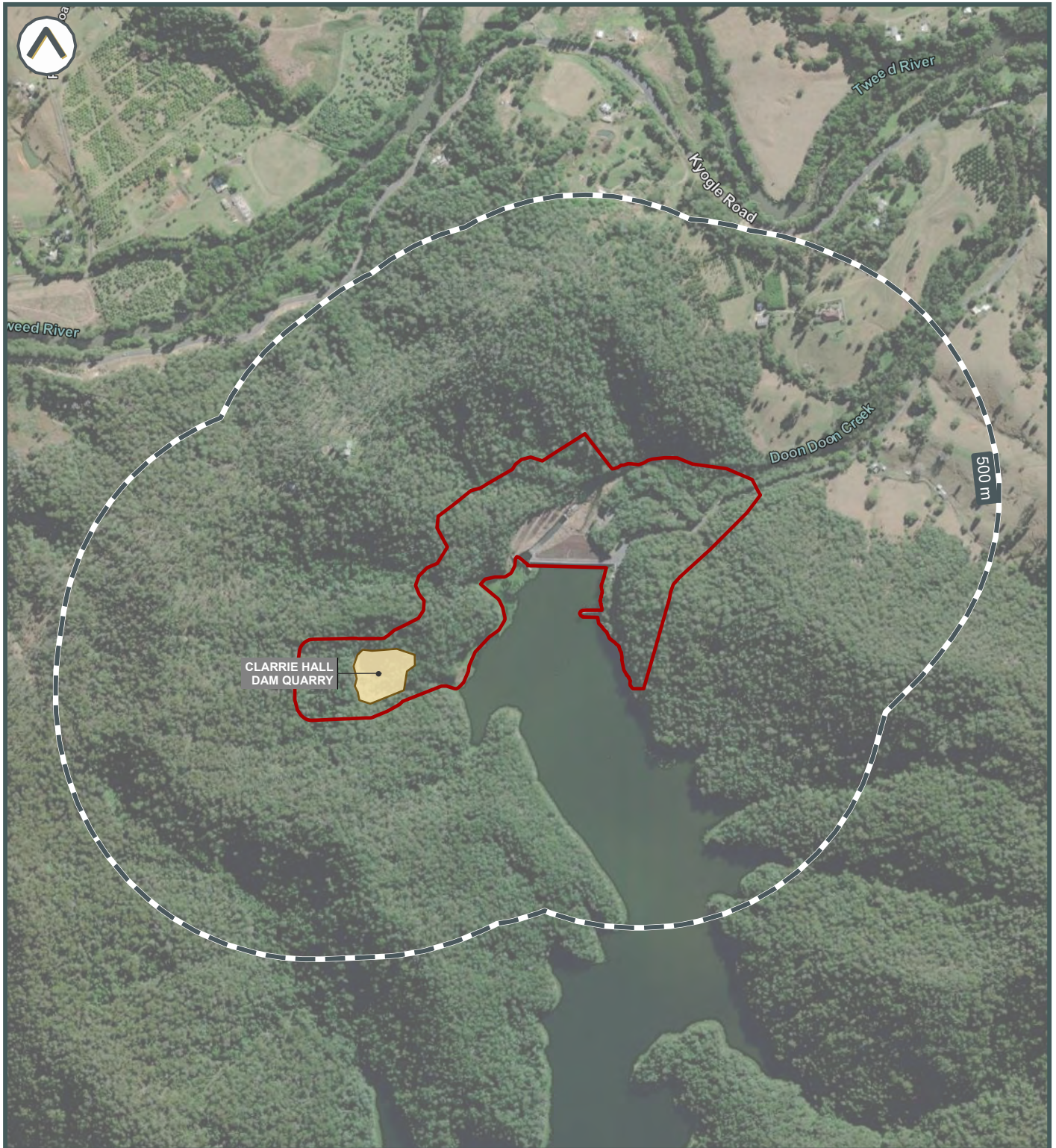
©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

 Subject area





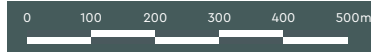


Other Potential Pollution Sources



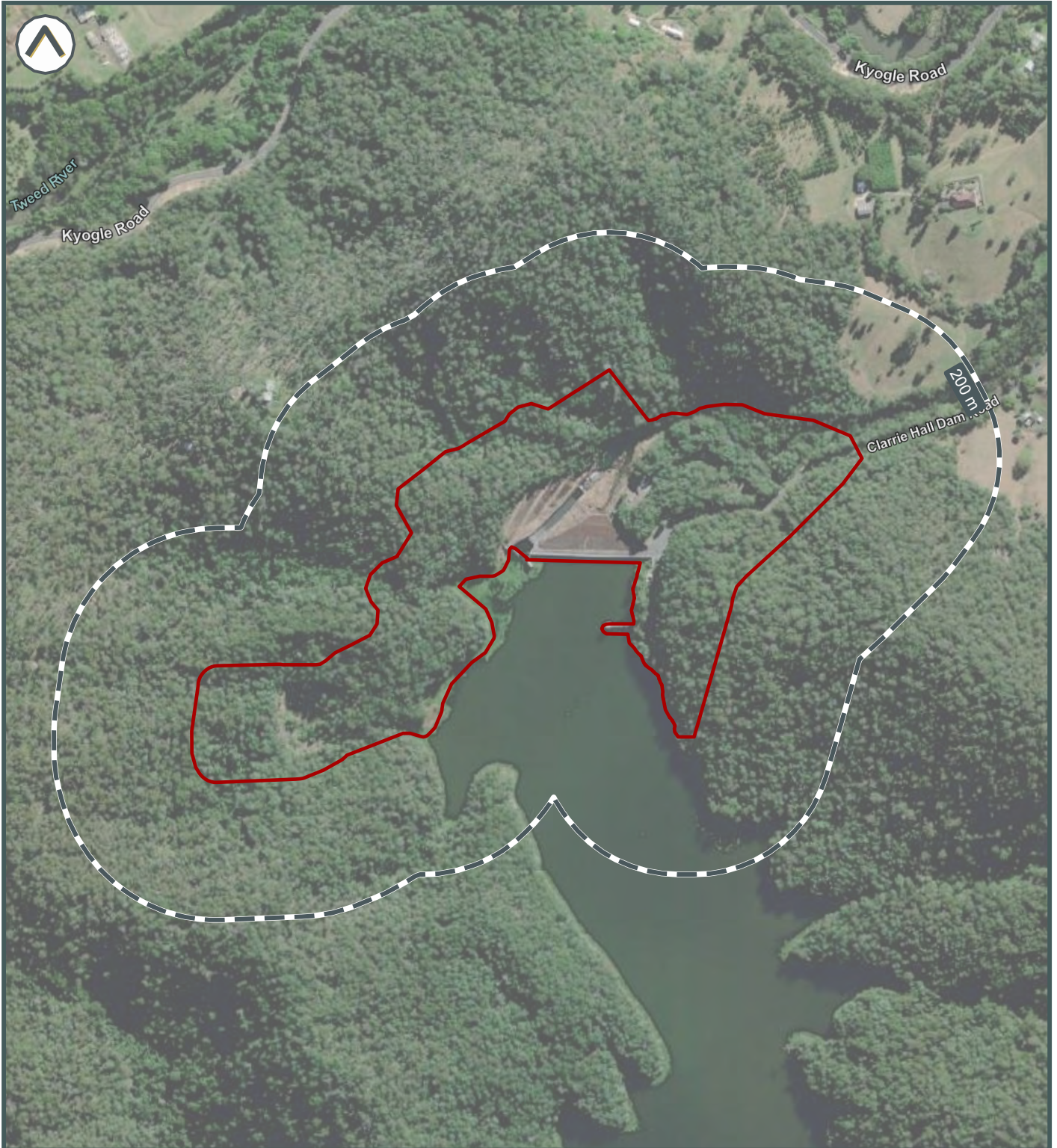
©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

-  Subject area
-  Derelict Quarries






Current Potentially Contaminating Activities (PCAs)



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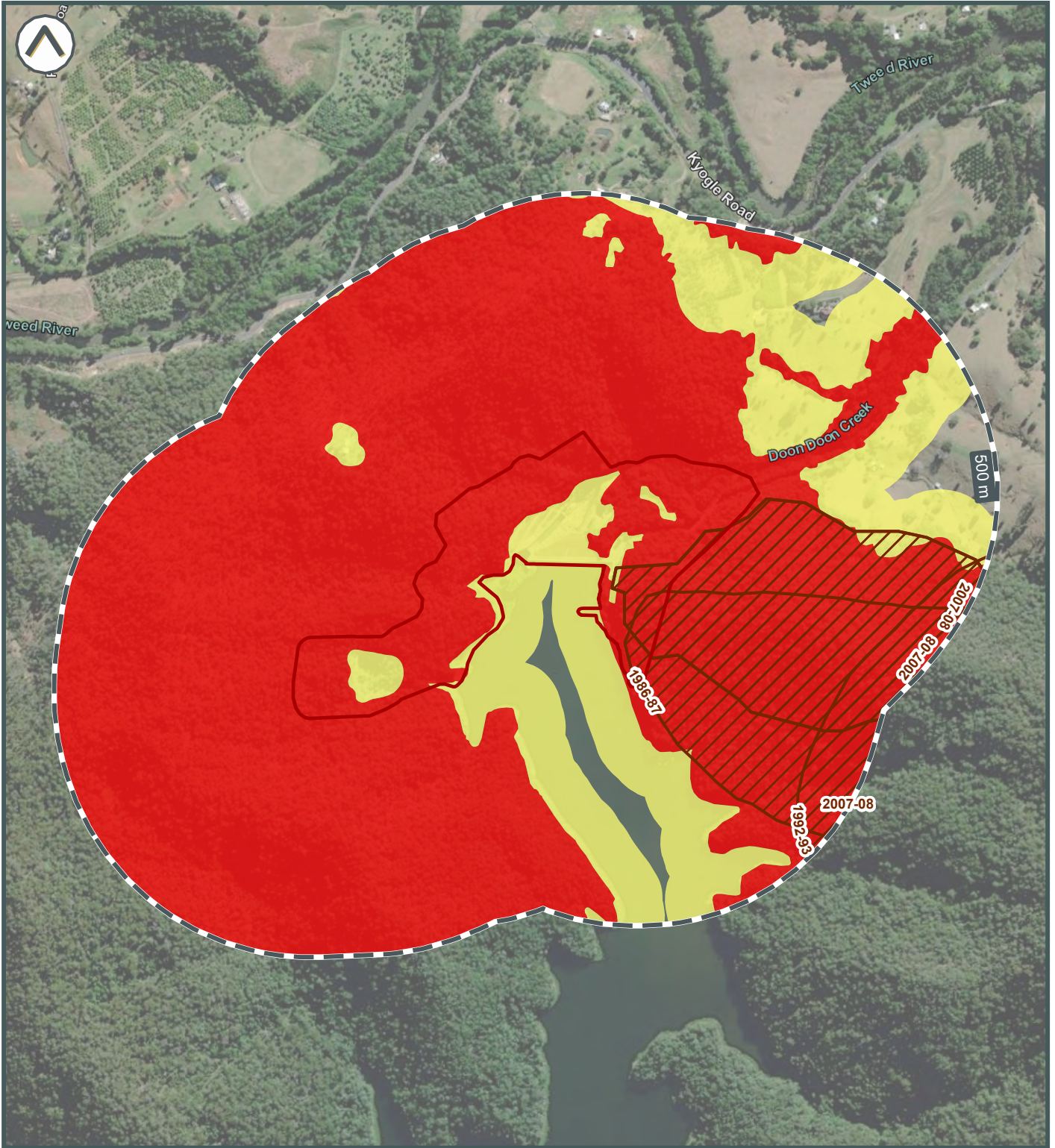
 Subject area

Data is current as when this report was created. However due to the turnover of business locations, some addresses may be former.



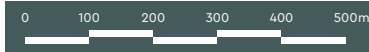


Fire Hazards



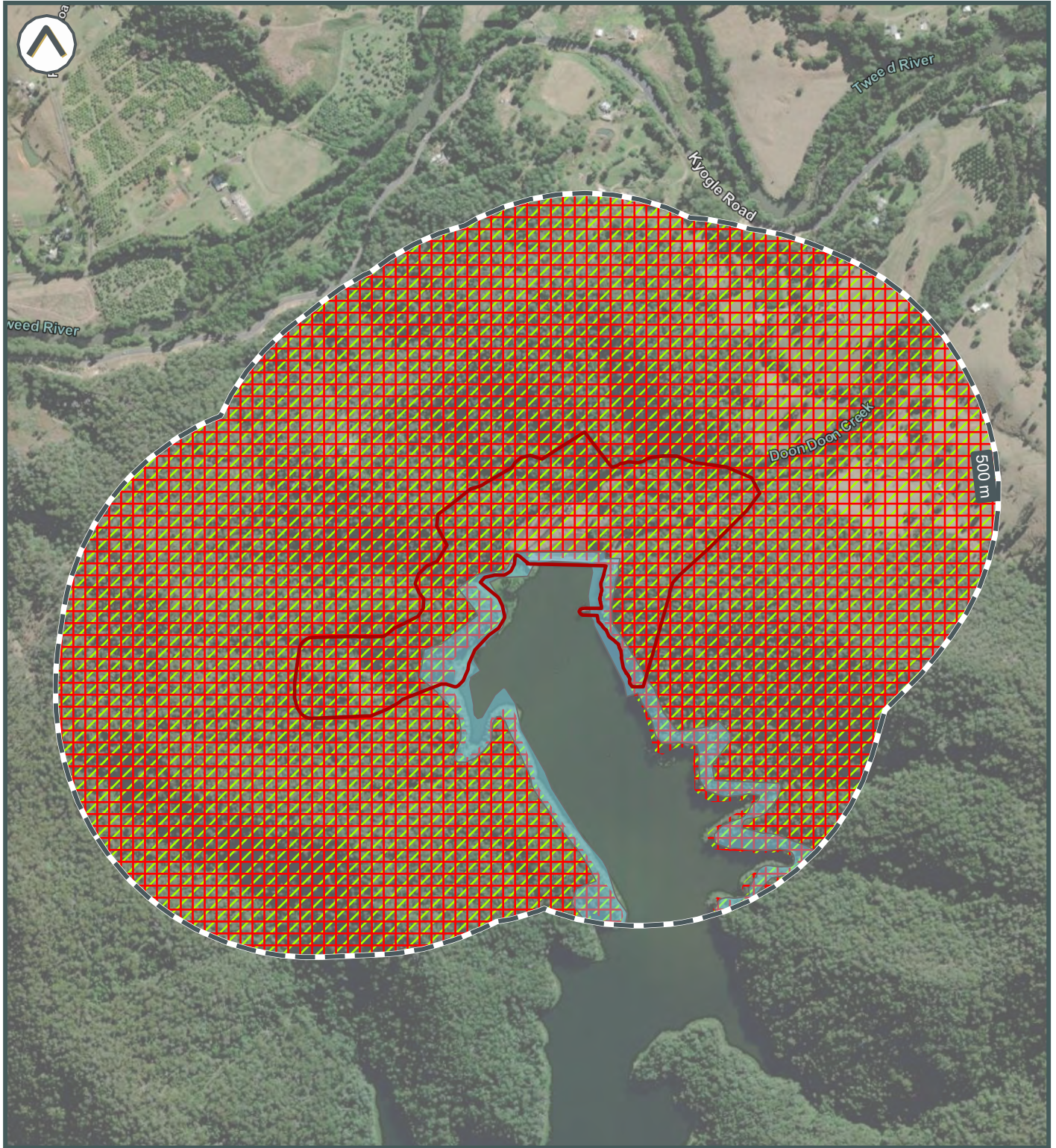
©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

-  Subject area
-  Vegetation Buffer
-  Fire History
-  Bushfire Prone Area
-  Vegetation Category 1



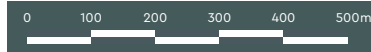


Flood and Erosion Hazards



©2023 Land Insight (LI) www.landinsight.co | 15/03/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Flood
- Inundation
- Wind Erosion Risk
- Low
- Water Erosion Risk
- Water Erosion Risk, Very High
- Landslip Erosion Risk
- Landslip Erosion Risk, Very High





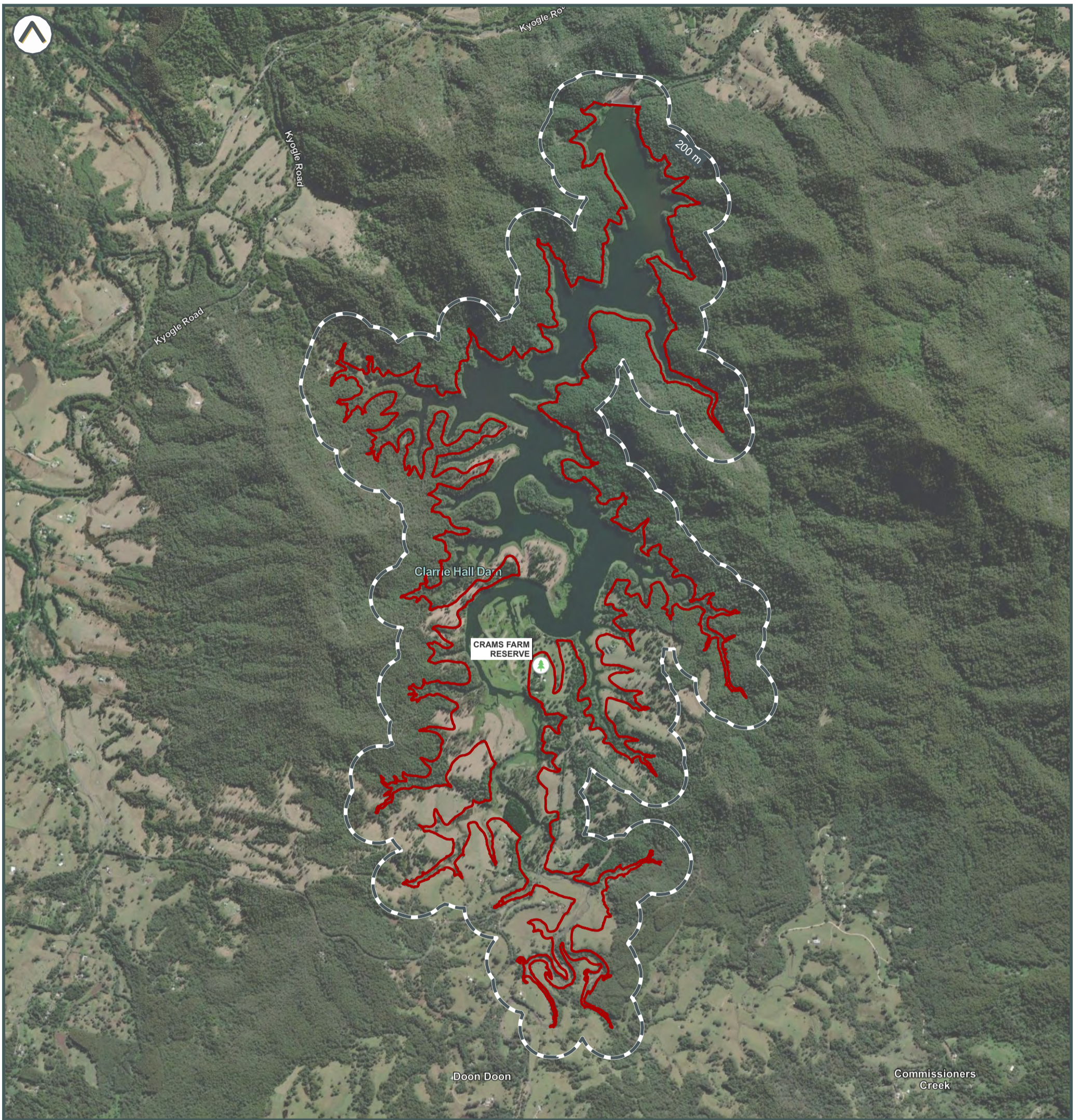
Appendix A

REPORT MAPS

Clarrie Hall Dam
Terragon, NSW



Subject Area and Sensitive Receptors



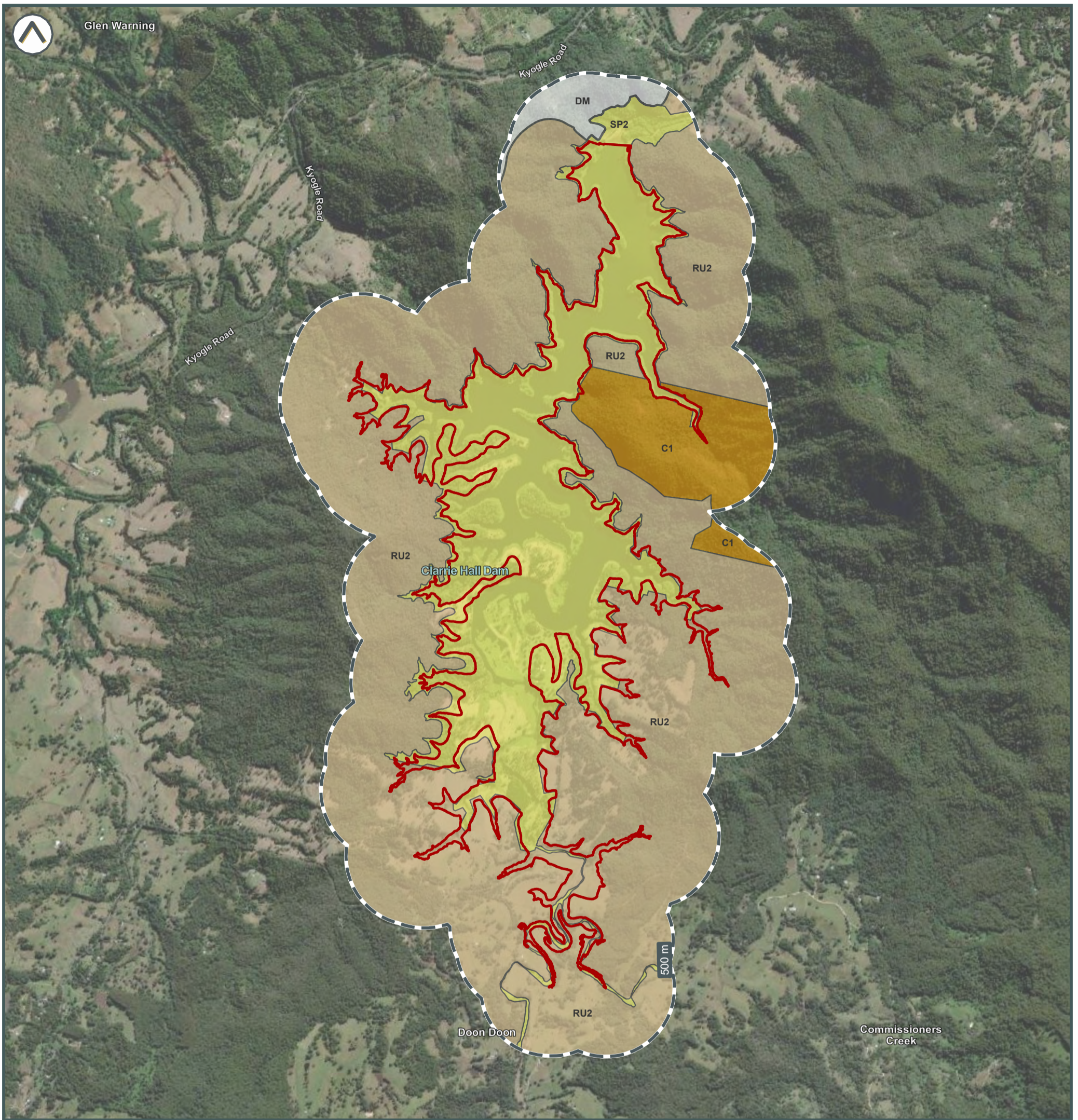
©2023 Land Insight (U) www.landinsight.co | Data source: Please refer to 'Digital Data Sources' in the Product Guide

Subject area
 Type
🌲 Parks





Zoning

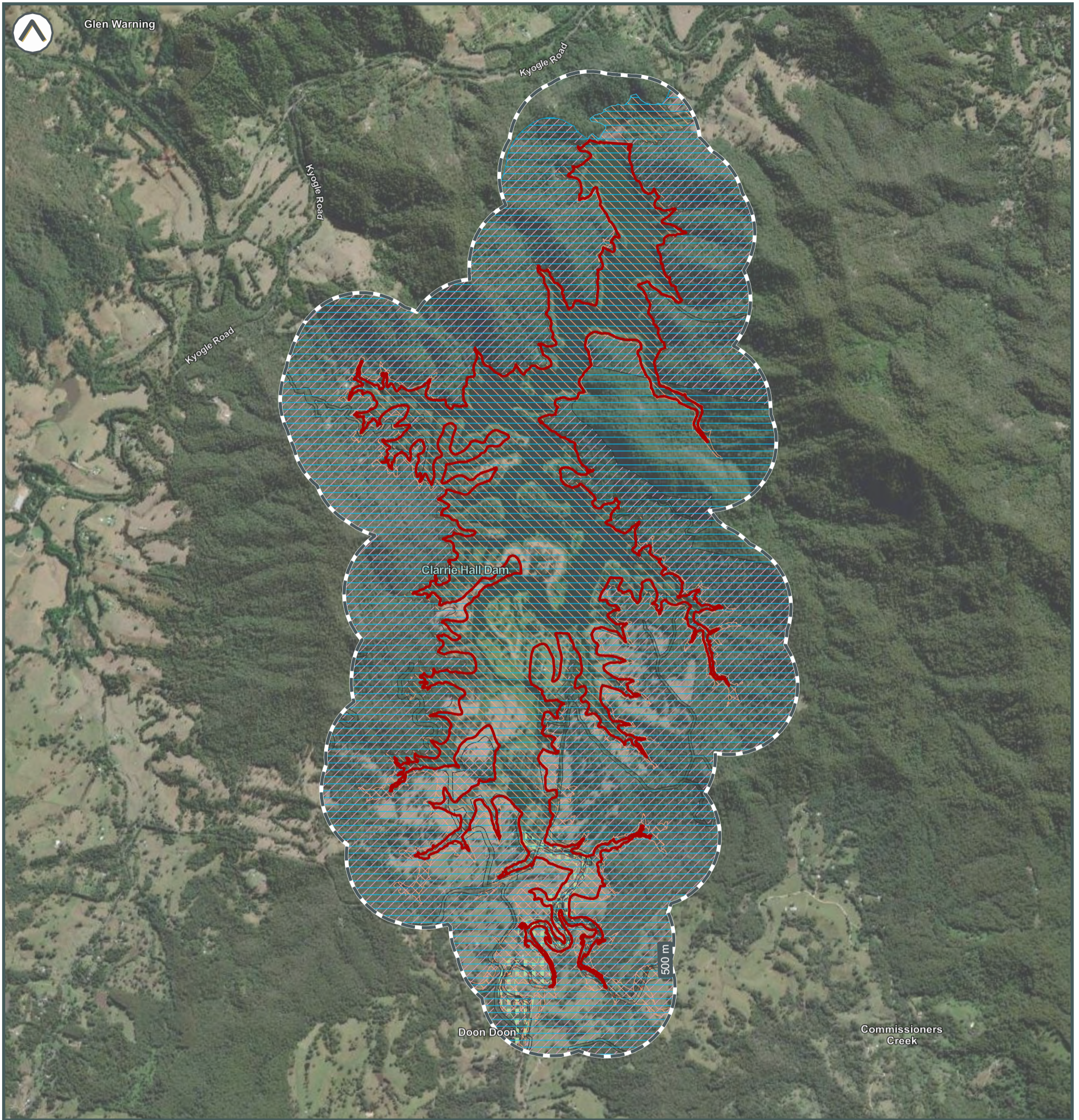


- Subject area
- Land Zoning**
- C1 | National Parks and Nature Reserves
- DM | Deferred Matter
- RU2 | Rural Landscape Zone
- SP2 | Special Purposes Zone - Infrastructure





Planning Overlays



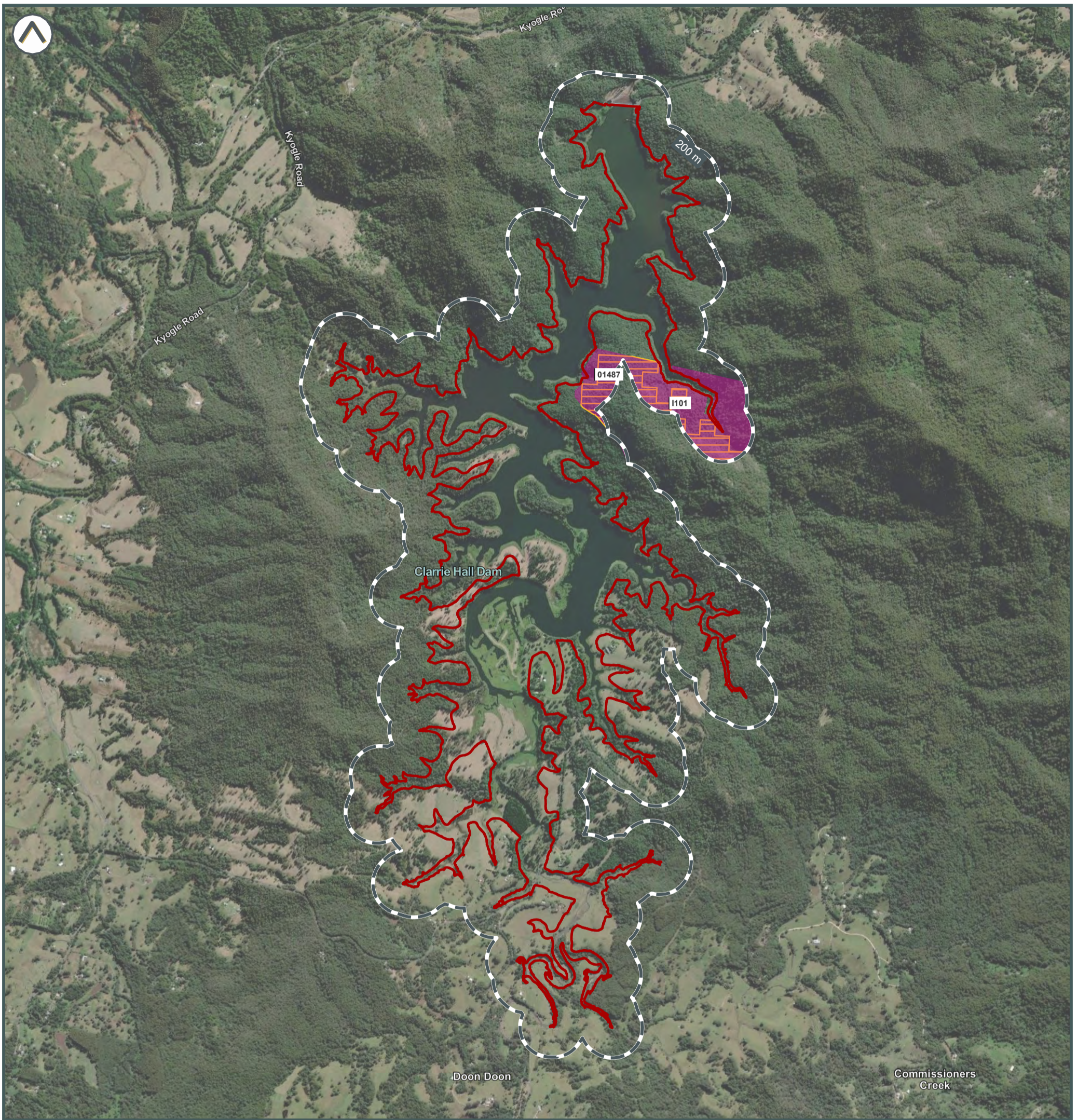
©2023 Land Insight (U) www.landinsight.co | 23/05/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Drinking Water Catchment
- Height of Building
- Local Provisions
- Lot Size
- Strategic Agricultural Land





Heritage



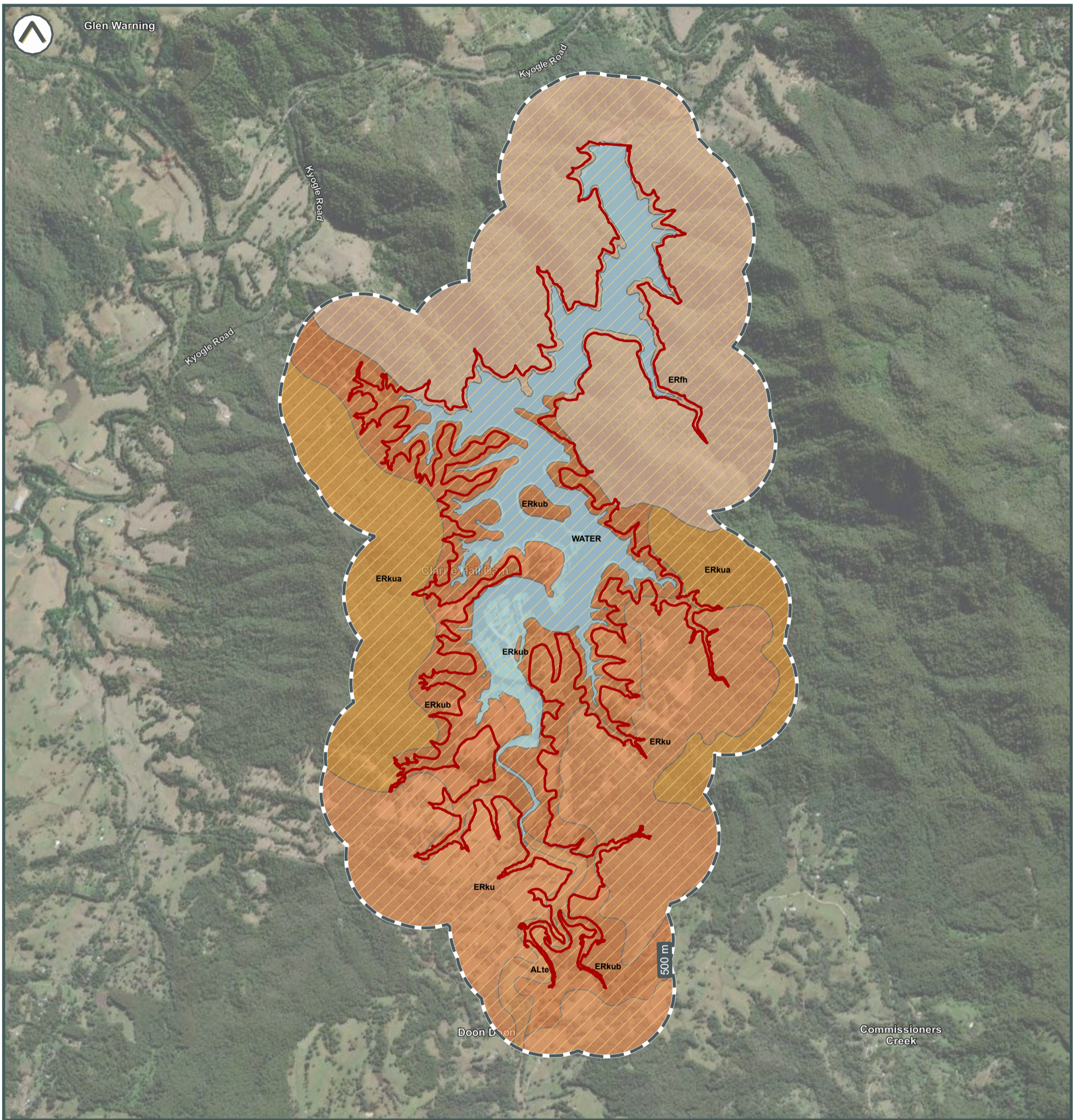
©2023 Land Insight (U) www.landinsight.co | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- State and Local Heritage Registers
- Heritage Register
- State Heritage Register

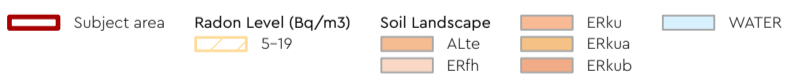




Soil Landscape and Salinity



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Acid Sulfate Soils



Glen Warning

Kyogle Road

Kyogle Road

Kyogle Road

Clarrie Hall Dam

Doon Doon

Commissioners Creek

500 m

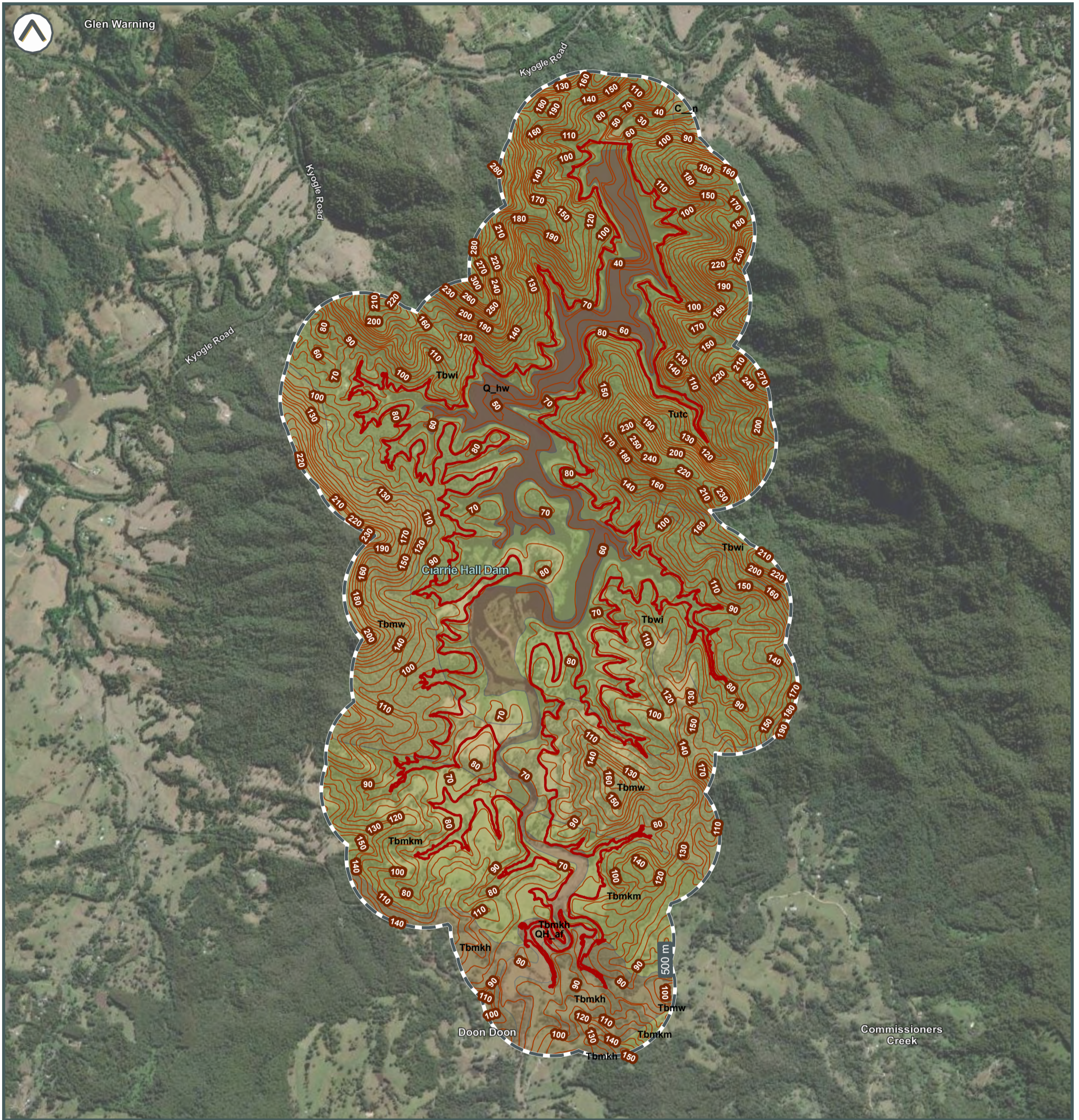
©2023 Land Insight (U) www.landinsight.co | 23/05/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Inland Acid Sulfate Soils**
- Moderate limitations
- Moderate to severe limitations
- Water
- Atlas of Australian Acid Sulfate Soils**
- High Probability of occurrence
- Low Probability of occurrence
- Extremely low probability of occurrence

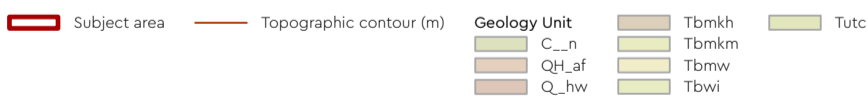




Geology and Topography

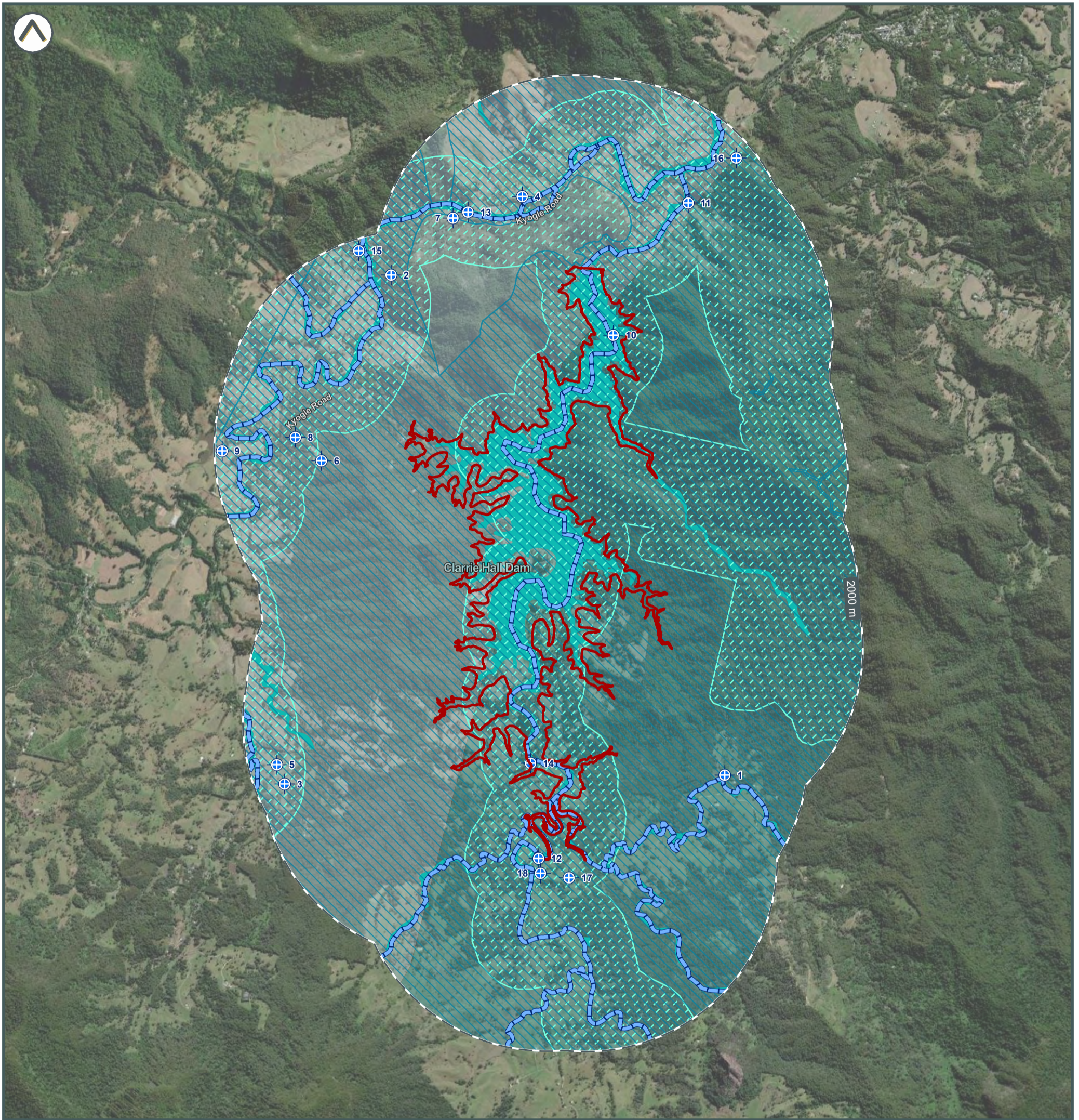


©2023 Land Insight (U) www.landinsight.co | 23/05/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide





Hydrogeology and Groundwater Bores



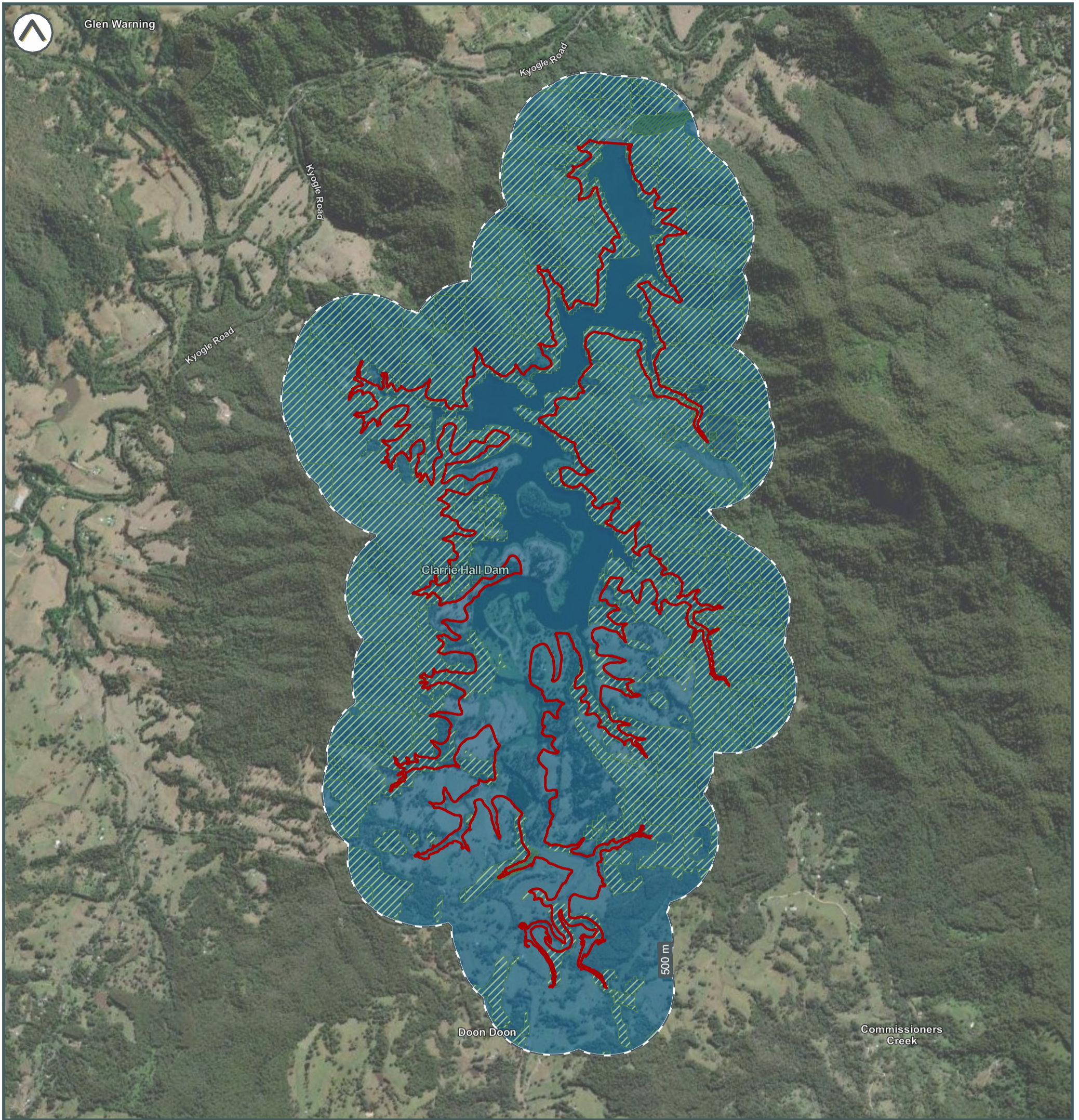
©2023 Land Insight (U) www.landinsight.co | 23/05/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- UPSS Environmentally Sensitive Zone
- Groundwater bores
- Protected Riparian Corridor
- Drinking Water Catchments
- Wetlands
- Aquifer type**
- Fractured or fissured, extensive aquifers of low to moderate productivity
- Porous, extensive highly productive aquifers





Hydrogeology and Other Boreholes



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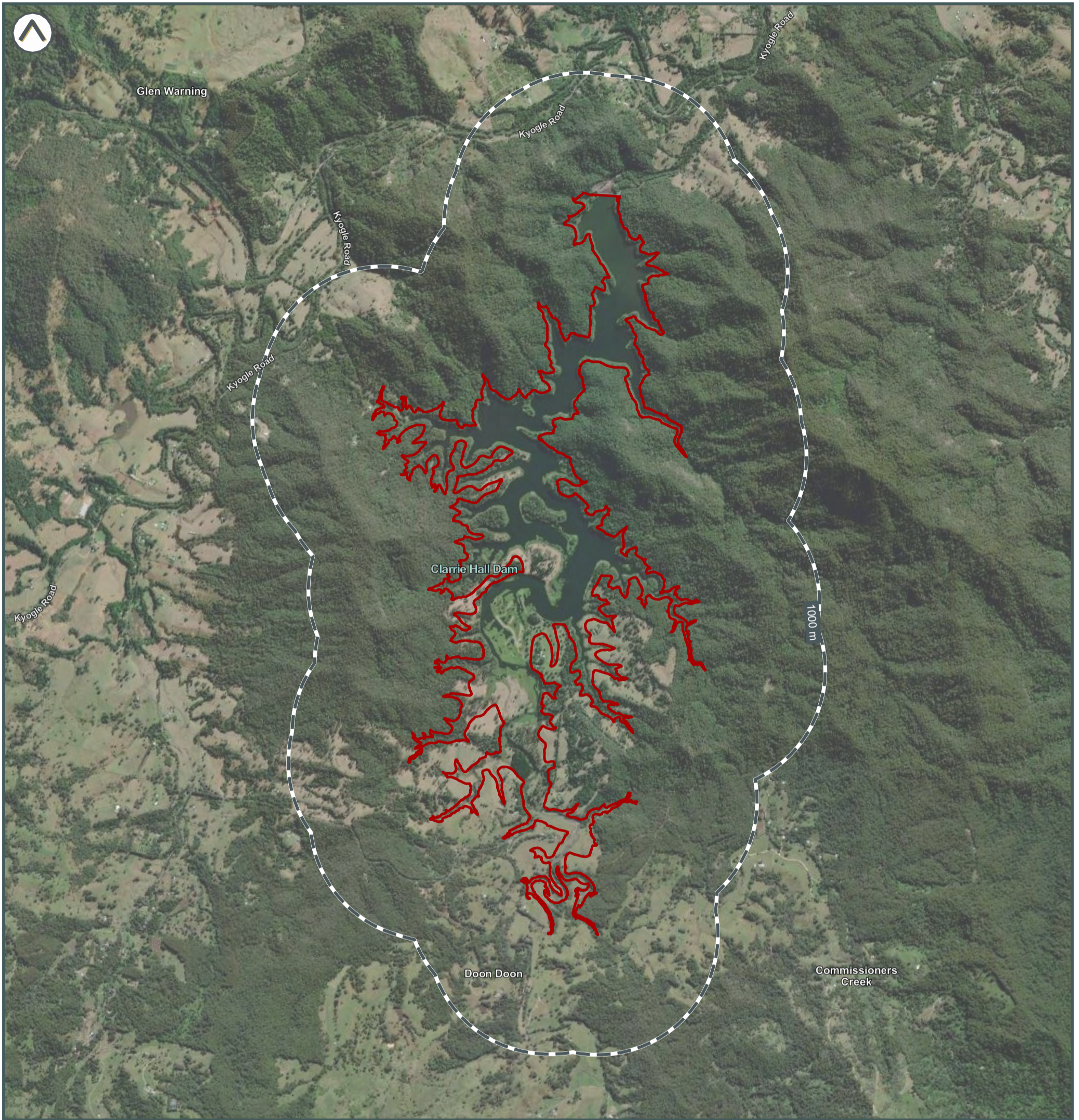
- Subject area
- Hydrogeologic Unit**
- Late Permian/Triassic sediments (porous media - consolidated)
- Ecosystems that rely on Subsurface presence of Groundwater**
- High potential GDE - from regional studies
- Moderate potential GDE - from regional studies
- Low potential GDE - from regional studies



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Contaminated Land Public Register



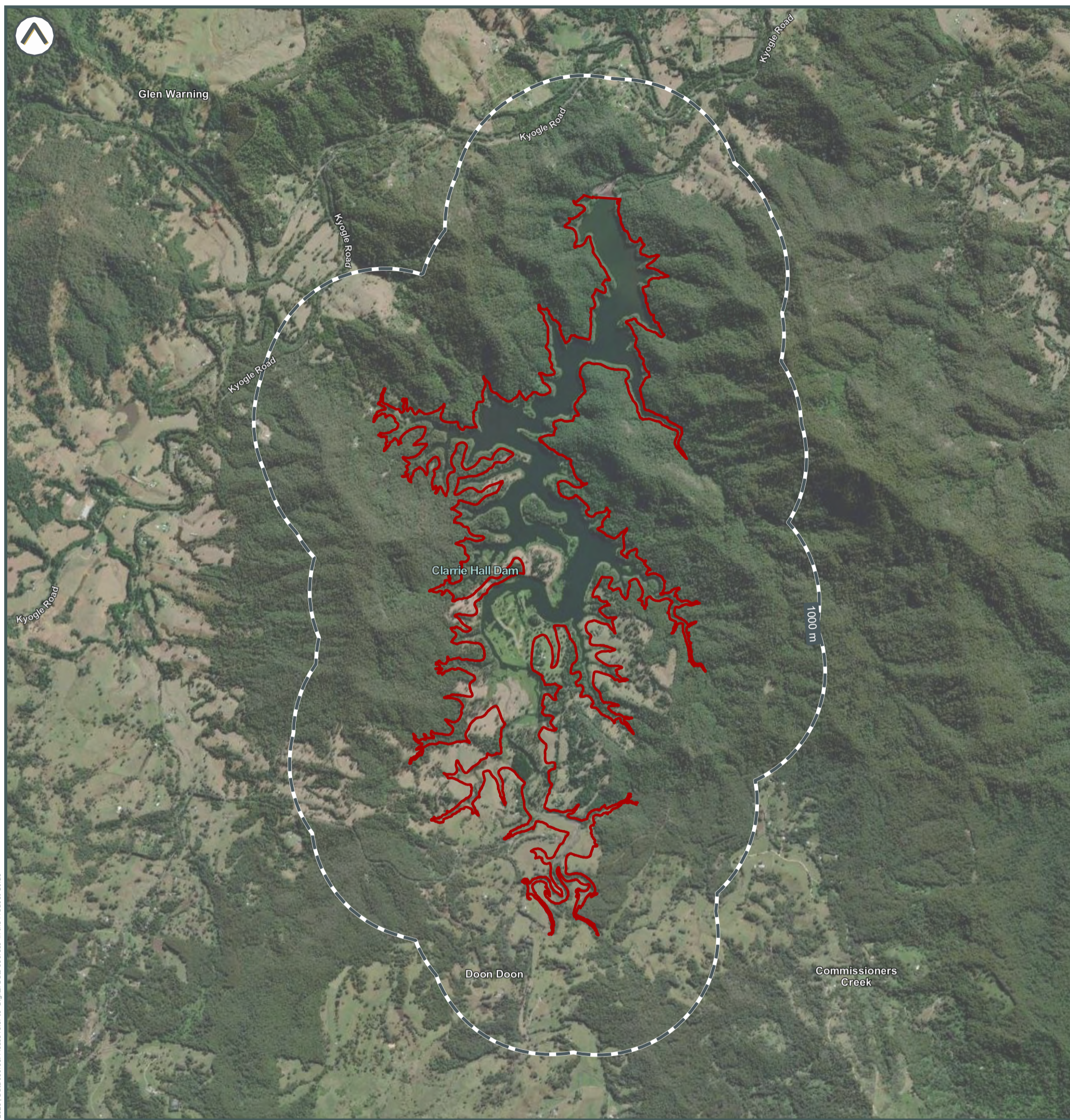
©2023 Land Insight (U) www.landinsight.co | 23/05/2023 | Data source: 'Digital Data Sources' in the Product Guide

Subject area





Licences, Approvals & Assessments



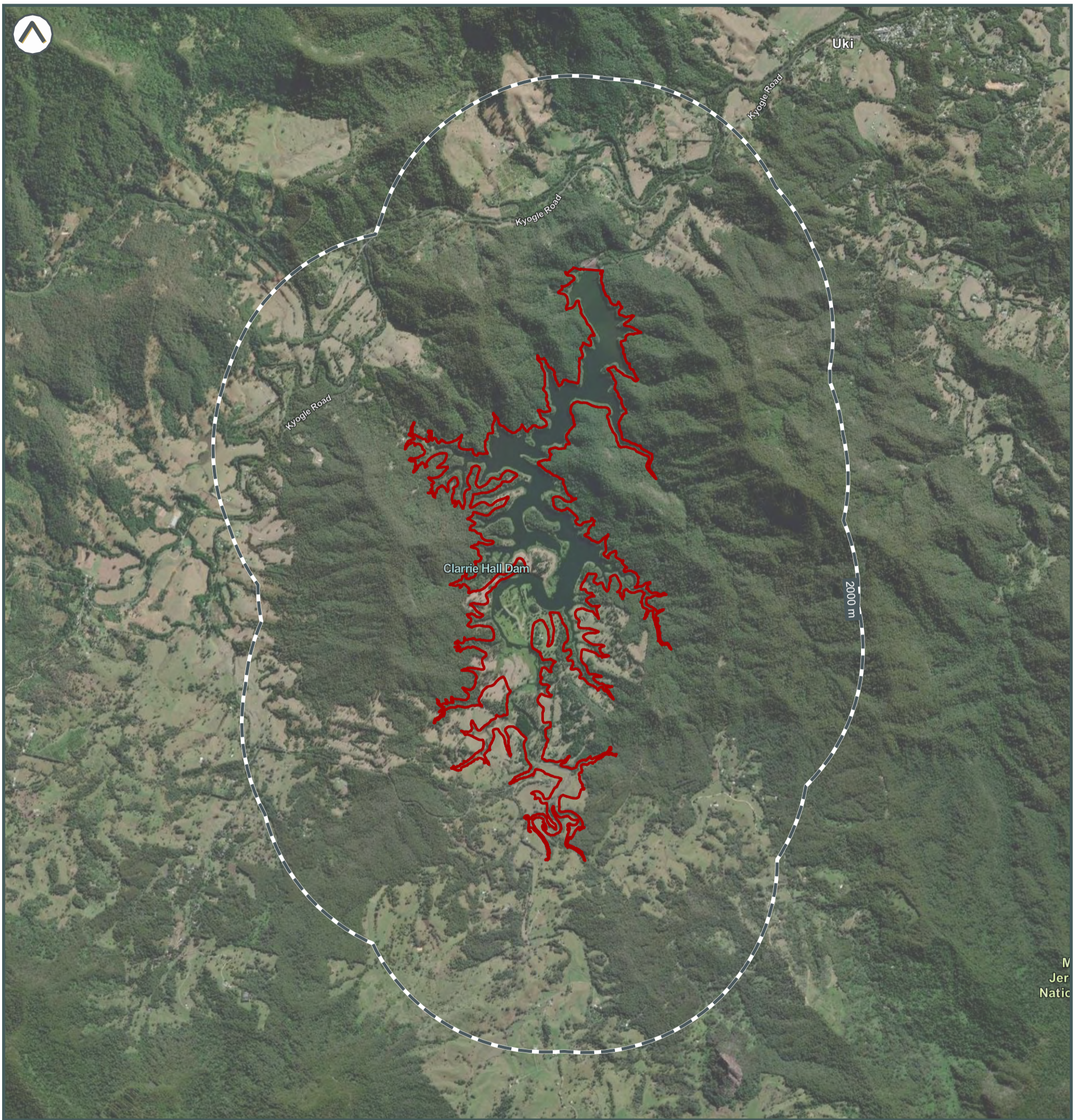
Subject area

©2023 Land Insight (U) www.landinsight.co | Data source: Please refer to 'Digital Data Sources' in the Product Guide





Sites Regulated by Other Jurisdictional Body



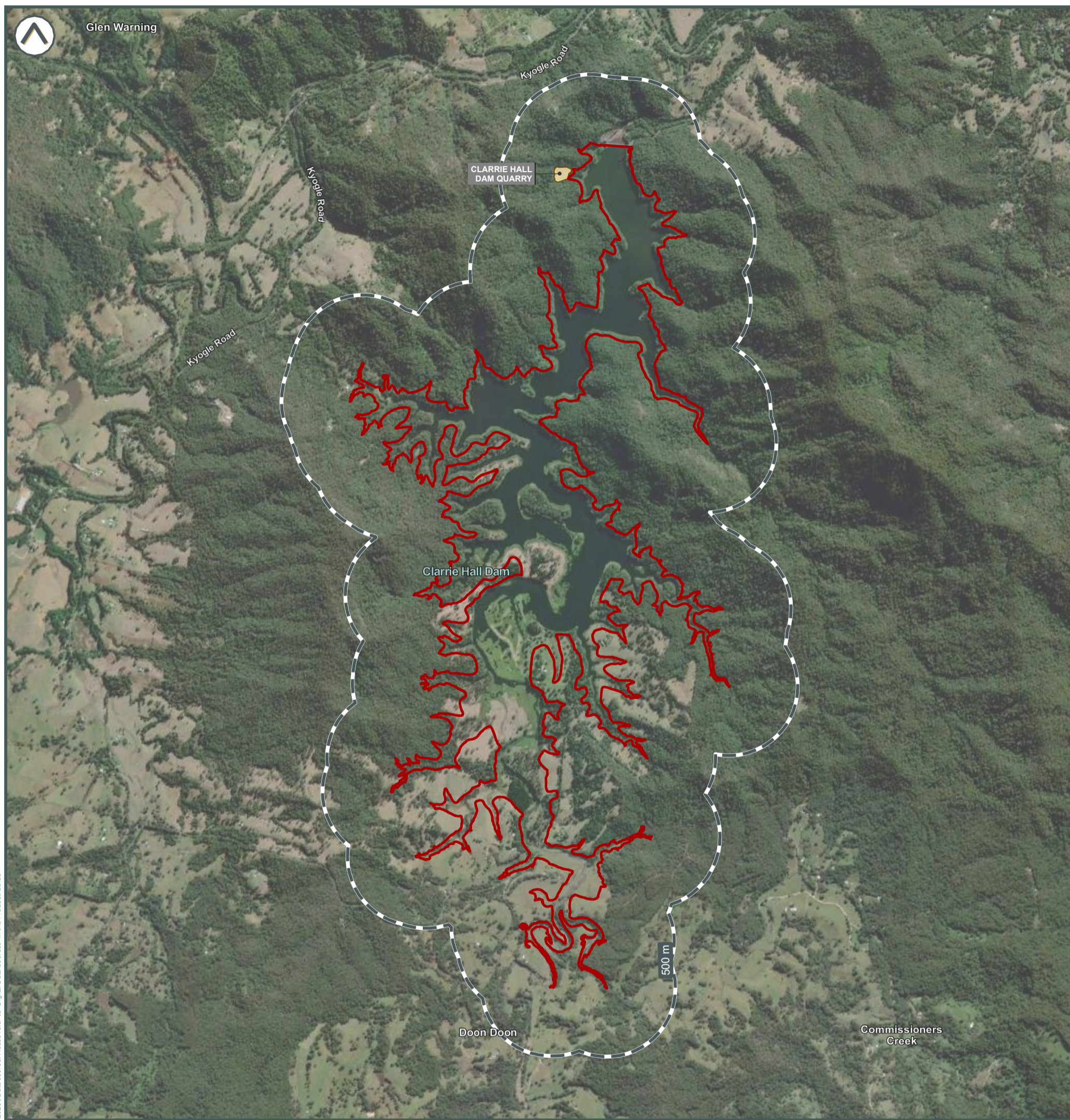
Subject area

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Other Potential Pollution Sources



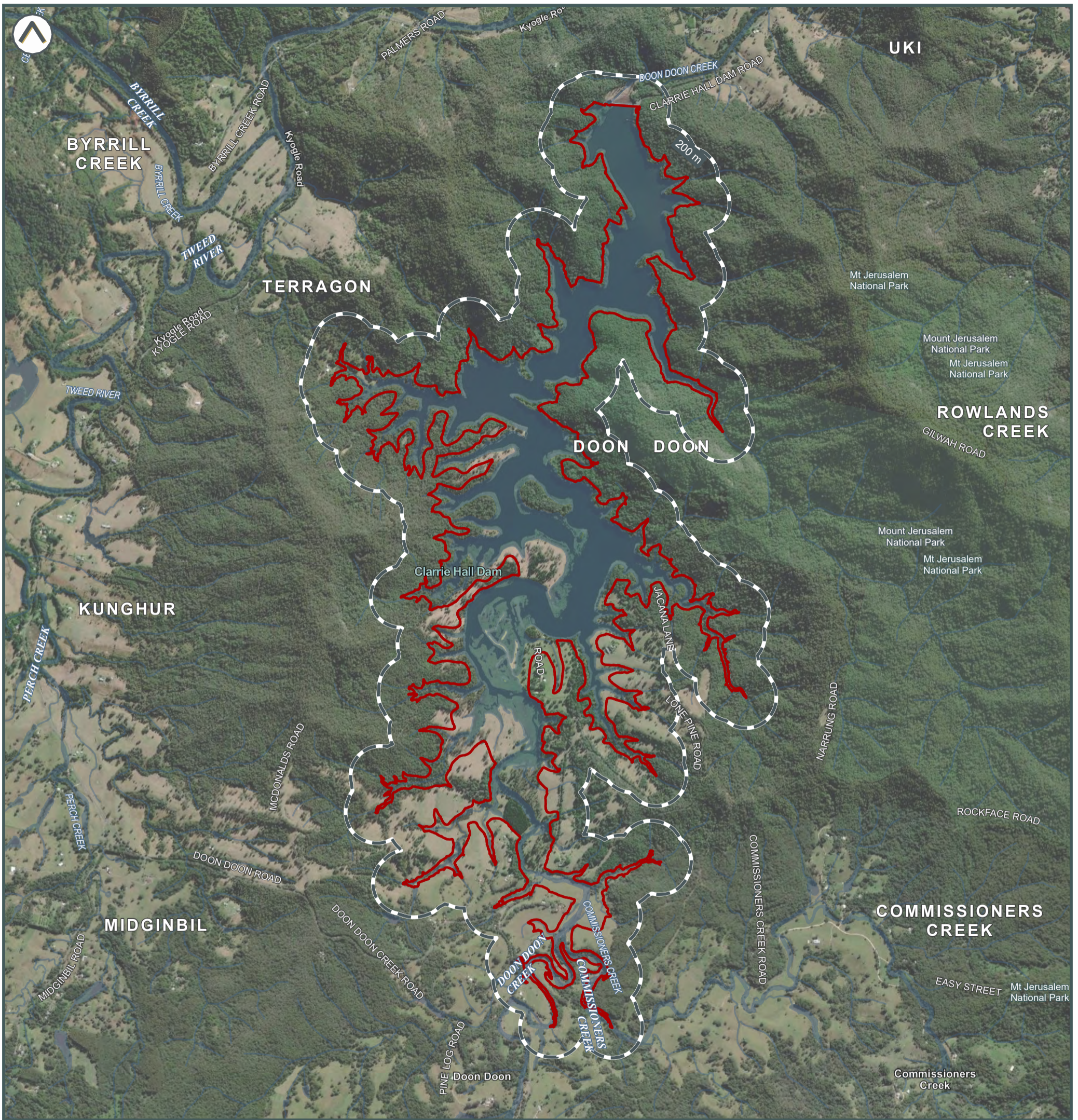
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- ▬ Subject area
- ▬ Derelict Quarries





Former Potentially Contaminated Land



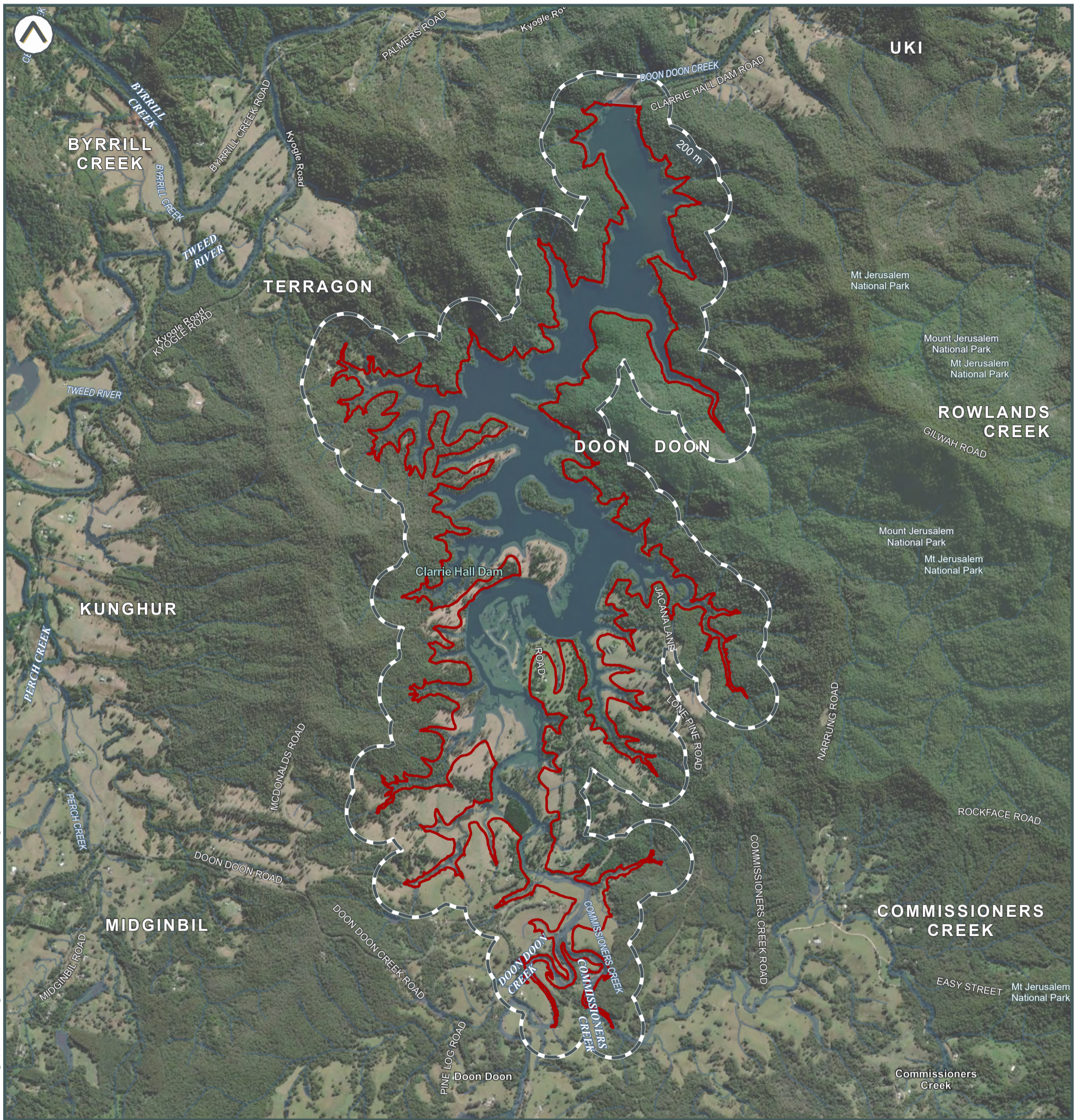
©2023 Land Insight (U) www.landinsight.co | Data source: Please refer to 'Digital Data Sources' in the Product Guide

Subject area





Potentially Contaminating Activities (PCAs)



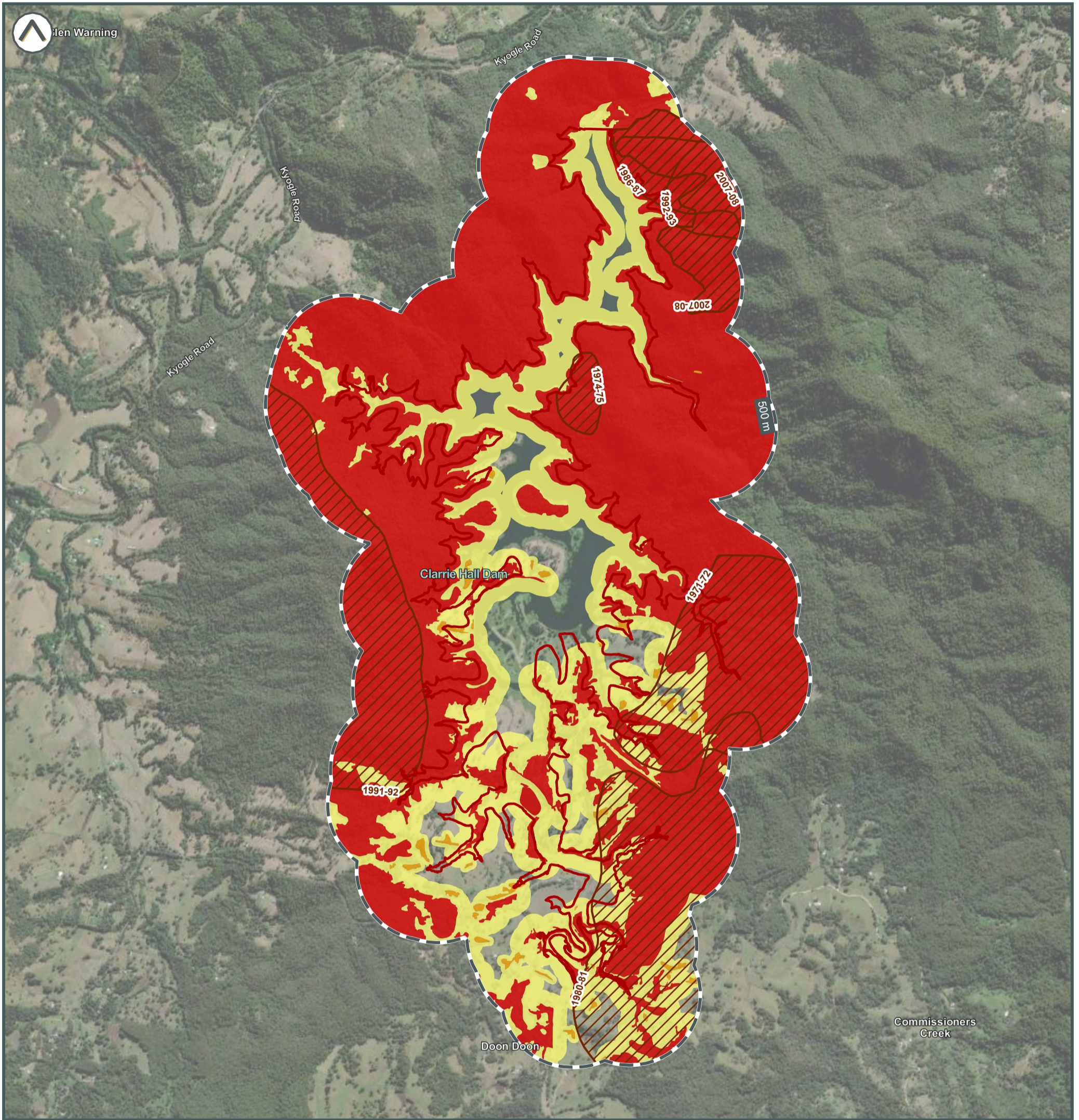
©2023 Land Insight (U) www.landinsight.co | Data source: Please refer to 'Digital Data Sources' in the Product Guide

Subject area





Warning

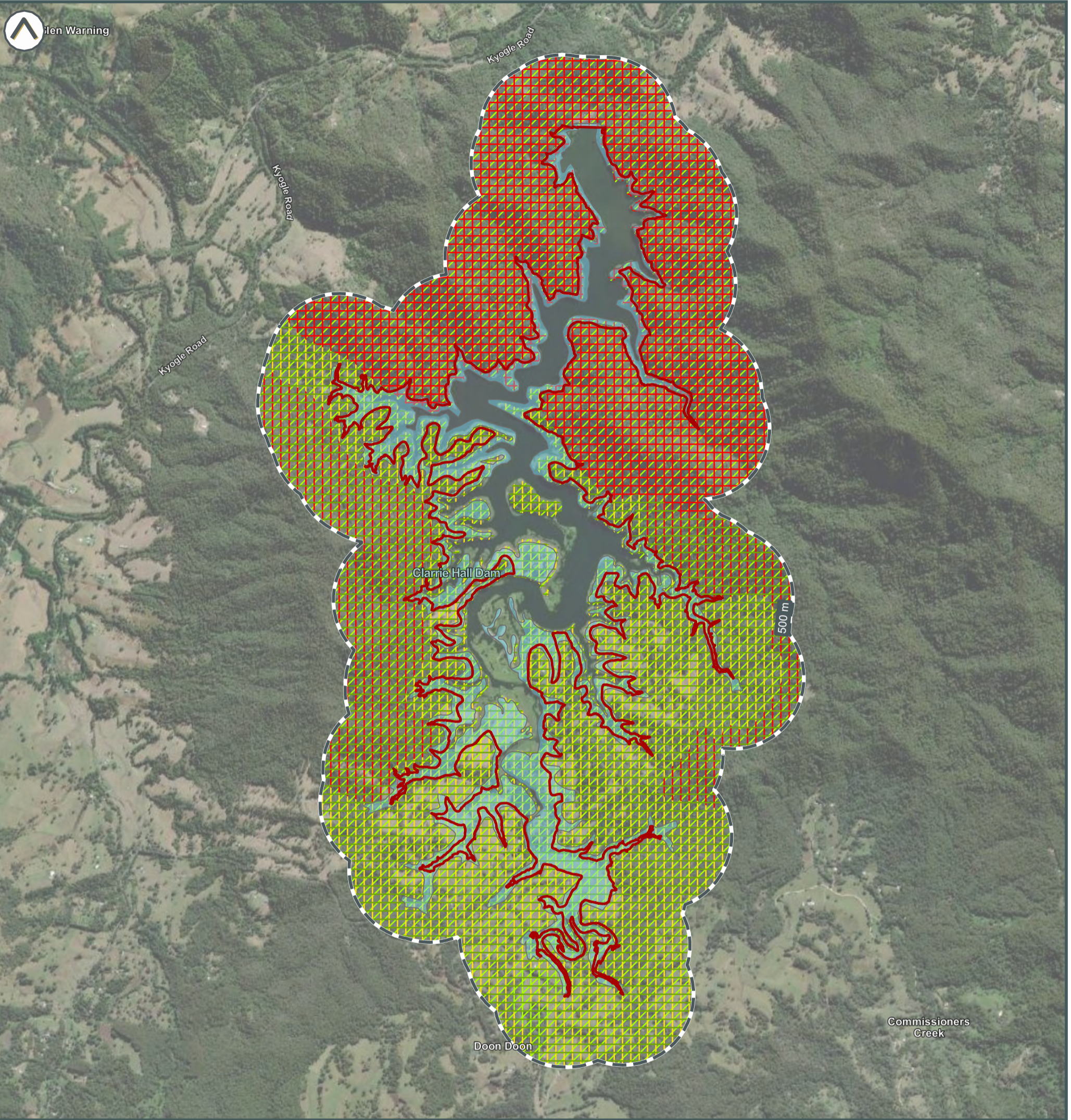


- Subject area
- Fire History
- Vegetation Category 2
- Vegetation Buffer
- Vegetation Category 1





Flood and Erosion Hazards



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- Subject area
- Flood extent
- Wind Erosion Risk**
- /// Low
- Water Erosion Risk**
- ||| Water Erosion Risk, Very High
- ||| Water Erosion Risk, Moderate
- ||| Water Erosion Risk, Low
- Landslip Erosion Risk**
- Landslip Erosion Risk, Very High
- Landslip Erosion Risk, Very Low





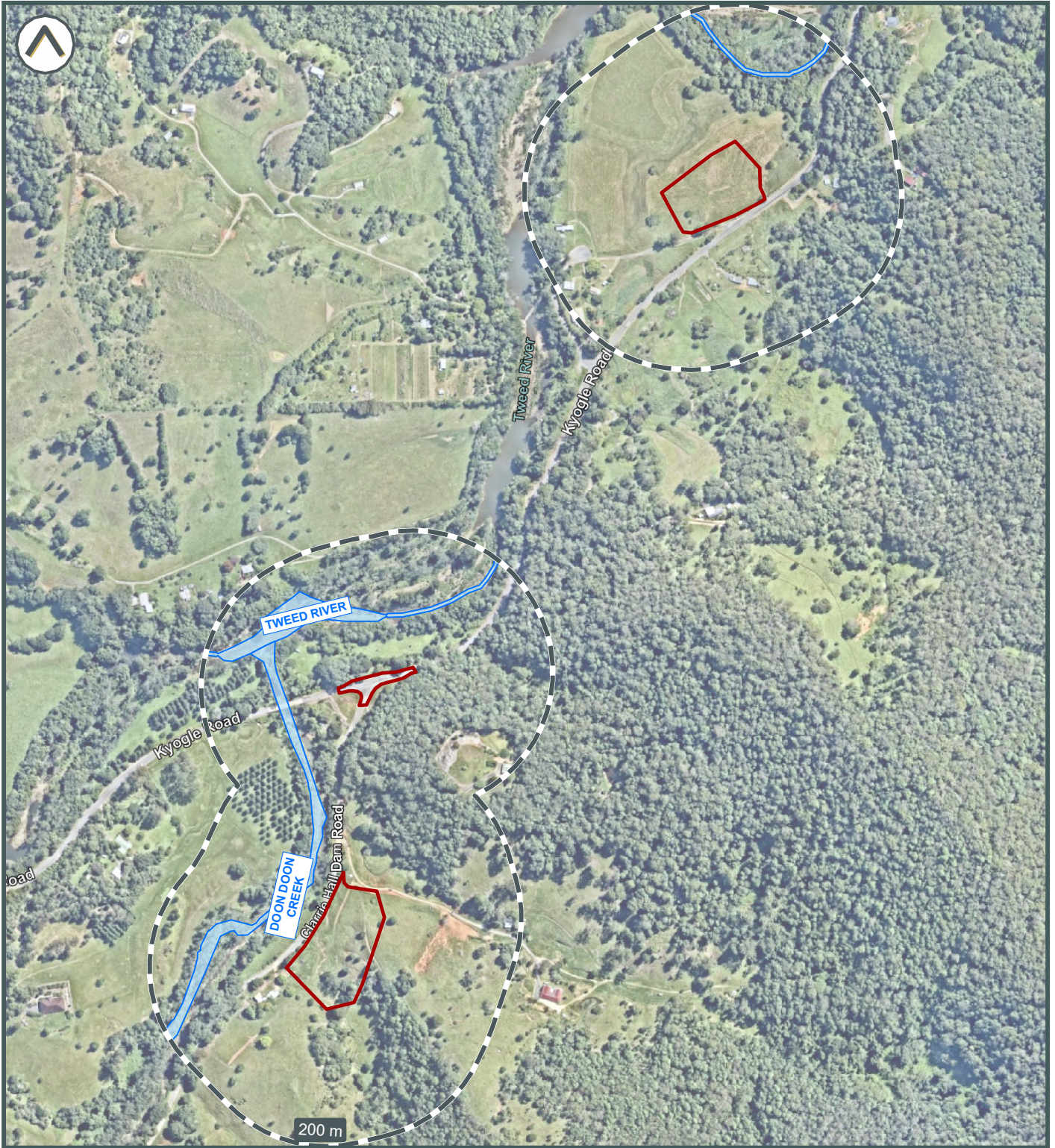
Appendix A

REPORT MAPS

Clarrie Hall Dam Extension Works
Terragon, NSW



Subject Area and Sensitive Receptors



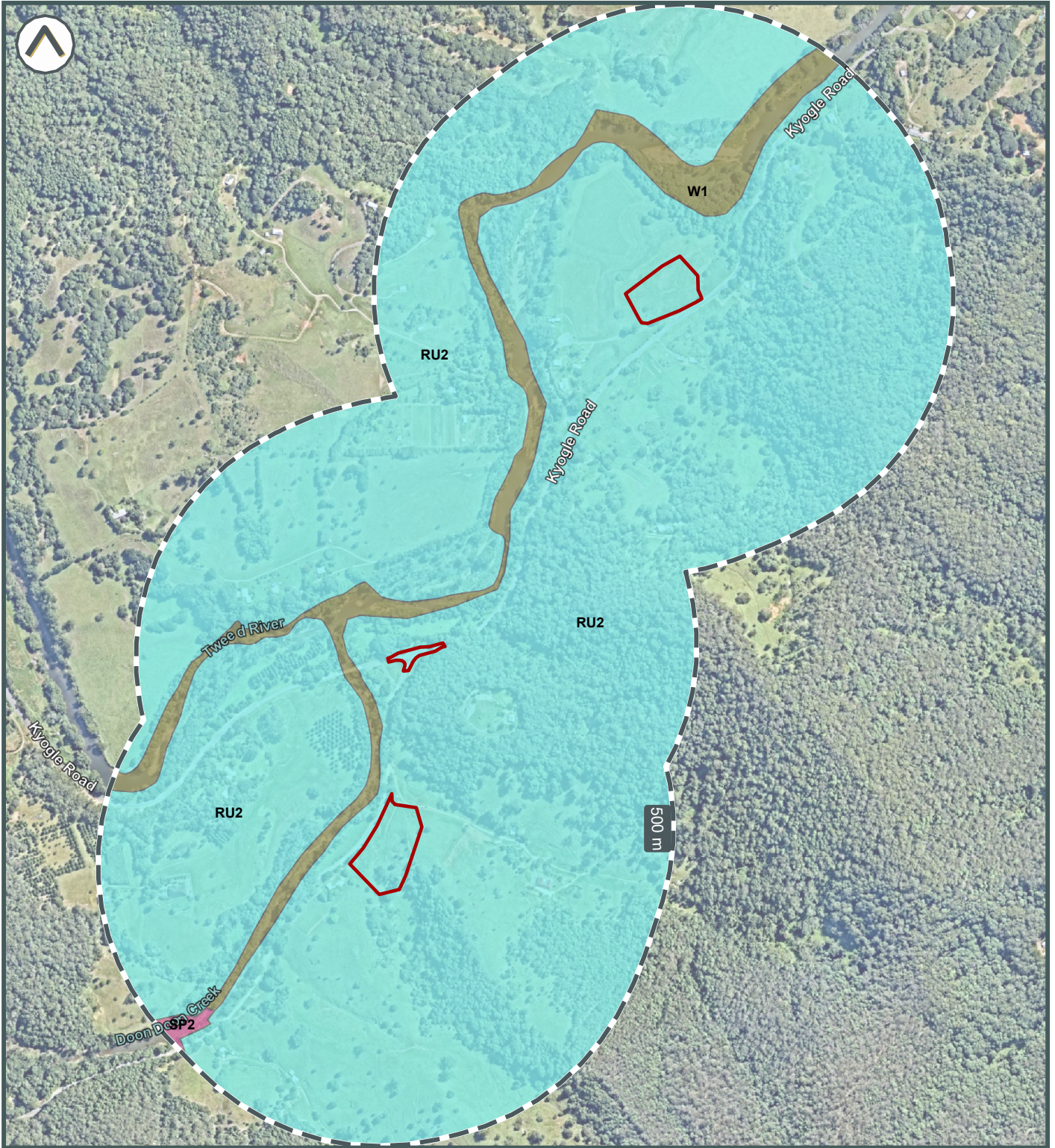
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

Subject area Water Bodies





Zoning



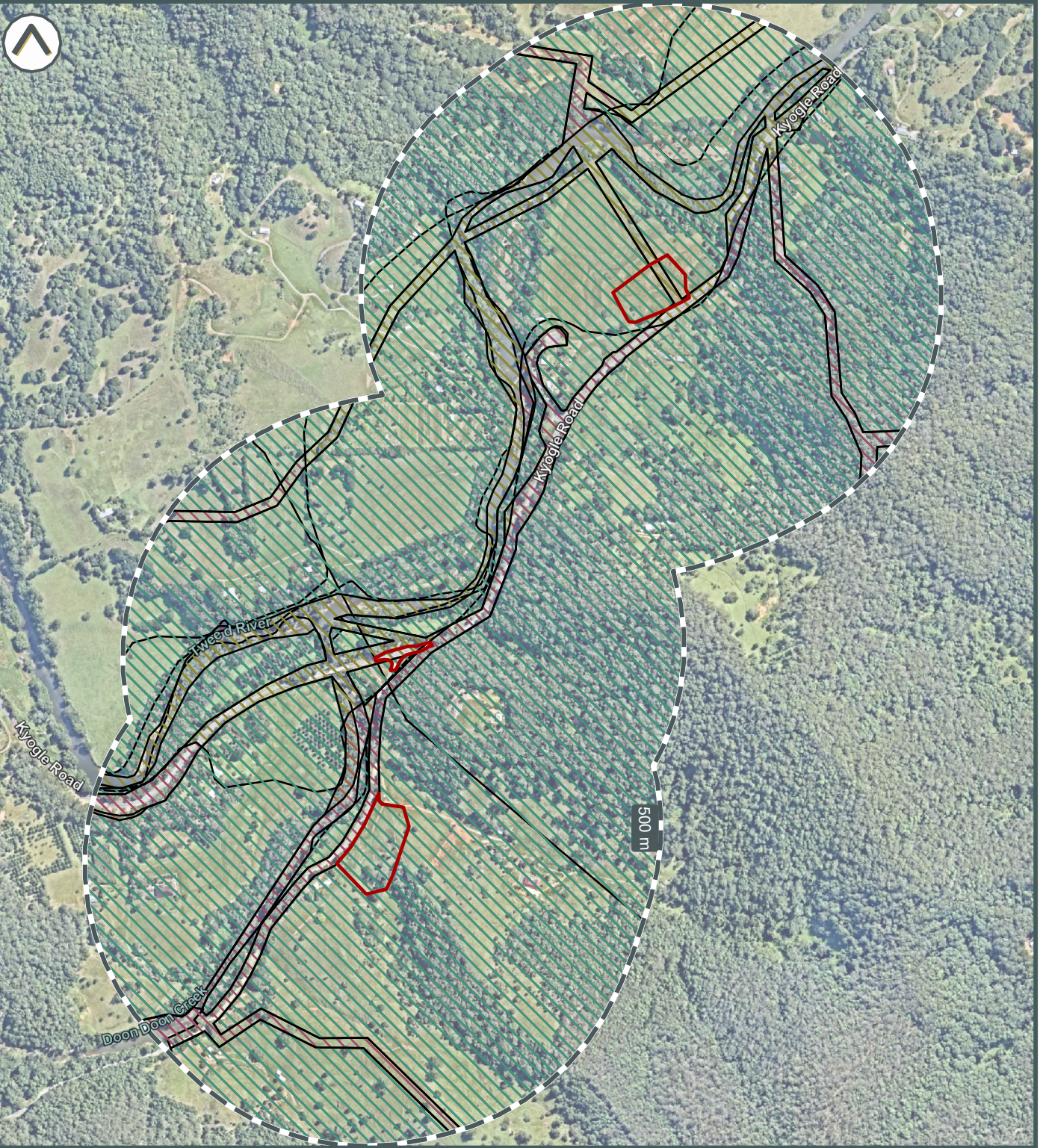
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Zoning RU2
- SP2 W1





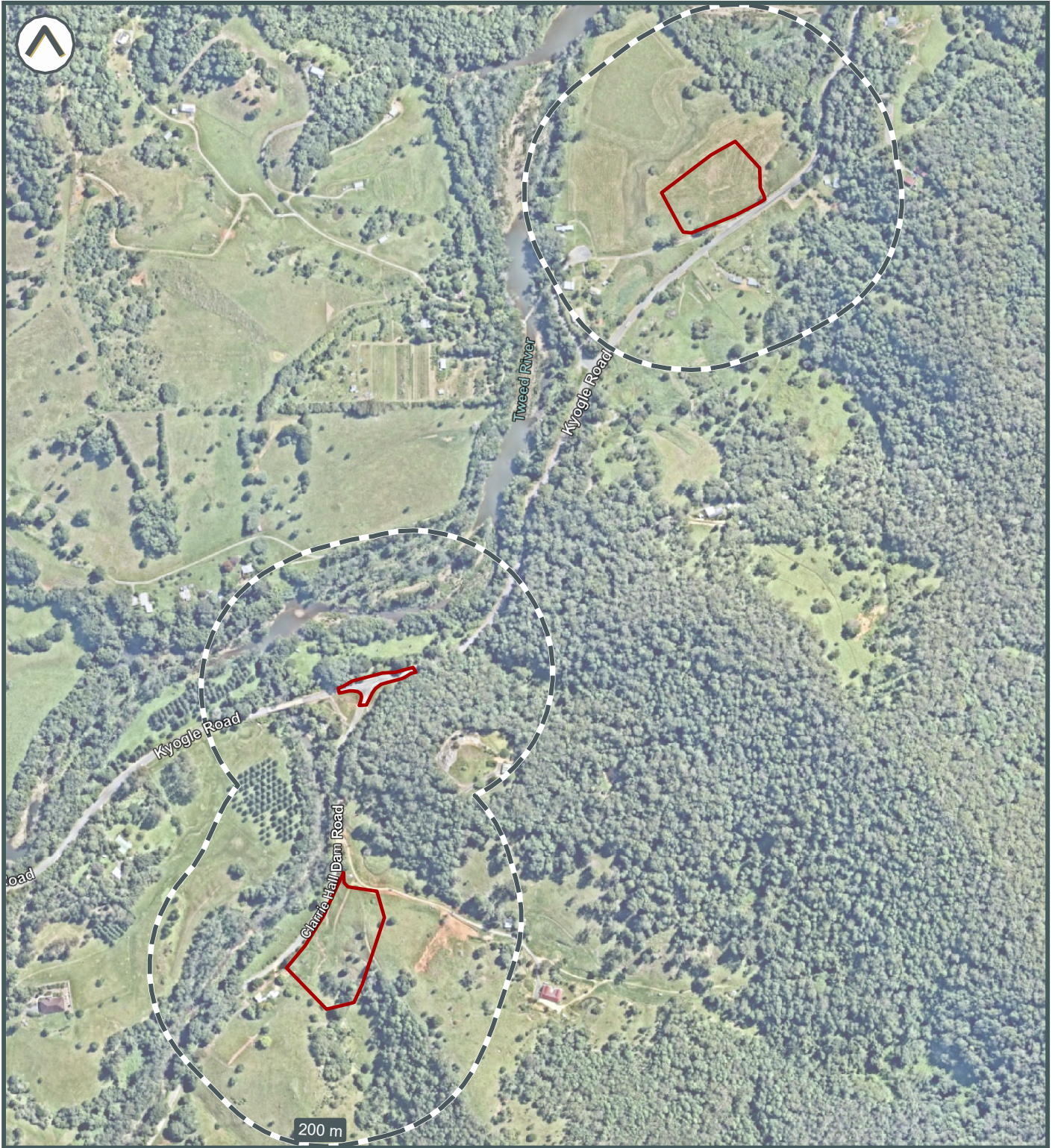
Planning Overlays




©2023 Land Insight (LI) www.landinsight.com.au | R:\LI\3931 ESR Terragon NSW\Working\GIS\Project\LI-XXXXX XXX\ 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Planning Overlays
- Coal Seam Gas Exclusions
- Drinking Water Catchment
- Height of Building
- Local Provisions
- Lot Size
- Strategic Agricultural Land





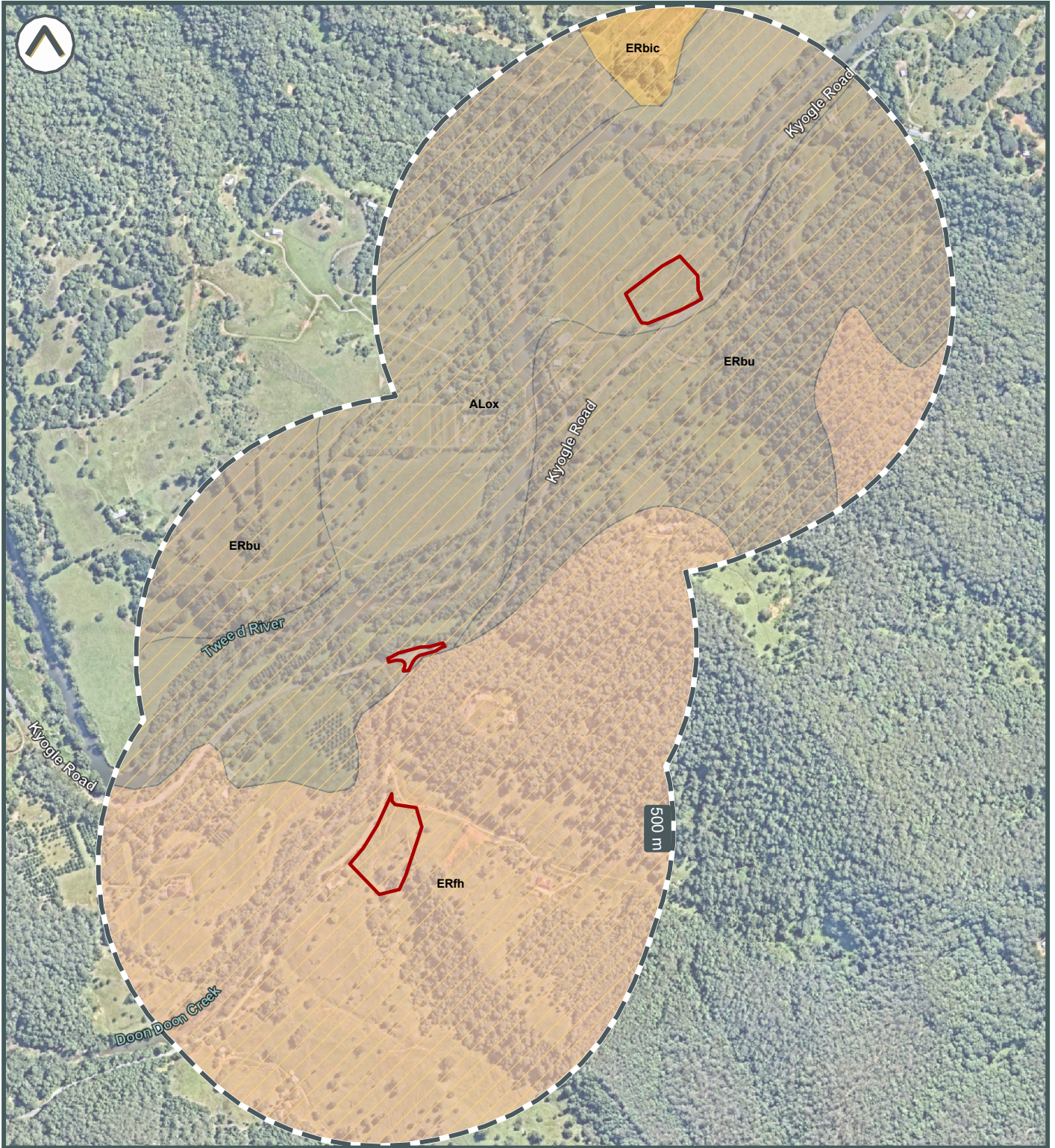
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

 Subject area





Soil Landscape and Salinity



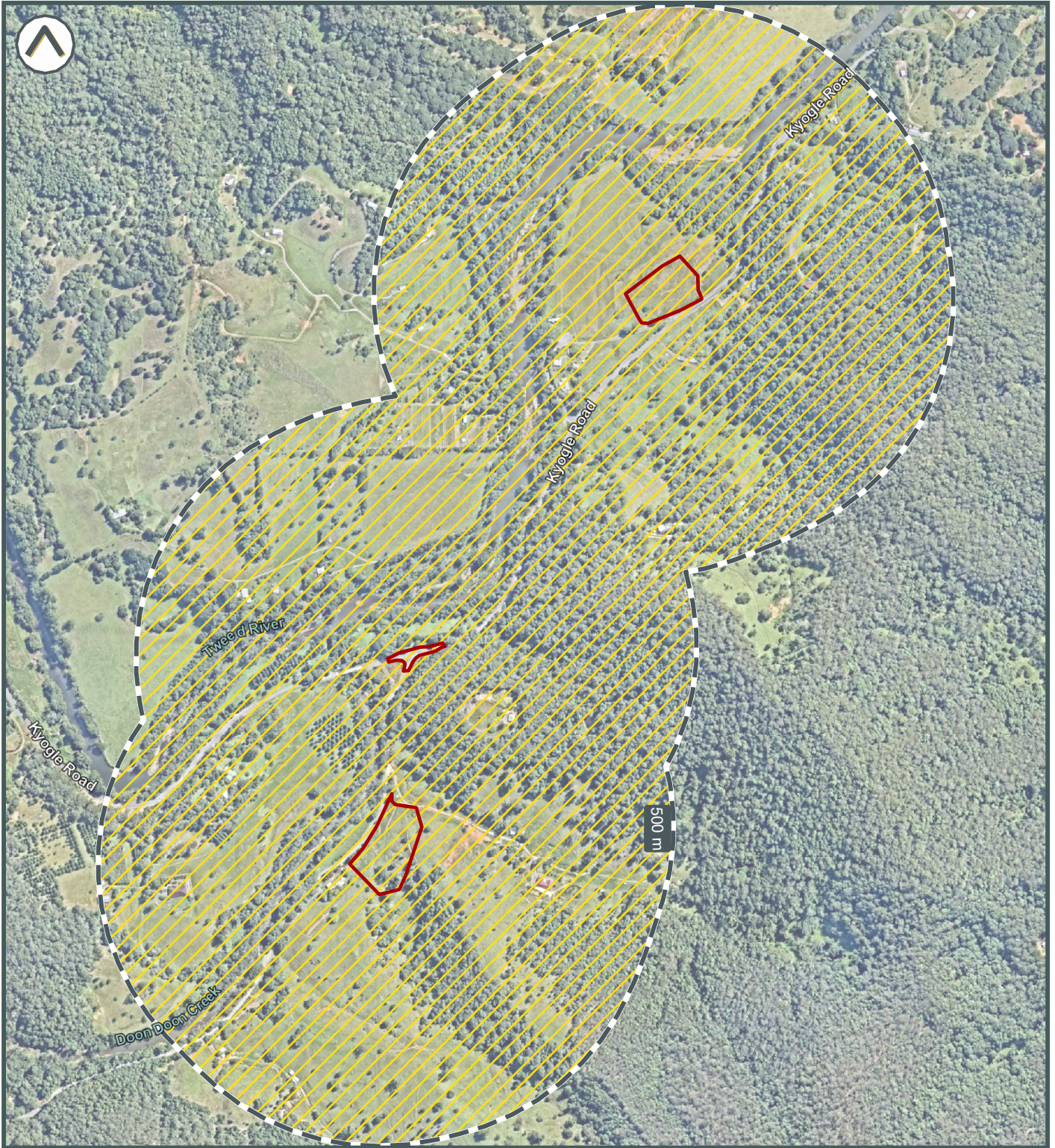
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Radon Level (Bq/m³)
- 5-19
- Soil Landscape
- ALox
- ERbu
- ERbic
- ERfh








Acid Sulfate Soils



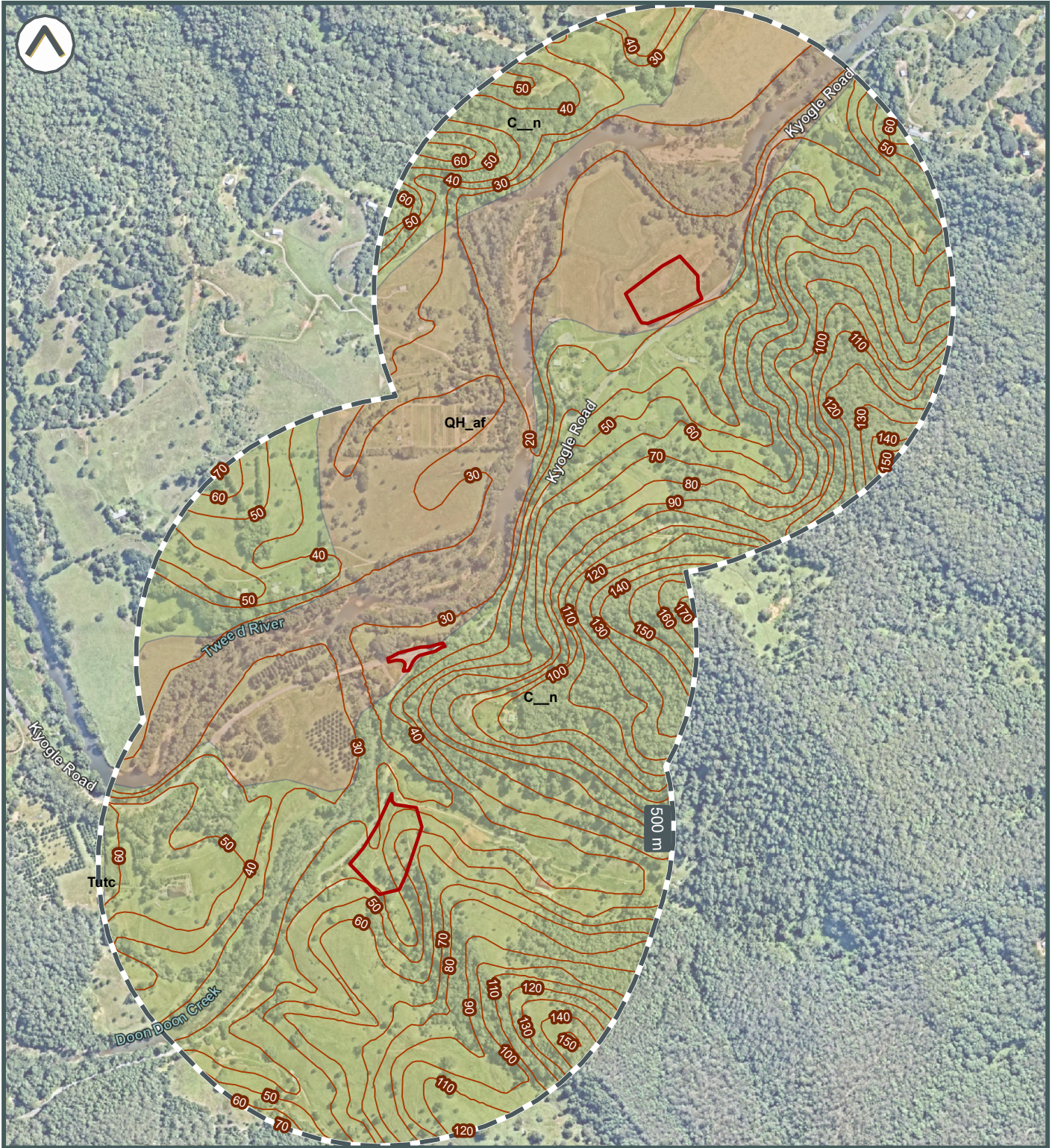
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

-  Subject area
-  Atlas of Australian Acid Sulfate Soils
-  Low Probability of occurrence



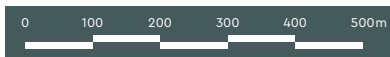


Geology and Topography



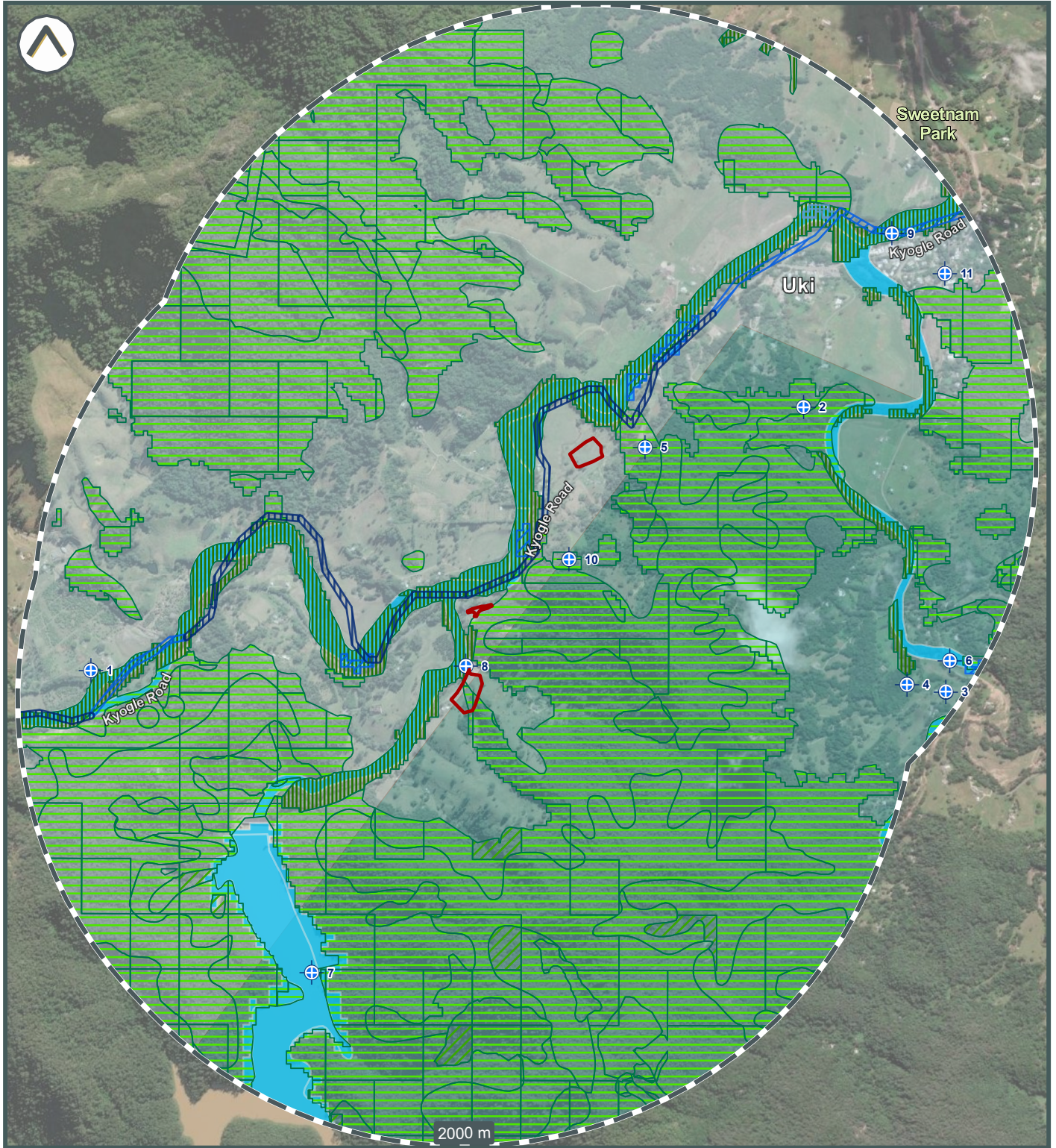
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Topographic contour (m)
- Geology Unit
- QH_af
- C_n
- Tutc





Groundwater Dependent Ecosystems & Hydrogeology Constraints



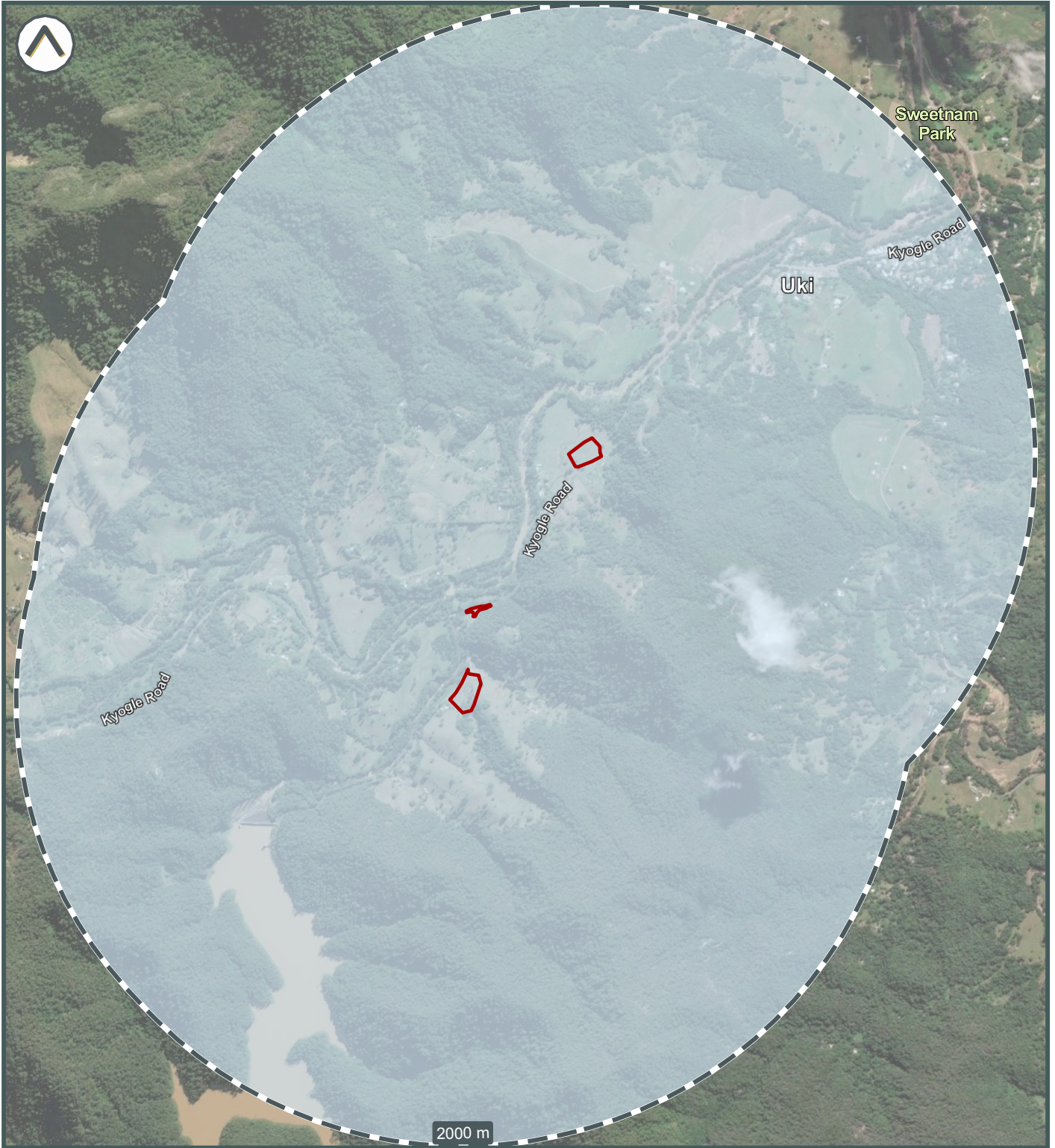
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Groundwater bores
- Ecosystems that rely on the Surface expression of Groundwater**
 - High potential GDE - from national assessment
 - Moderate potential GDE - from national assessment
 - Low potential GDE - from national assessment
- Ecosystems that rely on Subsurface presence of Groundwater**
 - High potential GDE - from regional studies
 - Moderate potential GDE - from regional studies
 - Low potential GDE - from regional studies
- Wetlands
- Aquifer type**
 - Fractured or fissured, extensive aquifers of low to moderate productivity





Groundwater and Other Bores



©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

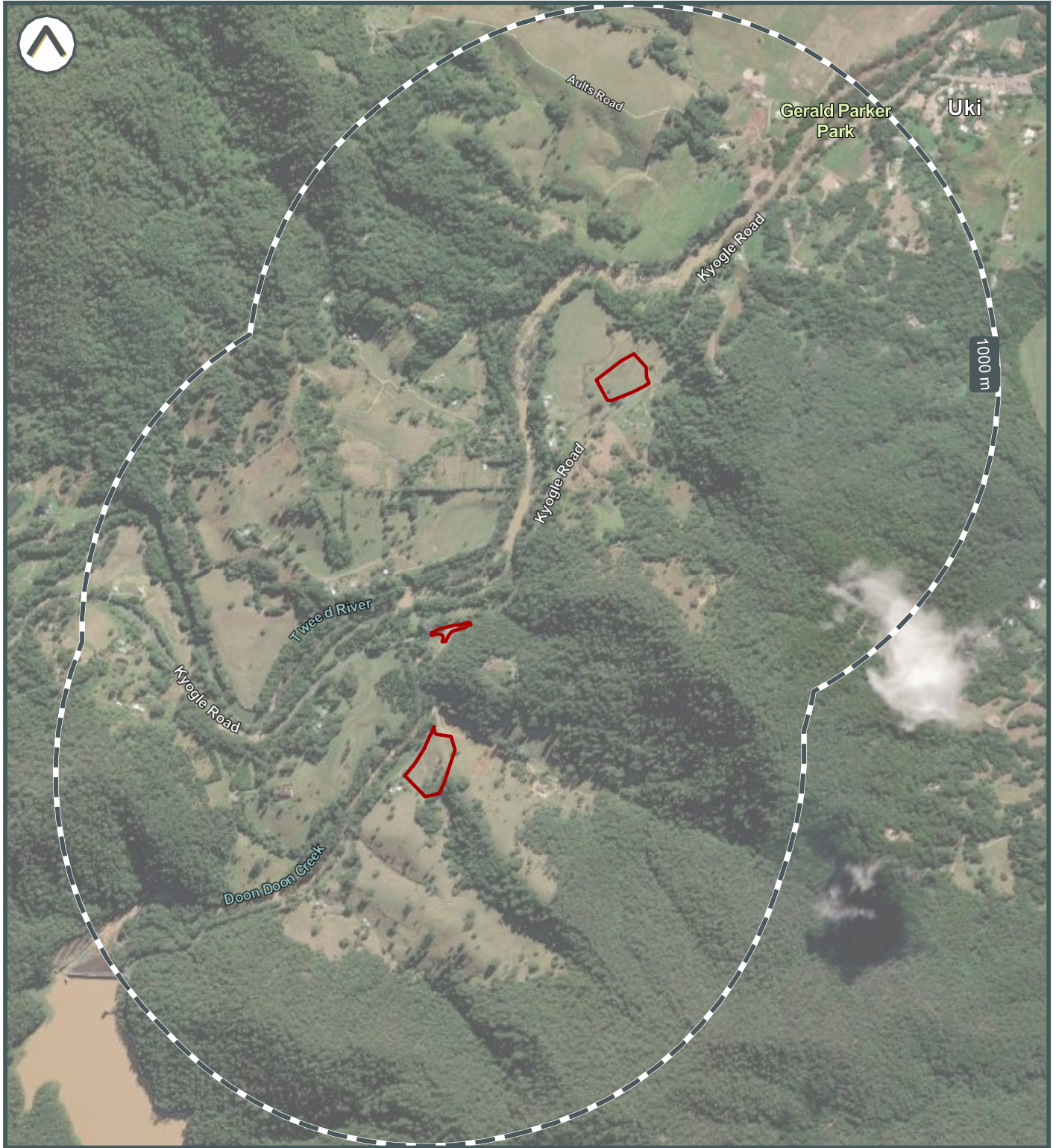
Subject area

 Salinity Class
 No Data






Contaminated Land Public Register



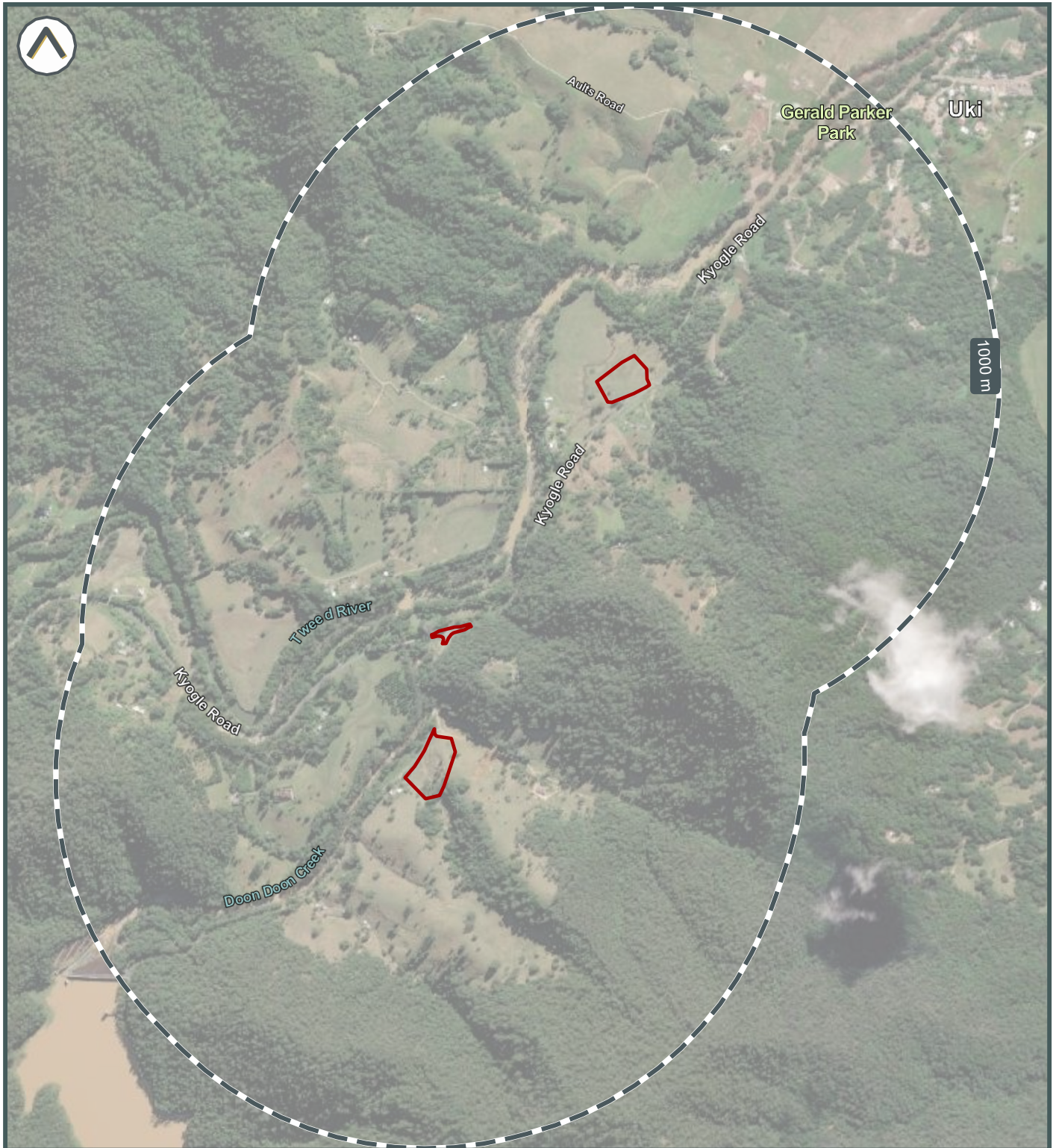
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

 Subject area






Licences, Approvals & Assessments



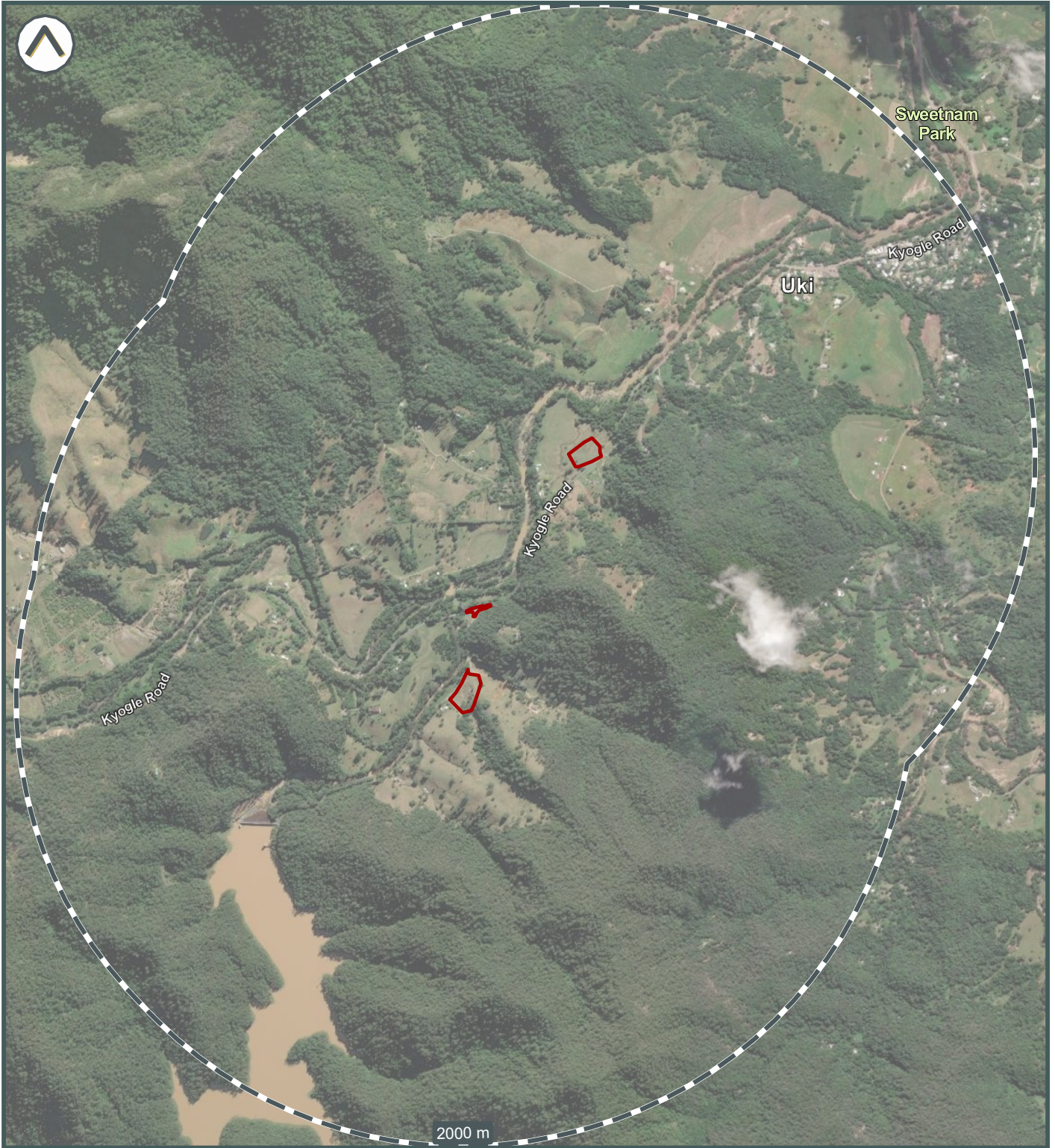
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

 Subject area






Sites Regulated by Other Jurisdictional Body



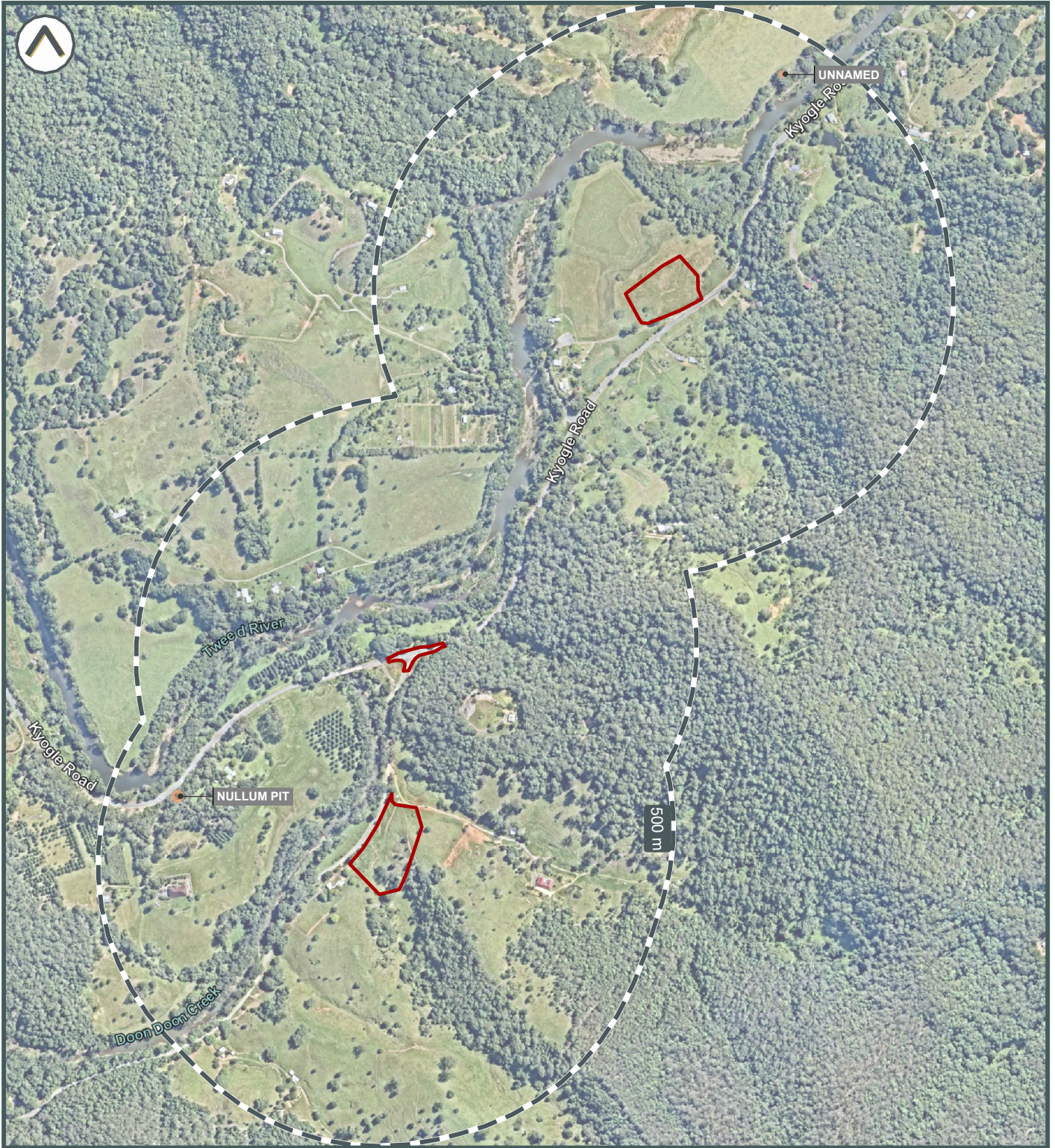
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

 Subject area






Other Potential Hazard Sources



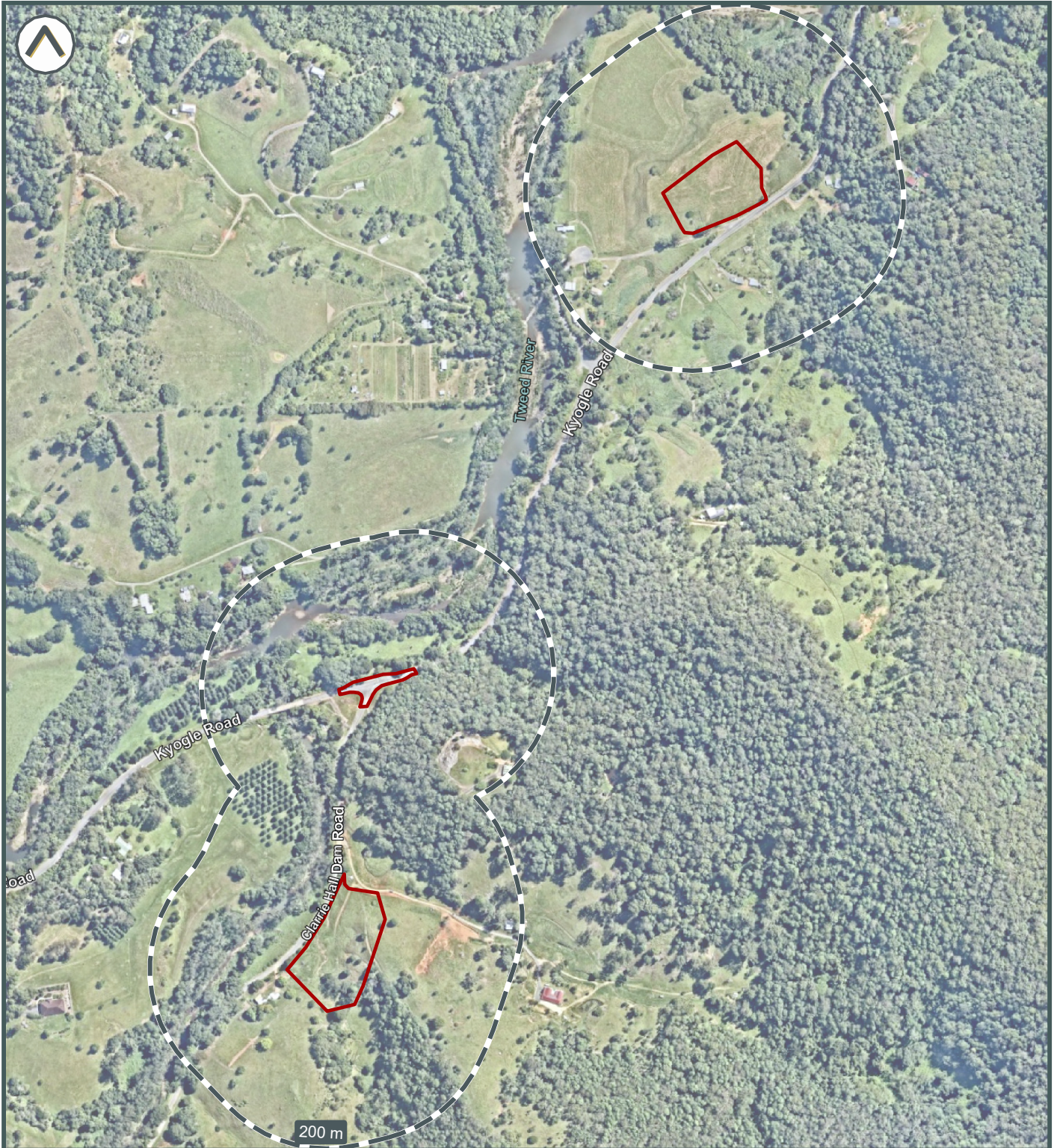
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

 Subject area  Mine








Potentially Contaminating Activities (PCAs)



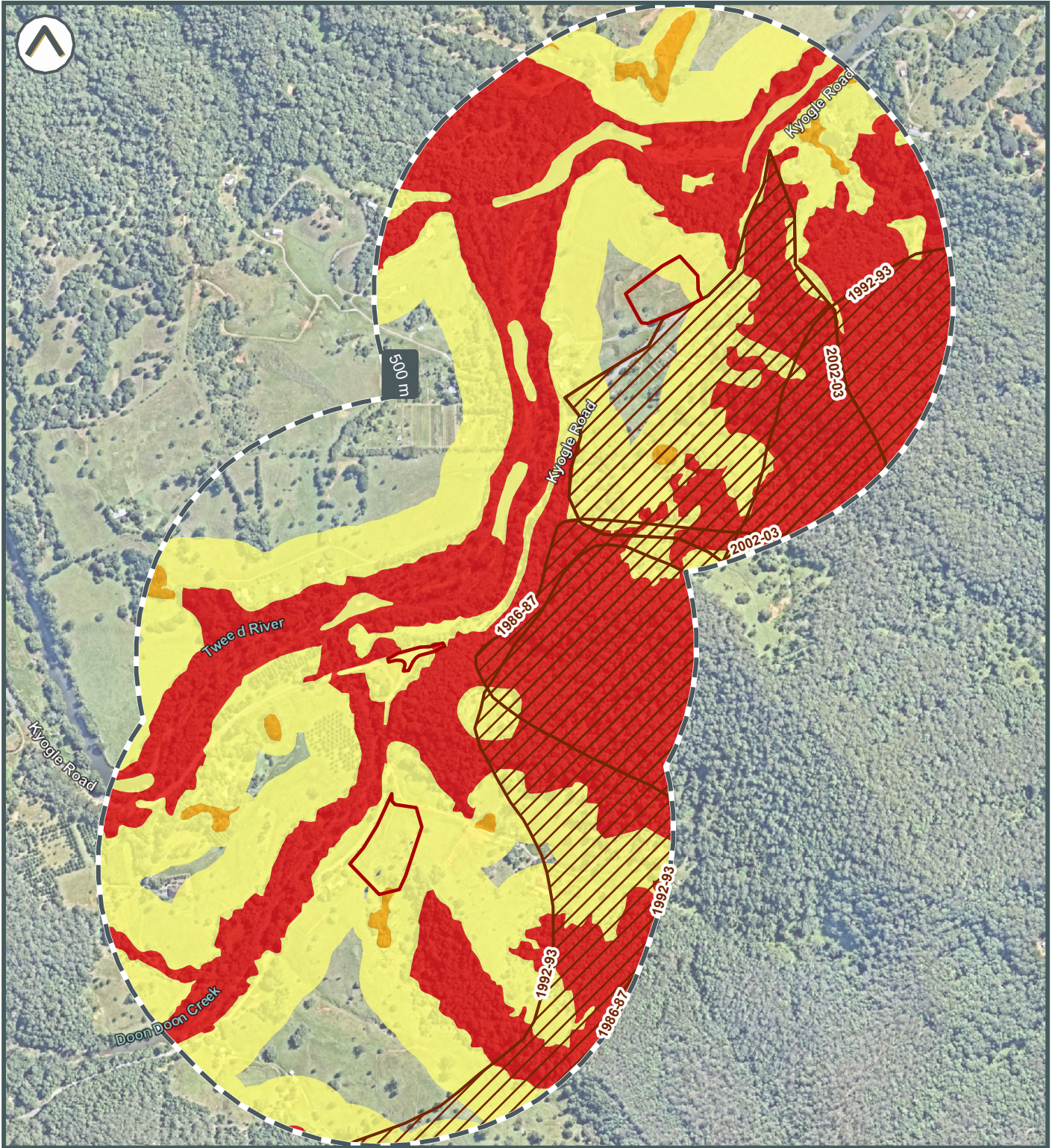
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

-  Subject area
-  Petrol Stations and Fuel Terminals
-  Waste and Recycling Facilities





Fire Hazards



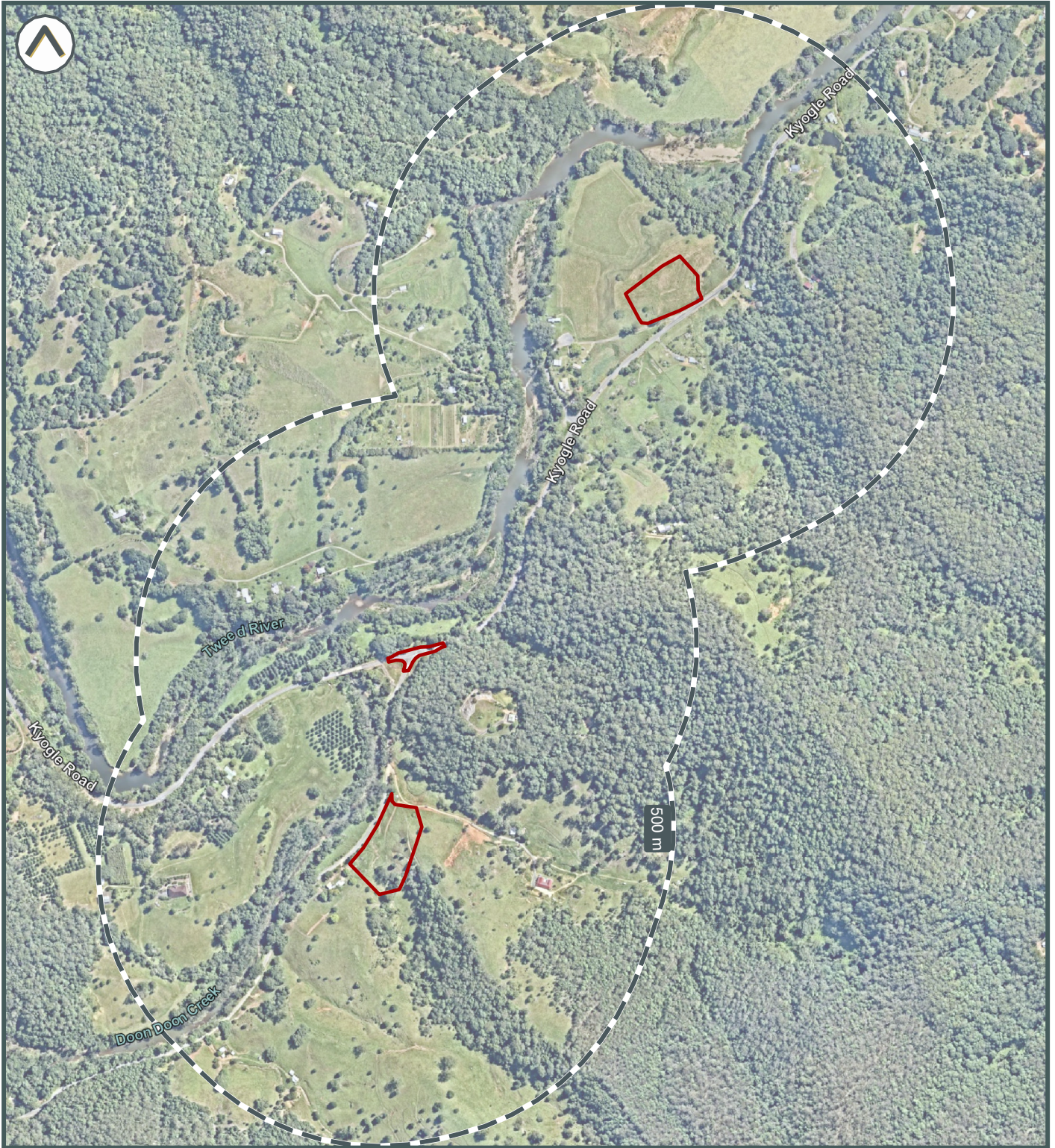
©2023 Land Insight (LI) www.landinsight.co | 12/12/2023 | Data source: Please refer to 'Digital Data Sources' in the Product Guide

- Subject area
- Fire History
- Bushfire Prone Area**
- Vegetation Category 1
- Vegetation Category 2
- Vegetation Buffer





Flood Hazard



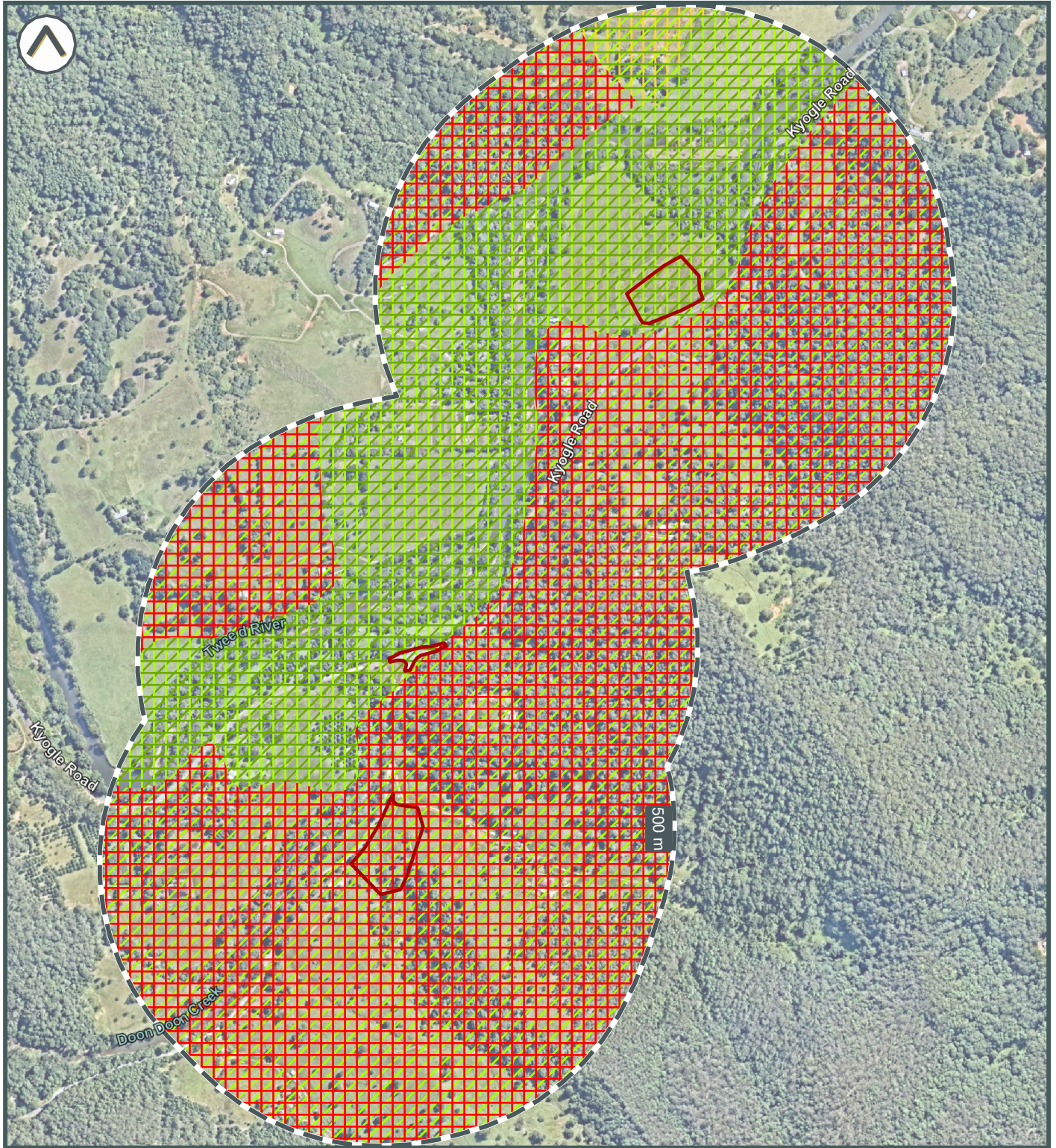
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Subject area





Erosion Hazard



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- Subject area
- Wind Erosion Risk
 - Low
 - Very Low
- Water Erosion Risk
 - Very High
- Landslip Erosion Risk
 - Very High
 - Very Low



Appendix C

Historical aerials

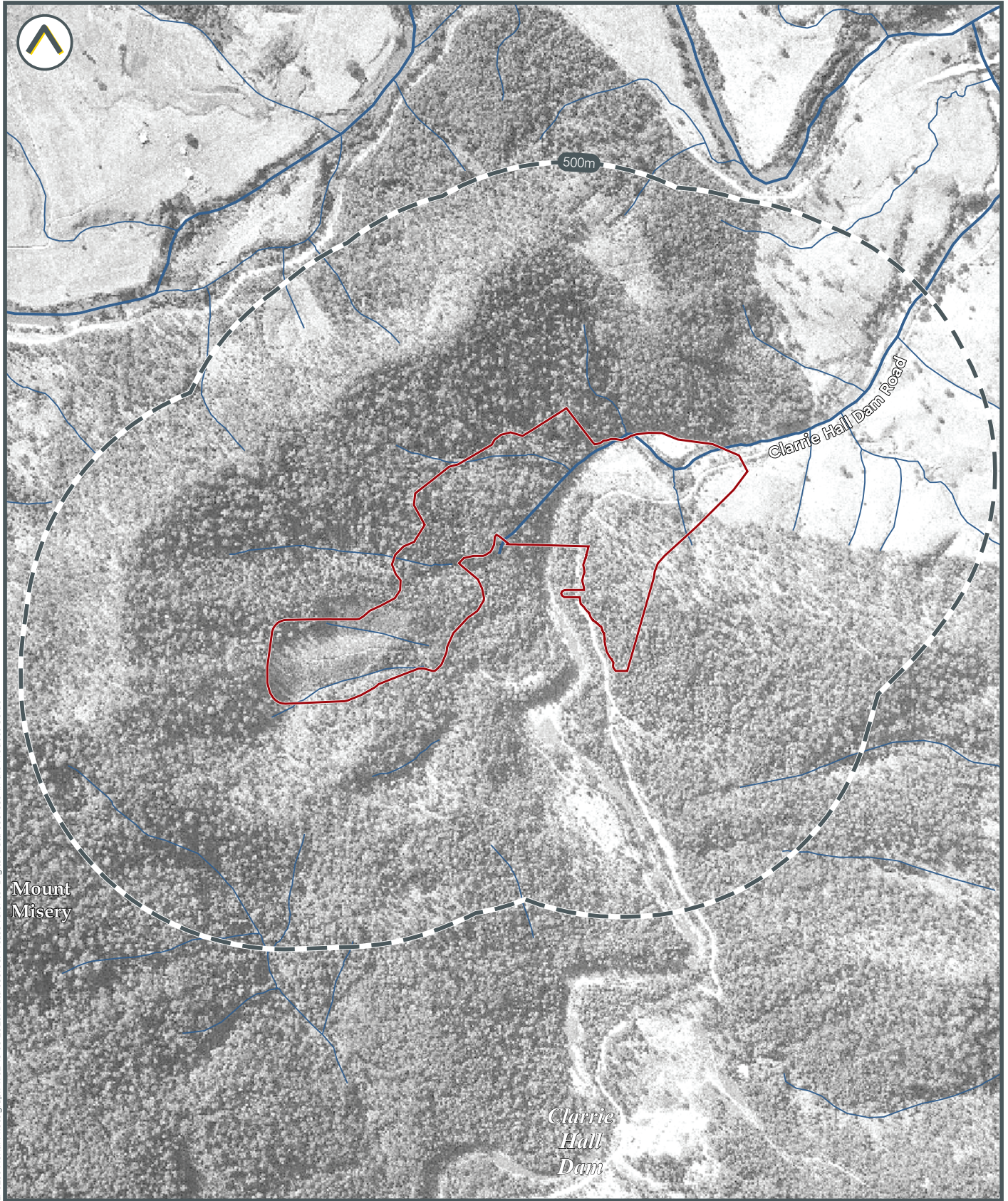
An aerial photograph of a vibrant turquoise river winding through a rugged, rocky landscape. The river is surrounded by dense, green and yellowish vegetation. The rocks are large and grey, with some smaller boulders scattered in the water. The overall scene is a natural, scenic view of a river valley.

Appendix B

HISTORIC IMAGERY

Clarrie Hall Dam,
Terragon, NSW

Historic Aerial Photograph - 1962



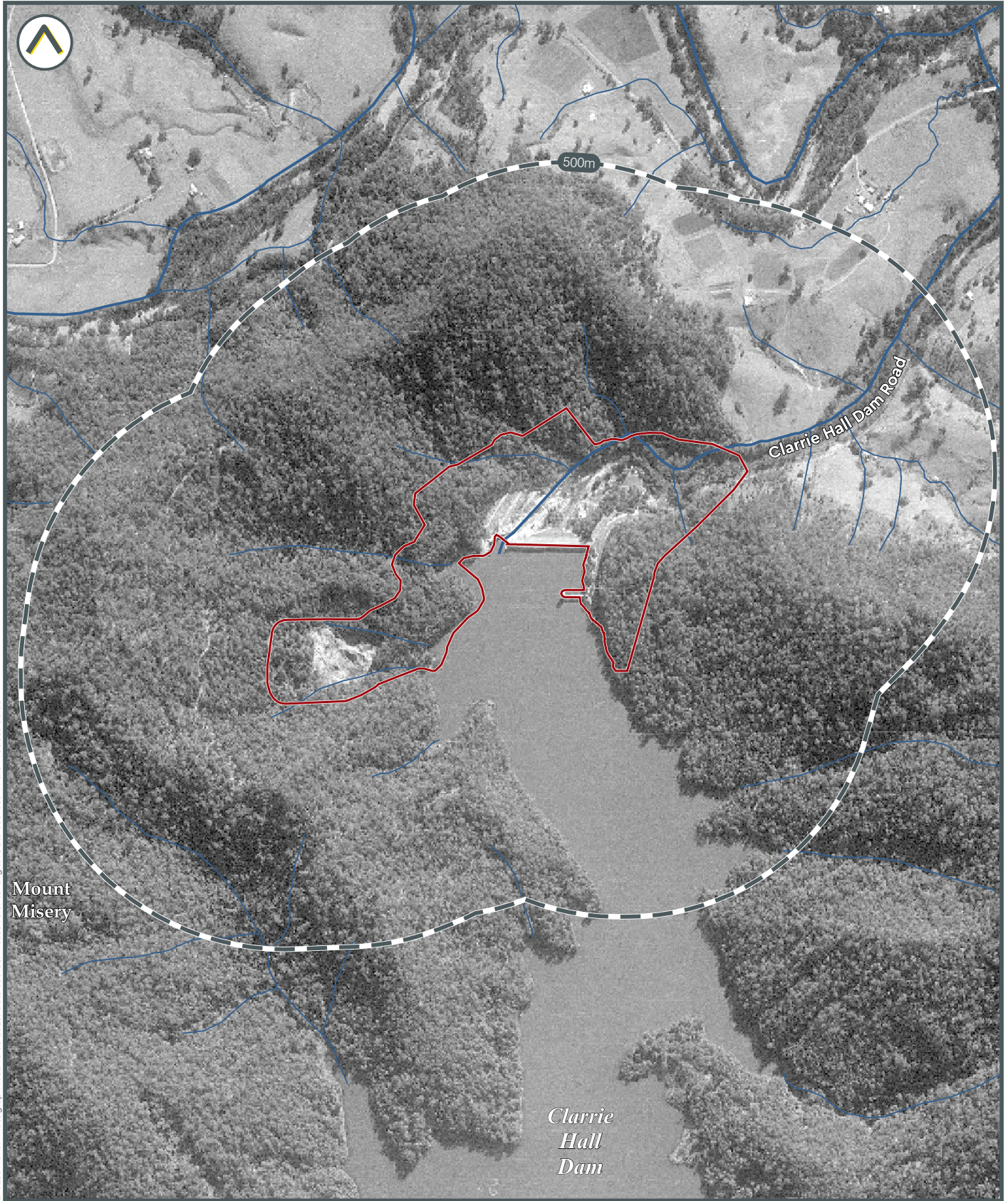
LI-3236 Aerial Photograph 1962. 15.03.2023. Data source: Please refer to 'Digital Data Sources' in the Product Guide

Subject area

0 200m



Historic Aerial Photograph - 1987



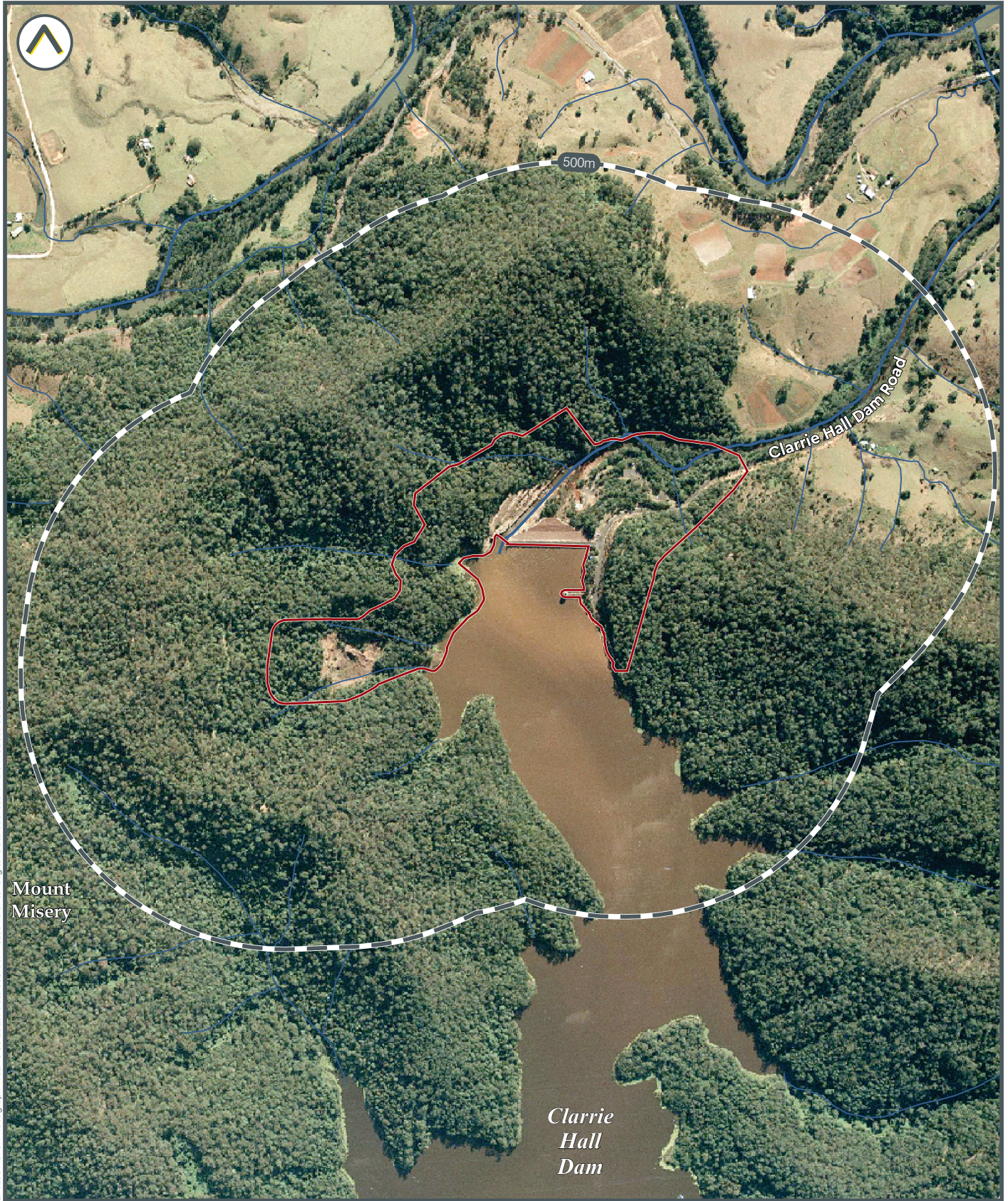
LI-3236 Aerial Photograph 1987 15 03 2023. Data source: Please refer to 'Digital Data Sources' in the Product Guide

Subject area

0 200m



Historic Aerial Photograph - 1991



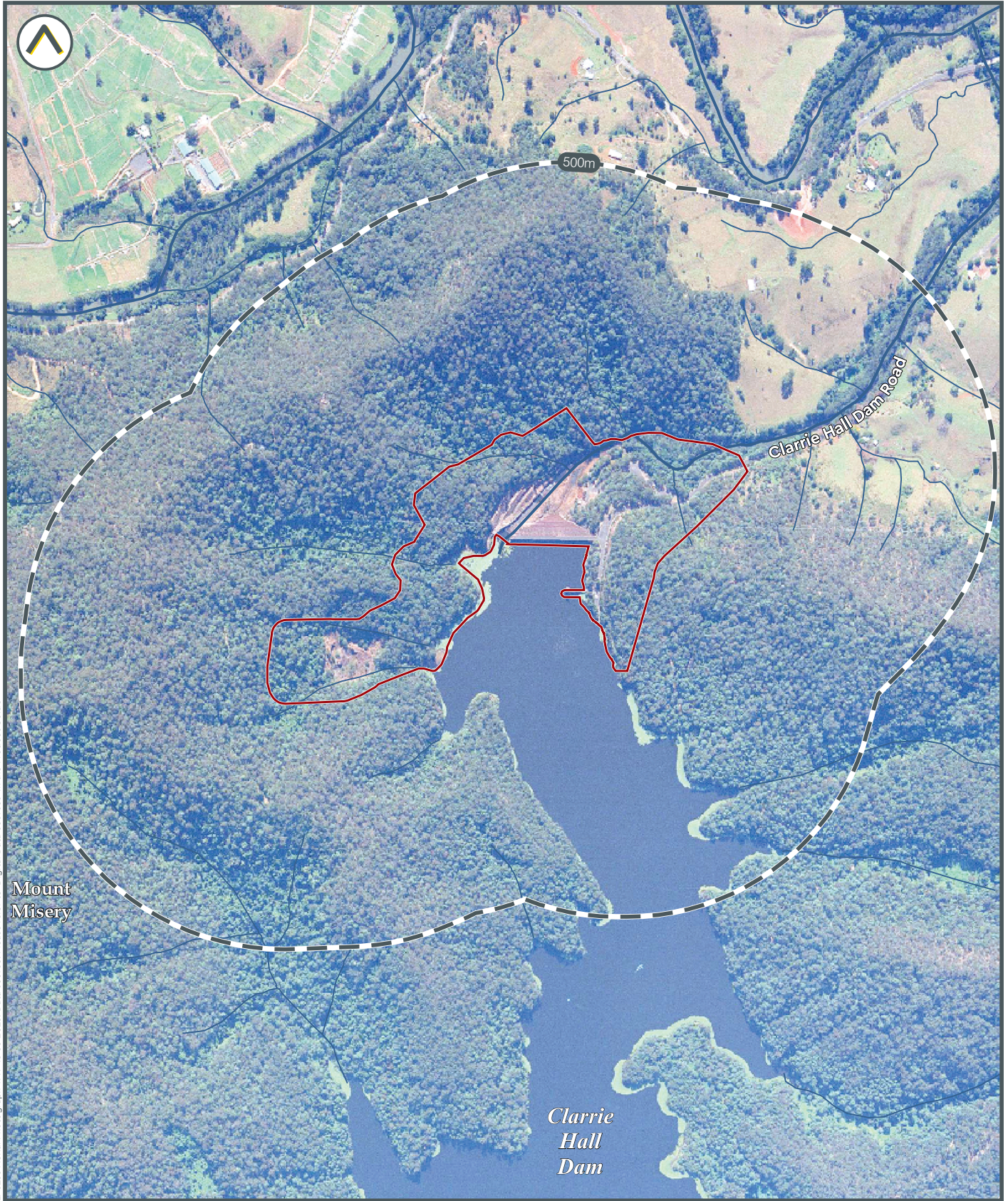
LI-3036 Aerial Photograph 1991. 15.03.2023. Data source: 'Digital Data Sources', in the Product Guide

Subject area

0 200m



Historic Aerial Photograph - 1997

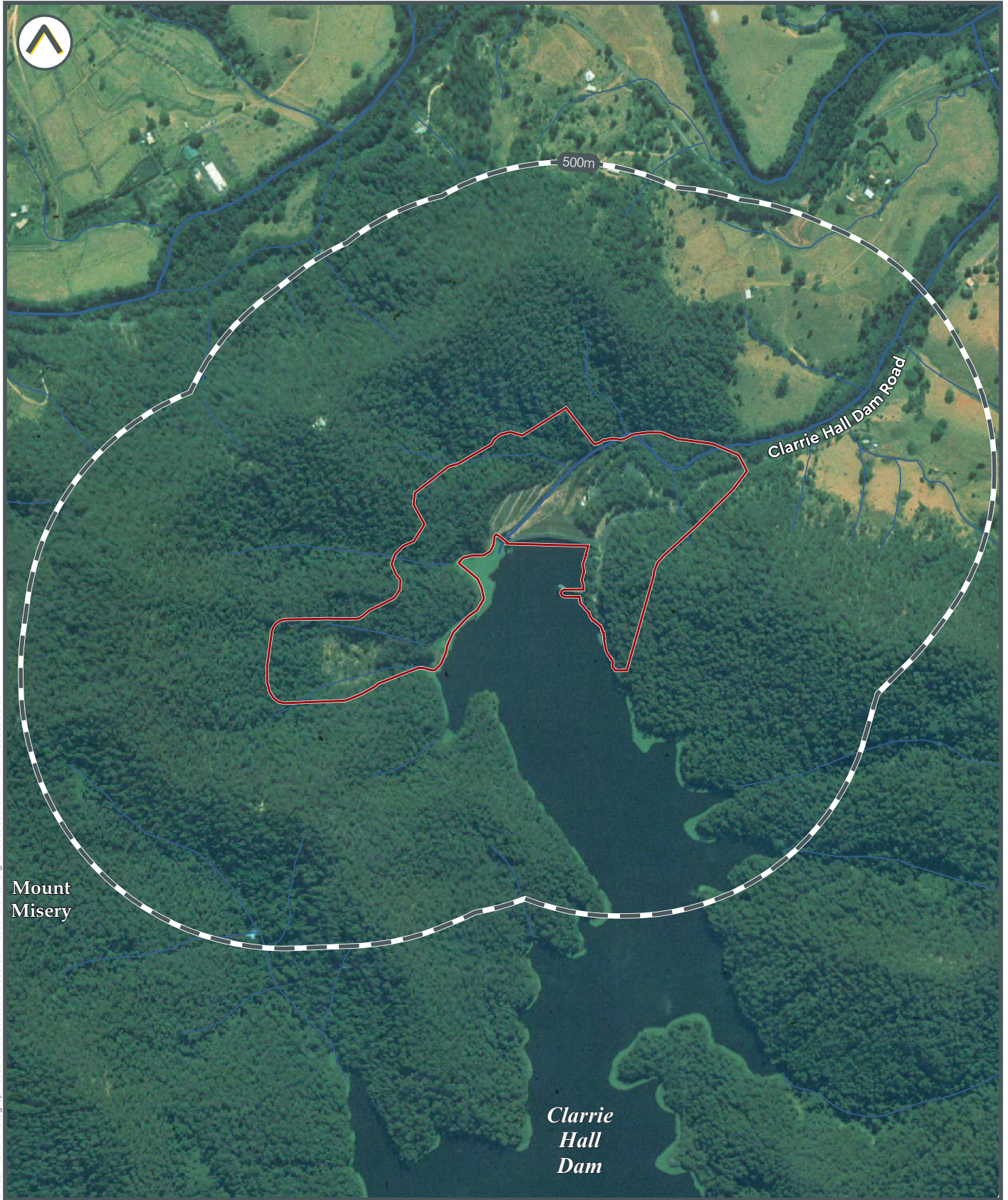


LI-3236 Aerial Photograph 1997 15.03.2023. Data source: Please refer to 'Digital Data Sources' in the Product Guide

Subject area



Historic Aerial Photograph - 2004

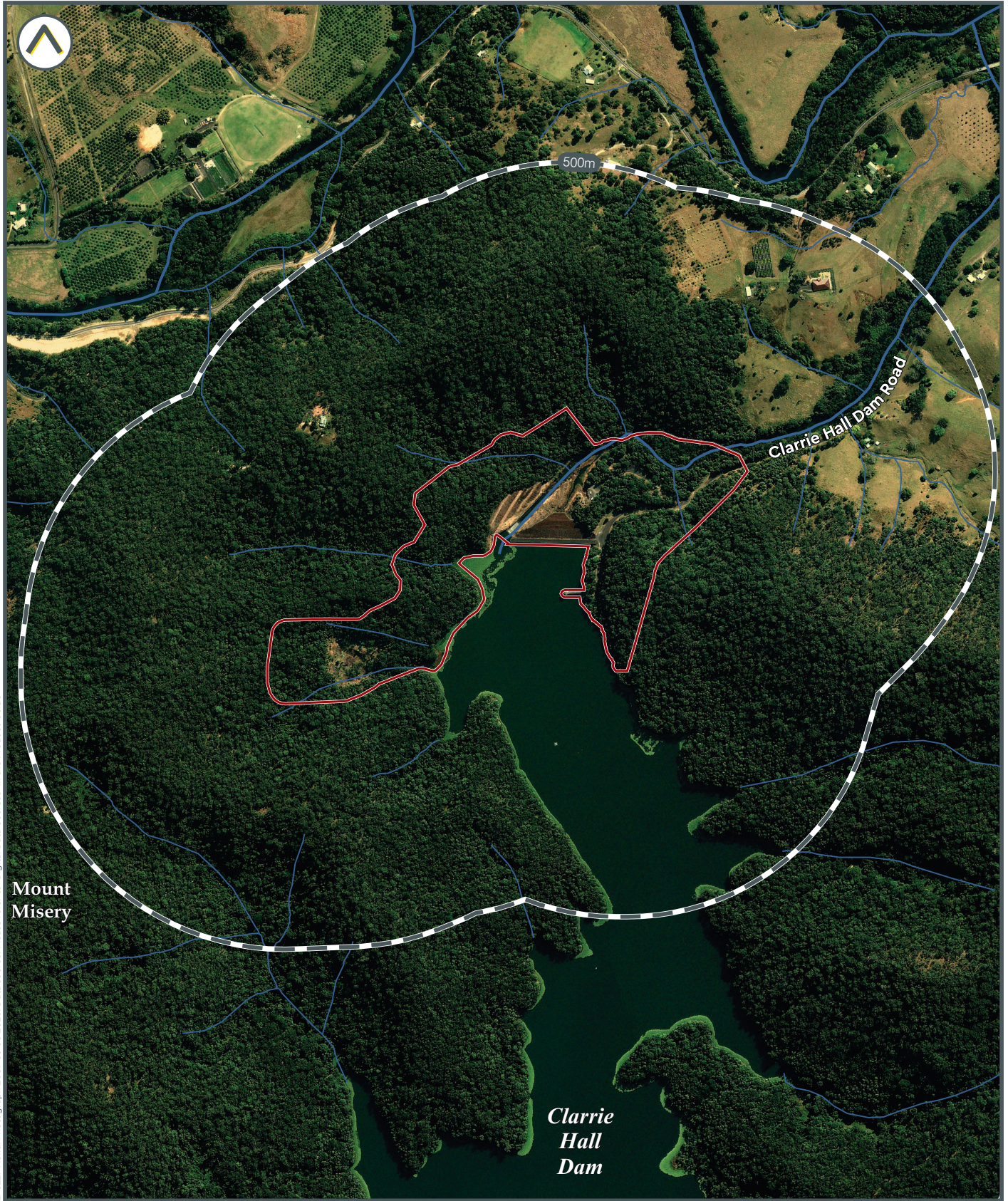


LI-3227 Aerial Photograph 2003 03 03 2023. Data source: Please refer to 'Digital Data Sources' in the Product Guide

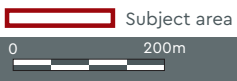
Subject area



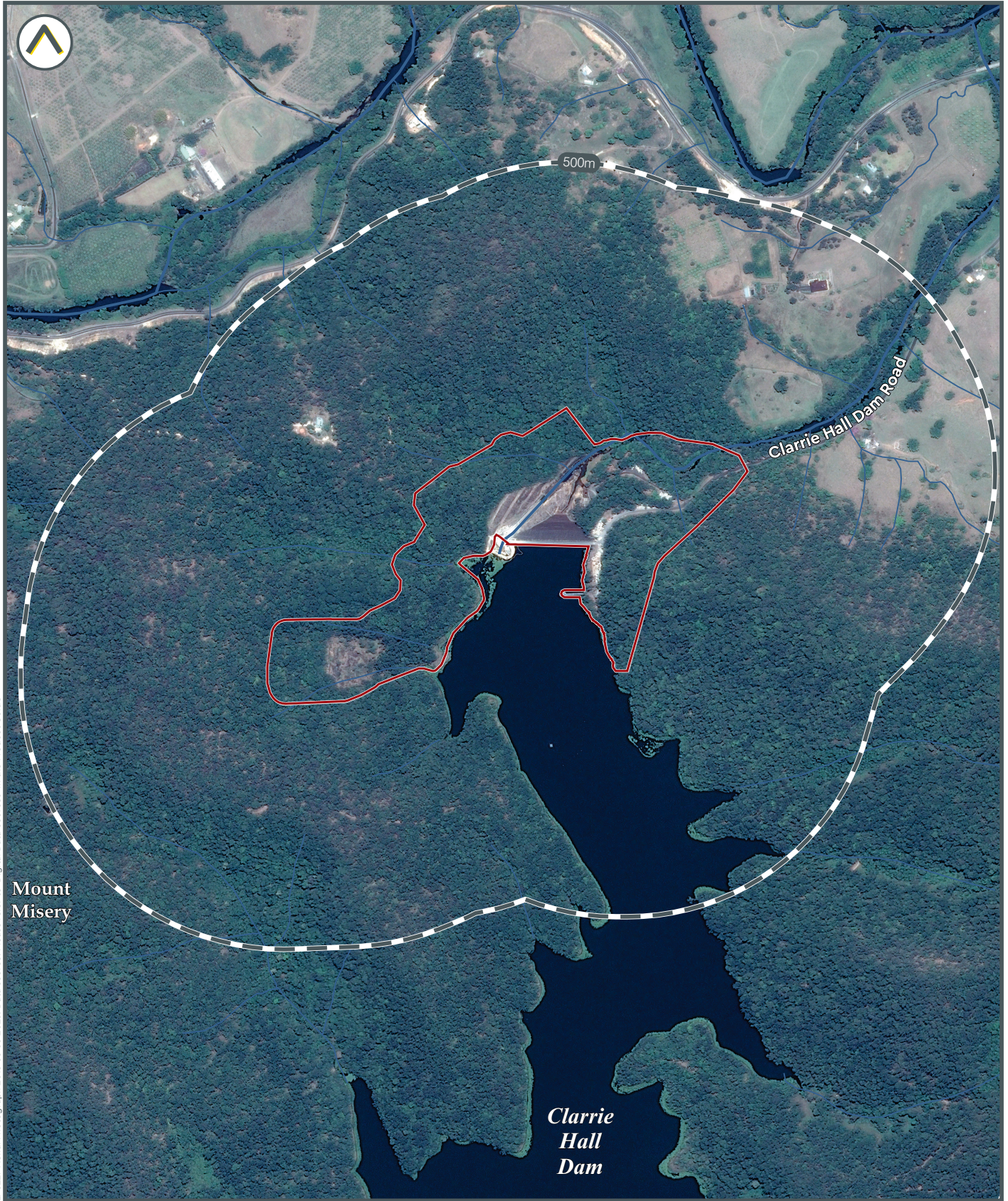
Historic Aerial Photograph - 2009



LI-3227 Aerial Photograph 2009 03 03 2023. Data source: Please refer to 'Digital Data Sources' in the Product Guide



Historic Aerial Photograph - 2013



LI-3227 Aerial Photograph 2013 03 03 2023. Data source: Please refer to 'Digital Data Sources' in the Product Guide

Subject area

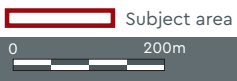
0 200m



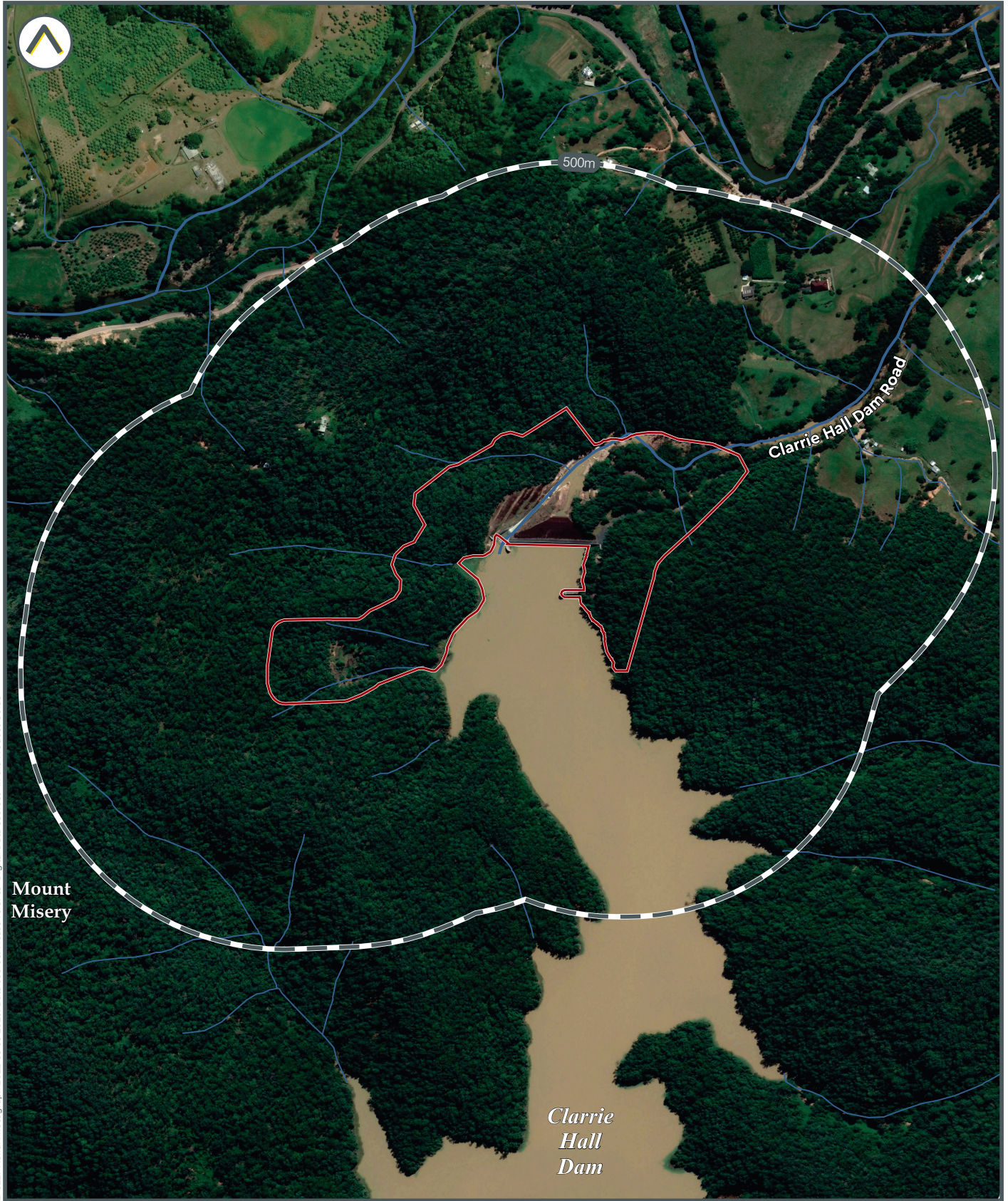
Historic Aerial Photograph - 2017



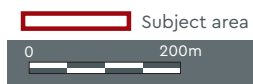
LI-3227 Aerial Photograph 2017 03 03 2023. Data source: Please refer to 'Digital Data Sources' in the Product Guide



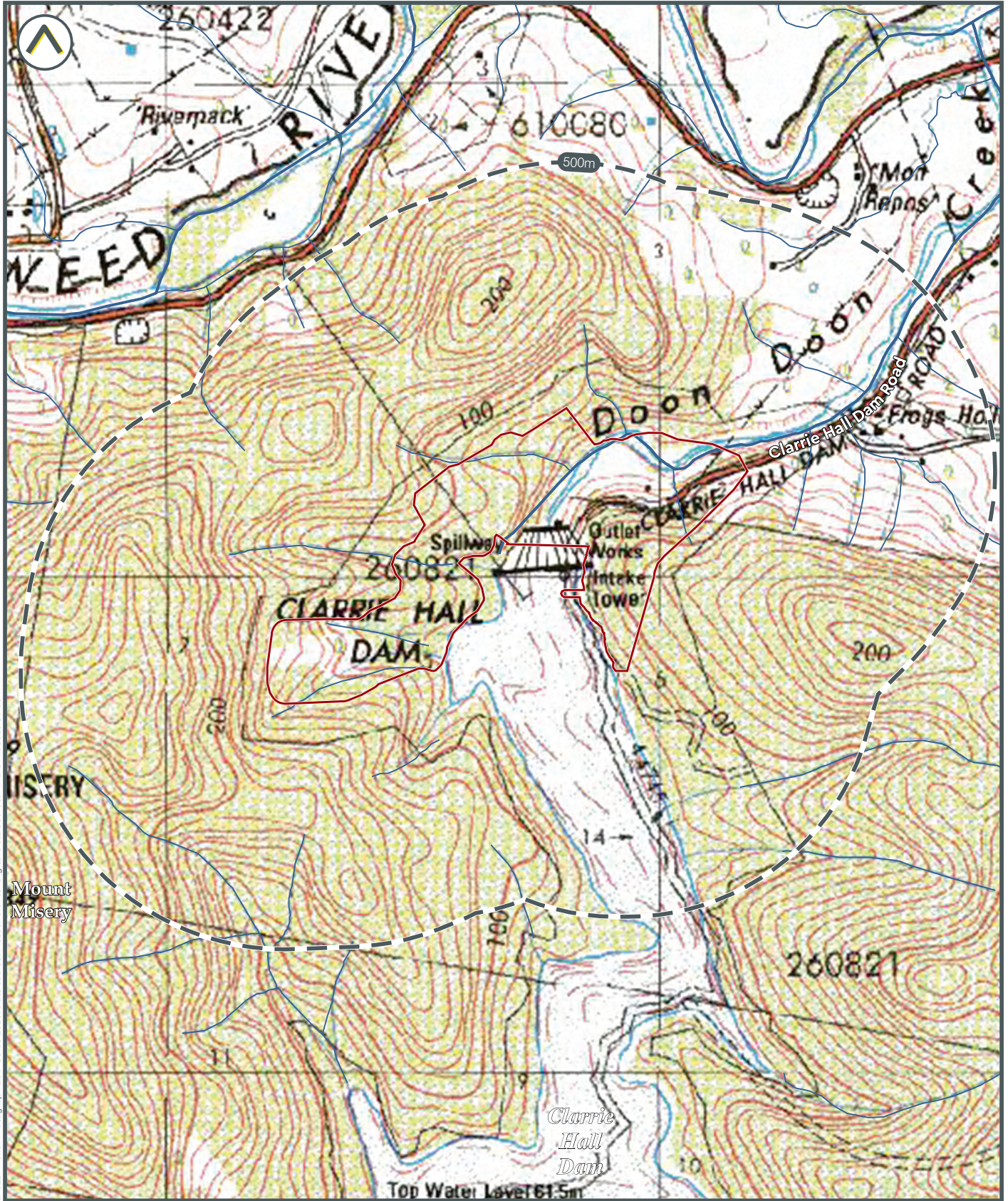
Historic Aerial Photograph - 2022



LI-3227 Aerial Photograph 2022 03 03 2023. Data source: Please refer to 'Digital Data Sources' in the Product Guide



1969-1991 1:25,000 Topographic Map (Burringbar 9541-2S)



LI-3027 Aerial Photograph 2017 03 03 2023. Data source: Please refer to 'Digital Data Sources' in the Product Guide

Subject area



Appendix D

Photo log

Photo log

Project	Clarrie Hall Dam		
Client	KBR	Job number	E230041
EMM field staff	Lachlan Lewis, Amy Hughes	Date:	26/04/2023



Photo 1

Quarry south

Location: -28.43978114/ 153.30118567

Direction: 87.33° clockwise from north

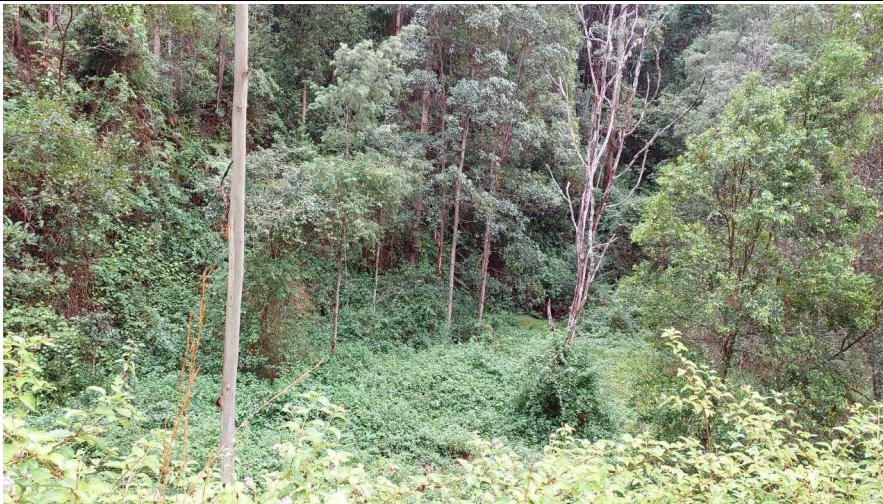


Photo 2

Quarry east

Location: -28.43977561/ 153.30119532

Direction: 103.09° clockwise from north



Photo 3

Dam wall and existing spillway

Location: -28.43742642/ 153.30395196

Direction: 86.36° clockwise from north



Photo 4

Disturbance area, new spillway and potential stockpile down end near the pool.

Location: -28.4374316/ 153.3039718

Direction: 107.42° clockwise from north



Photo 5

Intake tower

Location: -28.43883405/ 153.30552719

Direction: 112.94° clockwise from north



Photo 6

Inside intake tower

Location: -28.438733/ 153.30551882

Direction: 114.46° clockwise from north



Photo 7

Asbestos warning sign on toilet block adjacent to septic tanks at dam site

Location: -28.43680015/ 153.30721908

Direction: 77.36° clockwise from north



Photo 8

Livestock infrastructure adjacent to Kyogle Rd and Clarrie Hall Dam Rd. Doon doon cattle dip station

Location: -28.42919803/ 153.31519819

Direction: 163.8° clockwise from north



Photo 9

Hazardous chemicals sign on livestock infrastructure fence at intersection

Location: -28.42921925/ 153.31503872

Direction: 135.19° clockwise from north



Photo 10

Site 4: Crams Farm Reserve asbestos containing material warning sign on toilet block

Location: -28.47257908/ 153.30143817

Direction: 358.19° clockwise from north



Photo 11

Site 4: Doon Doon hall, Crams Farm Reserve.

Location: -28.47258597/ 153.30167361

Direction: 356.32° clockwise from north



Photo 12

McCabes Bridge, plans for realignment as part of dam raising project.

Location: -28.48465165/ 153.30197894

Direction: 280.4° clockwise from north



Photo 13

Site 7: 269 Doon Doon Rd. Diesel tank with stained ground underneath.

Location: -28.48328236/ 153.30008589

Direction: 58.03° clockwise from north



Photo 14

Site 7: 269 Doon Doon Rd. Sprayer container and various other chemical containers.

Location: -28.48344516/ 153.30005156

Direction: 7.67° clockwise from north



Photo 15

Site 8: 511 Doon Doon Rd. Mixed solid household waste. Electric and white goods, metals, old gas cans, wood, concrete, brick, plastic.

Location: -28.48464546/ 153.3007772

Direction: 305.82° clockwise from north



Photo 16

Site 15: Fogartys Dip. Abandoned cattle dip. Leftover fencing from cattle dip.

Location: -28.49393368/ 153.30208783

Direction: 196.43° clockwise from north



Photo 17

Site 10: 571 Doon Doon Rd. Abandoned diesel AST, unknown volume. Hasn't been used in approx 10 years. Hole in the top.

Location: -28.48631783/ 153.30310097

Direction: 192.94° clockwise from north



Photo 18

Site 9: 60 Commissioners Creek. Potential stock treatment area.

Location: -28.48362595/ 153.30355739

Direction: 153.34° clockwise from north

Australia

SYDNEY

Ground floor 20 Chandos Street
St Leonards NSW 2065
T 02 9493 9500

NEWCASTLE

Level 3 175 Scott Street
Newcastle NSW 2300
T 02 4907 4800

BRISBANE

Level 1 87 Wickham Terrace
Spring Hill QLD 4000
T 07 3648 1200

CANBERRA

Level 2 Suite 2.04
15 London Circuit
Canberra City ACT 2601

ADELAIDE

Level 4 74 Pirie Street
Adelaide SA 5000
T 08 8232 2253

MELBOURNE

Suite 8.03 Level 8 454 Collins
Street
Melbourne VIC 3000
T 03 9993 1900

PERTH

Suite 9.02 Level 9 109 St
Georges Terrace
Perth WA 6000

Canada

TORONTO

2345 Young Street Suite 300
Toronto ON M4P 2E5

VANCOUVER

60 W 6th Ave Suite 200
Vancouver BC V5Y 1K1



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