APPENDIX K

Historic Archaeological Assessment

Historical Archaeological Assessment

Clarrie Hall Dam Raising

Prepared for KBR

August 2024

Historical Archaeological Assessment

Clarrie Hall Dam Raising

KBR

E230038 RP1

August 2024

Version	Date	Prepared by	Reviewed by	Comments
1	18 January 2024	James McGuinness		Draft issued for KBR comment
2	30 January 2024	James McGuinness & Susan Lampard		Revised draft for Tweed Shire Council comment
3	22 February 2024	James McGuinness & Susan Lampard		Revised draft for final comment
4	2 August 2024	Susan Lampard		Updated flood modelling and inclusion of natural heritage for Tweed Shire Council comment
5	26 August 2024	Susan Lampard		Final

Approved by

Susan Lampard
Associate Archaeologist, Team Leader Historical Heritage
26 August 2024

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

Executive Summary

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 propose to raise the wall of Clarrie Hall Dam by 8.5 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 Department of Planning and Environment (DPE), now NSW Department of Climate Change, Energy, the Environment and Water (NSW DCCEEW), 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 objectives of the FNCRWS.

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 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 to the Tweed River, where it is subsequently harvested at the Bray Park Weir.

The Tweed District water supply is currently a run-of-river supply augmented by releases from Clarrie Hall Dam. Raw water is drawn from upstream of Bray Park Weir, effectively a saltwater barrage, in the Tweed River. In periods of low flow in the river, flows are augmented by releases from Clarrie Hall Dam to ensure availability of water for the Tweed District water supply.

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.

The project is being assessed under State Significant Infrastructure provisions, with the latest Secretary's Environmental Assessment Requirements (SEARs) for the project issued on 22 December 2023. EMM Consulting Pty Limited (EMM), in partnership with KBR Limited, has been engaged by Tweed Shire Council to complete an Historical Archaeological Assessment (HAA) (this document) for the Environmental Impact Statement (EIS), in accordance with the SEARs. In addition, this document addresses the potential impacts to the adjacent World, National, State and local natural heritage values contained in the Wollumbin and Mount Jerusalem National Parks.

Conclusions

Much of the project area has seen little change since the earliest phases of historical activity and modern development disturbances have been limited to areas that have been inundated following construction of Clarrie Hall Dam in 1983. These circumstances are conducive to the preservation of an archaeological landscape, and where specific locations of past activity have been identified, archaeological potential has been found to be high. However, past historical activity within the project area has not been intensive and areas of high archaeological potential are limited to specific sites of post-1920 dairy farming activities and the former Doon Doon Sawmill Company. Both of these potential resources are in the most prominent and well-documented historical land holding in the project area – Crams Farm. Nil to low archaeological potential has been identified for the remainder of the project area, as a very limited possibility exists that ephemeral archaeological evidence (i.e. individual or small numbers of artefacts randomly lost) may be present that could not be identified from documentary research or physical inspection of the landscape.

Assessment of the site histories for the potential archaeological resources at Crams Farm and Doon Doon Sawmill has determined that they are unlikely to be of research value or meet other thresholds for significance, and these areas therefore hold low archaeological sensitivity. As a result, this document has determined that archaeological 'relics' are unlikely to be present within the project area.

The location of the former sawmill has also been found to fall in the current FSL, rendering it inaccessible and subject to existing inundation impacts. However, those resources that are likely to be present within Crams Farm Reserve would not be impacted by the proposed enlargement of the FSL to 70 m AHD or the PMF to 77 m AHD. As a result, the raising of Clarrie Hall Dam is considered to pose no direct or indirect impacts to potentially significant archaeological resources as defined by the relics provision of the *Heritage Act (1977)*.

Given the size of the project area, very few historical properties or structures, past or existing, have been identified overall. However, two locally significant historical buildings have been identified in Crams Farm Reserve.

The Bails and Dairy has been assessed to be locally significant under NSW heritage assessment Criterion a) (historical significance), as it is characteristic of the development of Crams Farm and the broader, early development of dairy farms at Lower Doon Doon. The Bails and Dairy is also a highly contributory element of the historical setting of Crams Farm Reserve that includes Doon Doon Hall and mature tree plantings.

Doon Doon Hall has been assessed as locally significant under Criterion a) (historical significance) and Criterion d) (social/cultural significance), as it is among the oldest Federation-era community halls in the Tweed LGA, has occupied three separate sites within two Tweed communities and has served the Doon Doon community for almost 100 years as the sole historical public building.

Impact assessment within this document has determined that although the green space of Crams Farm Reserve will be reduced by the raising of Clarrie Hall Dam, no direct impacts are posed to the Bails and Dairy building by the proposed works, FSL or PMF. Indirect impacts will also be limited to reduction in the surrounding lawn green space and former area of Crams Farm. The immediate, contributory setting provided by mature trees and additional structures within Crams Farm Reserve will not be altered or impacted as a result of the proposed works. Proposed changes are therefore considered unlikely to adversely affect the significance of the Bails and Dairy or Doon Doon Hall. The historical narrative of the farm and the setting of the public reserve are both currently enhanced, not reduced, by the waterway formed by the dam and this would remain the case if the buildings were brought into closer proximity to the waterline.

An assessment of the potential indirect impacts to Wollumbin National Park, located three kilometres to the north and listed on the World and National heritage list, indicates that there would be no direct impacts. Indirect impacts would be limited to a potential change in the outlook from some areas of the Wollumbin National Park, but these changes are likely to be minimal due to the intervening distance, topography and vegetation.

An assessment of the potential indirect impacts to the State and locally listed Mount Jerusalem National Park, which abuts the Proposal, would be minimal. The measures proposed in the Biodiversity Development Assessment Report are suitable to manage the potential indirect impacts.

Recommendations

This HAA has identified that potential archaeological resources and existing locally significant historical structures are unlikely to be impacted by the proposed construction works or by inundation as a result of the raising of Clarrie Hall Dam (ie the operational impacts). The surrounding natural heritage values are unlikely to be impacted as a result of the Proposal. As a result, no further investigation or specific mitigation measures are required with regard to historical or natural heritage. However, the following general recommendations are provided to guide management during the construction and operation of the Proposal:

- Works can proceed with caution. An unexpected finds procedure should be integrated into the construction environmental management plan and implemented throughout the life of the Proposal to manage any unexpected archaeological resources.

- Should the proposed works as presented in Section 7.1 be altered, an addendum to this document may be required to assess the potential heritage and archaeological impact of the new works.
- As Doon Doon Hall and the Bails and Dairy have been assessed in this document to be of local heritage significance, they should be incorporated into the environmental management framework for the Proposal.
- Tweed Shire Council should consider the local heritage listing of built items Doon Doon Hall and the Bails and Dairy under future amendments to the Tweed Local Environmental Plan. This would ensure the appropriate ongoing management of the items in consideration of likely increased public engagement and interaction with the site following completion of the Proposal.
- The management measures outlined by the BDAR should be implemented to guard against impacts to the adjacent natural heritage values protected in the Mount Jerusalem National Park.

TABLE OF CONTENTS

Tables

Figures

Plates

1 Introduction

1.1 Proposal overview

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 region. Tweed Shire Council propose to raise the wall of Clarrie Hall Dam by 8.5 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).

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 propose to raise the wall of Clarrie Hall Dam by 8.5 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 DCCEEW, 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 objectives of the FNCRWS.

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 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.

The Tweed District water supply is currently a run-of-river supply augmented by releases from Clarrie Hall Dam down Doon Doon Creek via a shuttered intake in the intake tower into a pipe/outlet tunnel that runs under the dam wall to a valve chamber (outlet works) where there are a number of valves through which the water goes through before it discharges into Doon Doon Creek to the Tweed River. Raw water is drawn from upstream of Bray Park Weir, effectively a saltwater barrage, in the Tweed River. In periods of low flow in the river, flows are augmented by releases from Clarrie Hall Dam to ensure availability of water for the Tweed District water supply.

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

Clarrie Hall Dam is located in Uki, NSW; approximately 15 km southwest of Murwillumbah, within the Tweed Shire local government area (LGA), Parish of Nullum, County of Rous (Figure 1.1, Figure 1.2). Clarrie Hall Dam contains the catchment of Doon Doon Creek, a tributary of the Tweed River in the Northern Rivers region of New South Wales (NSW). The containment zone of the dam includes land that stretches south-west to the environs of the small rural location of Doon Doon, NSW.

1.2 Secretary's Environmental Assessment Requirements

The Proposal is being assessed under State Significant Infrastructure provisions of the *Environmental Planning and Assessment Act (1979)*. The Secretary's Environmental Assessment Requirements (SEARs) for the Proposal were issued by the NSW DCCEEW (formerly Department of Planning, Industry and Environment) on 22 December 2023, replacing the previous version of 26 April 2019 and 26 November 2021. EMM Consulting Pty Limited (EMM), has been engaged by KBR to complete an Historical Archaeological Assessment (HAA) in accordance with the SEARs. In addition to information contained in previous heritage assessment reports, this HAA provides the results of further research and outlines potential impacts to previously unidentified archaeological resources and proposed archaeological management, in consideration of the SEARs for the Proposal.

Table 1.1 presents the SEARs relevant to this Historical Archaeological Assessment and includes a summary of each component of the SEARs addressed in this report.

Table 1.1 SEARs addressing cultural heritage for the Proposal and their relevance to the HAA.

SEARs	EMM comment on compliance
The Proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance of: • Aboriginal places and objects, as defined under the National Parks and Wildlife Act 1974 and in accordance with the principles and methods of assessment identified in the current guidelines • Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan • environmental heritage, as defined under the Heritage Act 1977 • items listed on the National and World Heritage lists.	Environmental cultural heritage as defined under the Heritage Act (1977) is identified in Section 6 and potential impacts are assessed in Section 7.
Where impacts to State or locally significant heritage items are identified, the assessment must: • include a statement of heritage impact for all heritage items (including significance assessment)	Locally significant historical structures have been identified in previous iterations of the EIS and as part of this assessment. These are outlined in Sections 4.2.1, 4.2.2, and 6.1.1iv. Significance of the structures and any potential impacts are assessed in Sections 6.1.1ii, 7.3 and 7.4. Section 7.3 and 7.4 - Statement of Heritage Impact provided.
Consider impacts to the item of significance caused by the proposal, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant)	Relevant potential impacts are considered in Section 7.2.
Outline measures to avoid and minimise those impacts in accordance with the current guidelines	Mitigation measures are provided in Section 8.2.
be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria).	Section 1.4 - This report outlines the results of fieldwork, research and assessment by a suitably qualified Archaeologist and Heritage Consultant. No archaeological excavations are recommended as a result of this assessment.

SEARs	EMM comment on compliance
A historical archaeological assessment should be prepared by a suitably qualified historical archaeologist in accordance with the relevant guidelines. This assessment should identify what relics, if any, are likely to be present, assess their significance and consider the impacts from the proposal on this potential resource. Where harm is likely to occur, it is recommended that the significance of the relics be considered in determining an appropriate mitigation strategy. If harm cannot be avoided in whole or part, an appropriate Research Design and Excavation Methodology should also be prepared to guide any proposed excavations.	This HAA report fulfils this requirement, updating and expanding on previous assessments and providing archaeological assessment in accordance with the current SEARs and relevant NSW heritage guidelines, including: *Assessing Significance for Historical Archaeological Sites and Relics* (Heritage Branch, Department of Planning, 2009) *Assessing Heritage Significance* (NSW Heritage Office, 2001) (recently updated as *Assessing Heritage Significance* (Department of Planning and Environment, 2023) *Statements of Heritage Impact* (Heritage Office and Department of Urban Affairs & Planning, 2002) (recently updated as *Guidelines for Preparing a Statement of Heritage Impact* (Department of Planning and Environment, 2023) The overarching *Australia ICOMOS Burra Charter, 1979.*
The Heritage NSW letter notes: • The Clarrie Hall Dam is located directly adjacent to State Heritage Register (SHR) item High Conservation Value Old Growth Forest (SHR no. 01487), at Mount Jerusalem National Park. • The dam is also in the vicinity of SHR item Gondwana Rainforests of Australia (SHR no. 01002), at Wollumbin National Park. The Gondwana Rainforests is also listed on the National and World Heritage Lists.	The potential for impacts to these items is addressed in Section 7.5.

1.3 Heritage status

Clarrie Hall Dam is not a listed heritage item and there are no listed historical archaeological sites or heritage items in the Proposal area (Table 1.2 and Figure 1.3). Within 3 km is located the Wollumbin National Park, which is part of the World Heritage List (WHL) and National Heritage List (NHL) Gondwana Rainforests of Australia (Place ID 105135 and 105704 respectively), hereafter, GRA. Additionally, Mount Jerusalem National Park located within 500 m is listed on the State Heritage Register and the TLEP (Figure 1.3). Impacts to these items are addressed in Section 7.5.

Table 1.2 Historical and natural heritage listed items

Jurisdiction	Heritage Register	In study area	Within 3 km of study area
Federal	World Heritage List	Nil	Wollumbin National Park portion of the Gondwana Rainforests of Australia (ID#105135)
	Commonwealth Heritage List	Nil	Nil
	National Heritage List	Nil	Wollumbin National Park portion of the Gondwana Rainforests of Australia (ID#105704)
State	State Heritage Register	Nil	Wollumbin National Park and Mount Jerusalem National Park portions of the High Conservation Value Old Growth forest (SHR #01487)
	Section 170 Heritage and Conservation Registers	Nil	Nil

Jurisdiction	Heritage Register	In study area	Within 3 km of study area
Local	Tweed LEP 2000	Nil	Nil
	Tweed LEP 2014	Nil	'High Conservation Value Old Growth Forest', being Mount Jerusalem National Park is located 500 m east of the proposed. (#I101) & Wollumbin National Park
Non-statutory	Register of the National Estate	Nil	Nil

1.4 Authorship and limitations

This report was prepared by James McGuinness (Senior Archaeologist and Heritage Consultant). Additions and technical review were conducted by Dr Susan Lampard (Associate Archaeologist EMM). Two prior baseline heritage surveys of the entire study area have been conducted as part of previous historic heritage assessments conducted for the Proposal. This HAA addresses specific areas of archaeological sensitivity that have been identified through these previous assessments and through additional desktop research and targeted site inspections. As a result, the physical analysis within the Proposal area is limited to these areas and did not include survey of the entire Proposal area.

1.5 Methodology

This HAA has been prepared utilising historical documents, maps and plans, historical, contemporary aerial imagery and previous assessments to develop a desktop model of archaeological sensitivity. Targeted areas of sensitivity have been identified, framing an assessment that builds on previous Proposal area-wide baseline investigations conducted during a previous historic heritage assessment (Navin Officer 2018, ELA 2021). Physical analysis, discussions with landholders and local studies research have been carried out to inform the assessment process and identify whether the Proposal area has potential to hold historical archaeological relics of significance that may be impacted by the Proposal.

This assessment has been prepared with reference to NSW historical heritage principles and guidelines including:

- *The Burra Charter*, Australia ICOMOS 2013
- *Assessing Significance for Archaeological Sites and 'Relics'*, Heritage Branch, Department of Planning, 2009
- *Historical Archaeological Investigations: A Code of Practice*, NSW Department of Planning, 2006.
- *Archaeological Assessment Guidelines*, NSW Heritage Office, Department of Urban Affairs & Planning, 1996
- *Assessing Heritage Significance*, NSW Department of Planning and Environment 2023
- *NSW Heritage Manual*, NSW Heritage Office, Department of Urban Affairs & Planning, 1996
- Tweed LEP 2014 and the Tweed DCP 2016.

The potential impacts to the World and National heritage values of Wollumbin and Mount Jerusalem National Parks have been assessed using the *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties* impact assessment guideline (ICOMOS, 2001). The impact assessment matrix is set out in Table 1.3.

Table 1.3 Estimating impact significance

Significance of impact		Magnitude of change				
		Major	**Medium**	**Low**	**Negligible**	**No change**
Cultural heritage sensitivity	Extreme	Very large	Large/very large	Moderate/ large	Slight	Neutral
	Very high	Very large	Large/very large	Moderate/ large	Slight	Neutral
	High	Large/very large	Moderate/large	Slight/ moderate	Slight	Neutral
	Moderate	Moderate/large	Moderate	Slight	Neutral/ slight	Neutral
	Low	Slight/moderate	Slight	Neutral/ slight	Neutral/ slight	Neutral
	Negligible	Slight	Neutral/slight	Neutral/ slight	Neutral	Neutral

1.6 Previous Heritage Assessment

Previous HAAs were undertaken by Navin Officer Consultants (NOHC) in 2018, and Eco Logical Australia (ELA) in 2021.

Navin Officer Consultants (NOHC) (2018) NOHC undertook an HAA as part of a broader Aboriginal Cultural Heritage Assessment (ACHA) for a Preliminary Environmental Assessment prepared by Tweed Shire Council (2018). This NOHC report provided a summary of the Proposal, a cursory overview of regional historical development and historical and physical summaries of structures identified during the field survey. The NOHC report did not include an assessment of further areas subsequently identified as necessary, including replacement of McCabes Bridge, construction compound, concrete batching plant and accommodation. These further areas have been addressed in this report.

Three historical sites were identified, described and assessments were made of their respective heritage significance (NOHC 2018:132-139). Of the three sites two, Crams Farm Site Complex (CHD-H2) and Doon Doon Hall (CHD-H3), were determined to hold local heritage significance. The third site, the Francis Garner property building platform (CHD-H1), was assessed as not meeting NSW heritage significance thresholds.

An historical archaeological predictive model for the Proposal area was presented that identified there was high archaeological potential for relics associated with three key historical themes for structures and activities known or suspected to have taken place within the Proposal area, largely within the 20th century. These themes were identified as:

- Forestry and agriculture
- Pastoralism
- Land tenure

Potential structural and industrial relics associated with these themes included, but were not limited to,

> …hay barn, dairy, rural landscape, farmstead, fencing, shed, market garden, piggery, timber mill, shearing shed, homestead, labour accommodation, domestic refuse, fencing, well, water trough, wool store, survey mark, subdivision pattern, stone wall, cairn, survey mark, trig station.

(NOHC 2018:33)

Assessment of historical archaeological potential in the Proposal area was limited to statements regarding inferred archaeological potential associated with the immediate surrounds of the three potential built heritage sites (CHD-H1- CHD-H3) against NSW Heritage criterion (e) (potential to yield further information about the cultural history of the local area) (NSW Heritage Office 2000). Of the two sites determined to be locally significant, neither was identified as a site holding archaeological potential based on the physical inspection. Historical information provided for CHD-H2 indicated that the Crams Farm complex once included several other ancillary buildings, including at least one iteration of a sawmill and 'many' other buildings as well as Cram family residences and mill workers' cottages. No further desktop assessment of potential archaeological resources associated with these sites or broader past occupation of the Proposal area was provided that would support assessment against NSW heritage criteria.

The combined ACHA/HAA provided mitigation measures regarding historical heritage sites identified in the Proposal area. Table 11.3 of the report indicated the need to archivally record a component of CHD-H2 (namely the piggery), as well as mark on maps the other sites to avoid inadvertent impact, although the specific recommendations only state the following:

- *Archival recording should be conducted of historic sites within the inundation area assessed as locally significant prior to approval for development related impacts.*

- *The protocols for the unanticipated discovery of archaeological material and suspected human remains (presented in Appendix 4) should be implemented as necessary during activities involving ground surface disturbance and excavation.*

(NOHC 2018:198)

1.6.1 Eco Logical Australia (ELA) (2021)

ELA continued the assessment process from NOHC's previous HAA and sought to produce an HAA as part of an Environmental Impact Statement (EIS) for the Proposal in accordance with SEARs of the Proposal issued on 26 April 2019.

ELA provided a Proposal description, revised regional historical summary and a phased historical outline for the Proposal area and surrounds, set against NSW historical themes developed by the Heritage Council of NSW.

A review of the site histories and heritage fabric of the three sites identified by NOHC (CHD-H1-CHD-H3) was provided, however all three sites were not considered to meet the threshold for local significance.

In addressing archaeological potential, ELA outlined a predictive statement for the Crams Farm complex. This determined that areas of archaeological potential will be:

> *…located around the main activity areas such as houses and farm buildings. Evidence for a range of features relating to the use of the land historically is also likely to have been inundated. Based on historical research concerning land use and land modification (disturbance), the archaeological potential of the proposed inundation within the Project area is assessed as low with any surviving archaeological resource comprising of:*
>
> - *subsurface features, such as a well, rubbish or cesspits*
> - *demolished building footings*
> - *landscape alterations, such as road construction, terracing and levelling of bedrock for dam construction, garden design or plantings*
> - *pastoral and agricultural activities.*

(ELA 2021:10)

As part of their assessment of the Crams Farm complex, ELA reiterated that 'numerous other buildings were located on the property which are no longer present.' (2021:6). The specific locations of these buildings and their specific archaeological potential were not researched or addressed.

In conclusion, ELA determined that:

> *…any potential archaeological remains in the project area will be limited to minor occupation-related deposits and landscape modification dating to the 20th century. Due to the minimal archaeological potential of the Project area and the late date of the site's establishment it is concluded that the Project area site is unlikely to contain 'relics' as defined by the Heritage Act that are either of local or State significance.*

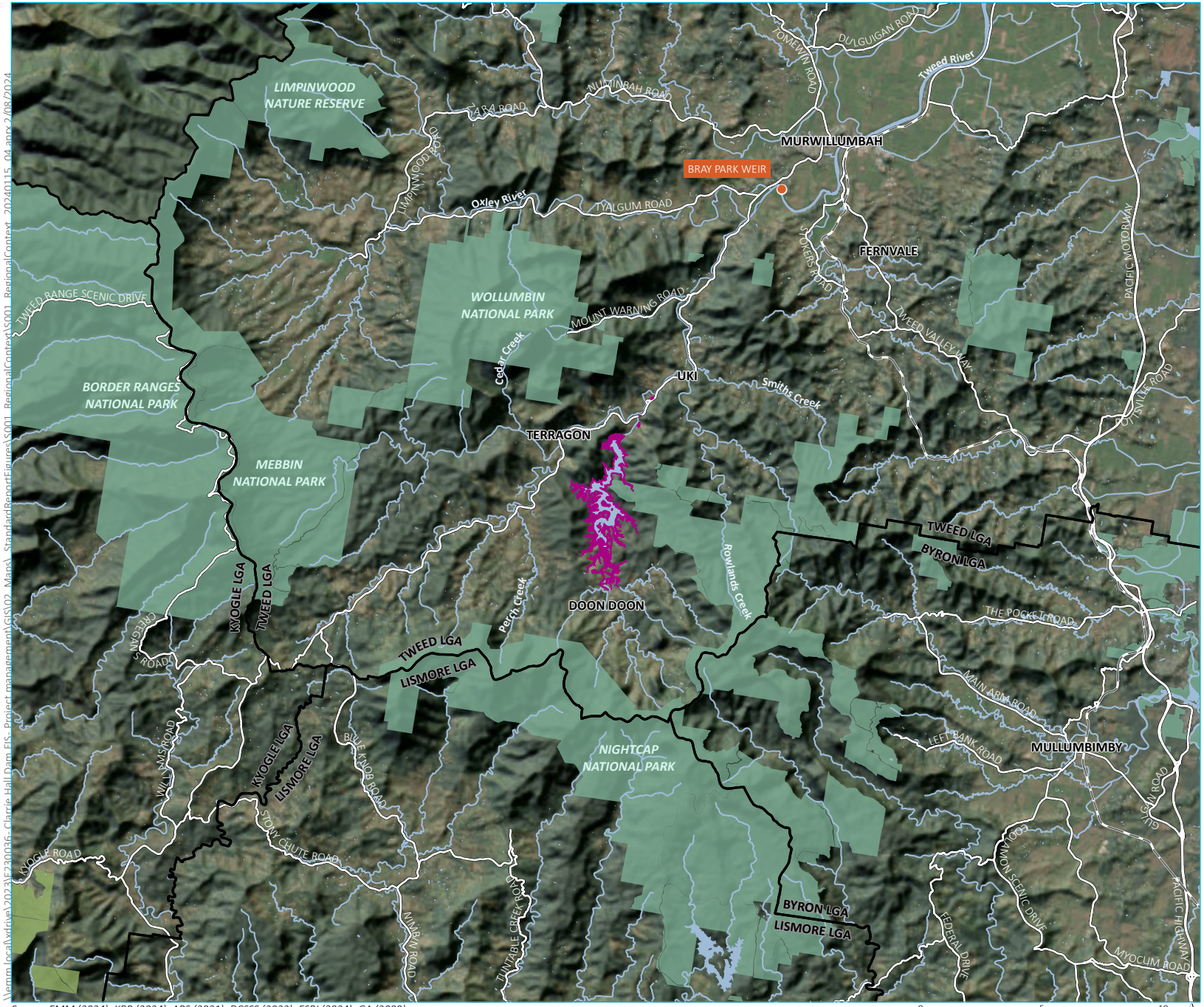
(ELA 2021:18)

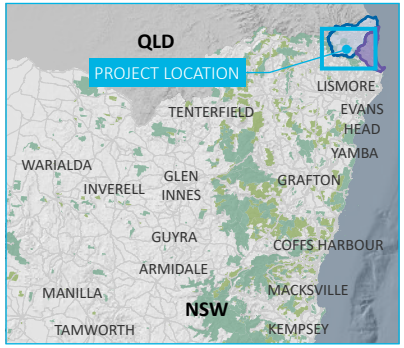
Four recommendations were provided, including:

- *Any physical intervention that will result in the disturbance of relics will require application for an excavation permit under section 139 of the Heritage Act 1977.*
- *The mitigation and management procedures outlined in section 7 should be adhered to. [These relate to the management of unexpected finds]*
- *Based on the results of the assessment it is recommended that any future excavation or ground disturbance works can go ahead without further approvals.*
- *If any unexpected Aboriginal objects, historical heritage items or human skeletal remains are uncovered in any future works at the site, the works must cease and the unexpected finds procedure (section 7.1) must be followed.*

(ELA 2018:18)

This HAA considers the results and recommendations of these previous reports as part of the assessment process and provides a synthesis of relevant information, identified previously and as a result of additional research, in order to assess the Proposal area in accordance with NSW heritage guidelines and the current SEARs for the Proposal.





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

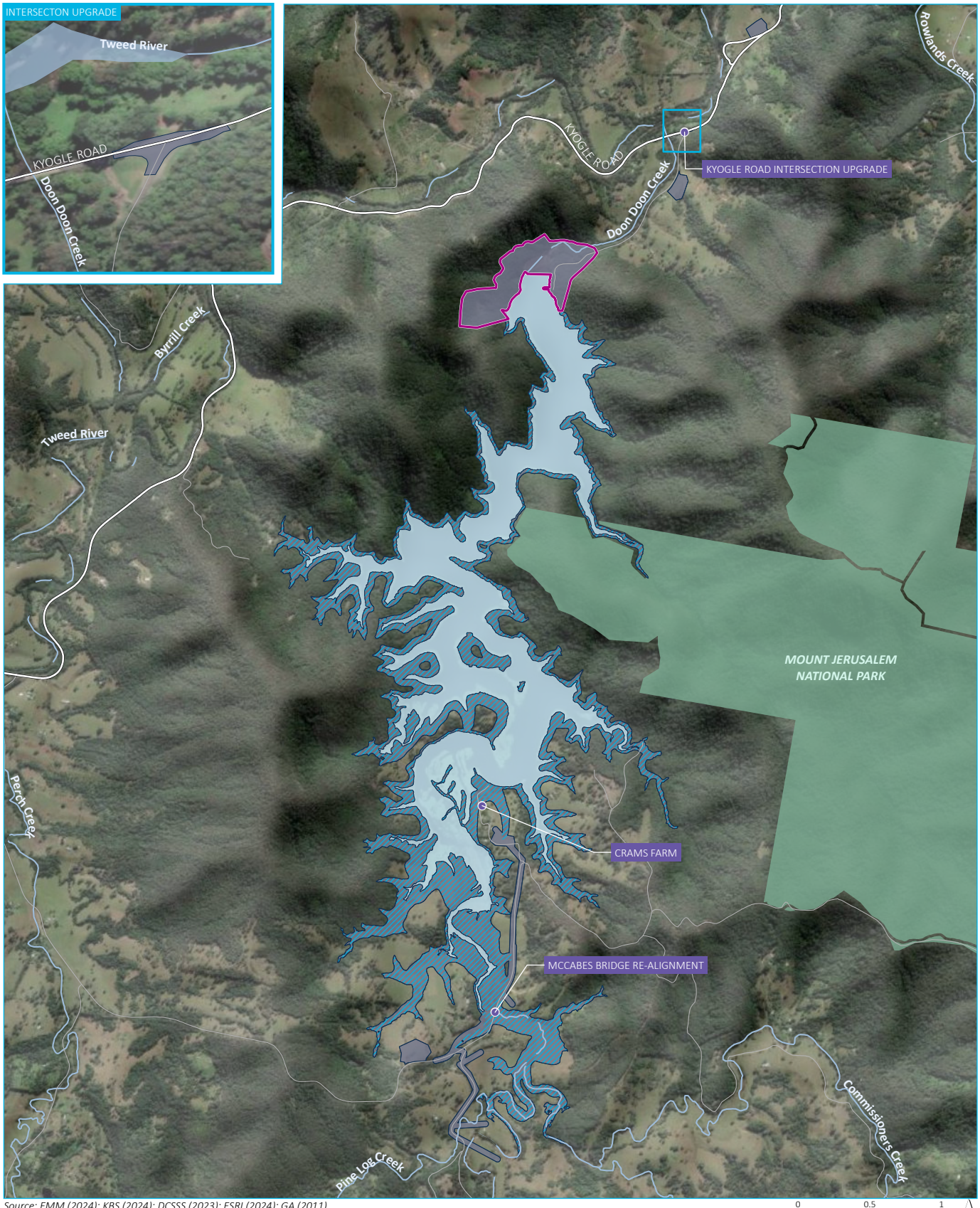
Source: EMM (2024); KBR (2024); ABS (2021); DCSSS (2023); ESRI (2024); GA (2009)

Regional setting

Clarrie Hall Dam EIS
Historical Archaeological Assessment
Figure 1.1

EMM
creating opportunities

\\emm.local\vtdrive\2023\E230036 - Clarrie Hall Dam EIS - Project management\GIS\02_Maps_StandardReportFigures\S001_RegionalContext\S001_RegionalContext_20240115_04.aprx 2/08/2024



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

0 0.5 1 km

GDA2020 MGA Zone 56

N

\\emm.local\xdrive\2023\E230036- Clarrie Hall Dam EIS- Project management\GIS\02_Maps_StandardReportFigures\S002_ProjectFootprint\S002_ProjectFootprint_20240801_07.aprx 2/08/2024

KEY

- Proposed construction disturbance footprint
- Existing inundation
- Inundation to FSL (61.5- 70 m AHD)
- Infrastructure upgrade location

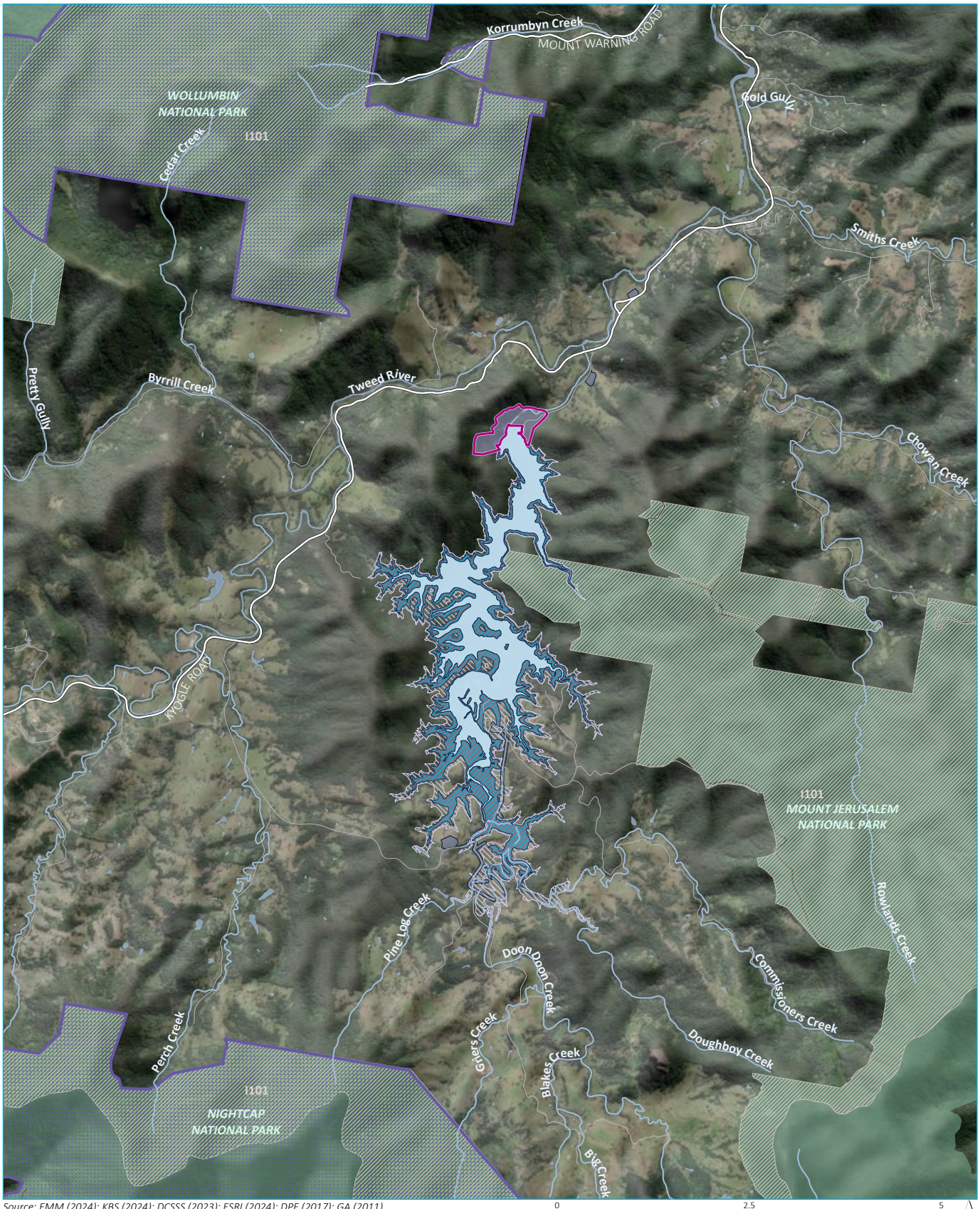
Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve

Local context

Clarrie Hall Dam EIS
Historical Archaeological Assessment
Figure 1.2

EMM
creating opportunities



Source: EMM (2024); KBS (2024); DCSSS (2023); ESRI (2024); DPE (2017); GA (2011)

0 2.5 5 km

GDA2020 MGA Zone 56

N

\\emm.local\xdrive\2023\E230036- Clarrie Hall Dam EIS- Project management\GIS\02_Maps_HH\HH005_HeritageItems\HH005_HeritageItems_20240801_02.aprx 2/08/2024

KEY

- Construction disturbance footprint
- Proposed construction disturbance footprint
- Existing inundation
- Inundation to FSL (61.5- 70 m AHD)
- FSL to PMF (70-77 m AHD)
- High conservation value old growth forest (I101)- Tweed LEP 2014
- World & National heritage listed Gondwana Rainforest

Existing environment

- Major road
- Minor road
- Named watercourse
- Waterbody
- NPWS reserve

Heritage items

Clarrie Hall Dam EIS
Historical Archaeological Assessment
Figure 1.3

EMM
creating opportunities

2 Statutory framework

In NSW, two main Acts (discussed below) give legal protection to items that have been assessed as worthy of protection on the basis of their environmental, which includes heritage, significance. The State Heritage Register (SHR), the S170 registers, and heritage schedules of local environment plans (LEPs) are statutory listings that identify specific items and places that require management to ensure that change does not diminish their significance.

2.1 Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

The EPBC Act provides a legal framework to protect the environment. The EPBC Act definition of environment includes places of natural, Indigenous and historic heritage value. Under the EPBC Act, heritage places can be listed on:

- World Heritage List (WHL) – places inscribed on the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage List;
- National Heritage List (NHL) -places of significance to the nation; and
- Commonwealth Heritage List (CHL) - items belonging to the Commonwealth or its agencies.

The EPBC Act requires actions on Commonwealth land (Section 26) and actions undertaken by a Commonwealth agency (Section 28) to be assessed to determine whether they are likely to have a significant impact on the environment. Heritage places may be listed on a statutory register, such as the WHL, NHL, CHL or State-based registers, or may be an unlisted item identified by a Commonwealth agency.

Additionally, actions that may impact on Matters of National Environmental Significance (MNES) must also be assessed for impacts. MNES that relate to heritage include identification on the WHL or NHL. Under the EPBC Act, an action that may have a significant impact on a MNES is deemed to be a 'controlled action' and can only proceed with the approval of the Commonwealth Minister for the Environment. An action that has the potential to cause significant impacts to MNES is to be referred to the Department of Climate Change, Energy the Environment and Water (DCCEEW) for determination as to whether it is a controlled action. If deemed a controlled action the Proposal is assessed under the EPBC Act for approval.

2.2 Environmental Planning and Assessment Act 1979 (NSW)

The *Environmental Planning and Assessment Act 1979* (EP&A Act) establishes the framework for development assessment within NSW, with one of the objects of the Act being to promote the sustainable management of built and cultural heritage, including Aboriginal cultural heritage.

As the majority of development assessment and consent is undertaken by Local Government (council), the EP&A Act directs council to prepare a local environmental plan (LEP) and development control plans (DCPs) for their local government. LEPs are to be developed under the standard instrument, which provides planning consistency across the State. Schedule 5 of the Standard Instrument provides a list of identified environmental heritage within the LGA, impacts to which are to be considered during the development assessment and approval process. DCPs provide policies that are specific to the local environment and character of the LGA or a subset of the LGA. The NSW department with responsibility for planning may also prepare state environmental planning policies (SEPPs) to guide planning across the State.

Due to the size, economic value or impacts, some types of development are assessed as State Significant Development (SSD) or State Significant Infrastructure (SSI). Where a project is identified as SSD or SSI, the NSW department with responsibility for planning is the consent authority and directs the proponent to prepare an application for the secretary's environmental assessment requirements (SEARs), which define the various studies and guidelines for the preparation of an environmental impact statement (EIS) and supporting technical reports. The project has been assessed as SSI and the SEARs, outlined in Section 1.2, include the preparation of this HHA.

The purpose of all assessment processes is to consider impacts to, among other things, cultural heritage items and places as well as archaeological sites and deposits associated with the proposal and to identify measures to avoid, mitigate or ameliorate impacts.

2.3 Heritage Act 1977 (NSW)

The Heritage Act is the primary piece of State legislation affording protection to items of environmental heritage (natural and cultural) in NSW that have been formally placed on the State Heritage Register (SHR), or archaeological sites that are assessed as relics. Under the Heritage Act, 'items of environmental heritage' include places, buildings, works, relics, moveable objects and precincts identified as significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. State significant items are listed on the SHR and are given automatic protection under the Heritage Act against any activities that may damage an item or affect its heritage significance.

The Heritage Act also protects 'relics', regardless of their listing status. It applies to all land in NSW, except Commonwealth land. Section 4(1) of the Heritage Act (as amended 2009) defines relic to mean:

> … any deposit, artefact, object or material evidence that:
> (a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and
> (b) is of State or local heritage significance."

Section 139(1) of the Heritage Act states that:

> *"A person must not disturb or excavate any land knowingly or having reasonable cause to suspect that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, damaged or destroyed unless the disturbance or excavation is carried out in accordance with an excavation permit."*

The archaeological management process on a project that is not a major project requires that activities that may harm relics be compliant with section 139 of the Heritage Act. A permit is required to disturb land where relics are anticipated.

2.4 Tweed Local Environmental Plan 2014 (NSW)

As a standard instrument, Part 5, Section 5.10 of the Tweed LEP 2014 addresses the conservation of heritage significance within the LGA. The objectives of the LEP in relation to heritage are:

a) to conserve the environmental heritage of Tweed;

b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views;

c) to conserve archaeological sites; and

d) to conserve Aboriginal objects and Aboriginal places of heritage significance.

Schedule 5 of the LEP provides a list of heritage items, archaeological sites and conservation areas within the LGA. The Tweed Shire Development Control Plan (DCP), Section A18 (2016) provides heritage protections and guidelines for development within the LGA, including Part C, assessment of heritage impacts (2016:58). Section 5.10 of the Tweed LEP 2014, provides the following provisions with regard to archaeological sites of European heritage:

(2) Development consent is required for any of the following—

> *(a) demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance)—*
>
> *(i) a heritage item,*
>
> *(ii) an Aboriginal object,*
>
> *(iii) a building, work, relic or tree within a heritage conservation area,*
>
> *(c) disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed*

The Tweed DCP has no specific controls for archaeology.

3 Historical context

3.1 Early European settlement

The Proposal area falls in the traditional country of the Bundjalung-Yugambeh language group (Gahan 2004, p.18). The Bundjalung-Yugambeh country stretches from the Clarence River in the south to the Logan River in the north and extends westward to Warwick and Tenterfield (Boileau 2004, p.19). In 1844, the Commissioner for Crown Lands reported to the Colonial Secretary that inland peoples occupying the eastern ranges were 'very numerous and are divided into numerous small tribes, principally occupying the heads of small creeks and rivers' (Boilleau 2004:22).

European exploration of the richly-forested Richmond/Tweed region was first commenced by river, beginning with John Oxley's seven kilometre voyage up the Tweed in 1823 from Fingal Head, and Captain Henry Rouse's 1828 voyage up the Richmond aboard the *HMS Rainbow* (Boilleau 2004:21; Ballina Shire Council, 2008:75). These voyages initiated interest in the region's abundant supply of valuable timber, particularly red cedar, as well as fertile grazing land and European settlers began to infiltrate the Tweed Valley from the 1840s (Kass 1995:4; Boilleau 2004:12). However, the dense rainforests that supplied the timber severely slowed these incursions and concentrated settlement did not take hold until the 1860s (Boilleau 2004:12). By this time, most of the easily accessible cedar had been logged and the cedar getters had extended their search to the upper reaches of the Tweed River and its numerous tributaries, such as those within the Proposal area. As a result, land was gradually cleared to an extent where stock could be moved into the hinterland and this coincided with improvements in land selection terms and conditions under the *Robertson Land Act* of 1860. Livestock grazing, particularly dairy farming, became established, with the first grazing runs in the vicinity of the project area being established by Joshua Bray and Samuel Gray after 1860.

3.2 Villages in the vicinity of Mount Warning

The 1884 Land Act, which revised the 1861 Act, furthered access to land for small holders, albeit at a generally increasing cost. By 1900, inland settlements in the vicinity of the Proposal area such as Tyalgum were growing and the pace of settlement in the Tweed Valley increased rapidly after the turn of the century as a result of the rapid increase in purchases, soldier settlement subdivisions and conditional leases (Boilleau 2004:51). Settlers were increasingly drawn to the region from the major cities and other regional centres due to the ongoing promise of rich timber and grazing and agricultural land. The expansion of the dairying economy was also a government prerogative to alleviate unemployment during the depression of the 1890s. As noted by Ryan (1995):

> *From 1895 throughout the five counties of Rous, Richmond, Clarence, Fitzroy and Raleigh, millions of acres of [previously wilderness] land fell beneath the selector's axe and the land was sown to pasture for the dairy cow*.
>
> (Ryan 1995:5)

The present village of Uki, established as a stock reserve in the latter 19th century, had acquired a hall by 1904 from which regional land sales were conducted. In 1906, the present Uki School was built and was soon followed by a hotel, post office, general store, butter factory and sawmill, most of which survive and have had their heritage significance recognised within the Uki Conservation Area (TLEP 2012, Schedule 5 (Item C6).

Nearby Kunghur was opened for selection in 1904 and proclaimed a village in 1913 and soon acquired a school, post office and a community hall. Doon Doon was first opened for selection in 1906, a school was opened there in 1914 and community hall acquired from Terragon in 1930 (Section 3.4). Byrrill Creek, west of Tyalgum, was opened for selection in 1907 and a school was opened there in 1923.

3.3 Timber mills of the upper Tweed Valley

By the late 19th century, most red cedar had been harvested, however, all other excellent hardwood and softwood species were still abundant and the region's timber resource was considered the most valuable in the State. It was a major source of timber for subsequent growth in NSW and beyond (Boilleau 2004:128). Settlers found they had both a ready source of construction materials and a supplementary income source on their land, provided they were able to meet the challenges of processing and transporting the timber. Small mills sprang up to meet demand for timber for local growth after WWI and larger mills also shipped to major NSW centres.

Mills were present in Murwillumbah by 1891, Stokers Siding by 1900, and inland at Uki by 1908 (Boilleau 2004:60). Road access was limited, and upland of the Tweed River transportation of logs and milled timber was carried out by trained bullock teams hauling timber on four-wheeled 'jinker' wagons (Plate 3.1). Over the next 50 years, mills established in the South Arm of the Tweed region alone included Terragon (Plate 3.2), Crams mill at Doon Doon (Plate 3.9), two at Mt Nullum, Mt Warning, Mt Burrell, Kunghur, Kunghur Creek, Kunghur Loo, Commissioners Creek, Perch Creek, Smith's Creek, Rowlands Creek and Cedar Creek; all within a 30 km radius of the Proposal area (Hargreaves 1995:58-60). The widespread clearing of forests, which accelerated at the turn of the century, began to rapidly reduce the extent of rainforest across accessible parts of the region.

It was not until a Forestry Commission was established and the *Forestry Act (1916)* was introduced that indiscriminate clearing of leasehold lands in eastern and central NSW was brought under some degree of control through the declaration of State forests (Boilleau 2004:128). Coincident with the increase in regulation of timber sourcing was the increase in centralised commercial milling that advanced with the transition from steam to electricity-driven milling and from bullock carting to tractor and truck freighting. These changes saw many smaller mill operations close down or sell to larger operations such as the Standard Sawmilling Company or Sly Brothers Sawmill, both of Murwillumbah.

Plate 3.1 Bullock team hauling logs over the creek crossing at Uki in the early 20th century (Source: Tweed Regional Museum image, Image Id.: MUS2015.79.21)

Plate 3.2 Terragon Mill in 1925; a typical family-run operation (Source: Tweed regional Museum, Image Id.:US000319)

3.4 The settlement of Doon Doon

The majority of useable land at Lower Doon Doon, on either side of Doon Doon Creek, had been selected within 10 years of the land's resumption for sale in 1906. Early selectors of Upper Doon Doon to the south of the Proposal area were the Patch, Clark, Levy, Lillicrap, Sweetman, Roberts, Hawkey and Evans families, who all purchased land in 1907. These first settlers followed the old steep and winding cedar getters track from Terragon, bringing their belongings on jinkers pulled by bullocks and on pack horses if they had them (Johansen 2015:7). This road was soon improved under contract by Charles Hicks with a team of men, horses and drays. The settlers would then select their homestead site and they, or their contracted workers, would erect tents or bark huts as temporary shelters (Jack Evans in Johansen 2015:14) and commence clearing the land (Plate 3.3). Red Cedar was harvested for sale, the rest of the timber was initially cleared and burnt and paspalum grass was planted out for pasture with great success (ibid.).

Few details have been recorded for the early selectors of land within Doon Doon. These included Edward Percy Reeves, Abraham Levien, A.R. Wright, D. Lynch, A. F. Edwards, R.E. Walls and Alfred Parker, however it is unclear whether these initial selectors held or developed their land for any length of time. An early selector of land in the Proposal area was Francis Garner, who purchased Portion 110, located to the north of Crams Farm on the western side of Doon Doon Creek, in 1909. Francis Garner is known to have resided on the property for 12 years, before renting it out and moving to Murwillumbah (Navin Officer, 2018). By 1933, the English, Scottish & Australian Bank (E.S.& A. Bank) Ltd had taken ownership of the Garner property and the property continued to be leased to farming tenants (ELA 2021:4).

The original selector of the roughly 320 acre Portions 35 and 99 to the east and south of Doon Doon Creek was Thomas Wood who purchased these portions in 1909. The property was sold to David Gilmour and then 649 acres were purchased in 1918 by James and Mary Ann Cram (Plate 3.4).

Plate 3.3 **Turn of the century Tweed Valley pioneers outside their rough-sawn hut with external timber chimney (Source: Tweed Regional Museum, Image Id.: M8-23)**

3.5 The Cram family farm

Mary Ann (Polly) and James (Ned) Cram relocated to the Tweed with their six children from Bulli on the NSW south coast where Ned had worked as a commercial diver. It was a family joke that there were so many Crams in the Wollongong area that the place should be called 'Cramington'. They arrived at Ballina on the steamship *Orara* in February 1908 and lived for a time with relatives in Lismore where two more children were born (Johansen 2015:20).

The family then leased land near Nimbin and tried dairying until Ned decided to buy property at Doon Doon to run his own dairy. Ned reached an agreement with David Gilmour to purchase his 649 acres - just over 1 square mile, in 1918. Amendments to the 1921 parish map of Nullum show that son Charles Cram later added a third Portion of land to the south to the family property (Plate 3.4). The family came out to Lower Doon Doon in 1919 on a German wagon carting their pigs and driving their cattle on the dirt road. The farm was already partly cleared and had a house and dairy bails erected in a separate location to the later farm (Ron Duckworth, personal communication, September 15, 2023). Dolly, one of the Cram children, recalled in personal reminiscences recorded in 1991 that the children would happily assist with fetching tubs of water with the horse and slide, milking the 100 head of dairy cows or performing other farm chores prior to preparing for school and travelling the three and a half miles to Terragon Public School on foot or horseback (Johansen 2015:20).

The early decades on the farm coincided with the height of polio infections in Australia. At just 16 years of age Roy Cram contracted the disease and was for a time completely paralysed. His restless energy and resilience, as well as the urgency of economic survival on the farm are everywhere apparent in recollections of him. As soon as he was able, he would have himself taken to the bails in a wheelbarrow where he would milk the more cooperative cows. Eventually he received major corrective surgery after which he regained partial use of his limbs and could walk with the assistance of crutches and then a cane. Roy was an able horseman, continued to manage the bullock team and, not to be slowed on foot, would also travel about the farm on a specially constructed skid slide behind a trusted horse (Ron Duckworth, personal communication, September 15, 2023). He was renowned throughout the region for his physical ability and was able to perform all manner of farm labour. The mettle of the family is evident in the fact that Ned raised the heavy timber roof of the dairy holding yard with the help of a block and tackle and his 11 year old daughter Ivy and 9 year old son Joe. Tragically, Ron's elder brother Charles also contracted polio as an adult 20 years after Roy and suffered severe spinal and respiratory paralysis, spending several years in an iron lung and was afterwards confined to a wheelchair.

In 1929, the original farmhouse, thought to have been nearer the old road, burnt down and a new house was built on the current site beside the former dairy and milking yards (Ron Duckworth, personal communication, September 15, 2023). Around 1950, a photograph was taken of members of the Cram family and friends gathered at the rear of this second house (Plate 3.5). The house was soon remodelled, as seen from a photograph taken several years later that shows the current residence, sided in mass-produced vinyl cladding.

Over time, the farm grew to include the dairy/creamery, a timber mill (Section 3.6), Clydesdale stud, piggery, corn plantation, bullock herd and even the local telephone exchange. There were previously additional buildings on the Cram property that housed farm and mill workers (Plate 3.6), some of whom married into the family (ELA, 2021:2). The farm became something of a social centre with regular cricket matches and gatherings being held. The small and isolated community valued their social engagements and in 1930 arranged and paid for Terragon Hall (built c.1900) (Plate 3.7) to be relocated to Cliff Devine's property in central Doon Doon. The new Doon Doon Hall became a focal point of the community for celebrations as well as a refuge in times of flood. Over time, use of the hall declined and it came under the management of a local committee.

Following the death of Ned Cram in 1955, Roy, who had been living in Lismore for several years, returned to the farm, sold the lands east of the main Terragon Road to Ron Duckworth and managed the remaining land surrounding the farm. The dairy supplied cream to the Norco Butter Factory and then later produced whole milk after the Norco factory's closure. In 1979, when the family sold to Tweed Council, there were 19 family members living on the property (Tweed Council, Crams Farm signage).

Following construction of the dam, inundation of the Creek channel and floodplain surrounding Crams Farm created a scenic lake around the elevated cluster of farm buildings. Council recognised the aesthetic value of the setting and dedicated resources to the management of the site as a public reserve for community use. Council relocated Doon Doon Hall to the reserve in 1990 to ensure its survival and in doing so created an historical 'complex' at the site of Crams Farm that reflects the nature of farm and community life at Doon Doon in the 20th century.

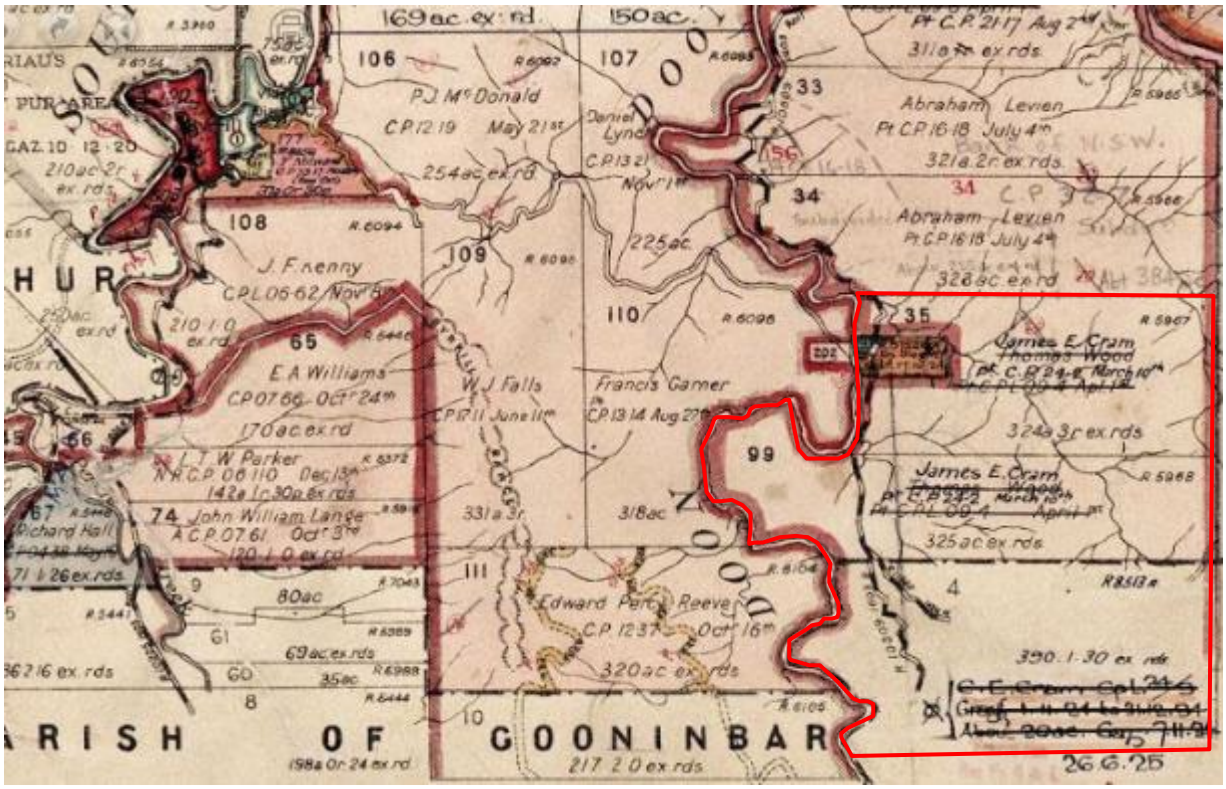


Plate 3.4 **1921 parish map of Nullum, County of Rous showing the two Portions bought by James (Ned) Cram as well as the southern Portion added purchased by Charles Cram at lower right (Source: NSW Land Registry Services: HRLV)**

Plate 3.5 **Members of the Cram family and friends c. 1950 at the rear of the Cram house. Charlie Cram is seated in the wheelchair and Grace Cram wears the white apron (Source: Tweed Regional Museum, Image Id.: US000027)**

Plate 3.6 **A working couple at the site of their basic cottage on Crams farm in 1937 (Tweed Regional Museum, Image Id.: MUS2015.26.36)**

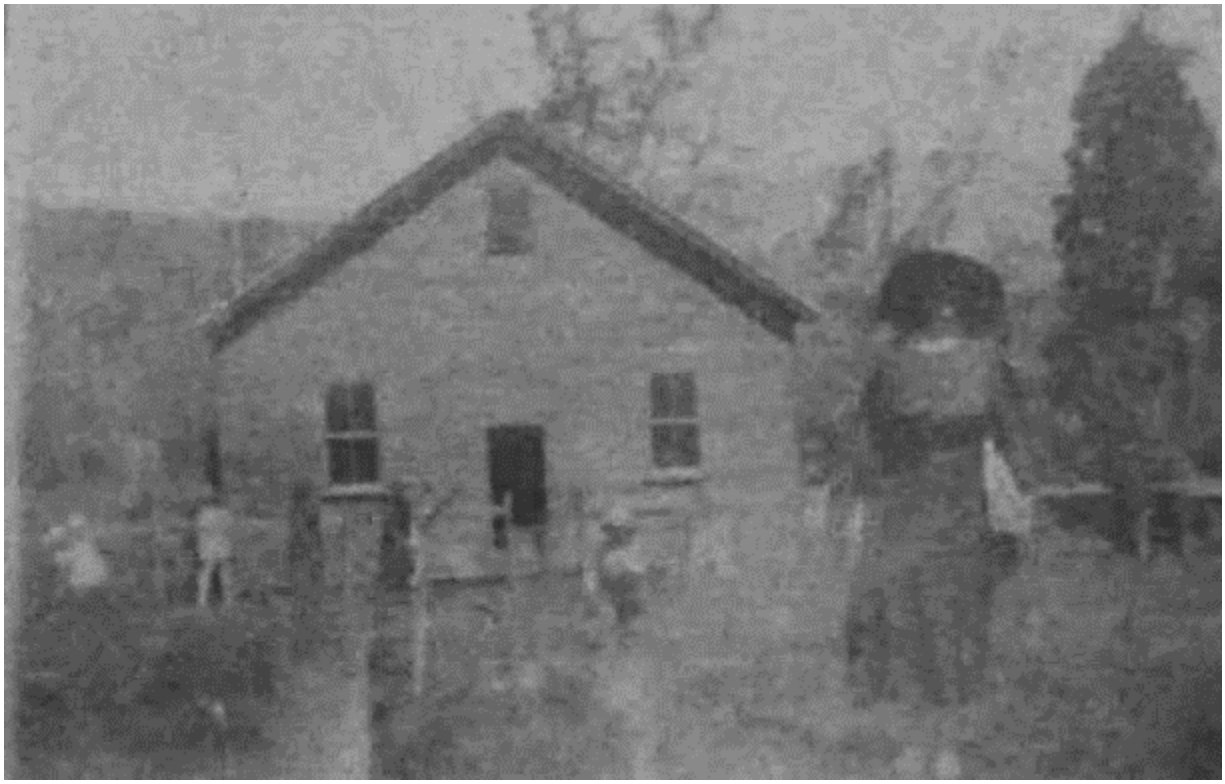


Plate 3.7 **Terragon Hall prior to its transferral to Doon Doon in 1927 (Source: Tweed Regional Museum, Image id.: US000027)**

3.6 The Doon Doon Sawmill Company

Soon after purchasing the property in 1919, Ned Cram, together with his brother Bob and Bob's son Tim, established a sawmill on the property that they named the Doon Doon Sawmill Co. Thousands of banana cases were cut and made for the many plantations in the region and they also cut timber for flooring and bridge decking in Murwillumbah. Timber was felled and 'snigged' (dragged) to the mill by the bullock team managed by Ned's teenage sons Charles and Roy. A c.1934 photograph of Charlie and the younger Roy moving timber with their bullocks survives (Plate 3.8) as well as a photograph of the team bringing logs in to the sawmill with the three Cram sisters sitting on the log (Plate 3.9). The mill can be seen to be a standard open-sided shed. Ancillary areas including the boiler and machinery cannot be seen.

In February 1927, the sawmill was destroyed by fire, the 'almost inevitable cause of major loss to sawmillers' due to the combination of heat, fuel and sawdust (Kerr 1998:24). The fire could not be contained and resulted in total loss of all structures, machinery and a portion of timber to the value of 300 pounds. The business was insured but was not reestablished by the Crams. However, in 1930 local residents Bill Charleton and George Richardson were contracted to rebuild the mill by Byron Bay Sawmillers who had purchased the rights to the timber and to re-erect the mill. (*Tweed Daily*, 23 October 1930, p.2; Johansen 2015:59). They operated it for a few years until Ned and Charlie Cram once again reworked the mill during the 1930s, with Charlie soon regaining ownership, likely in 1935 under Special Lease as indicated by the 1933 parish map of Nullum (NSW LRS: HLRV). Younger brother Joe now worked in the mill and operated the bullock team, sourcing timber from the Nullum and Goonenbar State Forests.

At around this time a number of worker's cottages were erected to the north of the mill, fronting the road into the valley from Terragon. The practise of providing such cottages for itinerant or semi-permanent mill workers was common throughout the region and encouraged skilled workers to remain at the providing mill. In 1937, a photograph of a contracted land clearer and his wife was taken outside a 'cottage below the caretaker's house, Crams Farm that was briefly their home (Plate 3.6). This would appear to depict the type of rudimentary accommodation available to dairy, timber and mill workers throughout the region during the hard years of the depression.

After Charlie became ill in 1938, operation of the mill became too much for the family and it was sold to Sly Brothers Sawmills in 1940. Sly Brothers had begun a steam powered mill at Greenhills in South Murwillumbah in the early 1930s and rapidly converted it into the first fully electrified sawmill on the north coast (Johansen 2015:52). It is unclear whether the Crams maintained any involvement in the mill after 1940 and by 1965 most of the mill infrastructure including the workers cottages had been removed (Ron Duckworth, personal communication, September 15, 2023).

Plate 3.8 **Charlie Crams bullock team moving timber at Crams Farm c.1934. Charlie is at left and the younger Roy Cram is seated on the white horse (Source: Tweed Regional Museum, Image Id: UH23)**

Plate 3.9 **Lily, Ivy and Dolly Cram sitting on logs brought into the mill by their brothers in 1934 (Source: Tweed Regional Museum, Image Id.: UH-24)**

3.7 Clarrie Hall Dam

Clarence Henry Hall, or "Clarrie" as he was known, was a dairy farmer and former schoolteacher from Kunghur. He entered Tweed Shire Council as a newly elected councillor in 1953 and went on to serve continuously on Council until his death 26 years later. He served during Council's 1970s development of the water supply scheme for the Tweed Shire and the development of Clarrie Hall Dam.

Clarrie Hall Dam was designed and constructed between 1974 and 1983 (construction began in 1979) by the Department of Public Works for the Tweed Shire Council. The dam is a concrete faced, rock filled embankment dam (CFRD); a type that employs a continuous slip concrete facing over a graded and compacted rock fill core. The development of the dam type has a long history, with early low-level rock fill dams pioneered in the California gold fields during the late 19th century and examples present in Australia from 1908 (IEA 2000:6). However, CFRD construction was prone to leakage and fracture until tall, highly engineered examples were developed within Australia through the 1960s and into the 1970s. These are exemplified by Cethana Dam in Tasmania, the tallest CFRD in the world when it was completed in 1971 (IEA 2000; Escobar and Posada 2008:5). The successful design employed continuous slip facing with vertical slab jointing via huge screed machines hauled up the upstream dam face via cranes and side rails. This allowed continuous concrete pours of up to 4 days duration in single strips determined by the width of the machine – 12 m in the case of Clarrie Hall Dam (Plate 3.10). This type of dam was in widespread use from the 1960s, with 6 constructed prior to Cethana Dam, and 25, including Clarrie Hall Dam, built between 1971 and 1999 (IEA 2000:7). At the time of Clarrie Hall Dam's construction 4 concrete slip forming machines were operating in Australia (Johansen 2015:81) and the type is still in use throughout the world.

In addition to the dam, the program included augmentation of the Bray Park treatment works, construction of additional reservoirs, pumping and trunk mains to meet the increasing demand of water in the shire (Johansen 2015:81). The scheme was one of the biggest carried out by a NSW regional council area at that time.

The dam was opened in August 1983 and was filled by heavy rainfall prior to the opening ceremony. The dam wall height is 43 metres and is 175 metres long. The maximum water depth is 41 metres and at 100% capacity the dam holds 16,500 megalitres of water, servicing over 20,000 households and businesses. The Tweed District water supply, of which Clarrie Hall Dam is an integral part, operates currently as a run-of-river supply augmented by releases from Clarrie Hall Dam. Raw water is drawn from upstream of Bray Park Weir, effectively a saltwater barrage, in the Tweed River. In periods of low flow in the river, flows are augmented by releases from Clarrie Hall Dam to ensure availability of water for the Tweed District water supply. In 2013, the spillway was upgraded including widening the spillway chute and construction of a parapet to comply with NSW Dam safety flood security requirements. This work did not increase the capacity of the dam and the upgrade was completed in 2014 (Tweed Council, Clarrie Hall Dam signage).

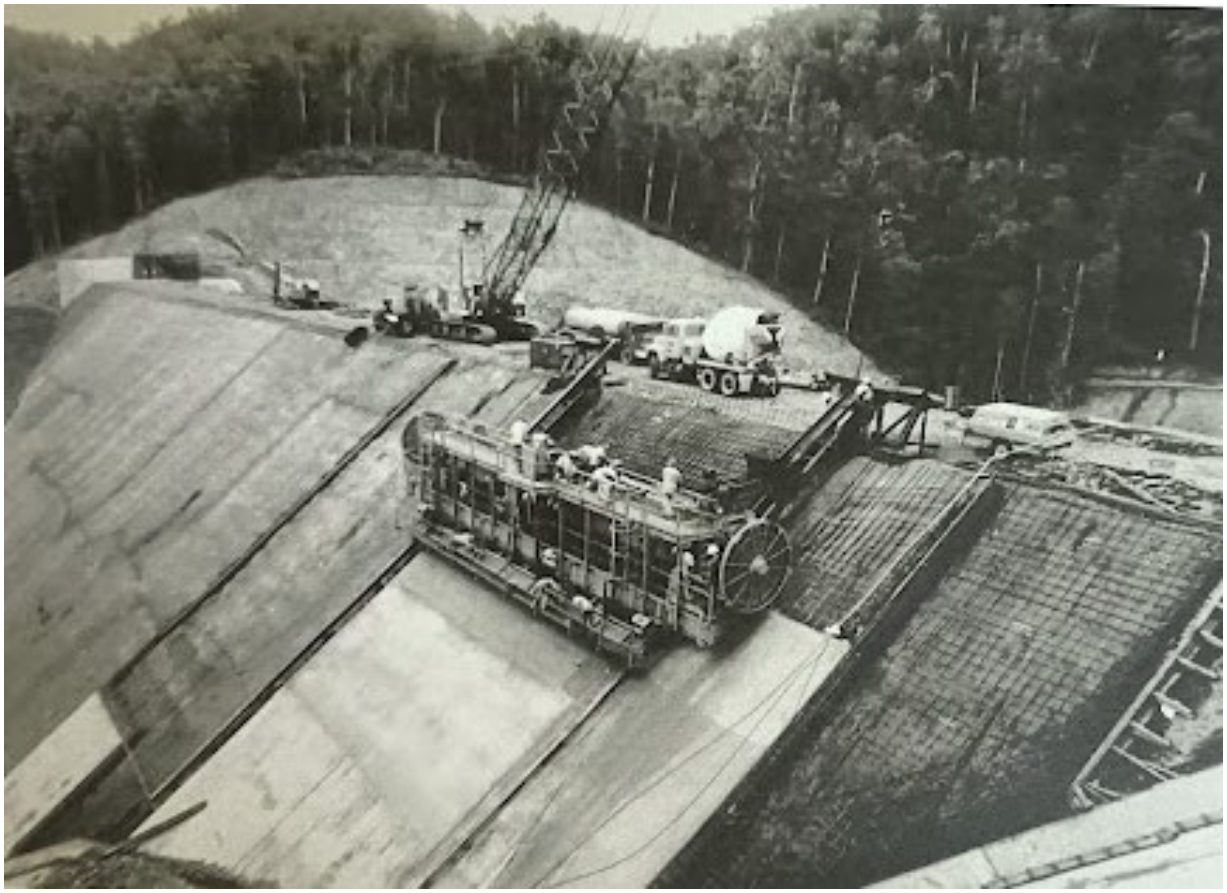


Plate 3.10 The giant screed machine applying a 300 mm concrete face to the inner compacted rock fill dam wall (Source: Johansen 2015:81).

3.8 Historical themes

The character and values of historical heritage in Australia are established through consideration of contextual histories, such as those presented above, against established historical themes characterising the development of Australia. The Australian Heritage Commission and the NSW Heritage Office (now Heritage NSW) have outlined 38 State and 9 National themes for this purpose in *NSW Historical Themes* (NSW Heritage Council 2001). Three National and eight related State themes have been identified (Table 3.1) as associative with identified areas of archaeological potential and heritage significance in the Proposal area. (Section 6).

Table 3.1 Aspects of the Proposal area that are contributory toward established National and State historical themes

Australian Theme Local Theme	NSW Theme	Local Theme	Aspect
3. Developing local, regional and national economies	Agriculture	Activities relating to the cultivation and rearing of plant and animal species, usually for commercial purposes.	The buildings surviving at Crams Farm are evidence of previous pastoral and agricultural use of the land. The property was subject to fencing, ploughing, farming, dairying and orcharding but much of this evidence has now been inundated.
3. Developing local, regional and national economies	Communication	Activities associated with the interactions between humans, human societies and the shaping of their physical surrounding.	Crams Farm operated as a telephone exchange for the local populace during a period of limited regional telecommunication. This aspect of the social history does not present physical evidence.
3. Developing local, regional and national economies	Forestry	Activities associated with identifying and managing land covered in trees for commercial timber purposes.	The Proposal area was subject to early and ongoing timber getting and timber processing. The Cram family operated a sawmill on their property.
3. Developing local, regional and national economies	Pastoralism	Activities associated with the breeding, raising, processing and distribution of livestock for human use	Many of the properties surrounding the Proposal area were livestock farms and the pastoral industry is still predominant in the region.
4. Building settlements, towns and cities	Governing	Activities associated with the provision of services, especially on a communal basis	Clarrie Hall Dam is representative of a local government providing services to the community.
8. Developing Australia's cultural life	Domestic life	Activities associated with creating, maintaining, living in and working around houses and institutions	The buildings at Crams Farm demonstrate the occupation of the property by multiple generations of the Cram family. Further domestic buildings were located on the property which are no longer present.
8. Developing Australia's cultural life	Leisure	Activities associated with recreation and relaxation	Clarrie Hall Dam and Crams Farm are used by the public for a range of recreational activities including fishing, bushwalking and picnicking.

4 Physical analysis

A physical inspection was undertaken by Heritage Consultant Jim McGuinness on 15 September 2023. The inspection targeted two parts of the Proposal area:

- Areas to be directly impacted by construction activities
- Areas within and adjacent to the proposed FSL zone identified as holding potential archaeological sensitivity or historical structures.

These are described in the following sections to provide a context for the discussion of archaeological potential (Section 5) and heritage significance (Section 6).

4.1 Clarrie Hall Dam

Clarrie Hall Dam is the only structure identified in areas to be directly impacted by the proposed construction activities. The dam is located on Clarrie Hall Dam Road and includes a small public recreation area with picnic tables and amenities. A fire trail and walking track that links to Mount Jerusalem National Park commences from the dam. The dam reservoir also provides a valuable public recreation area open to non-motorised vessels and fishing.

Clarrie Hall Dam (Plate 4.1 and Plate 4.2) is a concrete faced, rockfill embankment dam across Doon Doon Creek upstream of the small town of Uki. It has an uncontrolled, concrete-lined chute spillway and a catchment area of approximately 60 square kilometres.

Plate 4.1 **View west across the rockfill embankment of the dam toward the distant concrete spillway (Source: EMM 2023)**

Plate 4.2 **View west along the inner wall of Clarrie Hall Dam (Source: EMM 2023)**

4.2 Crams Farm Reserve

Crams Farm Reserve is located on Commissioners Creek Road, Doon Doon and occupies a low rise in a natural oxbow of Doon Doon Creek at the south end of the meandering Clarrie Hall Dam reservoir. The reserve encompasses 14 hectares of the former property of the Cram family that was purchased by Tweed Council and dedicated as a reserve in 1991 to provide public access to the reservoir for recreational purposes.

Over the generations the Cram family have planted out the farm with a variety of native and introduced trees that are now mature and create a park-like setting ideally suited to public recreation. These include several large native figs, stands of melaleucas and other Eucalypts, conifers, fruit trees and a large Pecan planted out by Grace Cram in 1954. The remaining buildings within the farm complex provide a historical landscape setting that is complimentary to the scenic backdrop of the reservoir and surrounding ranges with views to Mount Warning. There are four extant historical buildings present, the most prominent of which are the dairy yard and Doon Doon Hall. These buildings are outlined below individually.

Plate 4.3 **View west over the park-like setting of trees planted by successive generations of the Cram family (Source EMM 2023).**

Plate 4.4 Mature Pecan Tree planted in March 1954 by Grace Cram.

4.2.1 Doon Doon Hall

Doon Doon Hall (1930), originally Terragon Hall (1900), is an archetypal late-Victorian era community hall in its simplest form - a rectangular, weatherboard building raised on piers with a steeply pitched corrugated iron roof and gable ends, with a gabled entry (Plate 4.5 and Plate 4.6). Neatly spaced single-hung windows together with the centred, rectangular louvered gable vent reflect the standardised civic design elements that are common to many rural community halls in NSW. A skillion porch and covered deck has been added to the north side, as well as a later skillion extension to the rear (east) (Plate 4.8). A wheelchair accessible ramp has also been added to the southern side (Plate 4.7). The hall only came to be at Crams Farm during the early 1990s and although it sits well in the landscape, it rests on steel and concrete support piers and bearers that reflect this later arrival in the complex of buildings. These stabilise the fragile timber frame and floor.

Plate 4.5 View south-east toward Doon Doon Hall showing porch addition (Source: EMM 2023)

Plate 4.6 View north-east toward Doon Doon Hall showing side ramp and rear additions (Source: EMM 2023)

Plate 4.7 Access ramp (Source: EMM 2023)

Plate 4.8 Rear skillion addition to Doon Doon Hall on modern steel and concrete supports (Source: EMM 2023)

4.2.2 The Bails and Dairy

After the Cram family home burnt down in 1929, they relocated their homestead to this prominent hillcrest in an oxbow of Doon Doon Creek. Here they constructed their new house and the adjacent dairy yard was built by Ned and his sons in 1930. The dairy yard appears to have replaced or expanded upon open bails immediately to the north that are likely to be those that Ned raised with the help of his two youngest children Ivy and Joe. These open bails are no longer present (Ron Duckworth, personal communication, September 15 2023). The Bails and Dairy is one of the more visually impressive structures on the site, comprising a roundwood-framed, open-sided and gable-ended building with an iron roof (Plate 4.9). The building is framed in substantial, mill-squared Eucalypt tie and side beams of up to 18 m in length. These timbers were probably felled by the Crams and transported by Charlie or the younger Joe Crams bullock team to the reopened mill, which would place construction after October 1930. These beams are supported by 2.7 m tall roundwood posts of up to half a metre in girth that have replaced originals of similar dimensions. Redundant notches in the north and south side beams indicate that the original configuration of support posts was slightly different than that seen today (Plate 4.11 and Plate 4.15). The frame joinery is

a combination of square notch, saddle notch, mortise and tenon and butt-ended, hand-cut joins (Plate 4.10 and Plate 4.14).

The west interior was once divided up into walk-through cow bails. Mortise slots remain in the overhead tie beam above the former bails (Plate 4.13), eight timber doors remain at the western closed end of the yard (Plate 4.9 and Plate 4.12). An extension, possibly part of the functioning dairy but since converted into a locked kitchenette for hire, was added to the south-west corner at a later date (Plate 4.15).

The yard was originally earthen and has later been fitted with concrete pavers and picnic tables by Tweed Shire Council. Water for the cows and cleaning down of the yards and equipment was initially carted from the creek (Johansen 2015:20). After 1935, a masonry cistern or concrete formwork tank was sunk into the ground to the north of the milking bails (Ron Duckworth personal communication, September 15, 2023). A depression is still visible in the ground in this area (Plate 4.11). The tank was apparently filled in toward the end of the life of the dairy, including disposal of property refuse, including the remains of a small car (Ron Duckworth, personal communication, September 15, 2023).

Plate 4.9 View west toward the former dairy yard. Posts are not original (Source: EMM 2023).

Plate 4.10 Dairy yard from the east showing square notched joinery and refitted interior (Source: EMM 2023).

Plate 4.11 View south showing dairy. Former post notch is visible at centre and depressions at site of former inground cistern are seen in the foreground (Source: EMM 2023).

Plate 4.12 Exterior of western end with bail doors visible below windows (Source: EMM 2023).

Plate 4.13 Mortise recesses for previous bail yard divisions. (Source: EMM 2023)

Plate 4.14 Replacement post showing square notched joinery with remnant notching for previous post at base. (Source: EMM 2023)

Plate 4.15 Entry to dairy/kitchenette addition. Previous square notch for support post is visible above doorway (Source: EMM 2023).

Plate 4.16 View south-east toward dairy/kitchenette addition (Source: EMM 2023).

4.2.3 Piggery yard

With the establishment of the new dairy, Ned Cram also began raising pigs as a supplementary income and as a means of utilising the skimmed milk from cream production at the dairy. The piggery (Plate 4.17 and Plate 4.18) is stated within signage at the farm to have been built in 1960 by Roy and Ron Cram. This would appear to be too early a date, given that the structure is not yet present on a NSW Spatial Services historic aerial photograph of 1965 (Plate 5.2) – unless the date of the photograph has been recorded incorrectly (for instance, it may have been taken in 1955). As with the dairy, it was built with square-notched, squared framing and roundwood support posts. The piggery housed 150 pigs in a grid of walled pens either side of a central passageway. A central drainage sump channelled effluent off to the west into an earthen embankment settling pond. The piggery has been stripped back to its framing and a flat roof added to adaptive reuse it as a public space with a paved floor, electric barbeques and table seating. The date of these works is unknown.

Plate 4.17 View northwest toward the converted former piggery (Source: EMM).

Plate 4.18 View west toward the piggery (Source: EMM).

4.2.4 The Cram Residence

The former Cram residence is currently tenanted and was not entered or approached during the site inspection. The fabric of the residence has been detailed during previous assessment and found to be a modern building with little historic fabric (NOHC 2018:133). The southern side of the house retains some sympathetic historical detailing, with timber 'single skin' cladding and an open subfloor of timber stumps supporting the locally-milled floor. Later 20th century alterations have been substantial and include extensions, re-roofing, internal flooring, aluminium doors and windows and vinyl cladding (Plate 4.4).

Remaining buildings on Crams Farm are limited to modern water tanks, a shed and an amenities block.

It is apparent, as has been attested on signage at the reserve and through research in this document, that numerous other residential buildings once occupied Crams Farm. The location of one, a barn or pair of grain stores once occupied a position between the current adapted dairy and piggery, near Grace Crams Pecan tree (Ron Duckworth, personal communication, September 15, 2023).

Plate 4.19 The former Cram family residence showing various modern materials added over the life of the building (Source: NOHC 2018:135).

Plate 4.20 Amenities block at Crams Farm (Source: EMM).

4.2.5 McCabes Bridge

McCabes Bridge, named after the local pioneering McCabe family, forms a crossing of Doon Doon Creek south of Crams Farm on Doon Doon Road that is to be replaced as part of the Proposal. Concrete beam bridges of the first half of the 20th century have been recognised as structures of potential heritage value (RTA 2005). However, McCabes Bridge (Plate 4.22) is a modern, precast, concrete slab deck and girder bridge of no historical heritage significance and as a result, is not assessed within Section 6 of this report. McCabes Bridge was constructed after 1954 to replace an earlier roundwood timber beam bridge destroyed by flooding in 1954 (Plate 4.21). Replacement of the bridge may have taken some time to be completed as evidence remains of a concrete streambed crossing immediately to the east that has also been destroyed by the creek (Plate 4.22).

Flooding appears to have destroyed all historical timber bridges in the vicinity of the Proposal area, including the Byrrill Creek trestle bridge, constructed in 1929, which was also destroyed in the 1954 flood event. The only other crossing of note within the vicinity is a substantial concrete causeway, purportedly the first constructed in the Tweed Municipality in 1931 (Tweed Museum 2023), that may remain at Fogarty's Gap on Pine Log Road, however this location is outside the current Proposal area to the south.

Plate 4.21 **Former Lower Doon Doon Bridge in 1954 (Source: Tweed Regional Museum image id: UXS000179).**

Plate 4.22 **Current concrete McCabes Bridge. Former streambed crossing is visible beneath the bridge to the east (Source: EMM).**

4.2.6 The Doon Doon Sawmill

The location of the Doon Doon Sawmill was described as being on Crams Farm near the old road (Tweed Daily, 21 March 1942:3). Discussion with Ron Duckworth, the current landholder of adjoining lands to the east of Crams Farm Reserve (former Cram property) and long term neighbour of the Cram family, lead to the sharing of information on the former location of the sawmill and a photograph of the site, which was exposed within the FSL zone of the reservoir during drought in the early 2000s. (Ron Duckworth personal communication, September 15 2023) (Plate 5.5). The site was submerged at the time of the site inspection and could not be visited.

4.3 Natural heritage

The Proposal area is partly located adjacent to a portion of the curtilage of the GRA. The international significance of the GRA was recognised in 1986 when it was first listed on the WHL as the *Central Eastern Rainforest Reserves of Australia* (CERRA). In 1994, the listing was expanded and modified to include further areas in Queensland. In 2007, the name of the listing was altered to the Gondwana Rainforests of Australia as a better reflection of the heritage values (Department of Climate Change Energy the Environment and Water, 2021).

The GRA WHL and NHL is made up of eight geographically separated groups scattered along the Great Escarpment in both NSW and Queensland, which are:

- Tweed Caldera Group – located on the border between NSW and QLD and including the Wollumbin National Park (formerly Mount Warning National Park).
- Hastings-Macleay Group – located between the Hastings and Macleay Rivers.
- Main Range Group – incorporating the Main Range National Park, amongst other areas, QLD.
- Focal Peak Group – centred around the Mount Barney National Park, QLD.
- Washpool and Gibraltar Range – focused on the Washpool National Park, west of Grafton, NSW.
- Iluka Nature Reserve – south of Evans Head on the NSW coast.
- New England Group – in the New England/Dorrigo region.
- Barrington Tops Area – taking in the Barrington Tops National Park.

The Proposal sits to the south of Wollumbin National Park (formerly Mount Warning National Park) and west of Mount Jerusalem National Park (Figure 1.3), both of which are part of the Tweed Caldera Group for management purposes. The following discussion focusses on the physical description of the Wollumbin National Park, being the portion of the WHL and NHL area that is relevant to the Proposal. Additionally, the physical description takes in Mount Jerusalem National Park, which is State and locally listed. Wollumbin National Park was gazetted as a reserve for public recreation in 1928, while Mount Jerusalem National Park was formed between 1995 and 1999 over the former Nullum and Burringbar State Forests (NSW National Parks and Wildlife Service, 2004:9).

Wollumbin National Park takes in 2,607 hectares and Mount Jerusalem National Park 5,160 hectares (NSW National Parks and Wildlife Service, 2004:7). The Tweed Caldera Group consists mainly of eroded remnants of the Tweed shield volcano, with Wollumbin Mountain (formerly Mt Warning) being the central core of the volcano (NSW National Parks and Wildlife Service, 2022:31). The Tweed caldera is the result of the erosion of the more erodible basalts, from around the resistant rhyolite, resulting in Wollumbin Mountain, which dominates the regional landscape. From a biodiversity perspective, the Wollumbin National Park contains plants and animals that have developed in isolation following the breakup of Gondwana (NSW National Parks and Wildlife Service, 2022, p. 30). The diversity of plant species arises as the Wollumbin National Park sits in an area of overlap between the sub-tropical and temperate climatic conditions and therefore supports wet sclerophyll, dry sclerophyll, subtropical rainforest, warm temperate rainforest, dry rainforest, viney scrub with small areas of sub-montane heath around the summit of Wollumbin. The Plan of Management for Mount Jerusalem National Park notes that vegetation types of particular importance within the Park include:

- Heath dominated by *Leptospermum spp* and Pomoderris spp, occurring on exposed ridges, escarpments and rock outcrops with low fertility soils, with examples along Gilwah Road, Koonym Range and Blackbutt Plateau.
- Warm temperate rainforest dominated by sassafras *Doryphora sassafras,* coachwood *Ceratopetalem apetalum*, or crabapple *Schizomeria ovata* occurring on mid-mountain slopes and exposed ridges on shallow rhyolite derived soils. This vegetation type supports threatened flora including corakia (*Corakia whiteana)*, rusty rose walnut (*Endiandra hayesii),* small-leaved hazelwood (*Symplocos baeuerleni)* and peach myrtle (*Uromyrtus australis*).

- Wet sclerophyll open forest dominated by brush box (*Lophostemon confertus)*, flooded gum (*Eucalyptus grandis)* or tallowwood (*E. microcorys).* This vegetation type occurs in moist areas of fertile basalt and poorer rhyolite soils below 800m elevation. It provides habitat for threatened species such as the sooty owl (*Tyto tenebricosa)*, and the masked owl (*Tyto novaehollandiae),* and Albert.s lyrebird (*Menura alberti).* Mount Jerusalem National Park contains large areas of this vegetation type.

- Dry sclerophyll open forest and woodland dominated by eucalypts occurring in drier, less fertile areas that have a history of fire. Dominant eucalypts are bloodwood (*Corymbia spp.)*, tallowwood (*Eucalyptus microcorys)* and stringybark with an acacia/ she-oak understorey. In Mount Jerusalem National Park, this vegetation type occurs in small patches in the Koonyum and Nightcap Ranges.

- In addition to the natural heritage values, both national parks, but particularly Wollumbin National Park hold Aboriginal heritage significance. The Aboriginal heritage values are addressed in the Aboriginal Cultural Heritage Assessment (ACHA) for the Proposal.

5 Historical Archaeological Potential

5.1 Introduction

The nature of archaeological resources that can be expected in a given location is determined by the types of past historical activities that have occurred and the degree to which the location has been subject to subsequent development and ground disturbances that may have impacted the integrity of any archaeological resources that may have been present. These factors inform the predicted archaeological resource, however a third factor in the assessment of archaeological potential is geographical constraint, or, the precision with which locations of past activity can be demonstrated from documentary sources or physical evidence within the landscape. For instance, archaeological relics of the earliest phases of colonial occupation in regional NSW are of historical significance, particularly due to the often limited information available from existing historical records. However, assessments of archaeological potential for these initial phases are often restricted by these gaps in the historical record. For these reasons past activities of high historical significance may carry a low degree of archaeological potential and vice versa.

5.2 Methodology

The purpose of this report is to determine if archaeological resources and/or relics are likely to exist in the Proposal area that may be impacted by the proposed activity (Section 5), and to assess whether these resources are of significance (Section 6). The following revised assessment of archaeological potential is based on the definitions of 'relics' as outlined in Section 4(1) of the *Heritage Act* (as amended 2009), as they apply to the particular historical setting of the Proposal area, and applies the definitions of potential and disturbance presented in Table 5.1 and Table 5.2. Potential for archaeological 'relics' is presented in a contextual framework of separate historical phases as informed by the site history (Section 3). Archaeological significance and sensitivity to impacts as a result of the Proposal are presented in Section 6 and Section 7.

Table 5.1 Levels of archaeological potential applied to potential resources in the Proposal area

Level of Archaeological Potential	Explanation
High	Known, intensive activity has occurred (during the historical phase) that is likely to result in an archaeological resource. The activity is geographically constrained and is not likely to have been subject to subsequent disturbance.
Moderate	Known activity likely to result in an archaeological resource has occurred (during the historical phase). The activity is geographically constrained but may have been subject to subsequent disturbance.
Low	Known activity that may have resulted in an archaeological resource has occurred (during the historical phase). The activity is not geographically constrained and/or is likely to have been subject to substantial subsequent disturbance.
Nil	No known historical activity has been identified within a geographically constrained area that is likely to result in an archaeological resource and/or an area where subsequent subsurface impacts have been extensive.

Table 5.2 Definitions of disturbance levels informing assessment of archaeological potential

Level of Disturbance	Definition
High	The historical site or feature has been subject to subsequent development that clearly demonstrates subsurface disturbance has taken place that would have a major impact on any archaeological deposits or relics.

Level of Disturbance	Definition
Moderate	The historical site or feature has been subject to subsequent development that clearly demonstrates subsurface disturbance that would have an impact on any archaeological deposits or relics. Archaeological evidence is likely to remain.
Low	The historical site or feature has been subject to subsequent development however known subsurface disturbance has not been identified
Nil	The historical site or feature has been subject to no known subsequent development of subsurface impacts that would have a direct impact on any archaeological deposits or relics.

5.3 Historical Phases

Analysis of the historical information presented in Section 3 has resulted in division of the history of the Proposal area into historical phases that provide a framework for understanding the site history and associated archaeological potential that can be predicted. The relationships between historical activity and predicted archaeological resources in these phases are outlined in Table 5.1. Detailed discussion of archaeological potential for each phase is presented in Section 5.3.1- Section 5.3.6. The historical phases developed for this assessment are as follows:

- Phase 1 – Squatters and Cedar Getters (1840-1900).
- Phase 2 – Early European Settlement (1900-1920).
- Phase 3 – Industry and Agriculture (1920-1950).
- Phase 4 – Centralisation of Commerce (1950-1974).
- Phase 5 – Clarrie Hall Dam and Land Resumption (1974-1983).
- Phase 6 – The Modern Era (1983-2024).

Table 5.3 Overview of historical phases and predicted archaeological features

Historical Phase	Historical Activities in the Proposal Area	Possible Historical/Archaeological Features
Phase 1. 1840 - 1900: Squatters and Cedar Getters	Construction of vernacular dwellings and temporary camps, grazing of livestock, tree-felling, track-making and refuse disposal, burial of the dead.	Postholes, excavated ditches, sawpits, marked trees, isolated iron, glass and ceramic historical artefacts and refuse pits, isolated unmarked graves.
Phase 2. 1900 - 1920: Early European Settlement	Construction of temporary camps, vernacular dwellings and larger residential cottages and agricultural outbuildings in homestead farms, widespread tree-felling, track and roadmaking, blacksmithing (multifaceted), refuse disposal, burial of the dead.	Postholes, foundations, traces of timber floors, masonry chimneys, cobbled or Portland concrete surfaces, agricultural hoe marks, ridge and furrow cropping lines marked trees/stumps, sawpits, pit latrine, masonry wells and cisterns, sheet metal, barbed-wire, hand-wrought metal tools and fixings, mechanical and domestic refuse, isolated grave markers.
Phase 3. 1920 - 1940: Industry and Agriculture	Construction of residential cottages and worker's huts, agricultural outbuildings in homestead farms, including extant buildings at Crams Farm. Widespread tree-felling, steam-powered, and later, electrified sawmilling, widespread concrete casting in Portland cement, telecommunication infrastructure, bridge construction, orcharding, cropping, blacksmithing (farrier), track and roadmaking, refuse disposal.	Postholes, foundations, traces of timber floors, masonry chimneys, cobbled or Portland concrete surfaces, pit latrine, masonry wells and cisterns, exotic tree plantings, ridge and furrow crop lines, cut tree stumps, logging trails and camps, sheet metal, mass-produced tools and fixings, industrial refuse, increased mechanical and domestic refuse.

Historical Phase	Historical Activities in the Proposal Area	Possible Historical/Archaeological Features
Phase 4. 1940 – 1973: Centralisation of Commerce	Activities associated with the modernisation of agriculture, including replacement of timber building materials with synthetic, horse and bullock with diesel-powered transport, electrification, telecommunications, refrigeration, mechanisation, decline of sawmilling, bridge construction, waste disposal including hazardous wastes.	Postholes, masonry chimneys, Portland concrete surfaces, pit latrine, septic tanks, exotic tree plantings, ridge and furrow cropping lines, sheet metal, mass-produced tools and fixings, industrial refuse, increased mechanical and domestic refuse including plastics.
Phase 5. 1973 – 1983: Clarrie Hall Dam and Land Resumption	Major Public Works program (Clarrie Hall Dam), inundation of former roads and farms, end of farm development where lands are resumed.	Non-archaeological historical phase.
Phase 6. 1983 – 2023: The Modern Era	Public use of Clarrie Hall Dam Reservoir and Crams Farm Reserve, contracted but continued agricultural production (grazing).	Non-archaeological historical phase.

5.3.1 Phase 1. 1840 - 1900: Squatters and Cedar Getters

It is not known whether squatters moved into lands encompassed by the Proposal area prior to the introduction of the 1860 and 1884 land acts and subsequent sale of lands during historical Phase 1. It is considered unlikely, as the Proposal area appears to have remained heavily forested up until historical Phase 2 (Section 3.4). The possibility remains however that vernacular dwellings and fenced yards were present on Doon Doon Creek during Phase 1 that could leave ephemeral archaeological traces in the form of grave markers, postholes and refuse deposits. The Cram family moved into a pre-existing farm site with cottage and bail yard already in place in 1918, however these are likely to have been constructed in Phase 2 by David Gilmour and shortly before their arrival.

The wide availability of cedar throughout areas more readily accessible from the Tweed River suggests Cedar getters would not have had as pronounced a presence in the Proposal area as elsewhere during Phase 1. Cedar getters are known to have formed the rough tracks that would later become roads throughout the hinterland (in many cases from existing Aboriginal pathways). Such tracks have been suggested to be present during settlement of the valley in Phase 2 (Johansen 2015:7) and may denote an earlier, Phase 1, presence extending south from encampments at Terragon and Uki. They were certainly present in these areas from the latter decades of the 19th century, operating under government licences. However, as pointed out by Boilleau, 'The cedar getters were forbidden by law to erect permanent dwellings, so the camp remained a haphazard collection of tents, primitive bark huts and humpies.' (Boilleau 2004:45).

No documentary evidence survives suggesting squatters' farms or cedar getters' camps were present in the Proposal area over this period. It appears to have remained undeveloped, though in all likelihood was still utilised by the Bundjalung people.

There was a low level of disturbance in the Proposal area during Phase 1. Any archaeological resources of Phase 1 activity would be of potential significance, however no historical evidence has been found for activity within the Proposal area prior to the 20th century. As a result the likelihood of relics from Phase 1 to be present is considered low.

A low level of potential exists for archaeological resources associated with Phase 1 to be present in the Proposal area.

5.3.2 Phase 2. 1900 - 1920: Early European Settlement

The difficult task of settling the heavily-forested valleys of Doon Doon Creek and its tributaries necessitated an advance party of men to clear timber, form tracks and erect tents or bark huts and then simple two-roomed slab huts for initial shelter while the tasks of developing a farm – clearing land, building fences and yards and bringing in livestock – were undertaken (Jack Evans in Johansen 2015:14). Francis Garner is thought to have occupied his property to the north of the Crams for 12 years during the latter half of Phase 2 at a time when simple timber cottages were being built. The Cram family moved into such a dwelling in 1918, occupying it for a decade until it burned down in 1929, forcing them to finally divert their energies away from working the land and into constructing a new farmhouse.

The locations of the earliest homes and agricultural buildings of Phase 2 could not be identified from the available historical evidence, even for Crams Farm, for which a well-documented site history exists. No maps of properties in the Proposal area were made during Phase 2, and while personal reminiscences attest to earlier structures (see for example, Dolly Cram, in Johansen 2015:14; Ron Duckworth, personal communication, 15 September 2023), their whereabouts are unknown.

There was a moderate level of disturbance during Phase 2 as a result of land clearance. Phase 2 archaeological evidence could be present in the Proposal area outside of areas later affected by Clarrie Hall Dam. However, structures were quickly replaced when milled timber became available during Phase 3 and archaeological resources would be expected to be chronologically limited and ephemeral in nature.

A low level of potential exists for archaeological resources associated with Phase 2 to be present in the Proposal area.

5.3.3 Phase 3. 1920 - 1940: Industry and Agriculture

With much of the land cleared, farms began to expand their structural footprint and extend sources of income. Phase 3 building included the erection of larger primary dwellings and additional accommodation, machinery sheds, dairies and bail yards, barns, storage tanks and livestock pens. Very few farms have been identified from the site history that present a likelihood of Phase 3 archaeological resources being present. In addition to Crams Farm, standing structural remains that may span Phase 3 have been identified at the Francis Garner property to the north (NOHC 2018, ELA, 2021), however these were limited to the timber piers and platform of a former building, since removed. Any potential associated archaeological resources at the Garner property have previously been assessed as unlikely to meet thresholds for significance (ELA 2021:11).

The majority of development of Crams Farm took place during Phase 3. The Phase 2 cottage burnt down in 1929, prompting a move to the current homestead location on higher ground. In addition to the new dwelling, several extant and former buildings were constructed during Phase 3. Some of these are seen in the 1965 aerial (Plate 5.1) and have been identified through local knowledge of the farm (Ron Duckworth, personal communication, 15 September 2023). These structures included additional bails and a cistern to the north of the dairy, two sheds for silage and other storage adjacent to a large barn in the centre of the farm, and a number of small structures, some of which are likely to be outhouse privies (Plate 5.1). At the time the aerial photograph reproduced in Plate 5.1 was taken, the piggery had not been constructed and although Doon Doon Hall was moved to the town in 1929, it was not present in Crams Farm until Phase 6.

It is clear from the Crams second house, as well as the dairy yard at Crams Farm (Plate 4.10), that the style of domestic and agricultural building utilised - simple, boarded homes on piers with external chimneys and log framed, open-sided dairies and barns – had been set during Phase 2, with little subsequent change until Phase 4. These were working farms, with little time or capital to spend on rural architectural display such as that demonstrated by heritage listed properties within the Tweed LGA (Table 6.2).

Secondary economies were established at Crams Farm where a sawmill was built and operated by the family, bullock teams and carting services were operating for the transport of produce and orchards and agricultural crops were cultivated. Steam-powered engines were used and then replaced by electric and diesel-powered engines. Concrete and iron tanks removed the need for daily water carting and wells.

As described above, documentary evidence for the locations of structures in the valley is lacking prior to a 1965 aerial photograph. The Doon Doon (later Sly Brothers) Sawmill was described in an article in the *Tweed Daily* of 1942 as being on Crams Farm 'near the old road' (*Tweed Daily*, 21 March 1942:3). Amendments to the 1922 parish map of Nullum made in 1924 detail changes to a Travelling Stock and Cattle Reserve (TSCR) on James Crams northern 324 acre portion (Plate 5.2). The parish map of 1933 indicates that part of this TSCR was later subject to Special Lease to Charles Cram in 1935, the year he repurchased the sawmill from outside investors (Section 3.6). At around this time a number of worker's huts were erected for sawmill and farm employees (Plate 3.6). A group of these is purported to have once been sited in close proximity of the sawmill on land now inundated by the dam (Ron Duckworth, personal communication, 15 September 2023). By the time the 1965 aerial was taken, the sawmill and worker's accommodation were no longer present, however traces of activity are seen in the area of the TSCR, including a deviation or turning area beside the road and rectilinear fencelines or structural remains to the south (Plate 5.3).

Discussion with Ron Duckworth, the current landholder of adjoining lands to the east of Crams Farm Reserve (the former Cram property) and long term neighbour of the Cram family, lead to the sharing of information on the former location of the sawmill and a photograph of the site, which was exposed in the FSL zone of the reservoir during drought in the early 2000s. (Ron Duckworth personal communication, September 15 2023) (Plate 5.5). The combined evidence establishes the former location of the sawmill, as well as its status as in an inundated area of the FSL (Plate 5.2-Plate 5.5). As the site has been impacted (inundated) by the current FSL of Clarrie Hall Dam, the site could not be physically assessed. Previously observed remains of the sawmill indicate that substantial roundwood structural elements remain preserved in situ below the waterline. More fragile elements of the former mill are less likely to remain due to the apparent removal of the majority of less substantial fabric prior to 1965 and the effects of the dam.

A relatively low level of disturbance occurred in the Proposal area during Phase 3. Due to increased activity during Phase 3 and a greater degree of geographical constraint for the locations of activity there is a high likelihood of Phase 3 archaeological resources being present in the Proposal area within these specific areas of the former Cram family property.

A high level of potential exists for archaeological resources associated with Phase 3 to be present in the Proposal area.

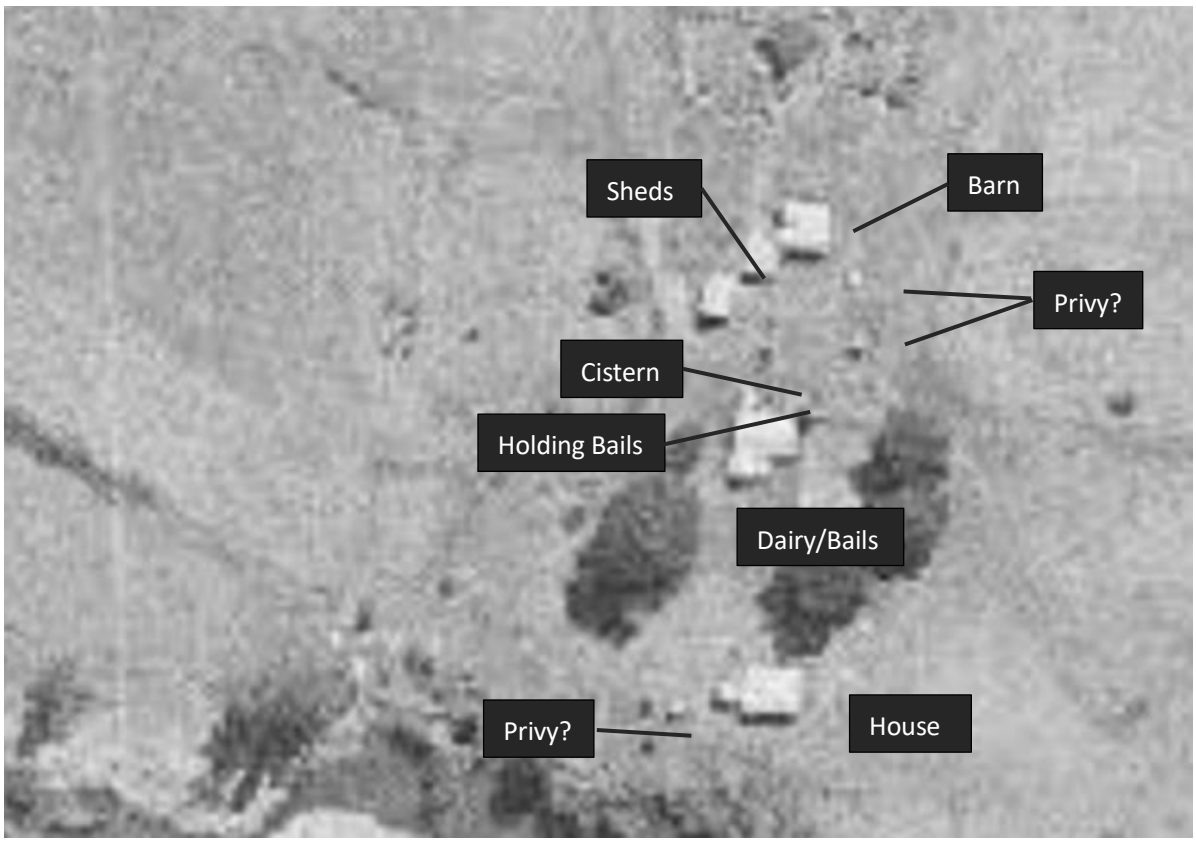


Plate 5.1 Detail of the 1965 aerial photograph showing the locations of structures present

Source: NSW Spatial Services: HLRV, EMM mark-up

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

0 25 50 m
GDA2020 MGA Zone 56
N

KEY

- High archaeological potential
- Existing inundation

Existing environment

- Minor road
- Named watercourse

Cram's Farm phase 3
archaeological potential

Clarrie Hall Dam EIS
Historical Archaeological Assessment
Figure 5.1

EMM
creating opportunities

\\emm.local\vxdrive\2023\E230036 - Clarrie Hall Dam EIS - Project management\GIS\02_Maps_HH\HH001_CramsFarmArchPortential\HH001_CramsFarmArchPortential_20240812_04.aprx 13/08/2024

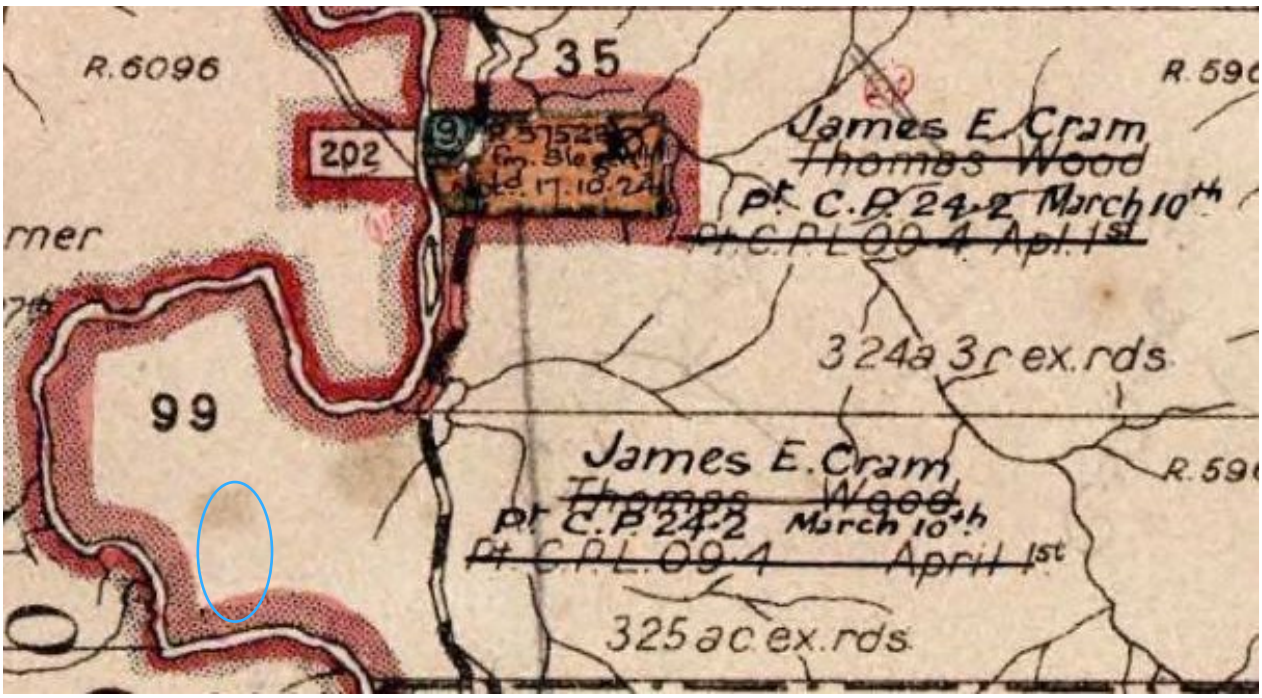


Plate 5.2 **Detail of the 1922 Parish map of Nullum. The TSCR in James Crams land is seen in orange. The location of Crams Farm is circled in blue**

Source: NSW Land Registry Services: HRLV. EMM mark-up

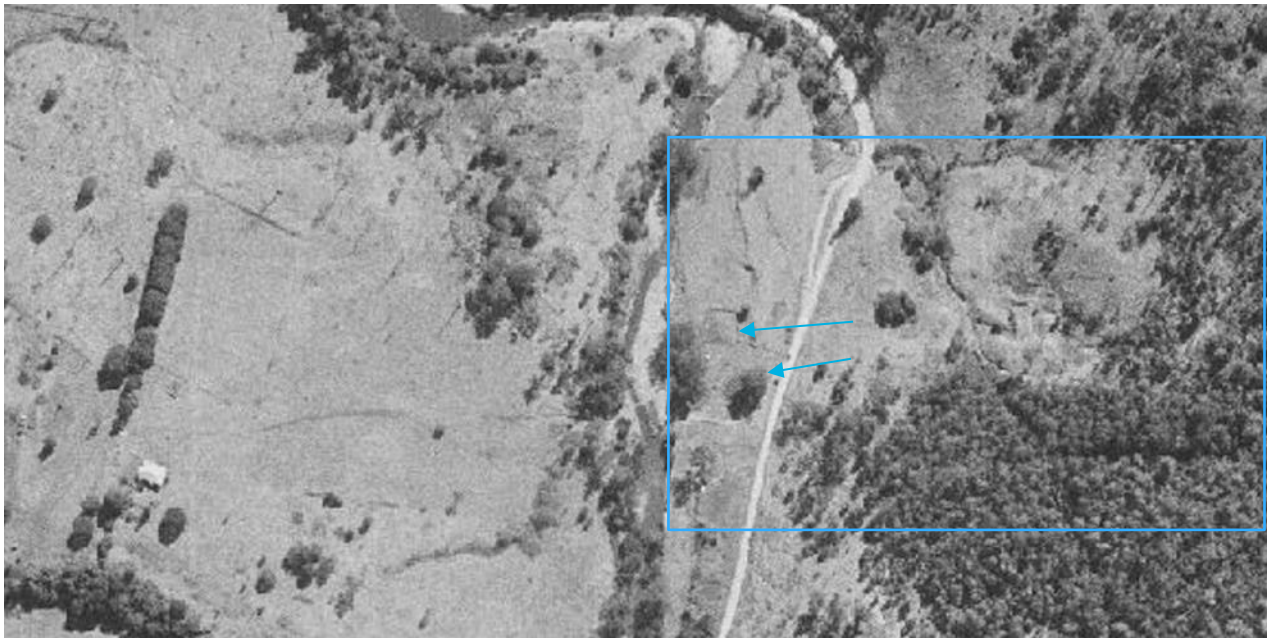


Plate 5.3. **Detail of 1965 aerial photo showing the TSCR boundary in blue. The area of Charles Crams 1935 Special Lease is west of the road where rectilinear features are indicated by the blue arrows. The building at left is the former Francis Garner property**

Source: NSW Spatial Services: HLRV. EMM mark-up

Plate 5.4 **Approximate location of the former Doon Doon Sawmill Company mill (circled). Crams Farm is seen at lower left**

Source: Sixmaps, EMM mark-up in blue

Plate 5.5 **Remains of the Doon Doon (Crams) Sawmill loading ramp exposed during drought. Crams Farm is in the middle distance beyond the vehicle**

Source: Ron Duckworth, personal communication, September 15, 2023

5.3.4 Phase 4. 1940 – 1960: Centralisation of Commerce

With improving economic conditions, Tweed economies became centralised and streamlined. Smaller timber mills closed down, machinery was abandoned and sawmilling was taken over by a smaller number of larger companies. Centralised butter factories bought dairy produce that was easily transported from farms over sealed roads and new bridges. Farming economies contracted back to primary agricultural activities. Abandoned machinery and vehicles and domestic refuse began to accumulate.

At Crams Farm, the piggery was built and the residence was renovated and reclad in modern vinyl weatherboard. Large parts of the property to the east of Doon Doon Creek were sold, including the sawmill and timber rights and activity was centralised around the dairy and piggery.

There remained a low level of disturbance in the Proposal area during Phase 4. There was a contraction in activities undertaken in predominantly extant Phase 3 buildings. As a result, archaeological resources specific to Phase 4, excepting refuse accumulations, are unlikely to be present in the Proposal area.

A low level of potential exists for archaeological resources associated with Phase 4 to be present in the Proposal area.

5.3.5 Phase 5. 1960 – 1983: Clarrie Hall Dam and Land Resumption

With the population growth on the coastal plain, the valley of Doon Doon Creek was prioritised as a clean water catchment and area of forest reserves. Farmland in the proposed Clarrie Hall Dam reservoir footprint was partially, or entirely purchased by Tweed Council. Several resident families, including the Crams, moved out of the Doon Doon area, leaving structural property and taking knowledge of the area's social history and development with them. Clarrie Hall Dam flooded the valley, inundating much of the alluvial land and lower slopes and the former roads and structures in these landforms. The Doon Doon sub-catchment became divided between remaining areas of agricultural land use (>70%) (ELA 2021:5) and reserves of sclerophyll open forest and sub-tropical rainforest. There has been no known use of the Proposal area during this phase that would result in a substantial archaeological signature.

A high level of disturbance occurred during Phase 5 as a result of inundation of large areas of Lower Doon Doon below the FSL contour (61.5m AHD). This would have included disturbance to earlier phase archaeological resources. There has been no known use of the Proposal area during this phase that would result in a substantial archaeological signature.

Low levels of disturbance remain above the FSL contour.

Nil potential exists for archaeological resources associated with Phase 5 to be present in the Proposal area.

5.3.6 Phase 6. 1983 – 2023: The Modern Era

Residents remain in areas unaffected by the dam reservoir. The Clarrie Hall Dam catchment area provides access to walking trails in the adjacent Mount Jerusalem and Mebbin National Parks and Crams Farm is opened to the public during daylight hours all year round for recreation activities. Public facilities including a jetty and picnic areas have been available since the 1980s. There has been no known use of the Proposal area during this phase that would result in a substantial archaeological signature.

Low levels of disturbance remain above the FSL contour (61.5m AHD).

Nil potential exists for archaeological resources associated with Phase 6 to be present in the Proposal area.

5.4 Summary of historical archaeological potential

In consideration of the site history and above assessments of archaeological potential, the revised summary of archaeological potential is provided below.

Table 5.4 Summary of archaeological potential in the Proposal area

Historical Phase	Archaeological Potential	Possible Resources	Potential Significance
Phase 1. 1840 - 1900: Squatters and Cedar Getters	Low - nil	Postholes, excavated ditches, sawpits, marked trees, isolated iron, glass and ceramic historical artefacts and refuse pits, isolated unmarked graves.	Local
Phase 2. 1900 - 1920: Early European Settlement	Low	Postholes, foundations, traces of timber floors, masonry chimneys, cobbled or Portland concrete surfaces, agricultural hoe marks, ridge and furrow cropping lines marked trees/stumps, sawpits, pit latrine, masonry wells and cisterns, sheet metal, barbed-wire, hand-wrought metal tools and fixings, mechanical and domestic refuse, isolated grave markers.	Unlikely to meet thresholds for significance (relics)
Phase 3. 1920 - 1940: Industry and Agriculture	Low	Postholes, foundations, traces of timber floors, masonry chimneys, cobbled or Portland concrete surfaces, pit latrine, masonry wells and cisterns, exotic tree plantings, ridge and furrow crop lines, sheet metal, mass-produced tools and fixings, industrial refuse, increased mechanical and domestic refuse.	Unlikely to meet thresholds for significance (relics)
Phase 4. 1940 – 1973: Centralisation of Commerce	Low	Postholes, masonry chimneys, Portland concrete surfaces, pit latrine, septic tanks, exotic tree plantings, ridge and furrow cropping lines, sheet metal, mass-produced tools and fixings, industrial refuse, increased mechanical and domestic refuse including plastics.	Unlikely to meet thresholds for significance (relics)
Phase 5. 1973 – 1983: Clarrie Hall Dam and Land Resumption	Nil	Non-archaeological historical phase.	Unlikely to meet thresholds for significance (relics)
Phase 6. 1983 – 2023: The Modern Era	Nil	Non-archaeological historical phase.	Unlikely to meet thresholds for significance (relics)

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

0 250 500 m

GDA2020 MGA Zone 56

N

\\emm.local\vxdrive\2023\E230036 - Clarrie Hall Dam EIS - Project management\GIS\02_Maps_HH\HH002_HistoricArchPotential\HH002_HistoricArchPotential_20240801_03.aprx 2/08/2024

KEY

- Proposed construction disturbance footprint
- Existing inundation
- Inundation to FSL (61.5 - 70 m AHD)
- FSL to PMF (70 -77 m AHD)
- Historic archaeological potential
- Infrastructure upgrade location

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve

Historical archaeological potential in the project area

Clarrie Hall Dam EIS
Historical Archaeological Assessment
Figure 5.2

EMM
creating opportunities

6 Significance Assessment

6.1 Historical heritage

6.1.1 Comparative analysis

The Heritage Council of NSW include comparative analysis of heritage items as a means of informing significance assessment through an evaluation of relative significance against NSW historic themes (Marsden and Spearitt 2021) and the NSW assessment criteria (Heritage NSW 2001). This section provides comparative context for the heritage items identified in the Proposal area to provide a basis for understanding the comparative rarity and significance of the Proposal area among comparable sites.

The comparative analysis considers key research questions outlined by the Heritage Council of NSW in *Investigating Heritage Significance* (Heritage NSW 2021) including:

- Does the item demonstrate any of the themes in the NSW historical themes or maritime themes?
- Does it have historic links to other related items or significant cultural activities?
- Does the fabric of the place particularly reflect its history and the changes made to it?
- Does the item hold social significance for any communities?
- Is the item unique, one of a group or one of many made at a certain time?
- Is the item significant to multiple regions or levels of significance (local, state, national, world)?

As areas of identified archaeological potential in the Proposal area occur in association with built structures and the heritage status of these built structures has not been clearly defined (NOHC 2018, ELA 2021), this comparative analysis has been developed to frame an understanding of the key historical sites identified through Sections 3 and 4 that may be impacted by the proposed works and to inform an assessment of significance for any associated archaeological resources that may be impacted by the proposed FSL zone or construction activities.

i Clarrie Hall Dam

Due to the proposed modifications to Clarrie Hall Dam, the original structure is to be impacted by the proposed works and as a result potential impacts to significant heritage fabric should be considered.

There are 22 dams that are of State heritage significance in NSW and 97 that are of local significance. The item type is highly represented on the NSW Heritage Inventory (SHI). As a result, this comparative analysis considers comparable items from in the local Tweed LGA in order to gain an understanding of the significance of Clarrie Hall Dam in its local and historical context. Based on these criteria, one locally listed item has been identified, as summarised below and outlined in Table 6.1.

'Mount Warning Dam' is locally significant (TLEP# I143) as the first dam to supply a permanent water source to the Tweed region from 1896. It is also significant as an early example of concrete dam construction in NSW - in this instance innovative thin concrete arch construction - that replaced the earthen embankment dams that preceded them.

While Clarrie Hall Dam demonstrates the same historical theme as the Mount Warning Dam and may hold a degree of social significance to members of the community involved in its construction, the dam is not unique and does not share comparable levels of historical and technical significance.

Table 6.1 Comparative Analysis of water stortage dam heritage items in NSW (Source: SHI).

Heritage Item	Historical Themes Demonstrated	Description	Significance Assessment
'Mount Warning Dam' (LEP# I143) Tweed LGA, NSW	4. Building settlements, towns and cities.	The Mount Warning Dam was the first dam that supplied water to the Municipality of Murwillumbah and was instrumental in the development of the town as a service area. Significance summary: The Mount Warning Dam represents an important stage in the economic and public works development of the Tweed Shire. The Mount Warning Dam is also significant from an engineering perspective, in that it is one of twenty thin arch concrete dams constructed in NSW between 1896 and 1920. Before this construction type, most Australian dams were earth embankments following the English experience (Chanson & James, 1998a). The design of the thin arch dam was based on the thin arch formula, and was probably a world first in the standardisation of the design technique.	Locally significant heritage item. It represents an important stage in the economic and public works development of the Tweed area. The Mount Warning Dam is also significant from an engineering perspective, in that it is one of twenty thin arch concrete dams constructed in NSW between 1896 and 1920. The design of the thin arch dam was based on the thin arch formula and was probably a world first in the standardisation of the design technique.

ii Crams Farm

There are 52 listed heritage items in NSW that are of State significance for their association with historical farm complexes and 352 items of local significance. The item type is one of the most highly represented on the SHI. This comparative analysis focuses on comparable items from in the local Tweed LGA in order to gain a comprehensive understanding of the significance of the Crams Farm Complex in its historical (local) context. Just two comparable homesteads with agricultural histories and associated buildings have been identified, as outlined in Table 6.2.

Comparable heritage listings to Crams Farm include 'Lisnagar House and Dairy' (TLEP #I01987) and 'Dum Dum Homestead and Worker's Cottage' (TLEP #I25). These properties are significant aesthetically as representative examples of late 19th and early 20th century Tweed Selector/settler farmsteads where the success of the farm is reflected through the distinct, regional architectural styles and details of the main homestead (Table 6.2). Both items demonstrate associations with historical figures who have made contributions to the development of the Tweed region. Both items form a group listing due to the presence of contributory dairy buildings (TLEP #I01987) and a worker's cottage (TLEP #I25).

Crams Farm demonstrates the same historical themes identified for the comparable heritage items (Table 6.2). However, the various elements of Crams Farm do not all provide contributory significance; as is the case for 'Lisnagar House and Dairy' and 'Dum Dum Homestead and Worker's Cottage'. As a group of buildings Crams Farm is not unique and does not share associations with persons significant in the development of the region. The significance of individual elements in Crams Farm Reserve are assessed in Section 6.

Table 6.2 Heritage listed homesteads with agricultural buildings in the Tweed LGA (Source: SHI)

Heritage Item	Historical Themes Demonstrated	Description	Significance Assessment
'Lisnagar House and Dairy' (LEP #01987) Tweed LGA, NSW	3 Developing local, regional and national economies. 4 Building settlements, towns and cities.	Two storey timber house in a square shape with encircling two storey verandah and projecting entrance. Built in 1906 by Edward Twohill as his third homestead at Kynnumboon Bridge - previous two homesteads have been demolished. Named after 'Lisnagar Castle' near his old home in Ireland. Constructed in cedar in Queensland 'single skin' style on wooden piers. Verandah has wooden columns with decorative iron lace infill, iron curved roof. French doors open to verandah. Hipped roof, short ridge, with two decorative iron finials and offset brick chimney. Interior has basic four room floor plan with central hall on each floor, four panel doors with rectangular headlights, stencilling in the major rooms. Kitchen was built into the north west ground floor verandah. Dairy built about 1925 and a barn are at the rear of the house; both are in need of repair. Significance summary: The Twohill family is one of the earliest families in the Tweed Valley and have occupied Lisnagar continually; and contemporary fittings and furniture have been retained. Lisnagar is a large picturesque timber house which is a rare example of the Victorian style two storey house built in the tropical Queensland 'single skin' method.	Lisnagar is a large picturesque timber house which is a rare example of the Victorian style two storey house built in the tropical Queensland 'single skin' method. The Twohill family is one of the earliest families in the Tweed Valley and have occupied the house continually; contemporary fittings and furniture have been retained. Whilst some repairs are required to the verandah and porch the house itself is in excellent condition.

Heritage Item	Historical Themes Demonstrated	Description	Significance Assessment
'Dum Dum Homestead and Worker's Cottage' (LEP #I25) Tweed LGA, NSW	3 Developing local, regional and national economies. 4 Building settlements, towns and cities.	Dum Dum means many yams and property was named by James Buchanan in 1878. Buchanan arrived in Australia from Ireland as a gold seeker in 1862 and later came to the Tweed to buy land at Condong from James Ford on which he established a dairy farm called "Mayfield". He purchased more land from James Hall and John Berry and the farm then comprised 331 acres. It was used as a cattle run. The first house, built in 1900 by J.M. Holston, was a share farmer's residence and Mr. Neil McDonald commenced dairying. This house was removed in late 1970's. Buchanan was one of the founding members of Norco and helped in the development of the butter industry on the Tweed. He also owned the Condong Hotel and the original Australian Hotel in the Broadway in Murwillumbah. He was a Justice of the Peace, a benefactor to the Presbyterian Church and a road contractor responsible for the construction of many vital links for the Shire. He pioneered the Nightcap Track to the Richmond River and the Dungay Road to Tallebudgera to the north. James Graham Buchanan jr. built the present homestead in 1911 at a cost of 400 pounds. Timber for the house was milled at Uki. The land stayed in the family for over 100 years. This early federation home is a single storey residence of weatherboard and iron with magnificent views to Mount Warning. It has some Queen Anne influences and has an asymmetrical entrance, enslemble of roof styles, a wide verandah with curvilinear Art Nouveau ornamentation to the entry and a timber curtain screen below verandah. In 1918, part of Dum Dum was leased to the Department of Education for the construction of a school and residence. A worker's cottage was previously used for Farm Stay accommodation. Currently the land has been planted with grape vines and will be developed as a boutique winery.	The homestead is an excellent example of the rural domestic architecture of the prosperous farmer. The house and its setting are representative of the architecture of the successful settlers. The homestead has strong links with the Buchanan family who were important as farmers businessmen and benefactors to the development of the Tweed Shire. Dum Dum Homestead has strong links with the Buchanan family who were important as farmers businessmen and benefactors to the development of the Tweed Shire.

iii The Doon Doon Sawmill

There are two listed heritage items in NSW that are of State significance for their association with historical sawmills. The heritage category is relatively rare on the SHI, with just 17 sawmill items of local significance listed across the State. No extant or archaeological sawmill sites are listed as significant on Schedule 5 of the Tweed LEP, despite the importance of the category for the history of the region and the many mills that were once in operation (Section 3.3). The nearest listed sawmill heritage Item is 'Wyan Creek Bennett's Sawmill site, former' (RLEP #A10), found in the Richmond Valley LGA at Grafton and this is summarised in Table 6.3 for comparative analysis.

The location of extant fabric of the Doon Doon Sawmill Co. on former Cram family lands was identified as a result of this assessment (Plate 5.4). However, as the site has been impacted (inundated) by the current FSL of Clarrie Hall Dam, the site could not be physically assessed. Previously observed remains of the sawmill (Plate 5.5) indicate that substantial roundwood structural elements remain well preserved in situ.

The Doon Doon Sawmill site history demonstrates the same historical themes identified for 'Wyan Creek Bennett's Sawmill site, former' (RLEP #A10). As with Benntt's Sawmill, the site is associated with related historical buildings (Crams Farm) and the site may hold a degree of social significance to members of the Doon Doon community. However, the location does not retain structural remains on a comparable scale to Bennett's Sawmill due to the apparent removal of the majority of built fabric prior to 1965 and the effects of the dam. As a result, the site is not of comparable complexity in demonstrating mill operations. The site type is not accessible, is not unique and although the Doon Doon Sawmill site is associated with the Cram family, it is not associated with important persons in the forestry industry.

Table 6.3 Heritage listed sawmill Items in NSW (Source: SHI)

Heritage Item	Historical Themes Demonstrated	Description	Significance Assessment
'Wyan Creek Bennett's Sawmill site, former' (RLEP #A10) Richmond Valley LGA, NSW	3 Developing local, regional and national economies.	Located just in the Belmore State Forest, The sawmill started operations in 1943 and ceased about the mid-1980s. The mill was established in a period, which according to Blackmore and Associates (1993), saw massive exploitation of the State's forests due to greatly increased pressures and demands. This period extended from World War 11 to the mid 1960s. The Bennett family, who operated this mill, have been associated with the forestry industry in northern NSW for four generations. John Samuel Bennett had mills at Yorklea, Tatham and South Grafton and started the Wyan Creek mill. The site is characterised by the butt-ends of a number of logs: the pipes belonging to an old petrol bowser, what was left of the steam boiler which provided power for the mill, the log skid and trolley way, a group of short, sawn posts that had been part of the foundations of the mill building, a trench that was probably part of the sawdust pit, a timber lined well, the sawdust dump and area of parallel ruts that may have been caused by the stacks of sawn timber. Other remains at the site mark the site of a house which was occupied until 1965 when the site was finally abandoned. At least two other houses were in the vicinity Approximately 300 metres west of the sawmill, near a lined of Hoop Pines, is the site of the Wyan Creek school.	The Bennett's Saw Mill site is a significant reminder of the long history of forestry in Copmanhurst Shire and Richmond Valley. As much of the material evidence of the forestry industry is of an ephemeral nature this archaeological site is rare as it contains some evidence of mill operations and the associated Wyan Creek school. This mill is associated with the Bennett family who in turn have had a long association with the forestry industry. As much of the material evidence of forestry is ephemeral and industrial processes are not substantial this historically more recent mill site provides a rare example of a working mill site and associated school. Little of the original fabric exists.

iv Doon Doon Hall

There are no (0) listed rural community hall heritage items in NSW that are of State significance. There are 67 community halls of local significance listed on the SHI. The vast majority of these are built in timber weatherboard and are of a regularised style and appearance comparable to Doon Doon Hall. The heritage category is relatively rare on the SHI. There are six (6) community halls listed as significant on Schedule 5 of the Tweed LEP – 9% of the State total. A selection of these are outlined in Table 6.4.

The hall houses the veterans honour roll for the locality and has a rich history of public events that are recalled by local residents (Ron Duckworth, personal communication, September 15 2023) that have been documented in local histories (Johanson 2015:23). It is significant as the sole building preserving a physical record of the locality's social history.

Doon Doon Hall is particularly analogous with the Palmvale/Reserve Creek Community Hall (TLEP #I87). Both buildings demonstrate the simplest, core stylistic form of the Federation era community hall found throughout NSW. Although Doon Doon Hall has been relocated and stabilised, it retains much of its original fabric and as with Palmvale/Reserve Creek Community Hall, it has 'acted as a centre for social and cultural activities over nearly 100 years' (Table 6.4).

Table 6.4 Heritage listed community hall Items in the Tweed LGA (Source: SHI)

Heritage Item	Historical Themes Demonstrated	Description	Significance Assessment
'Tyalgum Hall' (LEP #I110) Tweed LGA, NSW	4 Building settlements, towns and cities. 8. Culture: Townships, Social institutions	Opened in 1908, the hall was also used as a library with books loaned by the Public Library of Sydney. Yearly birthday celebrations grew into the Empire Day Sports day, which later became the Tyalgum Diggers Sports. The hall was used for a variety of purposes. It served as a hospital during the influenza epidemic; movie screenings started in 1916 and continued until 1962. The hall served as a meeting place for a variety of community groups and in 1991 the Tyalgum Music Festival commenced, bringing classical musicians of world stature to play in the acoustically superb hall. A rectangular, two storey building that once had a balcony where the entry is now located, acting as facade to the rear building. Art deco influenced skyline and vertical pilasters, and fenestration in a Georgian form. A wooden Roll of Honour is kept at the Tyalgum Hall as recorded in the History of Tyalgum & District.	Including war memorial rolls, the Tyalgum Hall has a strong association with the residents of Tyalgum. It has acted as a centre for social and cultural activities for nearly 100 years. The memorial is part of the cultural history of the Tweed Valley and has a special association with the community in which it is housed. It has acted as a centre for social and cultural activities over nearly 100 years.
'Burringbar Community Hall' (LEP #I3) Tweed LGA, NSW	4 Building settlements, towns and cities. 8. Culture: Townships, Social institutions	An excellent example of hall architecture circa 1910. A timber structure with minimal detailing. Decorative flying gables with finials and simple collar tie to front of symmetrical facade. Some late Victorian, Carpenter Gothic influences. Roof broken into segments. Reflects the style of Federation community halls throughout the country. Weatherboard cladding, with corrugated steel roofing. Prominent 'circular' roof vent to main gable. In 1949 a projection box was erected to allow films to be shown. A supper room was pulled down in mid 1940 and another constructed adjoining the main hall. The Burringbar School of Arts was established in 1909 and served the community as a meeting place for social events and housed a library for many years. In March 1980, new extensions, costing $25,000 were officially opened during an afternoon and night of festivities. The Burringbar School of Arts continued to host balls, banquets, weddings, socials and a new activity - indoor hockey. Over a span of 85 years Burringbar School of Arts has been a wonderful source of enjoyment for an enormous number of people.	The Burringbar Community Hall has a strong association with the residents of Burringbar. It has acted as a centre for social and cultural activities for nearly 100 years. The timber building demonstrates the simple design materials and finishes associated with local community structures and has retained the integrity of the original construction.

Heritage Item	Historical Themes Demonstrated	Description	Significance Assessment
'Community Hall' (LEP #I87) Tweed LGA, NSW	4 Building settlements, towns and cities. 8. Culture: Townships, Social institutions	Palmvale/Reserve Creek Community Hall. A pre-war, simple timber hall with single gable with gabled entry. Louvred vent to top of gable. Battens to gable front. Roof vent features reminiscent of terra-cotta chimney pots Edwardian / Federation. Windows Edwardian.	The Palmvale/ Reserve Creek Community Hall has a strong association with the Palmvale community. It has acted as a centre for social and cultural activities over almost 100 years. The building maintains the timber structure cladding details from the original design.

6.1.2 Significance assessment criteria

In NSW, historical value is ascribed to buildings, places, archaeological sites and landscapes modified in the Australian historical period for purposes other than traditional Aboriginal use. The assessment of heritage significance in NSW is based on the *Burra Charter* (Australia ICOMOS 2013) and further expanded upon in *Assessing Heritage Significance* (Department of Planning and Environment (NSW), 2023)*, including significance assessment criteria,* outlined below in Table 6.5. The *Heritage Manual* (Heritage Office 2001) also provides a framework to identify heritage gradings that apply to heritage elements (features or components) within a given context. These gradings are provided in *Assessing Heritage Significance* (Department of Planning and Environment (NSW), 2023), are set out in Table 6.6, and provide context for assessment of elements within Crams Farm (Section 6.1.3). The result of the assessments of significance may determine that an individual component does not meet the threshold for local or State significance as an individual item, but that it does contribute to the significance of the larger complex. The components of Crams Farm are assessed in Table 6.7.

Table 6.5 NSW heritage assessment criteria (DPE, 2023)

Criterion	Explanation
a)	An item is important in the course or pattern of NSW's (or the local area's) cultural or natural history (Historical Significance).
b)	An item has strong or special association with the life or works of a person, or group of persons of importance in NSW's (or the local area's) cultural or natural history (Associative Significance).
c)	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area) (Aesthetic Significance).
d)	An item has a strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons (Social Significance).
e)	An item has the potential to yield information that will contribute to an understanding of NSW's (or the local area's) cultural or natural history (Research Significance).
f)	An item possesses uncommon, rare or endangered aspects of NSW's (or the local area's) cultural or natural history (Rarity).
g)	An item is important in demonstrating the principal characteristics of a class of NSW's (or the local area's) cultural or natural places or environments (Representativeness).

Source: Assessing heritage significance (Department of Planning and Environment 2023, p.21).

Table 6.6 NSW gradings of heritage significance (DPE, 2023:19)

Grading	Justification
Exceptional	Rare or outstanding element directly contributing to a place or object's significance
High	High degree of original fabric. Demonstrates a key element of the place or object's significance. Alterations do not detract from its significance.
Moderate	Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance of the place or object.
Little	Alterations detract from its significance. Difficult to interpret.
Intrusive	Damaging to the place or object's significance.

Table 6.7 Gradings of Significance for elements within Crams Farm

Element	Date	Grading of Significance
Doon Doon Hall		
Hall building	c.1900	High
Deck and porch	indeterminate	Moderate
Skillion rear addition	Indeterminate	Little
Access ramp	c.1990	Little
Crams Farm Bails and Dairy		
Roundwood and square notched framing	c.1930 – c.1990	High
Milking yard doors	c.1930	High
Sheet metal roof	Indeterminate	Moderate
Renovated dairy annex	Indeterminate	Little
Concrete floor and picnic tables	c.1990	Little
Remaining Crams Farm Buildings		
Residence	c.1930-c1960	Little
Piggery	c.1960	Little
Toilets and Sheds	c.1990	Intrusive
Crams Farm Landscape Elements		
Moreton Bay fig trees	Indeterminate	High
Pecan tree	Indeterminate	High
Melaleuca group	Indeterminate	Moderate
Other plantings	Indeterminate	Moderate

6.1.3 Statement of heritage significance

The historical phases developed for this assessment (Section 5.3) outline historical activities over at least 120 years of development. A degree of archaeological potential has been identified for several of these phases, in association with historical structures that are present in the Proposal area. Statements of significance are provided below for historical structures (Table 6.8) to determine whether these structures meet NSW heritage criteria for significance (DPE, 2023), and for potential archaeological resources (Table 6.10) to determine whether these resources are likely to hold significant relics, as defined by Section 4(1) of the *Heritage Act* (as amended 2009).

Table 6.8 Statement of significance – built heritage

Historical Phase	Assessment
1. Historical significance	The Proposal area contains a collection of historical farm buildings in Crams Farm Reserve. Of these, the Phase 3 Dairy and Bails is of historical significance as the oldest structure in the group and most characteristic of the development of Crams Farm and the broader, early development of dairy farms at Lower Doon Doon. The Bails and Dairy is also demonstrative of the forestry and sawmilling industries and the vernacular form of agricultural construction that is characteristic of the area. Crams Farm Reserve also contains Doon Doon Hall, a structure that housed community events first in Terragon and subsequently in Doon Doon through five of the six historical phases identified in this document from its initial construction c. 1900. Through an outline of the historical contexts of these elements, comparative analysis with comparable heritage Items and through assessment against NSW heritage criteria, it has been determined that: **The Bails and Dairy meets the threshold for significance under this criterion at the local level.** **Doon Doon Hall meets the threshold for significance under this criterion at the local level.** **Remaining historical elements and structures in the Proposal area do not meet the threshold for significance under this criterion.**
2. Historical Association	The Bails and Dairy is associated with the Cram family; early settlers in Lower Doon Doon and long term residents and contributors to the local community and local industry. Doon Doon Hall is not directly associated with any significant persons or groups of persons in development of NSW or the local area. **Historical elements and structures in the Proposal area do not meet the threshold for significance under this criterion.**
3. Aesthetic/creative/ technical achievement	The Crams Farm Bails and Dairy demonstrates aesthetic qualities that demonstrate the local character of vernacular construction. The building forms the centrepiece of the historical setting of mature trees that is highly contributory to the current scenic character of the Crams Farm Reserve public space. Doon Doon Hall is typical of this architectural group of federation era public buildings. Clarrie Hall Dam does not represent a unique technical achievement, being modelled on previous examples of pioneering CFRD dams developed in Australia from the 1960s and exemplified by Cethana Dam in Tasmania, built in 1971 (Section 3.7). **Historical elements and structures in the Proposal area do not meet the threshold for significance under this criterion.**
4. Social, cultural, spiritual Significance	The Crams Farm Bails and Dairy is evocative of the dairying industry of the past, a central element of economic and socio-cultural life in Doon Doon. The building is important to living members of the Cram family and is appreciated by the wider community as an historical feature in a scenic public reserve. Doon Doon Hall is of significance to the community of Doon Doon as a centre of social gatherings since 1927. Living memory of use of the hall spans historical phases 4 to6 and the importance of the building to the community is demonstrated by the fact it has occupied three separate sites, been given pride of place in Crams Farm Reserve and afforded careful reinstatement at Crams Farm Reserve by Council and the community. **Doon Doon Hall meets the threshold for significance under this criterion at the local level.** **Although the Crams Farm buildings are appreciated by the community, they do not meet the threshold for heritage significance under this criterion.**

Historical Phase	Assessment
5. Research Potential	**Historical elements and structures in the Proposal area do not meet the threshold for significance under this Criterion.**
6. Rarity	**Historical elements and structures in the Proposal area do not meet the threshold for significance under this Criterion.**
7. Representativeness	The Crams Farm Bails and Dairy is representative of the local character of vernacular construction. However, elements have been modified from their original form during adaptation of the structure to public use, reducing the overall representativeness of this example of a working dairy yard. Doon Doon Hall is representative of Federation era community halls of this type, which are widespread in NSW. However, the building does not occupy its original location, and has been substantially modified through later additions, affecting its overall representativeness. **Historical elements and structures in the Proposal area do not meet the threshold for significance under this criterion.**

6.1.4 Assessing archaeological significance

The significance assessment criteria outlined in Table 6.4 are also applied to the assessment of potential archaeological sites, as supported in *Assessing Significance for Historical Archaeological Sites and 'Relics'* (NSW Heritage Branch, 2009) and outlined in the 2013 *Burra Charter of Australia* (Australia ICOMOS, 2013). Consideration against the seven criteria determines whether an item meets thresholds of State or local heritage significance. Definitions of archaeological significance are presented in Table 6.9 and Table 6.10 assesses the significance of potential archaeological resources at Crams Farm.

Table 6.9 Assessment of archaeological potential against NSW heritage criteria.

Criterion	Explanation
Archaeological Research Potential NSW Heritage Criterion E	Archaeological research potential is the ability of archaeological evidence, through analysis and interpretation, to provide information about a site that could not be derived from any other source, and which contributes to the archaeological significance of that site and its 'relics'.
Associations with individuals, events, or groups of historical importance NSW Heritage Criteria A, B, D	Archaeological remains may have associations with individuals, groups and events which may transform mundane places or objects into significant items through their relationship with important historical occurrences.
Aesthetic or technical significance NSW Heritage Criterion C	Whilst the technical value of archaeology is usually considered as 'research potential' aesthetic values are not usually considered to be relevant to archaeological sites. This is often because until a site has been excavated, its actual features and attributes may remain unknown. It is also because aesthetic is often interpreted to mean attractive, as opposed to the broader sense of sensory perception or 'feeling' as expressed in the Burra Charter.
Ability to demonstrate the past through archaeological remains NSW Heritage Criteria A, C, F & G	Archaeological remains have an ability to demonstrate how a site was used, what processes occurred, how work was undertaken and the scale of an industrial practice or other historic occupation. They can demonstrate the principal characteristics of a place or process that may be rare or common.

Source: Assessing Significance for Historical Archaeological Sites and 'Relics' (NSW Heritage Branch, 2009, p.11)

Table 6.10 Statement of significance – archaeological resources

Criterion	Assessment
Phase 1 1840 – 1900 Squatters and Cedar getters	Phase 1 archaeological resources are considered highly unlikely to be present in the Proposal area (Section 5.3). Any possible traces of Phase 1 activity would be expected to be highly ephemeral and limited in nature. If present, archaeological resources are unlikely to demonstrate the principal characteristics of activities that were undertaken, or hold associations with individuals that would be of significance. However, archaeological resources could inform the site history in ways that could not be derived from other sources and that could present further research potential. **Phase 1 archaeological resources could meet the threshold for 'relics' under NSW heritage assessment criteria, however very limited potential (nil – low) has been identified for any such resources to exist in the Proposal area.**
Phase 2 1900 – 1920 Squatters and Cedar getters	Phase 2 archaeological resources are considered unlikely to be present in the Proposal area (Section 5.3). Any possible traces of Phase 2 activity would be expected to be ephemeral and limited in nature. If present, archaeological resources are unlikely to demonstrate the principal characteristics of activities that were undertaken, or hold associations with individuals that would be of significance. Any such Phase 2 archaeological resources would be unlikely to inform the site history in ways that could not be derived from other sources or present further research potential. **Phase 2 archaeological resources are unlikely to meet the threshold for 'relics' under NSW heritage assessment Criteria.**
Phase 3 1920 – 1940 Agriculture and Industry	High potential has been identified for Phase 3 archaeological resources to be present in the Proposal area, including former agricultural structures and refuse accumulations in Crams Farm (Plate 5.2), and the site of the Doon Doon Sawmill in former Crams Farm land. However, these archaeological resources are unlikely to demonstrate the principal characteristics of activities that were undertaken or hold associations with individuals that would be of significance. Phase 3 archaeological resources would be unlikely to inform the site history in ways that could not be derived from other sources or that would present significant research potential. **Phase 3 archaeological resources are unlikely to meet the threshold for 'relics' under NSW heritage assessment criteria.**
Phase 4 1940 – 1960 Centralisation of Commerce	No known development occurred in the Proposal area during this phase that would result in a substantial archaeological signature. Phase 4 has been assessed to hold low archaeological potential. **Any Phase 4 archaeological resources are unlikely to meet the threshold for 'relics' under NSW heritage assessment criteria.**
Phase 5 1960 – 1983 Clarrie Hall Dam and Land Resumption	There has been no known use of the Proposal area during this phase that would result in a substantial archaeological signature. Phase 5 has been determined to hold nil archaeological potential. **Phase 5 archaeological resources that would meet the threshold for 'relics' under NSW heritage assessment criteria are unlikely to be present.**
Phase 6 1983 – 2023 The Modern Era	There has been no known use of the Proposal area during this phase that would result in a substantial archaeological signature. Phase 5 has been determined to hold nil archaeological potential. **Phase 5 archaeological resources that would meet the threshold for 'relics' under NSW heritage assessment criteria are unlikely to be present.**

6.2 Natural heritage

6.2.1 Heritage values assessment and summary statement

The World Heritage Committee accepted that the natural values of the GRA met three of the ten heritage criteria, as laid out in Table 6.11.

Key to successfully addressing impacts of significance is the identification of the attributes that define the identified values. Attributes provide the physical (or tangible) characteristics and elements against which it is possible to measure an impact. Listings under the EPBC Act commonly already have identified attributes, but it is noted this is not the case for the GRA. Alterations to attributes arising from a Proposal are therefore defined as an impact. EMM have used the text from the WHL citation to create attributes. Given the geographic extent of the listing, it has been identified that attributes may vary between the groups. Attributes that are specific to the Tweed Caldera Group have therefore been identified, in addition to general attributes that are true for the GRA as a whole.

When the GRA was added to the NHL in 2007, the official values were not prescribed, with the text "This place is taken to meet this National Heritage criterion in accordance with subitem 1A(3) of Schedule 3 of the *Environment and Heritage Legislation Amendment Act (No.1) 2003*, as the World Heritage Committee has determined that this place meets World Heritage criteria (viii), (ix) and (x)" appearing against criteria A (historical processes), B (rarity), C (research) and D (principal characteristics). It is therefore assumed that the assessment against the World Heritage criteria viii, ix and x can be divided between the four EPBC Act criteria, as assessed by EMM in Table 6.12.

Table 6.11 World Heritage Values

Criterion	Assessment	Attributes
viii – To be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.	The GRA provides outstanding examples of significant ongoing geological processes. When Australia separated from Antarctica following the breakup of Gondwana, new continental margins developed. The margin which formed along Australia's eastern edge is characterised by an asymmetrical marginal swell that runs parallel to the coastline, the erosion of which has resulted in the Great Divide and the Great Escarpment. This eastern continental margin experienced volcanicity during the Cenozoic Era as the Australian continental plate moved over one of the planet's hot spots. Volcanoes erupted in sequence along the east coast resulting in the Tweed, Focal Peak, Ebor and Barrington volcanic shields. This sequence of volcanos is significant as it enables the dating of the geomorphic evolution of eastern Australia through the study of the interaction of these volcanic remnants with the eastern highlands. The Tweed Shield erosion caldera is possibly the best preserved erosion caldera in the world, notable for its size and age, for the presence of a prominent central mountain mass (Wollumbin/Mt Warning), and for the erosion of the caldera floor to basement rock. All three stages relating to the erosion of shield volcanoes (the planeze, residual and skeletal stages) are readily distinguishable. Further south, the remnants of the Ebor Volcano also provide an outstanding example of the ongoing erosion of a shield volcano.	**General:** • Great Escarpment; and • Volcanic geological formations, particularly the: – Tweed Shield erosion caldera/Wollumbin/Mt Warning; and – Ebor Volcano. **Tweed Caldera Group:** • Wollumbin Mountain.
ix – To be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.	The GRA contains outstanding examples of major stages in the Earth's evolutionary history as well as ongoing evolutionary processes. Major stages represented include the 'Age of the Pteridophytes' from the Carboniferous Period with some of the oldest elements of the world's ferns represented, and the 'Age of Conifers' in the Jurassic Period with one of the most significant centres of survival for Araucarians (the most ancient and phylogenetically primitive of the world's conifers). Likewise, the GRA provides an outstanding record of the 'Age of the Angiosperms'. This includes a secondary centre of endemism for primitive flowering plants originating in the Early Cretaceous, the most diverse assemblage of relict angiosperm taxa representing the primary radiation of dicotyledons in the mid-Late Cretaceous, a unique record of the evolutionary history of Australian rainforests representing the 'golden age' of the Early Tertiary, and a unique record of Miocene vegetation that was the antecedent of modern temperate rainforests in Australia. The property also contains an outstanding number of songbird species, including lyrebirds (Menuridae), scrub-birds (Atrichornithidae), treecreepers (Climacteridae) and bowerbirds and catbirds (Ptilonorhynchidae), belonging to some of the oldest lineages of passerines that evolved in the Late Cretaceous. Outstanding examples of other relict vertebrate and invertebrate fauna from ancient lineages linked to the break-up of Gondwana also occur in the GRA. The flora and fauna of the GRA provides outstanding examples of ongoing evolution including plant and animal taxa which show evidence of relatively recent evolution. The rainforests have been described as 'an archipelago of refugia, a series of distinctive habitats that characterise a temporary endpoint in climatic and geomorphological evolution'. The distances between these 'islands' of rainforest represent barriers to the flow of genetic material for those taxa which have low dispersal ability, and this pressure has created the potential for continued speciation.	**General:** • Araucarians; • Ferns; • Songbirds, particularly: – lyrebirds (Menuridae); – scrub-birds (Atrichornithidae); – treecreepers (Climacteridae); and – bowerbirds and catbirds (Ptilonorhynchidae). **Tweed Caldera Group:** • as above

Criterion	Assessment	Attributes
x – To contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.	The ecosystems of the GRA contain significant and important natural habitats for species of conservation significance, particularly those associated with the rainforests which once covered much of the continent of Australia and are now restricted to archipelagos of small areas of rainforest isolated by sclerophyll vegetation and cleared land. The GRA provides the principal habitat for many species of plants and animals of outstanding universal value, including more than 270 threatened species as well as relict and primitive taxa. Rainforests covered most of Australia for much of the 40 million years after its separation from Gondwana. However, these rainforests contracted as climatic conditions changed and the continent drifted northwards. By the time of European settlement rainforests covered only 1% of the landmass and were restricted to refugia with suitable climatic conditions and protection from fire. Following European settlement, clearing for agriculture saw further loss of rainforests and only a quarter of the rainforest present in Australia at the time of European settlement remains. The GRA protects the largest and best stands of rainforest habitat remaining in this region. Many of the rare and threatened flora and fauna species are rainforest specialists, and their vulnerability to extinction is due to a variety of factors including the rarity of their rainforest habitat. The GRA also protects large areas of other vegetation including a diverse range of heaths, rocky outcrop communities, forests and woodlands. These communities have a high diversity of plants and animals that add greatly to the value of the GRA as habitat for rare, threatened and endemic species. The complex dynamics between rainforests and tall open forest particularly demonstrates the close evolutionary and ecological links between these communities. Species continue to be discovered in the GRA including the re-discovery of two mammal species previously thought to have been extinct: the Hastings River Mouse (Pseudomys oralis) and Parma Wallaby (Macropus parma).	**General:** • rainforest habitat; • threatened fauna species; • extent of rainforest; • heaths, rocky outcrop communities, forests and woodlands; and • Hastings River Mouse (Pseudomys oralis) and Parma Wallaby (Macropus parma). **Tweed Caldera Group:** • as above; including • Parma Wallaby (*Macropus parma*).

Source: UNESCO World Heritage Centre: https://whc.unesco.org/en/list/368

Table 6.12 Assessment against the National Heritage significance criteria

Criterion	Assessment	Attributes
(a) The place has significant heritage value because of the place's importance in the course, or pattern, of Australia's natural or cultural history.	**Official values:** The GRA provides outstanding examples of significant ongoing geological processes. When Australia separated from Antarctica following the breakup of Gondwana, new continental margins developed. The margin which formed along Australia's eastern edge is characterised by an asymmetrical marginal swell that runs parallel to the coastline, the erosion of which has resulted in the Great Divide and the Great Escarpment. This eastern continental margin experienced volcanicity during the Cenozoic Era as the Australian continental plate moved over one of the planet's hot spots. Volcanoes erupted in sequence along the east coast resulting in the Tweed, Focal Peak, Ebor and Barrington volcanic shields. This sequence of volcanos is significant as it enables the dating of the geomorphic evolution of eastern Australia through the study of the interaction of these volcanic remnants with the eastern highlands. The GRA contains outstanding examples of major stages in the Earth's evolutionary history as well as ongoing evolutionary processes. Major stages represented include the 'Age of the Pteridophytes' from the Carboniferous Period with some of the oldest elements of the world's ferns represented, and the 'Age of Conifers' in the Jurassic Period with one of the most significant centres of survival for Araucarians (the most ancient and phylogenetically primitive of the world's conifers). Likewise, the GRA provides an outstanding record of the 'Age of the Angiosperms'. This includes a secondary centre of endemism for primitive flowering plants originating in the Early Cretaceous, the most diverse assemblage of relict angiosperm taxa representing the primary radiation of dicotyledons in the mid-Late Cretaceous, a unique record of the evolutionary history of Australian rainforests representing the 'golden age' of the Early Tertiary, and a unique record of Miocene vegetation that was the antecedent of modern temperate rainforests in Australia. The GRA also contains an outstanding number of songbird species, including lyrebirds (*Menuridae*), scrub-birds (*Atrichornithidae*), treecreepers (*Climacteridae*) and bowerbirds and catbirds (*Ptilonorhynchidae*), belonging to some of the oldest lineages of passerines that evolved in the Late Cretaceous. Outstanding examples of other relict vertebrate and invertebrate fauna from ancient lineages linked to the break-up of Gondwana also occur in the GRA. The flora and fauna of the GRA provides outstanding examples of ongoing evolution including plant and animal taxa which show evidence of relatively recent evolution. The rainforests have been described as 'an archipelago of refugia, a series of distinctive habitats that characterise a temporary endpoint in climatic and geomorphological evolution'. The distances between these 'islands' of rainforest represent barriers to the flow of genetic material for those taxa which have low dispersal ability, and this pressure has created the potential for continued speciation.	**Official Values:** **General:** • Great Escarpment; and • Volcanic geological formations, particularly the: – Tweed Shield erosion caldera/Wollumbin/Mt Warning; and – Ebor Volcano. **Tweed Caldera Group:** • Wollumbin Mountain

Criterion	Assessment	Attributes
(b) The place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history.	**Official values:** The ecosystems of the GRA contain significant and important natural habitats for species of conservation significance, particularly those associated with the rainforests which once covered much of the continent of Australia and are now restricted to archipelagos of small areas of rainforest isolated by sclerophyll vegetation and cleared land. The Gondwana Rainforests provides the principal habitat for many species of plants and animals of outstanding universal value, including more than 270 threatened species as well as relict and primitive taxa. Rainforests covered most of Australia for much of the 40 million years after its separation from Gondwana. However, these rainforests contracted as climatic conditions changed and the continent drifted northwards. By the time of European settlement rainforests covered only 1% of the landmass and were restricted to refugia with suitable climatic conditions and protection from fire. Following European settlement, clearing for agriculture saw further loss of rainforests and only a quarter of the rainforest present in Australia at the time of European settlement remains. The GRA protects the largest and best stands of rainforest habitat remaining in this region. Many of the rare and threatened flora and fauna species are rainforest specialists, and their vulnerability to extinction is due to a variety of factors including the rarity of their rainforest habitat. The GRA also protects large areas of other vegetation including a diverse range of heaths, rocky outcrop communities, forests and woodlands. These communities have a high diversity of plants and animals that add greatly to the value of the GRA as habitat for rare, threatened and endemic species. The complex dynamics between rainforests and tall open forest particularly demonstrates the close evolutionary and ecological links between these communities. Species continue to be discovered in the GRA including the re-discovery of two mammal species previously thought to have been extinct: the Hastings River Mouse (*Pseudomys oralis*) and Parma Wallaby (*Macropus parma*).	**General:** • rainforest habitat; • threatened fauna species; • extent of rainforest; • heaths, rocky outcrop communities, forests and woodlands; and • Hastings River Mouse (*Pseudomys oralis*) and Parma Wallaby (*Macropus parma*). **Tweed Caldera Group:** • as above; including Parma Wallaby (*Macropus parma*).
(c) The place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history.	**Official values:** Species continue to be discovered in the GRA including the re-discovery of two mammal species previously thought to have been extinct: the Hastings River Mouse (*Pseudomys oralis*) and Parma Wallaby (*Macropus parma*).	**General:** • habitat. **Tweed Caldera Group:** • as above; including Parma Wallaby (*Macropus parma*).

Criterion	Assessment	Attributes
(d) The place has significant heritage value because of the place's importance in demonstrating the principal characteristics of: (i) a class of Australia's natural or cultural places; or (ii) a class of Australia's natural or cultural environments.	**Official values:** The GRA provides outstanding examples of significant ongoing geological processes. When Australia separated from Antarctica following the breakup of Gondwana, new continental margins developed. The margin which formed along Australia's eastern edge is characterised by an asymmetrical marginal swell that runs parallel to the coastline, the erosion of which has resulted in the Great Divide and the Great Escarpment. This eastern continental margin experienced volcanicity during the Cenozoic Era as the Australian continental plate moved over one of the planet's hot spots. Volcanoes erupted in sequence along the east coast resulting in the Tweed, Focal Peak, Ebor and Barrington volcanic shields. This sequence of volcanos is significant as it enables the dating of the geomorphic evolution of eastern Australia through the study of the interaction of these volcanic remnants with the eastern highlands. The GRA protects the largest and best stands of rainforest habitat remaining in this region.	**General:** • Araucarians; and • Ferns; and • Songbirds, particularly: – lyrebirds (Menuridae); – scrub-birds (Atrichornithidae); – treecreepers (Climacteridae); and – and bowerbirds and catbirds (Ptilonorhynchidae). **Tweed Caldera Group:** • as above; including Parma Wallaby (*Macropus parma*).
(e) The place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.	**Official values:** Not met.	Not applicable
(f) The place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period.	**Official values:** Not met.	Not applicable

Criterion	Assessment	Attributes
(g) The place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.	**Official values:** Not met.	Not applicable
(h) The place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.	**Official values:** Not met.	Not applicable
(i) The place has significant heritage value because of the place's importance as part of Indigenous tradition.	**Official values:** Not met.	Not applicable

6.2.2 Condition and integrity

The *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties* impact assessment guideline (ICOMOS, 2001), replicated in Table 1.3, uses the value of the heritage asset as a metric for determining the level of impact. Table 6.13 assesses the relative heritage values of the Wollumbin National Park section of the GRA. The value has been derived from the integrity and authenticity in conjunction with the contribution it makes to the World and National heritage listings.

Table 6.13 Heritage values within and adjacent to the Proposal area

Attribute	Integrity and authenticity	Value	Justification
Geology and geomorphology	High	Very High	The Wollumbin National Park contains geological features identified as being of World and National Heritage value.
Vegetation	High	Very High	The Wollumbin National Park contains vegetation communities that are identified as being of World and National Heritage value. The vegetation communities in this area display a high degree of authenticity and integrity.
Fauna	High	Very High	Species identified in the listing are present in the Wollumbin National Park.
Aquatic ecology	High	Medium	Aquatic ecology is not noted as contributing to the World and National Heritage value. However, the condition and integrity of the system is such that it supports the outstanding universal value and is likely to be of National heritage value.
Water and hydrology	High	Medium	Water and hydrology are not noted as contributing to the World and National heritage values. However, in recognition that the vegetation and fauna of the Wollumbin National Park are reliant on water and hydrology, it is considered as a supporting value.
Landscape, setting and views	High	High	Views in WRNP are well preserved, being largely undisturbed by development.

7 Assessment of the Proposal

7.1 Proposed Works

The Proposal would include the following main activities and elements:

- 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 temporary workers accommodation
- construction of a temporary 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
- removing or reconstructing impacted recreational infrastructure and facilities at Crams Farm
- upgrading the Kyogle Road and Clarrie Hall Dam Road intersection
- replacing McCabes Bridge and realignment of Commissioners Creek Road
- relocating existing power and telecommunications utilities
- construction of new recreation facilities including an amenities block, public shelters, viewing areas, interpretation signage, paths, car parks, and landscaping.

The detailed design will need to check the existing tunnel, valves and control systems remain suitable for new design flow velocities and pressures from the raised dam and their condition is suitable for extended service life.

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).

An overview of the elements of the Proposal is provided in Figure 7.1. Further details of the Proposal are provided in Section 3 of the EIS.

The construction disturbance area and associated activities include the dam wall area and ancillary areas, as summarised in Table 7.1.

The operational disturbance areas include the following:

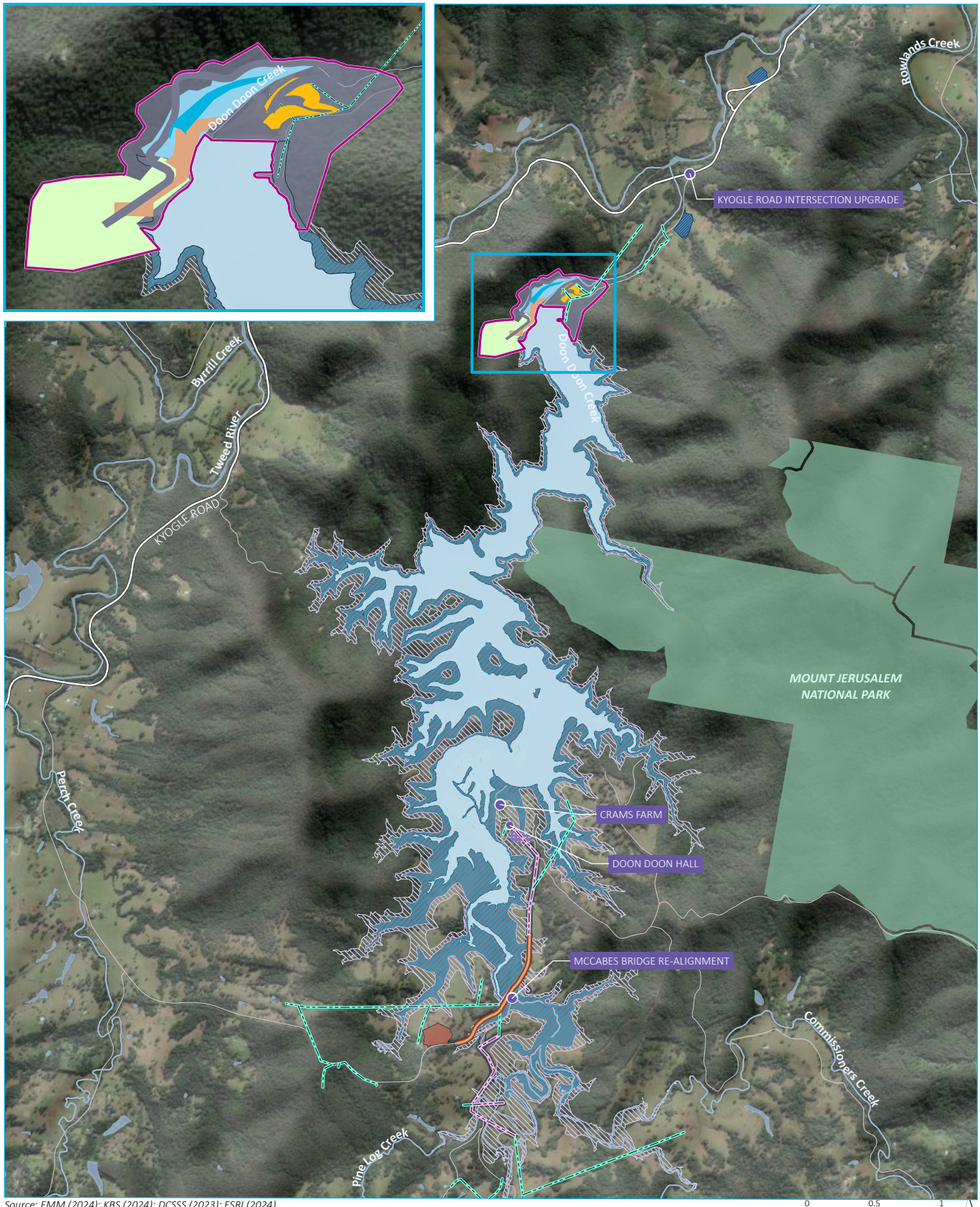
- area of inundation increased to the area below the RL 70 m contour, which is the waterline boundary at FSL
- area between FSL and PMF
- downstream areas due to changes in flow.

Table 7.1 Proposal summary

Proposal element	Summary of the Proposal
Operation	
Description	Raising the embankment wall of Clarrie Hall Dam by 8.5 m
Operational footprint	Approximately 209 ha for the proposed FSL Approximately 248 ha for the area between the proposed FSL and the PMF.
Dam wall infrastructure	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 a boat ramp
Ancillary works	Upgrading the intersection of Clarrie Hall Dam Road and Kyogle Road Remove and replaceMcCabes 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
Ancillary works	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 areas for materials stockpiling Establishing construction compounds including site offices, compounds and workforce accommodation
Dewatering	Lowering dam storage by 300 mm below FSL during construction

Proposal element	Summary of the Proposal
Property	Permanent and temporary property adjustments and property access refinements

It is anticipated that construction would start in 2026, subject to obtaining all necessary approvals.



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

0 0.5 1 km

GDA2020 MGA Zone 56

N

\\emm.local\xdrive\2023\E230036- Clarrie Hall Dam EIS- Project management\GIS\02_Maps_HH\HH003_ProposedDirectDisturbance\HH003_ProposedDirectDisturbance_20240801_03.aprx 2/08/2024

KEY

- Construction disturbance footprint
- Proposed construction disturbance footprint
- Existing inundation
- Inundation to FSL (61.5- 70 m AHD)
- FSL to PMF (70-77 m AHD)
- Infrastructure upgrade location

Proposed layout

- Haul Road- option 1
- Haul Road- option 2
- Office location
- Potential McCabes Bridge stockpile and construction office complex
- Quarry impact area
- Proposed spillway
- Spillway impact area
- Concrete batching plant or workforce accommodation
- Potential McCabes Bridge stockpile and construction office
- McCabes Bridge proposed realignment

Transmission line

- Existing
- New

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve

Proposed direct disturbance footprint

Clarrie Hall Dam EIS
Historical Archaeological Assessment
Figure 7.1

EMM
creating opportunities

7.2 Impact types – historical heritage

The raised dam will result in the inundation of an additional 209 ha of land throughout lower Doon Doon that lies below 70 m AHD. This will inundate parts of previously accessible roads, including Doon Doon Road at McCabes Bridge and a section of Long Pine Road to the northeast that accesses Council owned land (Figure 7.1). McCabes Bridge is proposed to be replaced or an alternate road constructed linking Doon Doon Road with Commissioner's Creek Road. The above works will not affect significant heritage values in the Proposal area.

Potential sources of impact in the vicinity of construction areas may include vibration from demolition and construction activities. Across the broader Proposal area impacts could include demolition, archaeological disturbance from earthworks, altered historical arrangements and access as a result of altered road alignments, visual amenity, alterations to landscape and vistas as a result of the raising of the dam reservoir and alterations to historic curtilages.

Crams Farm Reserve holds value for local communities as a recreation area and would be directly impacted by the Proposal (KBR 2023:99). Potential permanent and temporary impacts that may occur as a result are outlined below.

7.2.1 Permanent Impacts

The existing boat ramp and pontoon at Crams Farm would be removed or replaced and the area of Crams Farm Reserve that surrounds the existing buildings, including the Bails and Dairy and Doon Doon Hall, will be reduced by approximately 35% due to increased water levels, significantly altering the current physical setting.

Based on the surface water report appended to the EIS, increases in water levels between the Clarrie Hall Dam wall and the Bray Park Weir are assessed as being imperceptible. No impacts to downstream heritage items have been identified.

7.2.2 Temporary Impacts

The area of Crams Farm Reserve is one of two locations that may be utilised for construction compounds, laydown areas and stockpiling during construction. Resulting impacts to the surface areas of Crams Farm would be negated by reinstatement of the original setting following completion of the Proposal. Following the raising of the dam periodic flood levels in excess of 70 m AHD would restrict access to the reserve and the PMF of 77 m AHD would isolate the Crams Farm buildings in a 1,700m² island of land.

7.3 Significant historical structures impact assessment

This assessment has determined that the reserve contains two locally significant historical structures, the Crams Farm Bails and Dairy, and Doon Doon Hall.

Council may apply specific controls in Section A18 of the Tweed DCP to the management of historic properties not listed as heritage items in the TLEP (2016:7). However, as the above historic structures are not currently listed in Schedule 5 of the TLEP potential impacts are here considered through relevant assessment questions outlined by Heritage NSW *Guidelines for Statements of Heritage Impact* (DPE, 2023), provided below in Table 7.2.

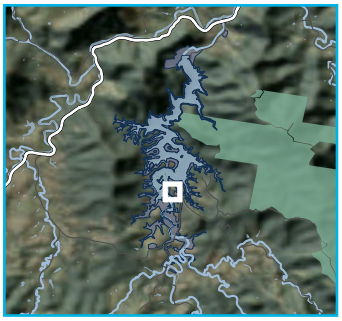
Table 7.2 Assessment of historical structures against relevant Statement of Heritage Impact questions (DPE, 2023:11).

Impact Consideration	Discussion
Will the proposed works affect the heritage significance of the adjacent heritage item or the heritage conservation area?	The Proposal will potentially involve utilisation of elevated areas of the entrance road into Crams Farm Reserve for stockpiling and establishment of construction offices. These works would be temporary and would occur at a remove from the identified significant historical structures. As a result, the Bails and Dairy, Doon Doon Hall and their setting would not be permanently affected by these proposed works. The increased holding capacity of the reservoir would significantly alter the current physical and hydrological setting of the area of Crams Farm Reserve that surrounds the Bails and Dairy and Doon Doon Hall. The terrestrial area of the Crams Farm Reserve will be reduced by approximately 35% by extension of the proposed Full Supply Level of 70 m AHD and inundation to the PMF of 77 m AHD would temporarily isolate the Crams Farm buildings in a 1,700m² island of land, inaccessible by road. The PMF would encroach upon the buildings and potentially inundate the root systems of the mature native figs, Melaleucas and other trees that form contributory elements of the setting. Despite these changes, the proposed works are unlikely to adversely affect the significance of the Bails and Dairy or Doon Doon Hall. The historical setting of the public reserve is currently enhanced, not reduced, by the waterway formed by the dam and this would remain the case if the buildings were brought into closer proximity to the waterline. It is also unlikely that the mature trees present would be adversely impacted by the PMF, as native Ficus and Melaleuca, and even the introduced Pecan tree are all tolerant of intermittent flooding or increase in the watertable (DECC, 2007; Wazir et al. 1988). The structures themselves are unlikely to be directly inundated. Doon Doon Hall sits close to the 77 m contour however the building is raised on steel supports that would elevate it above the predicted PMF.

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

0 25 50 m
GDA2020 MGA Zone 56

N



KEY

- Proposed construction disturbance footprint
- Existing inundation
- Inundation to FSL (61.5- 70 m AHD)
- FSL to PMF (70-77 m AHD)

Existing environment

- Minor road
- Named watercourse

Detail of Cram's Farm Reserve showing potential impacts and inundation zones

Clarrie Hall Dam EIS
Historical Archaeological Assessment
Figure 7.2

EMM
creating opportunities

7.4 Archaeological impact assessment

High potential for archaeological resources has been identified for areas in former Crams Farm. However, as a result of the assessment process in Section 6, the Proposal area has been determined to hold a nil to low level of potential to hold archaeological resources and any resources present are unlikely to meet the threshold of 'relics' as defined by the *Heritage Act* (1977).

Specific controls for archaeological resources are not listed in Section A18 of the Tweed DCP. The potential of the proposed works to impact any significant archaeological resources is assessed below in Table 7.3 in consideration of relevant questions from NSW Environment and Heritage's *Guidelines for Preparing a Statement of Heritage Impact* (2023).

Table 7.3 Assessment of archaeological resources against Statement of Heritage Impact questions (DPE, 2023:11).

Relevant Consideration	Discussion
Will any known or potential archaeological relics be affected by the landscape works? How will this be mitigated? Has advice been sought from a suitably qualified archaeologist?	Assessment of past historical activities and past land disturbance in the Proposal area has determined that the Proposal area holds a nil – to low level of potential to include significant archaeological deposits associated with historical Phases 1 and 2. Historical phases 3 – 6 have been found to hold Nil potential for significant archaeological deposits or 'relics' as defined by the relics provision of the Heritage Act (1977). If significant archaeological resources associated with Phases 1 and 2 are located in the study area, they may be impacted by the proposed increase in the inundation area, however any such presence and therefore any impact, is considered unlikely.

7.5 Impacts – natural heritage values

7.5.1 Wollumbin National Park

The proposed works outlined in Section 7.1 would occur within 3 km of the World, National, State and locally listed Wollumbin National Park. There will be no direct impacts arising from the Proposal on vegetation within the World Heritage property or National Heritage place given the distance between the Proposal and the Wollumbin National Park.

The raising of the dam wall will result in an increase in the surface area of Clarrie Hall Dam. However, given the distance between Clarrie Hall Dam and the Wollumbin National Park, together with intervening topography and vegetation, it is considered that the visual alteration is likely to be negligible. Wollumbin Mountain is closed at the behest of the Aboriginal custodians and it has therefore not been possible to provide images of the views from the Mountain towards Clarrie Hall Dam and determine the full extent of the possible change.

Wollumbin National Park sits at a higher elevation to Clarrie Hall Dam. Modelling of the Proposal on ground and surface water indicate that there will be no impact to the water regimes in Wollumbin National Park. Refer to the EIS and individual technical studies for further information in relation to the ground and surface water impacts.

7.5.2 Mount Jerusalem National Park

The proposed works outlined in Section 7.1 would directly abut the State and locally listed Mount Jerusalem National Park at two locations, as shown in Figure 7.1. While there would be no direct impact on Mount Jerusalem National Park, and therefore its natural heritage values, the Biodiversity Development Assessment Report (BDAR) for the Proposal does identify potential indirect impacts relevant to Mount Jerusalem National Park , including:

- edge effects

- introduction and spread of weed species, resulting in degradation of retained native vegetation and habitat
- temporary increase in noise, dust, vibration and artificial lighting levels associated with construction
- temporary inundation of retained native vegetation and habitats during extreme flood events.

The likelihood of each of these impacting the natural heritage values of Mount Jerusalem National Park is outlined below.

i Edge effect

Edge effects are zones of changed environmental conditions that occur along the edges of habitat fragments. These new environmental conditions along the edges can promote the growth of different plant species (including weeds), supress the growth of some native plant species, promote invasion of or change the behaviour by some native and introduced animals that specialise in such modified environments (Moenting and Morris, 2006). For instance, edge zones can be subject to higher levels of predation by introduced mammal and native bird predators, which changes the composition of the fauna community. Nevertheless, the extent of the edge effect is largely driven by the nature of the disturbance, with the distance of edge effects influence varying according to human activities.

The BDAR identified that the Proposal area has been historically logged, however the edge effect that has resulted from this disturbance has been minimal, concluding that "apart from the removal of large trees by past forestry, most vegetation is intact and has little weed invasion" (EMM Consulting, 2024, p. 178). At the Dam, the edge effect had manifested differently, with denser vegetation evident, albeit in a very narrow (less than 20 m) band as a result of increased access to light. The BDAR concludes:

> It is not expected that the project will significantly change the spatial extent of the edge effect adjacent to the dam, since the water level would simply move upslope. Hence, the edge environment associated with the dam edge would also be expected to move upslope once water levels stabilise following raising of the dam wall and subsequent filling of the dam.
>
> (EMM Consulting, 2024, p. 179)

It is therefore not anticipated that the Proposal would have a significant impact on the natural heritage values of the Mount Jerusalem National Park in relation to edge effect.

ii Weed introduction and spread

The introduction of weeds is possible during construction as many weed species thrive on ground disturbance and will rapidly colonise in areas disturbed by construction before native species can recolonise. The construction disturbance would occur approximately one kilometre downstream of Mount Jerusalem National Park, thereby reducing the initial risk of introducing weeds. The BDAR provides measures to manage the residual impact. No substantial impact on the natural heritage values of the Mount Jerusalem National Park is anticipated.

iii Disturbance of native flora and fauna in adjacent habitat

There may be temporary impacts from noise, vibration, dust and artificial lighting during construction of the project. The impacts of noise, vibration, dust and artificial lighting are only predicted to potentially impact areas adjacent to the construction footprint of the project. The areas surrounding the operational footprint of the project, that are not in the vicinity of the construction footprint are not likely to be affected by these indirect impacts as these areas will be subject to inundation only, with no construction activities proposed. Therefore, no impact on the natural heritage values of the Mount Jerusalem National Park is anticipated.

iv Temporary inundation of native fauna and flora habitat during flooding events

Areas of the Mount Jerusalem National Park that are located between the proposed FSL and the new PMF of the Dam may experience infrequent, temporary inundation for short periods during operation, during and following extreme rainfall events that may flood the Dam. These extreme flooding events are predicted to be highly infrequent, with the Dam levels remaining relatively stable most of the time, with the proposed Dam expected to be at FSL approximately 70% of the time (refer to the surface water report for the EIS). During such extreme flooding events, habitat between the FSL and PMF may become temporarily unsuitable for some threatened fauna species. As these flooding events are temporary in nature, the fauna species are likely to be able to return to these areas between flood events. Additionally, flora species that are adapted to riparian and floodplain environments, and so would be expected to grow adjacent to the Dam, are typically tolerant to temporary inundation (Howell and Benson, 2000). The impact of such inundation on the Mount Jerusalem National Park is therefore expected to be minor and temporary (Table 1.3).

The Dam has the potential to enhance groundwater recharge however, based on current observations of vegetation adjacent to the existing Dam and the groundwater studies the impact of ground water recharge is likely to be negligible (refer to Groundwater Impact Assessment for the EIS) and it is not expected that any changes in groundwater associated with raising the Dam wall would adversely affect any groundwater dependant ecosystemss within the Mount Jerusalem National Park. That is, any increase in soil moisture resulting from modification of groundwater associated with raising the Dam wall should be tolerated by the wet sclerophyll and rainforest vegetation that is located adjacent to the Dam within the National Park.

8 Conclusions and Recommendations

8.1 Conclusions

Much of the Proposal area has seen little change since the earliest phases of historical activity and modern development disturbances have been limited to areas that have been inundated following construction of Clarrie Hall Dam. These circumstances are conducive to the preservation of an archaeological landscape, and where specific locations of past activity have been identified, archaeological potential has been found to be high. However, past historical activity in the Proposal area has not been intensive and areas of high archaeological potential are limited to specific sites of post-1920 dairy farming activities and the former Doon Doon Sawmill Company. Both of these potential resources fall in the most prominent and well-documented historical land holding in the Proposal area – Crams Farm. Nil to low potential has been identified for the remainder of the Proposal area, as a very limited possibility exists that ephemeral archaeological evidence may be present that could not be identified from documentary research or physical inspection of the landscape.

Assessment of the site histories for the potential archaeological resources described above has determined that they are unlikely to be of research value or meet other thresholds for significance, and these areas therefore hold low archaeological sensitivity. The location of the former sawmill has also been found to fall in the current FSL, rendering it inaccessible and subject to existing inundation impacts. As a result, this document has determined that archaeological 'relics' are unlikely to be present in the Proposal area. Further, those resources that are likely to be present in Crams Farm Reserve would not be impacted by the proposed enlargement of the FSL to 70 m AHD or the PMF to 77 m AHD. As a result, the raising of Clarrie Hall Dam is considered to pose no direct or indirect impacts to potentially significant archaeological resources as defined by the relics provision of the *Heritage Act* (1977).

Given the size of the Proposal area, very few historical properties or structures, past or extant, have been identified overall. However, two locally significant historical buildings have been identified in Crams Farm Reserve.

The Bails and Dairy has been assessed to be locally significant under NSW heritage assessment Criterion a) (historical significance), as it is characteristic of the development of Crams Farm and the broader, early development of dairy farms at Lower Doon Doon. The Bails and Dairy is also a highly contributory element of the historical setting of Crams Farm Reserve that includes Doon Doon Hall and mature tree plantings.

Doon Doon Hall has been assessed as locally significant under Criterion a) (historical significance) and Criterion d) (social/cultural significance), as it is among the oldest Federation era community halls in the Tweed LGA, has occupied three separate sites in two Tweed communities and has served the Doon Doon community for almost 100 years as the sole historical public building in the local area.

Impact assessment in this document has determined that although the green space of Crams Farm Reserve will be reduced by the raising of Clarrie Hall Dam, no direct impacts are posed to the Bails and Dairy building by the proposed works, new FSL or PMF. Indirect impacts will also be limited to reduction in the surrounding lawn green space and former area of Crams Farm. The immediate, contributory setting provided by mature trees and additional structures in Crams Farm Reserve will not be altered or impacted as a result of the proposed works. Proposed changes are therefore considered unlikely to adversely affect the significance of the Bails and Dairy or Doon Doon Hall. The historical narrative of the farm and the setting of the public reserve are both currently enhanced, not reduced, by the waterway formed by the dam and this would remain the case if the buildings were brought into closer proximity to the waterline.

An assessment of the potential indirect impacts to Wollumbin National Park, located three kilometres to the north and listed on the World and National heritage list, indicates that there would be no direct impacts. Indirect impacts would be limited to a potential change in the outlook from some areas of the Wollumbin National Park, but these changes are likely to be minimal due to the intervening distance, topography and vegetation.

An assessment of the potential indirect impacts to the State and locally listed Mount Jerusalem National Park, which abuts the Proposal, would be minimal. The measures proposed in the Biodiversity Development Assessment Report are suitable to manage the potential indirect impacts.

8.2 Recommendations

This HAA has identified that potential archaeological resources and existing locally significant historical structures are unlikely to be impacted by the proposed construction works or by inundation as a result of the raising of Clarrie Hall Dam. The surrounding natural heritage values are unlikely to be impacted as a result of the Proposal. As a result, no further investigation or specific mitigation measures are required with regard to historical or natural heritage. However, the following general recommendations are provided to guide management during the construction and operation of the Proposal:

- Works can proceed with caution. An unexpected finds procedure should be integrated into the construction environmental management plan and implemented throughout the life of the Proposal to manage any unexpected archaeological resources.
- Should the proposed works as presented in Section 7.1 be altered, an addendum to this document may be required to assess the potential heritage and archaeological impact of the new works.
- As Doon Doon Hall and the Bails and Dairy have been assessed in this document to be of local heritage significance, they should be incorporated into the environmental management framework for the Proposal.
- Tweed Shire Council should consider the local heritage listing of built items Doon Doon Hall and the Bails and Dairy under future amendments to the Tweed LEP. This would ensure the appropriate ongoing management of the items in consideration of likely increased public engagement and interaction with the site following completion of the Proposal.
- The management measures outlined by the BDAR should be implemented to guard against indirect impacts to the adjacent natural heritage values protected in the Mount Jerusalem National Park.

9 References

9.1 General and historical heritage

Australia ICOMOS The Burra Charter

Ballina Shire Council (2008) Draft Shire Wide Community Based Heritage Study.

Boileau, Joanna (2004) Tweed Shire Council Community Based Heritage Study: Thematic History. Unpublished report for Tweed Shire Council.

Clarence and Richmond Examiner and New England Advertiser (1888) 'Advertising', Clarence and Richmond Examiner and New England Advertiser, 20 March, p. 3. Available at: http://nla.gov.au/nla.news-article62094222.

Department of Planning and Environment (NSW) (2023) Assessing heritage significance. Parramatta, NSW: Environment and Heritage, Department of Planning and Environment (NSW).

Department of Environment and Climate Change (NSW) (2007) Sub-tropical Coastal Floodplain Forest https://www.environment.nsw.gov.au/resources/threatenedspecies/EECsubtropicalforestlowres.pdf

Ecological Australia Pty Ltd (2020) Clarrie Hall Dam Raising - Historical Archaeological Assessment. Report for Tweed Shire Council.

EMM (2022) Review of Environmental Factors: PR471 Construction of 132kV Aerotropolis Feeder from Orchard Hills to Luddenham (Stages 4-7). Sydney: Unpublished report for Endeavour Energy, September 2022. Available at: https://www.endeavourenergy.com.au/__data/assets/pdf_file/0016/43423/PR471-Aerotropolis-Stages-4-7-Draft-Final-

Escobar, C.M. and Posada, A.M. (2008) Recent Experience on Design, Construction and Performance of CFRD Dams. International Conference on Case Histories in Geotechnical Engineering. 9. https://scholarsmine.mst.edu/icchge/6icchge/session11b/9

Hargreaves, J. (ed), Uki Public School 1895 – 1995, Uki Public School Centenary Committee, 1995, pp. 58. – 61. 95.Heritage Council of New South Wales (2001) 'New South Wales Historical Themes', p. 10.

The Institution of Engineers, Australia September (2000) Cethana Dam Tasmania. Submission for a National Engineering Landmark, from the Engineering Heritage Committee, Tasmania Division. https://portal.engineersaustralia.org.au/system/files/engineering-heritage-australia/nomination-title/Cethana%20Dam%20-%20Nomination%20-%20Sept%202000.pdf

Johansen, R. Tales of our Times, Vols 1 – 11, self published, Murwillumbah Print Spot, Murwillumbah, 1992 – 2003.

Kass, T. (1995) Lismore Hertiage Study Historic Context Report.

Kellogg Brown & Root Pty Ltd (2023) Clarrie Hall Dam Raising: State Significant Infrastructure Application - Scoping Study. Unpublished report prepared for Tweed Shire Council.

Lismore City Council (2022) History of Lismore. Available at: https://lismore.nsw.gov.au/historical-information-about-the-city-of-lismore (Accessed: 17 September 2022).

Marsden, S. and Spearritt, P. (2021) The Twentieth-Century Historic Thematic Framework: A Tool for Assessing Heritage Places. With contributions from Leo Schmidt, Sheridan Burke, Gail Ostergren, Jeff Cody, and Chandler McCoy. Los Angeles: Getty Conservation Institute. https://hdl.handle.net/10020/gci_pubs_historic_thematic_framework_tool.

Northern Star (1888a) 'Official Correspondence', Northern Star, 6 June, p. 3. Available at: http://nla.gov.au/nla.news-article71724757.

Northern Star (1888b) 'Official Correspondence', Northern Star, 8 September, p. 4. Available at: http://nla.gov.au/nla.news-article71725387.

Northern Star (1889) 'Inspector's Report of Public Schools Richmond River District', Northern Star, 11 September, p. 2. Available at: http://nla.gov.au/nla.news-article71713576.

NSW Heritage Manual, NSW Heritage Office, Department of Urban Affairs & Planning, 1996.

Tweed Daily (1930) ' New Sawmill for Doon Doon Creek' Tweed Daily 23 October 1930 p. 2.

Tweed Daily (1942) Tweed Daily Sat 21 March 1942 p. 3

Historical Archaeological Investigations: A Code of Practice, NSW Department of Planning, 2006.

Navin Officer (2018). Proposed Raising of Clarrie Hall Dam, Murwillumbah NSW Archaeological Assessment and Aboriginal Cultural Heritage Assessment. Prepared for Tweed Shire Council.

NSW Heritage Branch (2009) Assessing Significance for Historical Archaeological Sites and 'Relics'. Parramatta: NSW Heritage Office. Available at: http://www.heritage.nsw.gov.au/docs/Arch_Significance.pdf.

NSW Heritage Office (1996) 'Archaeological Assessments: Archaeological Assessment Guidelines'. Parramatta: NSW Heritage Office & Department of Urban Affairs and Planning. Available at: https://www.heritage.nsw.gov.au/assets/Uploads/files/archaeological-assessments-guidelines.pdf.

NSW Land Registry Service (2020) Crown Land, NSW Land Registry Service. Available at: https://www.nswlrs.com.au/Crown-Land (Accessed: 11 October 2021).

Ryan, M. (1995) Norco 100: A Centenary History of Norco 1895 - 1995. Lismore, Norco Co-operative 4Limited.

Roads and Traffic Authority (NSW) (2005) Historical Overview of Bridge Types in NSW: Extract from the Study of Heritage Significance of Pre-1948, RTA Controlled Concrete Beam Road Bridges (Sydney, South West and Southern Regions). https://roads-waterways.transport.nsw.gov.au/documents/about/environment/bridge-types-historical-overviews-2006-concretebeam.pdf

Stubbs, B. J. (2007) Thematic History of the Richmond Valley Local Government Area.

The Sydney Morning Herald (1906) 'Advertising', The Sydney Morning Herald, 2 June, p. 20. Available at: http://nla.gov.au/nla.news-article14776365.

Tweed Shire Council (2016) Tweed Shire Development Control Plan

Tweed Shire Council https://www.tweed.nsw.gov.au/ClarrieHallDam, accessed 22/11/2023

Tweed Regional Museum https://museum.tweed.nsw.gov.au/ExploreOurHistory, accessed 20/11/2023

Tweed Shire Local Environmental Plan https://legislation.nsw.gov.au/#/view/EPI/2014/177, accessed 17/11/2023

Wazir, K.F. Smith, M. W. and Akers, S. A. (1988) Effects of Flooding and Soil Phosphorus Levels on Pecan Seedlings. In HortScience 23 (3):595-597, 1988.

9.2 Natural heritage

Ballina Shire Council (2008) Draft Shire Wide Community Based Heritage Study.

Boileau, J. (2004) Tweed Shire Council Community Based Heritage Study Thematic History.

Department of Climate Change Energy the Environment and Water (2021) World Heritage Places - Gondwana Rainforests of Australia. Available at: https://www.dcceew.gov.au/parks-heritage/heritage/places/world/gondwana#more-information (Accessed: 23 August 2022).

Department of Planning and Environment (NSW) (2023) Assessing heritage significance. Parramatta, NSW: Environment and Heritage, Department of Planning and Environment (NSW).

EMM Consulting (2024) *Biodiversity Development Assessment Report: Clarrie Hall Dam Raising*.

Gahan, K. (2004) Wardell Community Based Heritage Study.

Howell, J. and Benson, D. (2000) 'Predicting potential impacts of environmental flows on weedy riparian vegetation of the Hawkesbury–Nepean River, south-eastern Australia', Austral Ecology, 25, pp. 436–475.

ICOMOS (2001) Guidance on Heritage Impact Assessments for Cultural World Heritage Properties. Paris: ICOMOS. Available at: https://www.iccrom.org/sites/default/files/2018-07/icomos_guidance_on_heritage_impact_assessments_for_cultural_world_heritage_properties.pdf.

Kass, T. (1995) Lismore Hertiage Study Historic Context Report.

Moenting, A. E. and Morris, D. W. (2006) Disturbance and Habitat Use: Is Edge More Important Than Area? Nordic Society Oikos.

NSW National Parks and Wildlife Service (2004) Parks & Reserves of the Tweed Caldera Plan of Management. NSW National Parks and Wildlife Service. Available at: http://www.environment.nsw.gov.au/parkmanagement/BorderRangesNPMgmtplan.htm.

NSW National Parks and Wildlife Service (2022) Wollumbin Aboriginal Place Management Plan: Tweed Caldera. Sydney: Department of Planning and Environment. Available at: https://www.environment.nsw.gov.au/research-and-publications/publications-search/wollumbin-aboriginal-place-management-plan.

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
Suite 2.04 Level 2
15 London Circuit
Canberra City ACT 2601

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

MELBOURNE
Suite 9.01 Level 9
454 Collins Street
Melbourne VIC 3000
T 03 9993 1900

PERTH
Suite 3.03
111 St Georges Terrace
Perth WA 6000
T 08 6430 4800

Canada

TORONTO
2345 Yonge Street Suite 300
Toronto ON M4P 2E5
T 647 467 1605

VANCOUVER
422 Richards Street Unit 170
Vancouver BC V6B 2Z4
T 604 999 8297

CALGARY
606 4th Street SW 11 Floor
Calgary Alberta T2P 1T1

linkedin.com/company/emm-consulting-pty-limited

emmconsulting.com.au