
Appendix A – JCIS Consultants – Terrestrial Archaeological Excavation Report

**ARCHAEOLOGICAL TEST
EXCAVATIONS AT THE
SOUTH GRAFTON BRIDGE
CONSTRUCTION SITE**

REPORT BY JCIS CONSULTANTS

Prepared for:

Biosis Pty Ltd on behalf of ARUP on behalf of Roads and Maritime Services

JCIS Consultants Report 13-036

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1 INTRODUCTION

Biosis Pty Ltd has been commissioned by ARUP on behalf of Roads and Maritime Services to undertake the non-Aboriginal assessment for the proposed additional crossing over the Clarence River at Grafton, NSW. The project proposes to construct a two lane bridge (one lane northbound, one lane southbound) immediately to the east of the existing bridge, and connect the Pacific Highway at Iolanthe Street in South Grafton to Pound Street in Grafton (Figure 1).

1.1 Background to this report

Historical photographs of the Clarence River Bridge construction show that the proposed development footprint on the south bank was the location for part of the 1930s bridge construction works; namely a large shed with smaller buildings located on the waterfront. In front of the shed was a row of wharves or moorings. This may have been a goods and materials wharf for the bridge construction. Remains of these structures are detailed in numerous plans and historical photographs of the project area for this report (Project Area CZB36).

As part of the on-going assessment work for this project; the Archaeological Assessment and Research Design to inform the Non-Aboriginal Heritage Assessment for the additional crossing of the Clarence River at Grafton, NSW (the Assessment) recommended that test excavations be undertaken at the site of the works area used to fabricate and assemble structures for the Grafton Road/Rail Bridge. This area was assessed as having high archaeological potential; that is, the potential to contain archaeological remains but moderate archaeological research potential. The Assessment commented on the area:

“Undoubtedly the construction of the bascule bridge over the Clarence River was the high point of steel bridge construction on the North Coast Line and was important in developing in-house engineering skills which were later used in the emergency replacement of the Hawkesbury River Bridge. The question is whether the archaeology of the construction site for the bridge can add anything to our knowledge of the bridge itself.

The structural steel for the bridge was fabricated by Clyde Engineering in Granville and, according to Roberts, the contract called for “the temporary erection in the manufacturer’s yard of each separate span of different type”. Thus little actual fabrication was reportedly done on the Grafton site rather the material was railed up to the South Grafton site and erected on a grillage and from there each span was floated out on punts to the erection site. Roberts, who was the engineer for the project, in his article presents a site plan for South Grafton. This shows work areas in detail and a workshop but little detail is provided on the actual fabrication and methods used.

There would appear to be no major archaeological research questions that can be developed that cannot be answered by reference to documentary sources or by the fabric of the bridge itself. However archaeological questions about the detail of how much fabrication and alteration of the prefabricated sections were actually undertaken on the site would be worth pursuing if only on the grounds that the main historical evidence is presented by the person in charge who would naturally present a positive picture of matters.

Therefore the archaeological research potential of the area is moderate the construction site having some potential to elaborate on the methods of construction of the Clarence River Bridge at Grafton". (Biosis 2014:32).

It was recommended that a program of archaeological testing in the area of the workshops for the bridge construction be undertaken to ascertain the nature of the potential archaeological resource in this area. The results of the test excavation would be incorporated in the overall non-Aboriginal Archaeological Assessment and Statement of Heritage Impact being prepared to form part of an Environmental Impact Assessment (EIA) which is being prepared as part of a State Significant Infrastructure project (SSI).

In November 2013 Biosis teamed with Dr Iain Stuart from JCIS Consultants to assist with finalising the Assessment for the archaeological work. Dr Iain Stuart was the Excavation Director for the fieldwork.

1.2 Project Area CZB36

The area of archaeological investigations was located on the eastern side of the bridge over the Clarence River between the river bank and the site of the locomotive roundhouse (Figure 1).

1.3 Heritage Listings

This site is not heritage listed.

1.4 Methodology

The methodology used in the preparation of this report is broadly consistent with the guidelines of the NSW Heritage Office and the principles outlined in the Australia ICOMOS Charter for Places of Cultural Significance (the Burra Charter).

The terminology used in this report is consistent with the NSW Heritage Manual and the definitions contained in the Burra Charter.

1.5 Limitations

This report is based on historical research and field inspections. It is possible that further historical research or the emergence of new historical sources may support different interpretations of the evidence in this report.

The register searches undertaken for this report are current only to the date a particular register was searched. In the normal course of events, items are added to or removed from heritage registers and users of this report should check that sites have not been added to or removed from a particular register since the date the register was searched.

The significance assessment made in this report is a combination of both facts and interpretation of those facts in accordance with a standard set of assessment criteria. It is possible that another professional may interpret the historical facts and physical evidence in a different way.

This report does not purport to be legal advice. It should be noted that legislation, regulations and guidelines change over time and users of this report should satisfy themselves that the statutory requirements have not changed since the report was written.

1.6 Author Identification

This report was prepared by Dr Iain Stuart and Jane Cummins Stuart of JCIS Consultants.

1.7 Acknowledgements

- Alexander Beben, Senior Archaeologist, Biosis Research
- Shoshanna Grounds, Senior Archaeologist, Biosis Research

2 HISTORICAL BACKGROUND

The railway into South Grafton was an isolated section to Glenreagh (from there a branch line headed to Dorrigo), opened in October 1915 (Milne 2005). The establishment of a terminus at South Grafton resulted in the resumption of land on the west side of Bent Street which included a number of existing houses. The terminus included a station, goods yards and shed, a six stall locomotive roundhouse and engine facilities, and a carriage shed. A branch line ran to the west over Alipou Creek to a government wharf. Later the North Coast Steam Navigation Company acquired land and established a jetty to the west of the wharf.

The line from Sydney was opened in 1923 with the opening of the section from Coffs Harbour, but this occasion did not require South Grafton railway station to be altered. This more or less completed the North Coast line between Murwillumbah on the Tweed and Sydney except for the bridge over the Clarence River. Construction of the main line to Brisbane via Kyogle was completed in 1930 putting Grafton on the main interstate line. The problem was the Clarence River crossing.

The NSW Government Railway adopted a temporary solution by acquiring a barge (the *Swallow*) and a small cargo ship (the *Induna*) and converting them into train ferries. This involved constructing an upper deck on which the rolling stock ran for transportation across the Clarence. Initially, only one track was installed on the upper deck of the *Swallow* but, soon after their entry into service, this was enlarged to three tracks. The *Induna*, being smaller, had only one track. The *Swallow* was first in service in 1925 followed by the *Induna* in 1926 (Dunn 2003 pp111-112).

The ferry route was from the railway wharf at South Grafton upstream to the railway wharf at Grafton and not directly across as is the case with the current bridge alignment. Jetties and track work were constructed at both locations. The tracks ran down steep embankments to jetties with “adjustable 100’ long drawbridges” leading to floating pontoons.

Plans for a bridge at Grafton had been underway since 1910 and, in 1913, the Public Works Committee recommended the construction of a bridge across the Clarence at Wilson’s Hill (i.e. its current location); however, design and resource problems held up construction. In 1924 there was a renewed Government commitment to construct a road and rail bridge – one which would open to allow river traffic. Workers and material began to arrive in late 1927 (there was a track running past the roundhouse at South Grafton noted as “steel road”; this is likely to have been for bridge materials).

The Minister for Works and Railways, Mr Buttenshaw, drove in the first rivet for the bridge on the 11th July 1928. Despite a slowdown in work due to the Depression, the bridge was opened for traffic on the 8th May 1932 (Kass 2009:220-221).

The structural steel for the bridge was fabricated by Clyde Engineering in Granville and, according to Roberts, the contract called for “the temporary erection in the manufacturer’s yard of each separate span of different type”. Thus little actual fabrication was reportedly done on the Grafton site; rather the material was railed up to the South Grafton site and erected on a grillage. From there each span was floated out on punts to the erection site. Roberts (who was the engineer for the project), in his article, presents a site plan for

South Grafton (Roberts 1932:409). This shows work areas in detail and a workshop, but little detail is provided on the actual fabrication and methods used.

The construction of the bascule bridge over the Clarence River was the high point of steel bridge construction on the North Coast Line and was important in developing in-house engineering skills which were later used in the emergency replacement of the Hawkesbury River Bridge (Fraser 1999:118)

After the bridge was completed, the railway sidings built to transport material to the construction site seem to remain “in situ”. The railway plans for South Grafton show the sidings until 1944 when the area was reorganized slightly to construct a large coal stage (adjacent to Project Area CZB36). Aerial photos show buildings erected there after 1946 and before 1954, but there is no indication on railway plans what these were used for.

These buildings remain after the demolition of the South Grafton locomotive depot but were removed between 1996 and 2004 when the whole area was reorganized and the sugar loading facility was erected.

3 ARCHAEOLOGICAL WORK

3.1 Aims

Test Excavation on the south bank was undertaken to assess the impacts of the proposed bridge construction on historical archaeological deposits that may lie along the south bank, within the bridge footprint, by identifying whether archaeologically significant remains from the bridge construction workshops were likely to be present along the south bank of the Clarence River.

3.2 Methods

Two trenches were excavated on the south bank, their location being sited in order to cover some of the buildings shown on the Roberts plan (Figure 2) and to avoid telecommunications services (installation of these would have disturbed archaeological deposits). Trench locations were recorded with a Topcon's Nomad DGPS and post-processed to 0.3m accuracy. The overall location of the trenches is shown in Figure 5.

Excavation was undertaken by a backhoe fitted with a toothless mud bucket under archaeological supervision. The machine excavation removed the deposits with regard to their stratigraphic order. Levels were recorded using an automatic level. A survey station (No 33 – installed as part of the pre-construction works) was conveniently located nearby and this provided a height datum (AHD 6.824) for the project.

Where archaeological features were identified they were recorded in detail and hand excavated to determine their nature.

Artefacts were retrieved, recorded and reburied on site.

At the conclusion of the test excavations the trenches were backfilled.

3.3 Trench 1

Trench 1 was set out as being 10m by 5 m and located in an area adjacent to the workshop location.

Context	Description
Context 1	The surface layer was unevenly grassed across the trench and quite dry. The layer was of a uniform thickness of 10cm across the site with a clear boundary to Context 2. The layer was comprised of a grayish brown (Munsell 10YR 5/2) clayish silt.

Context 2	This context was a gray (Munsell 10YR 5/1) coloured deposit comprising ash and burnt coal (coke) extending across the whole trench and c15cm thick. This deposit is clearly a fill and contains discarded metal artefacts and pieces of wood, including a railway sleeper. The ash and coke would have been obtained from steam locomotive servicing when the ash and burnt coal, which accumulated in the front of the locomotive boiler and in the tubes, were cleaned out. This material was typically used by the railways to consolidate ground as it had to be dumped somewhere.
Context 3	This context, the base layer extending across the trench, consisted of a very dark grayish brown (Munsell 10YR 3/2) clayish silt. There was a clear and distinct boundary between this context and Context 2. This context represents the remains of the natural soil profile across the site.

No archaeological features were identified in the excavation.

3.3.1 Artefacts

The following artefacts were recovered, partially cleaned and photographed before being reburied when the trench was backfilled.

Number	Fabric	Description
1	Steel	Flat bottom rail section, 34cm long.
2	Iron	Two links of a large chain, most likely from a coupling.
3	Iron	40cm length of 7.7cm diameter pipe.
4	Composite	Square lead washer; iron bolt with a square head; square keeper plate; and other corroded iron items.
5	Composite	Rectangular iron plate, with a bolt through it, plus another hole; remnant timber.
6	Composite	Rectangular iron plate, with a bolt through it, and remnants of timber.
7	Iron	Iron rail joining plate.
8	Composite	Four iron bolts with square washers and threaded end through a remnant timber.
9	Iron	Iron strap.
10	Steel	Circular metal piston ring stamped with the number 16001.
11	Iron	84 miscellaneous iron pieces.
12	Steel	Flat bottom rail 91cm long.
13	Wood	Timber sleeper.

Artefacts numbers 4, 5, 6 and 8 would seem to be part of a timber framed structure which used iron fastenings. This would be typical of any of the structures known to be on the site. Artefacts numbers 1, 12 and 13 are from railway track and Item 2 is likely to be from wagon couplings. All are common items on railway sites.

The only unique artefact is no. 10, which is clearly from some form of machinery, but it is unclear what type of machine.

Overall, the collection is not unexpected given the general area was the site of a locomotive depot in which all these items could have been found and discarded in situ. There is nothing in the artefact collection that specifically points to the construction of the bridge.

3.4 Trench 2

Trench 2 was located between the optical fibre cables in the vicinity of the workshops area and positioned to include a depression in the ground surface which, it was thought, might be related to the workshops. The Trench was 35m long and 5m wide.

Context	Description
Context 1	The surface layer unevenly grassed across the trench and quite dry. The layer was of a uniform thickness of 10cm across the site with a clear boundary to Context 2. The layer comprised of a grayish brown (Munsell 10YR 5/2) clayish silt.
Context 2	This context was a gray (Munsell 10YR 5/1) coloured deposit comprising ash and burnt coal (coke) only present in the western end of the trench and c15cm thick. This deposit is clearly a fill and contains discarded metal artefacts and pieces of wood, including a railway sleeper.
Context 3	This context, the base layer extending across the trench, consisted of a very dark grayish brown (Munsell 10YR 3/2) clayish silt. There was a clear and distinct boundary between this context and Context 2 and a marked absence of artefacts. This context represents the remains of the natural soil profile across the site.

Clearly Context 2 is a fill deposited over Context 3, and Context 1 later accumulated over both 2 and 3.

Seven archaeological features were identified in the trench:

Feature	Description
Feature 1	Consisted of two 35mm diameter metal pipes; one having a type of collar on it, bent over. They were in a pit cut into Context 3.

Feature	Description
Feature 2	A 34m diameter pipe bent over; no sign of a foundation trench but the pipe is clearly in Context 3.
Feature 3	A 35m diameter pipe bent over; no sign of a foundation trench but the pipe is clearly in Context 3.
Feature 4	A 35m diameter pipe bent over. The pipe seems to be associated with a concrete deposit consisting of large river pebbles loosely cemented together.
Feature 5	A drain consisting of 21cm terracotta agricultural pipes running across the trench.
Feature 6	A metal pipe, 52mm in diameter, running roughly parallel to the trench, 6m long. The pipe was resting in Context 1 and sealed by Context 2.
Post Hole 1	Was a roughly circular hole 82cm in diameter. The cut was square and 80cm deep and cut into Context 3, and sealed by Context 1. No post was in situ but the cut was backfilled with a dark brown/black silt containing abundant wood fragments.
Post Hole 2	Steep sided, flat bottomed post hole with post in situ. Post hole was 70cm deep and 33cm in diameter, cut into Context 3 and sealed by Context 1. Part of the post was in situ; the timber being a bush timber (i.e. not sawn).

3.4.1 Artefacts

The following artefacts were recovered, partially cleaned and photographed before being reburied when the trench was backfilled. The artefacts were mostly collected from the area of Context 2.

Number	Fabric	Description
14	Iron	Water pipe, 30mm diameter 63cm long.
15	Composite	Iron pipe with a copper pipe inserted; some sort of exhaust and guard for a machine perhaps?
16	Iron	Broken spanner.
17	Iron	Two iron straps.
18	Ceramic	Glazed circular ceramic piece, stamped "Hughes".
19	Iron	Metal object.
20	Iron	Metal link.
21	Ceramic	Fragment of a ceramic insulator.
22	Iron	Metal strap.
23	Aluminium	Fragment of a can – Golden Circle Orange Passion (fruit). Based on dates of cans with similar colour schemes c. early 1990's.

24	Iron	Iron wedge.
25	Ceramic	Two complete and four half bricks. Dry pressed standard dimensions.
26	Iron	Eighty-three miscellaneous and undiagnostic metal objects.
27	Wood	One railway sleeper.

Similar to the artefacts in Trench 1, those in Trench 2 are not unique and reflect the sort of items that would be discarded from railway workshops. The presence of a can from the 1990s suggests that Context 2 might have been deposited as part of the general site clearing, evidenced from the aerial photography as occurring in the mid 1990's.

Overall, Trench Two demonstrated that some archaeological features have survived in this area but there is nothing in the way of evidence that suggests these remains are from the 1930s workshops and the remains and archaeological features would be more easily explained as relating to the buildings shown in the location on the aerial photos from the 1950s to 1994.

3.5 Conclusions

The results of the archaeological work at the South Grafton Bridge construction site are that:

- 1) substantial archaeological remains from the 1930s workshops used to erect the spans for the Clarence River Bridge are unlikely to occur in this area; and
- 2) that archaeological remains from more recent building do exist, and numerous railway related artefacts occur in fill deposits such as Context 2.

Therefore, it is concluded that archaeologically significant remains from the bridge construction workshops are unlikely to be present along the south bank of the Clarence River.

3.6 Reassessment of Archaeological Significance Assessment of the South Grafton Bridge construction site

In the Assessment this area was assessed as having high archaeological potential; that is a high potential to contain archaeological remains. This remains true, despite further research discovering a greater use of the area after the bridge construction and the results of the archaeological test excavation.

However, the archaeological research potential of the South Grafton Bridge construction site has been altered by the results of the excavation. It is now apparent that there was greater use of the site after construction of the bridge was completed than previously thought and the results of the Test Excavation bear this out, with no real evidence of the construction activities being recovered by the archaeological work.

Therefore, the original assessment of archaeological research potential as being “moderate with the construction site having some potential to elaborate on the methods of construction of the Clarence River Bridge at Grafton” (Biosis 2014:44) should be revised to being low as it appears that the sub-surface archaeology of the South Grafton Bridge construction site cannot answer pertinent research questions about the construction and assembly of the Clarence River Bridge.

The overall assessment and management of non-Aboriginal heritage for the additional crossing of the Clarence River should take into account the alteration in assessment and the results of the test excavation.

4 BIBLIOGRAPHY

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5 MAPS, PLANS & IMAGES



Figure 1: General location of the South Grafton Bridge construction site.

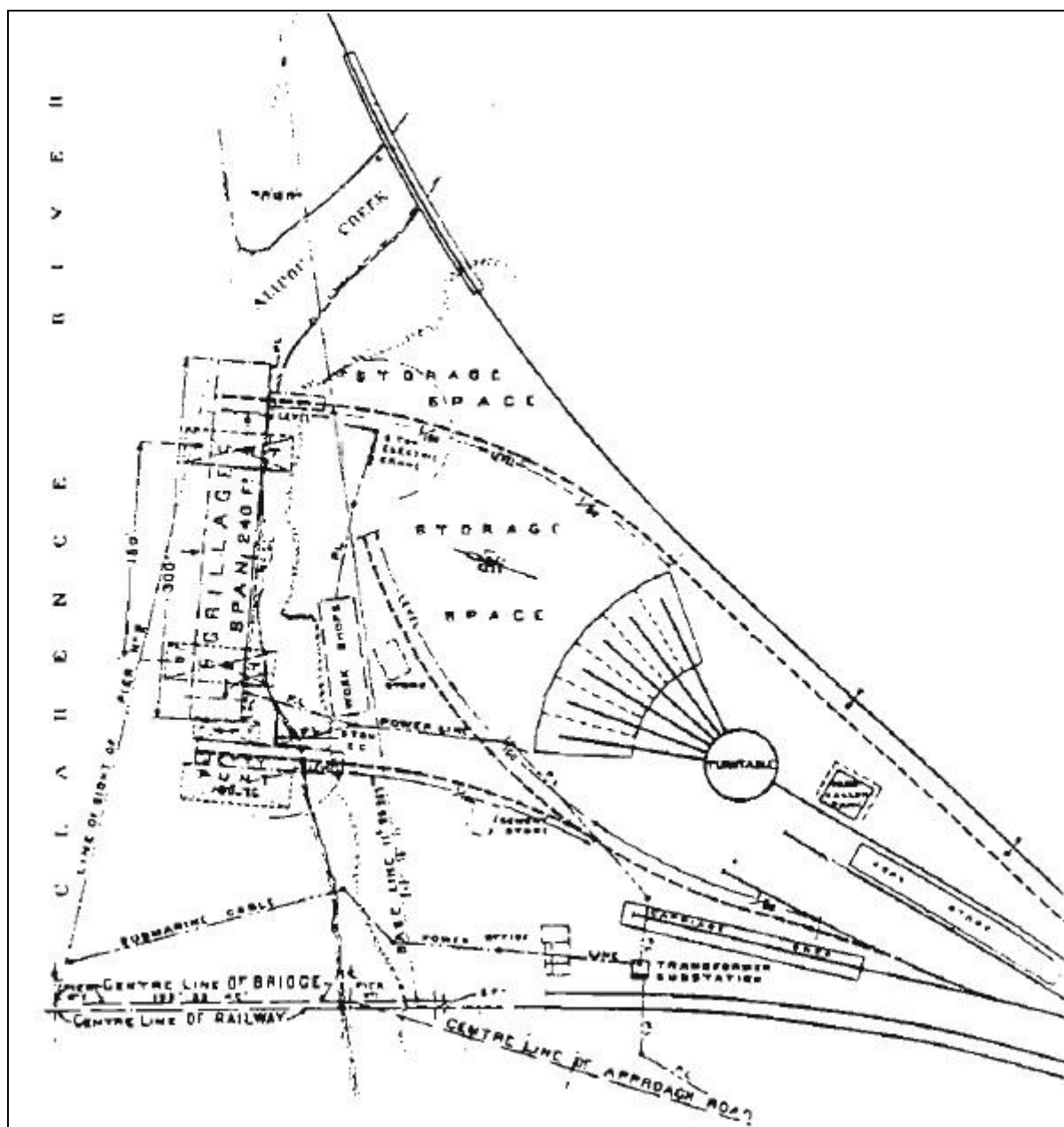


Figure 2: Plan of the construction site for the Clarence River Bridge (source Roberts 1932).

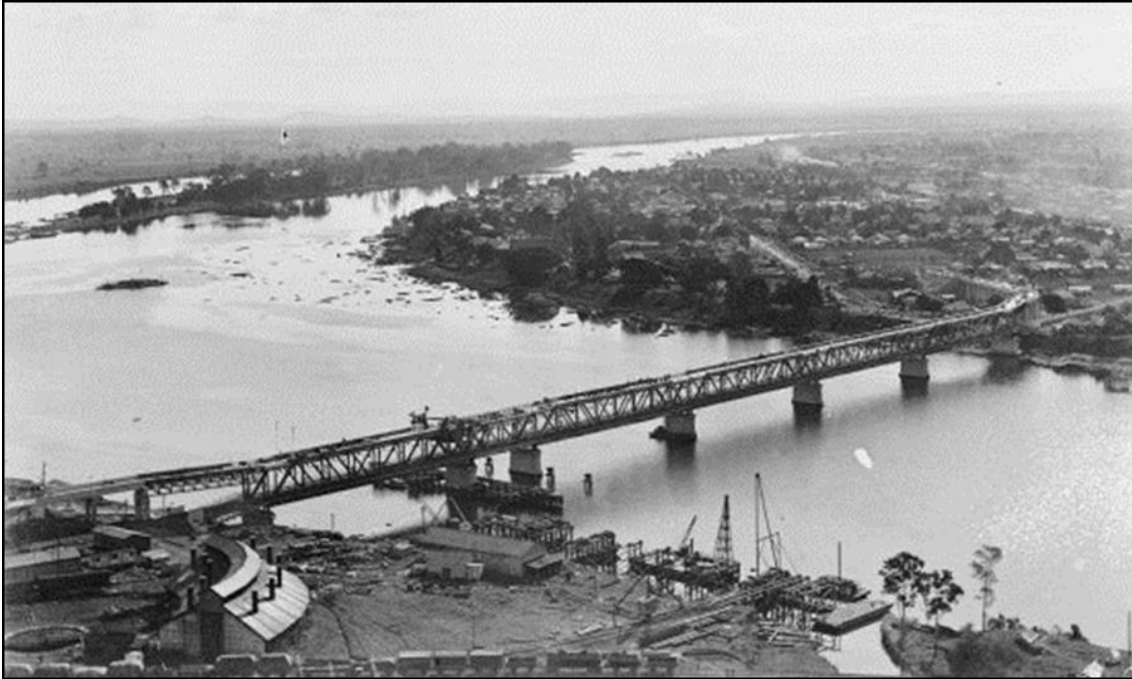


Figure 3: Aerial view of the opening of Grafton Clarence River Bridge, Grafton, NSW, 20 July 1932 (Source: National Library of Australia). This view shows extensive construction facilities on the south bank of the Clarence River and mostly in the project area, the steel siding is visible along with floating pontoons and cranes.



Figure 4: An aerial view of the Clarence River Bridge after construction in the 1930's. Many now-demolished elements of the Railway Terminus area (PB36 and PB37) occupy a large area east of the bridge.

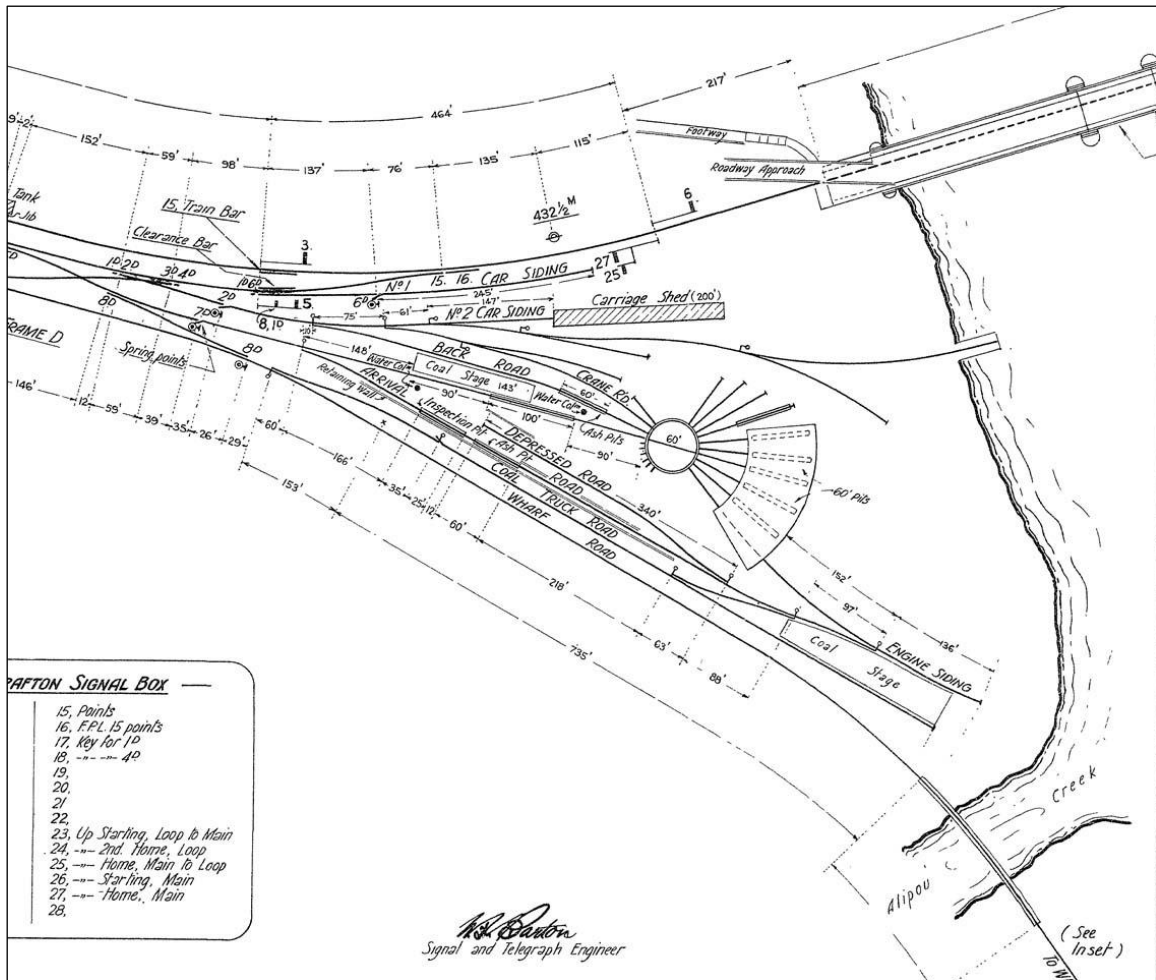


Figure 5: Part of a plan of the South Grafton Railway Station (1945) showing the locomotive depot and the study area.



Figure 6: Aerial Image of the South Grafton Locomotive Depot – note the works depot on the bank of the Clarence River



Figure 7: Locations of the Test Trenches at South Grafton.

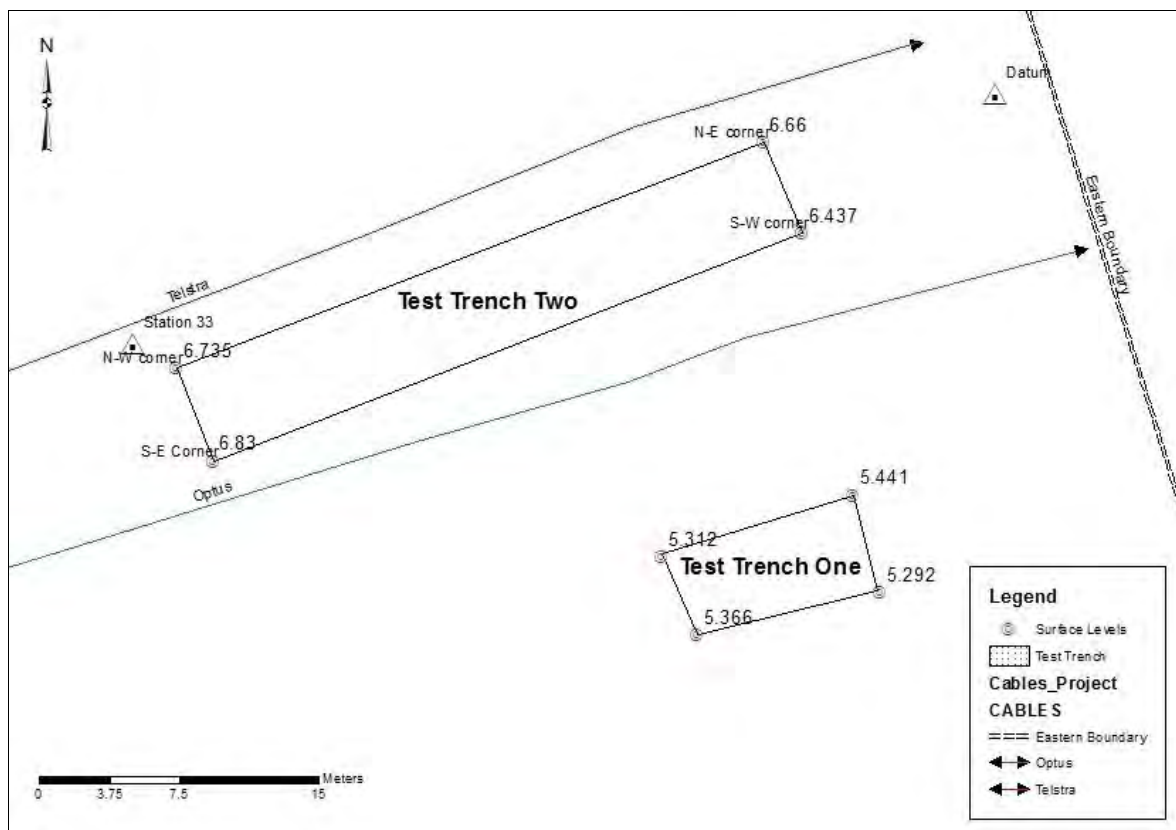


Figure 8: Surface levels of the Test Trenches (AHD).

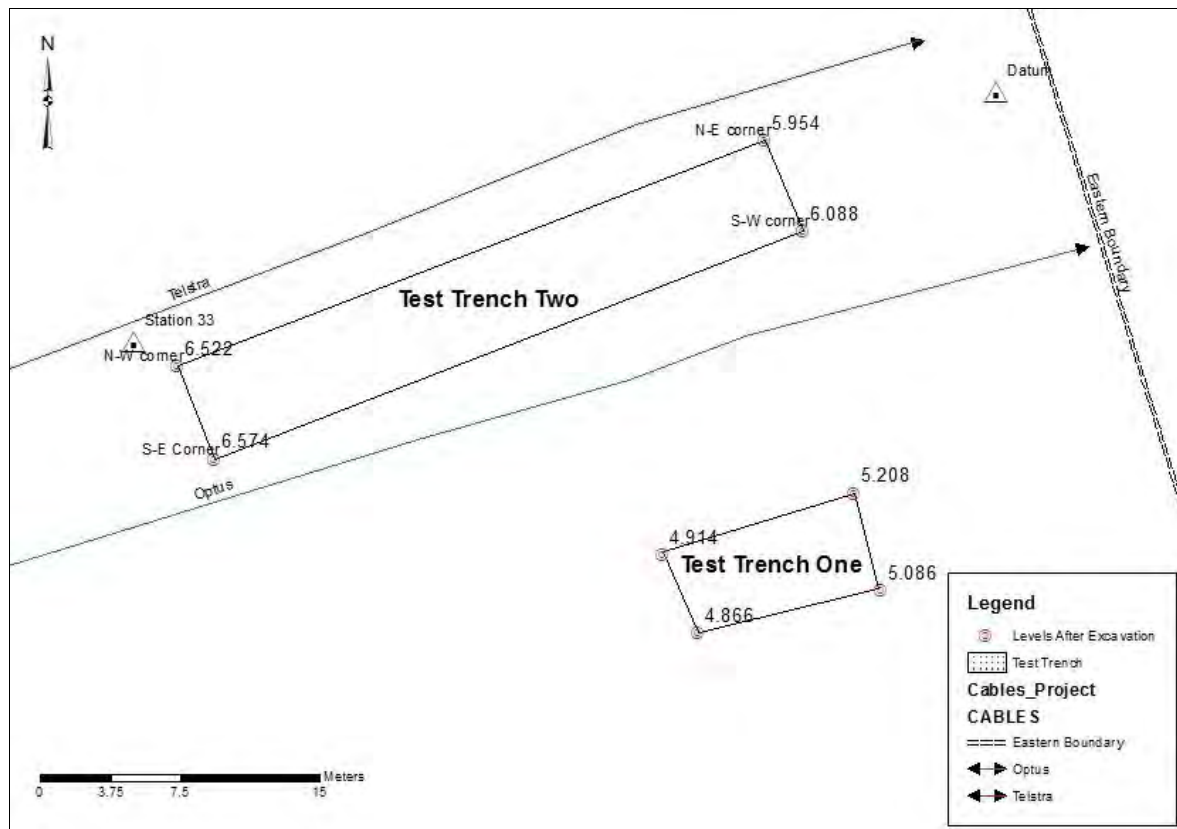


Figure 9: Levels after excavation of the test trenches (AHD).



Figure 10: Test Trench 1 looking west prior to excavation.



Figure 11: Test Trench 1 looking at the south wall after excavation.



Figure 12: Test Trench 1 looking east after excavation.



Figure 13: Artefacts from Test Trench 1.



Figure 14: Test Trench 2 before excavation looking west.



Figure 15: Test Trench 2 after excavation looking east.



Figure 16: Test Trench 2, Feature 1.



Figure 17: Test Trench 2, Feature 2.



Figure 18: Test Trench 2, Feature 3.



Figure 19: Test Trench 2, Feature 4.



Figure 20: Test Trench 2, Feature 5.



Figure 21: Test Trench 2, Feature 6.



Figure 22: Test Trench 2, Post Hole 1 prior to excavation.



Figure 23: Test Trench 2, Post Hole 1 after excavation.



Figure 24: Test Trench 2, Post Hole 2 prior to excavation.



Figure 25: Test Trench 2, Post Hole 2 after excavation.

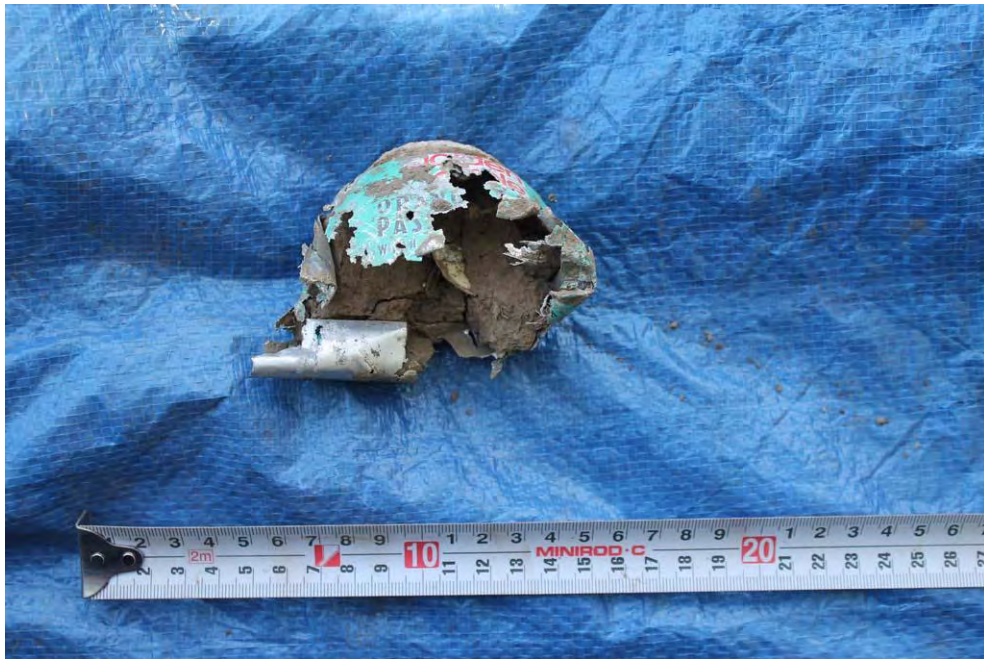


Figure 26: Golden Circle Can — Orange and Passion(fruit).

Appendix B - Comber Associates – Maritime Archaeological Assessment

ARCHAEOLOGY – HERITAGE – MEDIATION – ARBITRATION

CLARENCE RIVER CROSSING DUPLICATION

Underwater Cultural Heritage Assessment

PREPARED BY
REPORT TO

DAVID NUTLEY
BIOSIS PTY LTD ON BEHALF OF NSW ROADS
AND MARITIME SERVICES

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D	06/05/2014	D Nutley	J Comber	J Comber

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EXECUTIVE SUMMARY

Roads and Maritime Services NSW (Roads and Maritime) propose to construct a new bridge over the Clarence River at Grafton parallel to the existing road and rail bridge. Biosis has been commissioned by Arup, on behalf of the Roads and Maritime Northern Regional Office, to undertake non-Aboriginal archaeological heritage impact assessment of preferred crossing.

As the proposed bridge will have an impact on the river bed, Comber Consultants was commissioned by Biosis to assess potential impacts on underwater cultural heritage. Remote sensing surveys were conducted from 17-19 December 2013 and comprised of:

- Single beam Bathymetric recording of the topography of the river bed
- Sub Bottom Profiling of features buried under the riverbed sediment
- Sidescan Sonar survey of exposed features protruding from the riverbed.

Divers then investigated key identified features during the week of 28th January 2014. The only object of submerged cultural heritage of heritage significance found in the study area is the wreck of the protected historic shipwreck ss *Induna*. No other objects of significant heritage value were found.

The *Induna* is sufficiently clear to be of minimal risk of direct impact during bridge construction.

1. There would be no impact on underwater cultural heritage in the path of the bridge duplication.
2. The *Induna* is sufficiently clear of the proposed crossing to be of minimal risk of impact during construction. However, its presence must be considered in the planning and implementation of construction work associated with the bridge duplication as well as the proposed levee upgrade. This includes planning regarding the transport or establishment of any plant or equipment in the vicinity of the shipwreck. This consideration includes movements of water borne or land based plant, vehicles/watercraft. The *Induna* should be fenced on the landward side to protect it from any inadvertent impact during construction work. The exclusion perimeter fence should be placed on the property boundary to the south of the visible port side of the hull at midships and a minimum of 5 metres south of the visible starboard side of the hull at the bow and stern. (This will provide a 5m buffer on the landward side of the hull.) A maritime barrier should be placed 15 metres from the shipwreck to remind workboats to not enter this area. Terrestrial works in the vicinity of the wreck should consider the stability of the wreck and be undertaken in a manner which ensures that heavy machinery does not impact upon the river bank or the wreck.
3. The submerged cultural material adjacent to the southern bank consists of wharf remains and early twentieth century tools and fastenings. These are commonly found in other New South Wales railway and wharf contexts and have very limited potential to yield information of archaeological significance. These items are therefore not relics within the meaning of the NSW Heritage Act 1977.
4. There are no other known submerged cultural heritage impediments to construction of a bridge to the east of the existing bridge over the Clarence River at Grafton.
5. If any previously undetected relics are uncovered during the construction of the bridge, work must cease in the vicinity of that item and further advice sought from the Heritage Division, Office of Environment & Heritage.
6. For any previously undetected relics are uncovered during the construction of the bridge, the Roads and Maritime Services management requirements are detailed in the *Standard Management Procedure: Unexpected Heritage Items*, October 2013. (Figure 1 page 9 and Table 1 page 10 of those procedures).



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1.0 INTRODUCTION

BACKGROUND

LOCATION

DEVELOPMENT PROPOSAL

ARCHAEOLOGICAL ASSESSMENT OBJECTIVES



1.0 INTRODUCTION

1.1 Background

Roads and Maritime Services (Roads and Maritime) is seeking approval for an additional crossing of the Clarence River at Grafton to address short-term and long-term transport needs. Arup (on behalf of Roads and Maritime) has engaged Biosis Pty Ltd to undertake a non-Aboriginal heritage assessment. The non-Aboriginal heritage assessment will form part of an Environmental Impact Assessment (EIA) which is being prepared as part of a State Significant Infrastructure project (SSI) (Application No: SSI 13_6103).

In April 2013, the Minister for Roads and Ports announced the preferred option for an additional crossing of the Clarence River at Grafton. The preferred option consists of a new road link between the Pacific Highway, South Grafton, and Pound Street, Grafton, with a new road bridge constructed across the Clarence River downstream of the existing combined road and rail bridge. Detailed designs for the project are yet to be finalised.

Key components of the project include:

- Construction of a new bridge over the Clarence River about 70 metres downstream (east) of the existing road and rail bridge, comprising two traffic lanes
- Upgrading parts of the road network in Grafton and South Grafton to connect the new bridge to the existing road network.
- Flood mitigation works, which include raising the height of sections of the existing levee upstream from the new bridge in Grafton and South Grafton
- Ancillary facilities required for the construction of the project, including some or all of the following: site compounds, concrete batching plant, pre-cast facilities, and stockpile areas for materials and temporary storage of spoil and mulch.

As the installation of the foundations of the proposed bridge will have an impact on the river bed, Comber Consultants was commissioned by Biosis to assess potential impacts on underwater cultural heritage in the study area. This report documents background research undertaken to determine the areas of underwater and historic shipwreck archaeological potential with the project area. It includes the results of remote sensing surveys and diver based surveys that were conducted to identify any potential features in the river and a riverbank survey of the exposed remains of the historic rail ferry vessel *Induna*. In addition, the report provides an assessment of the archaeological and research potential of those areas, assesses the level of significance and provides recommendations to mitigate potential impacts to the archaeological resource present.

The remote sensing surveys were conducted from 17-19 December 2013. The survey enclosed an area of about 22ha of river spanning the existing Clarence River crossing between North and South Grafton. The remote sensing survey covered around 500 metres either side of the bridge and all but the sub-2 metre depth range along the northern shoreline. The remote sensing surveys comprised of:

- Single beam Bathymetric recording of the topography of the river bed
- High Resolution Sub Bottom Profiling of features buried under the riverbed sediment
- Sidescan Sonar survey investigations of exposed features protruding from the riverbed.

The diver based surveys were conducted in the week of 28th January 2014 and investigated selected anomalies identified from an analysis of the remote sensing survey results.

1.2 Location

Grafton is located 35km inland from the NSW coast. It is approximately 65km upstream of the mouth of the Clarence River at Iluka/Yamba and approximately 75km, by road, north of Coffs Harbour. It is around 212km south of the Queensland border at Tweed Heads (Figure 1).

The study area straddles the Clarence River Bridge at Grafton in the Local Government Area of Clarence Valley, County of Clarence, Parish of Great Marlow (Figure 3). It spans both sides of the present bridge and the proposed route for the bridge duplication (Figure 2) (Biosis 2010:16).

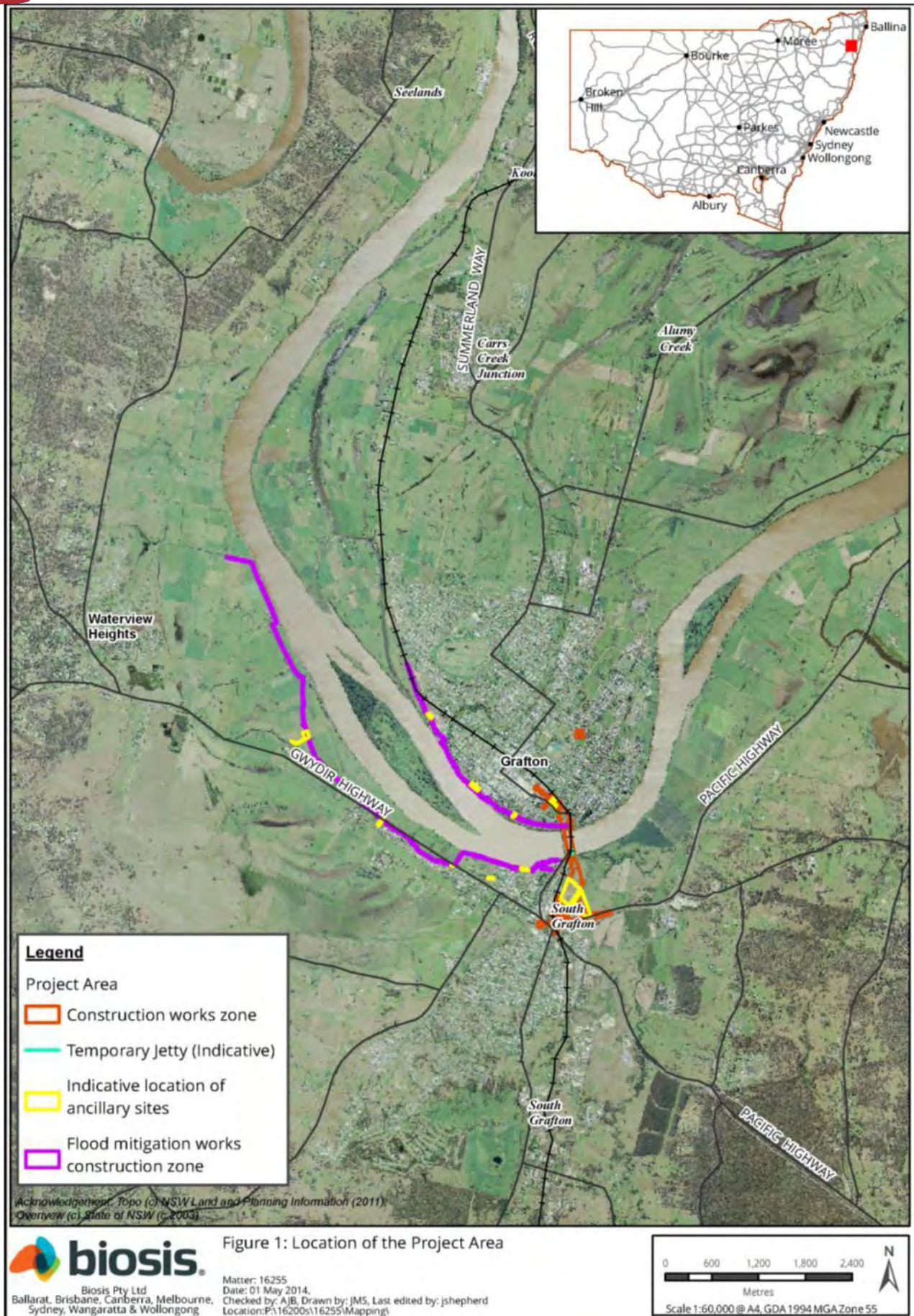


Figure 1: Project area at Grafton (Source – Six Maps)

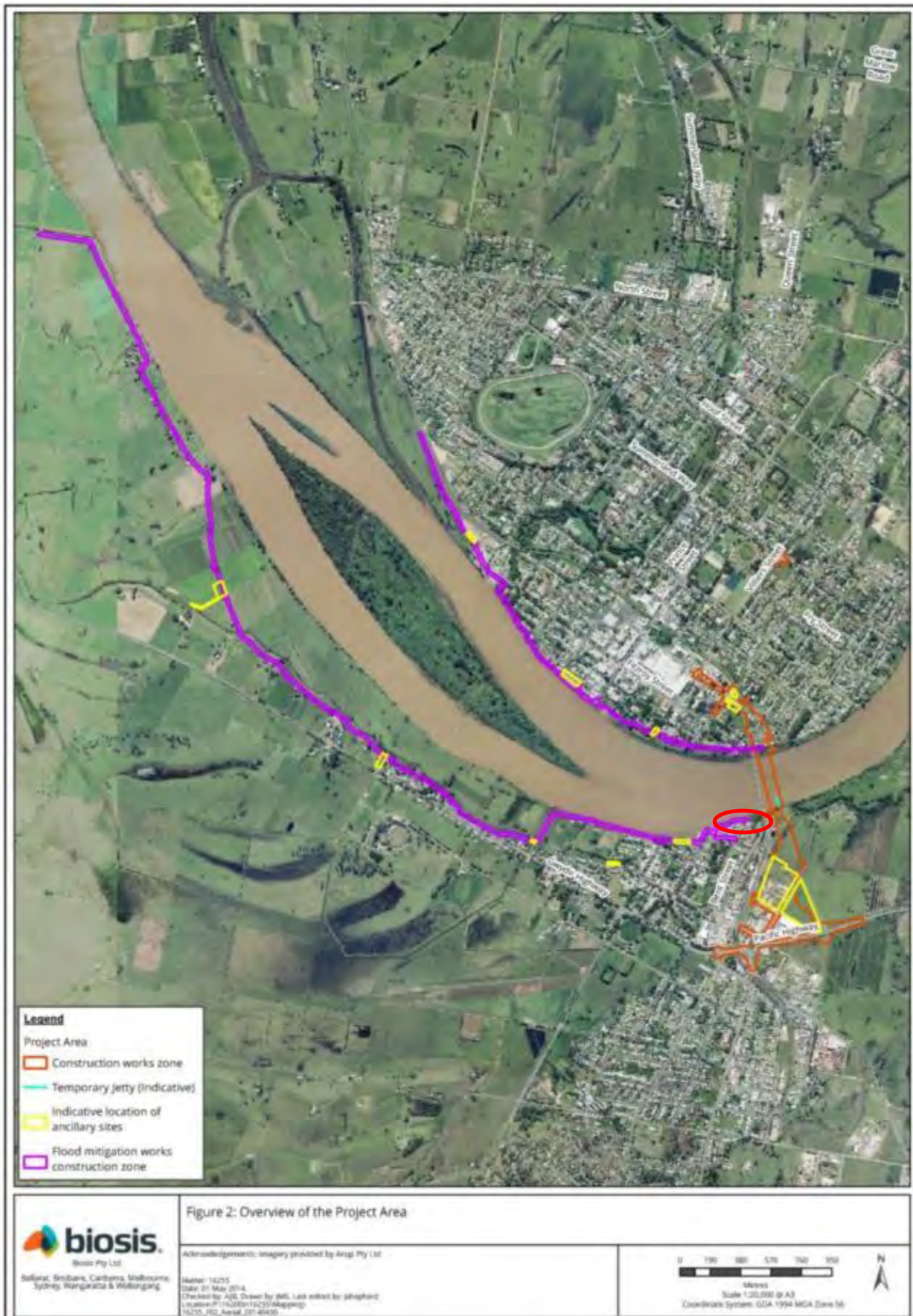


Figure 2: Overview of study area with flood mitigation works outlined in purple. Induna site circled in red (Biosis)



Figure 3: The survey area at Grafton, New South Wales, outlined in red (source – SixMaps). Location of the ss *Induna* is circled in yellow.

1.3 Underwater cultural heritage objectives and methodology

Objectives

The objective of the maritime archaeological survey was to

- Identify any items of cultural heritage that may be in the river bed and which may be impacted upon during the construction of the new bridge;
- Investigate any anomalies identified during the remote sensing stage as being of potential heritage significance using divers to confirm their identity and condition;
- Assess the significance of those items in accordance with the NSW Heritage Council's standard assessment criteria; and
- Make recommendations to mitigate impacts on any items of heritage significance will then be prepared.

Methodology

The survey and assessment of potential targets was informed by historical research prepared by Biosis Research (Biosis (2010:27-32) and through additional inspection of the State Heritage Inventory and Historic Shipwreck Database of the Heritage Division of the Office of Environment and Heritage.

Site visits

Remote sensing survey

The remote sensing surveys were conducted from 17-19 December 2013 under the supervision of Comber Consultants' archaeologist, David Nutley. The hydrographic and marine geophysical surveys were conducted by Mapping & Hydrographic Surveys from aboard its 4.9 metre survey vessel *Delta Tauri* (Photograph 1). An area of approximately 22ha of the Clarence River between North and South Grafton was defined in which to identify any potential features. The survey area extended 100m upstream (west) of the historic shipwreck ss *Induna*. To the east, the survey area extended about 375-400 metres downstream of Alipou Creek. (See details of methodology in attached Hydrographic and Marine Geophysical report – Appendix 1).



Photograph 1: Mapping & Hydrographic Surveys from aboard its 4.9 metre survey vessel *Delta Tauri*

Shore based ss Induna survey

The shore-based survey of the *Induna* was conducted by David Nutley and consisted of measured sketch plans and high resolution 35mm digital photographic records.

Dive operations

The diver based investigation of key anomalies identified during the remote sensing survey was conducted on 29th January 2014 under the direction of David Nutley. The survey was conducted using Gilbert Diving's five metre barge 'Junior' (Photograph 2) as a dive platform with dive logistics supplied by Colin Browne of Taylored Offshore Pty Ltd. All dive operations were conducted in accordance with Australian Standard 2299 using Surface supplied Breathing Apparatus (SSBA). The four person dive team included 4 divers with two of those also being boat handlers. All dives were conducted with a dive tender and standby diver and with one of two boat handlers always topside to undertake vessel management as required.

Low visibility precluded video or photographic coverage or site sketches. All diver observations were therefore transmitted orally from the diver to the surface. The notes taken at the surface were then cross checked with the diver upon his return to the boat.



Photograph 2: Colin Browne on board the dive platform

2.0 LEGISLATION

NSW HERITAGE ACT 1977

COMMONWEALTH HISTORIC SHIPWRECKS ACT 1976

ENVIRONMENTAL PLANNING AND ASSESSMENTS ACT 1979



2.0 LEGISLATION

2.1 NSW Heritage Act 1977

Historic Shipwrecks in State waters (out to the 3 nautical mile limit) are protected under the provisions of Part 3C of the NSW *Heritage Act* (the Act). Section 47 (1a) of the Act defines an historic shipwreck as the remains of any ship, and any articles associated with the ship, that has been 'situated in State waters, or otherwise within the limits of the State, for 75 years or more'. The shipwreck is then included in the State's section 49 Register of Shipwrecks. The Act does not specify that the ship has had to have been wrecked or abandoned for that period of time. The ss *Induna* has been in NSW State waters for more than 75 years (since at least 1925 and an abandoned shipwreck since 1935) and is therefore a protected historic shipwreck. Under section 51(a) of the Act 'A person must not move, damage or destroy any historic shipwreck otherwise than in accordance with a historic shipwrecks permit' (ie, a permit referred to in section 139 of the Act).

Other archaeological relics are protected under section 139 of the Act if they are deposits, artefacts, objects or material evidence that:

- (a) relate to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and
- (b) is of State or local heritage significance.

The ss *Induna*, including its associated relics in the debris field on the southern bank of the Clarence River and the bow section in the memorial on Riverside Drive have been assessed as being of State significance (see Section 6 of this report) and therefore protected under s139 of the *Heritage Act 1977*.

None of the other anomalies identified through the remote sensing survey and subsequent physical inspection have been assessed as being of local or State significance (see section 6 of this report) and are therefore not protected under the Act.

2.2 Commonwealth Historic Shipwrecks Act 1976

The ss *Induna* is not protected under the provisions of the Commonwealth *Historic Shipwrecks Act*. The jurisdiction of the Commonwealth Act extends seaward of the Australian Territorial baselines. The ss *Induna* is in the Clarence River and therefore landward of the territorial baseline.

2.3 Clarence Valley Local Environmental Plan 2011 (LEP)

The ss *Induna* and Bow Memorial are listed as item I133 in Schedule 5 of the LEP. (The Bow Memorial is located in a small grassed area on Riverside Drive in front of the retirement village.)

Part 5, *Environmental Planning and Assessment Act 1979*, would allow the project to proceed under the State Environmental Planning Policy (Infrastructure) 2007 (ISEPP). Management of items listed on the heritage schedule of the existing LEP would be assessed with appropriate mitigation approved by the Roads and Maritime rather than Council. Clarence Valley Council would be notified by the RTA and given the opportunity to respond (see section 6.4 below) (Biosis.2010:64)

6.4 Environmental Planning and Assessment Act 1979

This project will be assessed under Part 5.1 of the *Environmental Planning and Assessment Act 1979*. Therefore, approval from the Minister for Planning and Infrastructure is required for the project. The non-Aboriginal assessment, including this underwater component, will form part of an Environmental Impact Statement (EIS) report which is being prepared as part of a State Significant Infrastructure project (SSI) (Application No: SSI 13_6103).

As detailed in section 6.3 above approval from the Clarence Valley Council will not be required, although Roads and Maritime will liaise with Council.

Archaeological sites, including historic shipwrecks, require approval under s140 or endorsement under s139 of the *Heritage Act 1977* when being assessed under the ISEPP (Biosis 2010:64).

3.0 HERITAGE LISTINGS

NSW STATE HERITAGE INVENTORY

NSW HISTORIC SHIPWRECKS REGISTER

NORTH COAST REGIONAL ENVIRONMENTAL PLAN

CLARENCE VALLEY DRAFT LOCAL ENVIRONMENTAL PLAN 2011



3.0 HERITAGE LISTINGS

3.1 NSW Historic Shipwrecks Register

The *ss Induna* is an historic shipwreck on the NSW Register of Shipwrecks as required under the provisions of section 49 of the *NSW Heritage Act 1977* (see section 7.1 of this report).

3.2 North Coast Regional Environmental Plan

The hull of *ss Induna* and the Bow Memorial are listed on the REP as a single listing. The hull is located on the bank of Clarence River, 200 m west of Grafton Road and Rail Bridge (part of the bank of Clarence River below MHW, R56146 from Sale or Lease Generally). The Bow Memorial is near the southern approaches to Grafton Bridge within the grounds of the retirement village on Riverside Drive, South Grafton

3.3 Clarence Valley Local Environmental Plan 2011

The hull of *ss Induna*, located on the Clarence River, south side of bridge, is listed on the LEP as Item Number I133 of local significance.

4.0 SS INDUNA

HISTORY

4.0 SS INDUNA HISTORY

After a remarkable career, the iron steamer *Induna* was dismantled and abandoned at a wharf on the south bank of the Clarence River, just west of the bridge at Grafton in 1932 (Shipwreck Atlas of New South Wales,pB8). The vessel's final working years had been to serve as a train ferry across the river providing an important link in the transport of goods and services along the east coast of Australia (Photographs 4 and 5).

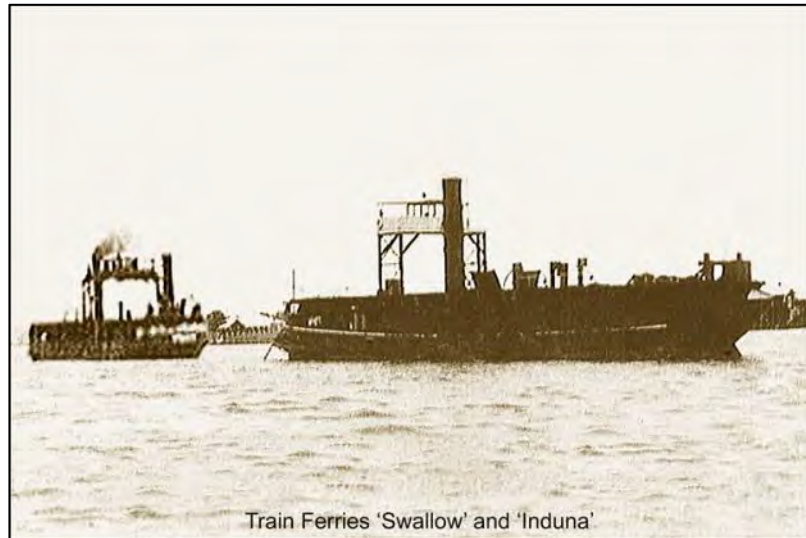
However, the *Induna* had travelled far to arrive at Grafton and, in the process, played an important part in the history of Britain and the conduct of World War Two. The *Induna* was a 703 ton (gross) screw steamer built by Hall and Russell of Aberdeen in the United Kingdom in 1891 (NSW Historic Shipwreck Database). Eight years later it aided in the rescue of a 25 year old escapee from the Boer War in Pretoria, South Africa (Photograph 3). That escapee went on to be Britain's First Lord of the Admiralty in World War One and World War Two, (arguably one of the greatest war time leaders of the 20th century) and one of the most famous British Prime Ministers of all time. The escapee, Winston Churchill, (an ex-British Army officer serving as a war correspondent for the London Morning Post), boarded the weekly mail boat at Lourenco Marques (now Maputo), Mozambique for the last leg of his escape to Durban. The mail boat was the ss *Induna*. (Graham 1965:13)



Photograph 3: (Winston Churchill (right) shortly after being captured (UK Government Archives)

At the time of Churchill's escape, the *Induna* was operated by Rennie and Sons in South Africa. In 1904 Burns Philp bought the *Induna* for trading in the Pacific, primarily in the Gilbert and Ellice Islands. The Patrick Steam ship Company of Sydney bought the *Induna* in 1920 for the Tasmanian and Australian East Coast trade. It was in 1925 that the *Induna* was refitted as a train ferry after being sold to the NSW Department of Railways (Photographs 4-8). The refit involved substantial changes to the superstructure and the introduction of heavy concrete and iron rail ballast.

The opening of the railway bridge over the Clarence in 1932 ended the need for rail ferries and it was abandoned west of the bridge at Grafton. The superstructure and a section of the bow were removed from the *Induna* in 1972. In 1975 the Council of the City of Grafton erected the section of the bow as a monument on a grassed area beside Riverside Drive in front of the retirement village in 1975 (Photographs 8 and 9).



Train Ferries 'Swallow' and 'Induna'

Photograph 4: Rail Ferries *Swallow* (left) and *Induna* (courtesy of Frozen in Time Gallery, www.frozentime.com.au)



Photograph 5: Rail Ferries wharves for *Induna* and *Swallow* (courtesy of Frozen in Time Gallery, www.frozentime.com.au)



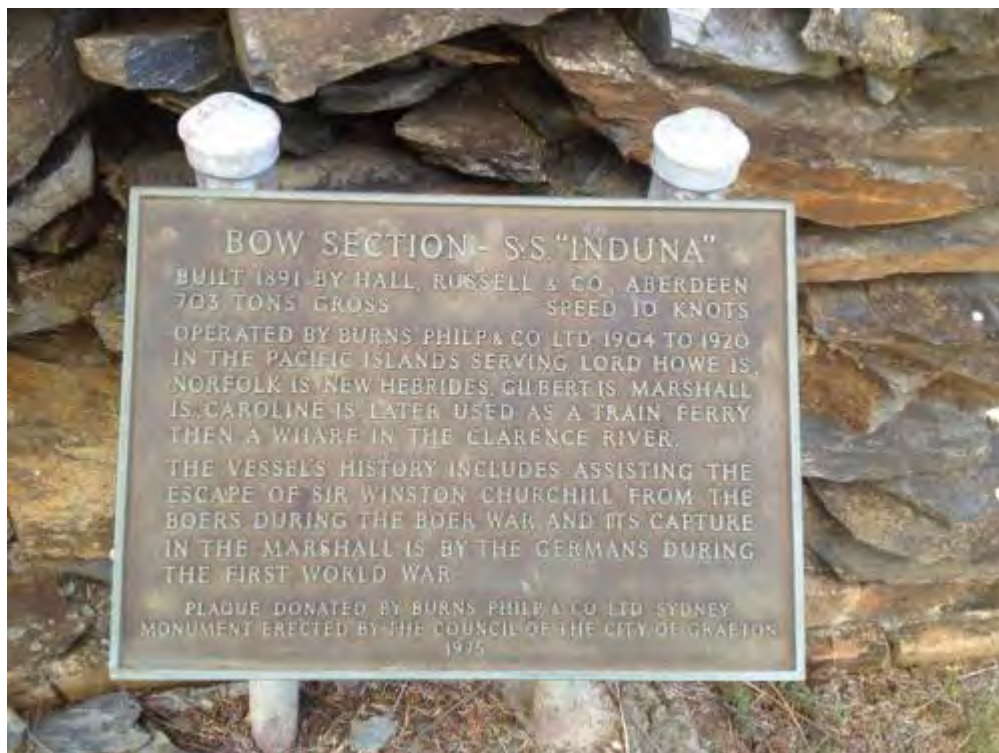
Photograph 6: Rail carriages on board *Swallow* (courtesy of Frozen in Time Gallery, www.frozentime.com.au)



Photograph 7: Train leaving *Swallow* after crossing the Clarence River at Grafton
(courtesy of Frozen in Time Gallery, www.frozentime.com.au)



Photograph 8: Section of ss *Induna* bow erected as a monument in front of the nearby retirement village



Photograph 9: Bow Memorial to ss *Induna*

5.0 HYDROGRAPHIC AND MARINE GEOPHYSICAL SURVEYS



5.0 HYDROGRAPHIC AND MARINE GEOPHYSICAL SURVEYS

5.1 Bathymetry

Bathymetry was surveyed along predefined lines at 5 metre spacing over the specified survey area with DELTA TAURI's centrally mounted through hull Single Beam Echosounder Transducer.

5.2 Sub-bottom profiling

High Resolution Sub Bottom Profiler data was surveyed concurrently with the Bathymetric Survey at 5 metre line spacing. The higher operating frequency of 10kHz was used for maximum resolution of the subsurface.

5.3 Side scan sonar

Sidescan Sonar data was acquired along predefined lines at 25 metre spacing over the specified survey area with a CMAX CM2 Digital Sidescan Sonar Towfish operating at a range of 50 meters and 325KHz frequency. This provided adequate overlap of data for quality control and ensured 100-300% insonification across the site.

5.4 Features of Interest

Several features of potential underwater cultural heritage interest were identified as detailed below. The positions of these features are also included in green on the plan in Figure 17.

5.4.1 Feature 1 - E: 494401 N: 6714690

Feature 1 appears as a bathymetric 1-2m length 0.8m high anomaly (Figure 4) and also as a feature in the side scan sonar data (Figure 5). Its absence from the pinger survey (sub-bottom profile – Figure 6) suggested that it did not have any substantial presence below the seabed.

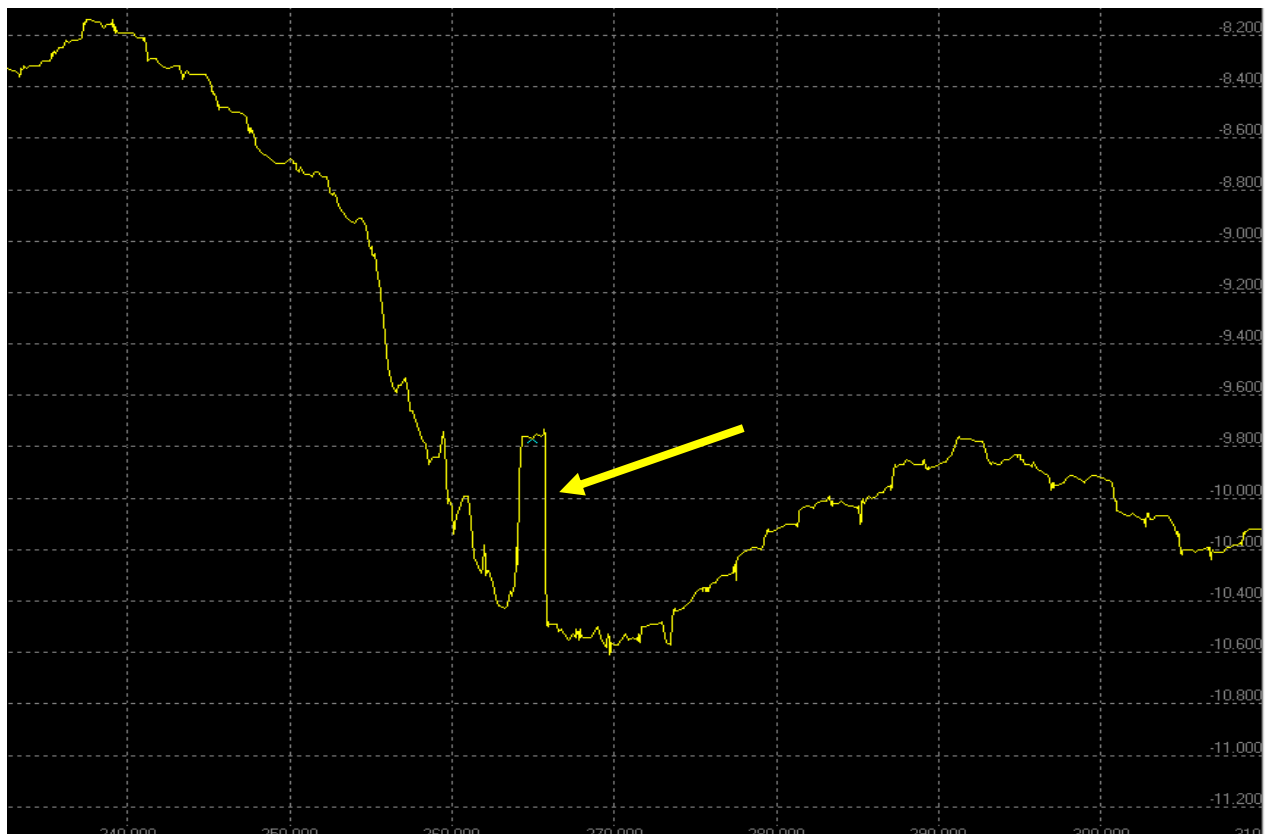


Figure 4:— Feature 1 -Clear bathymetric anomaly in the SBES data (yellow arrow), 1-2m length 0.8m height above the riverbed.

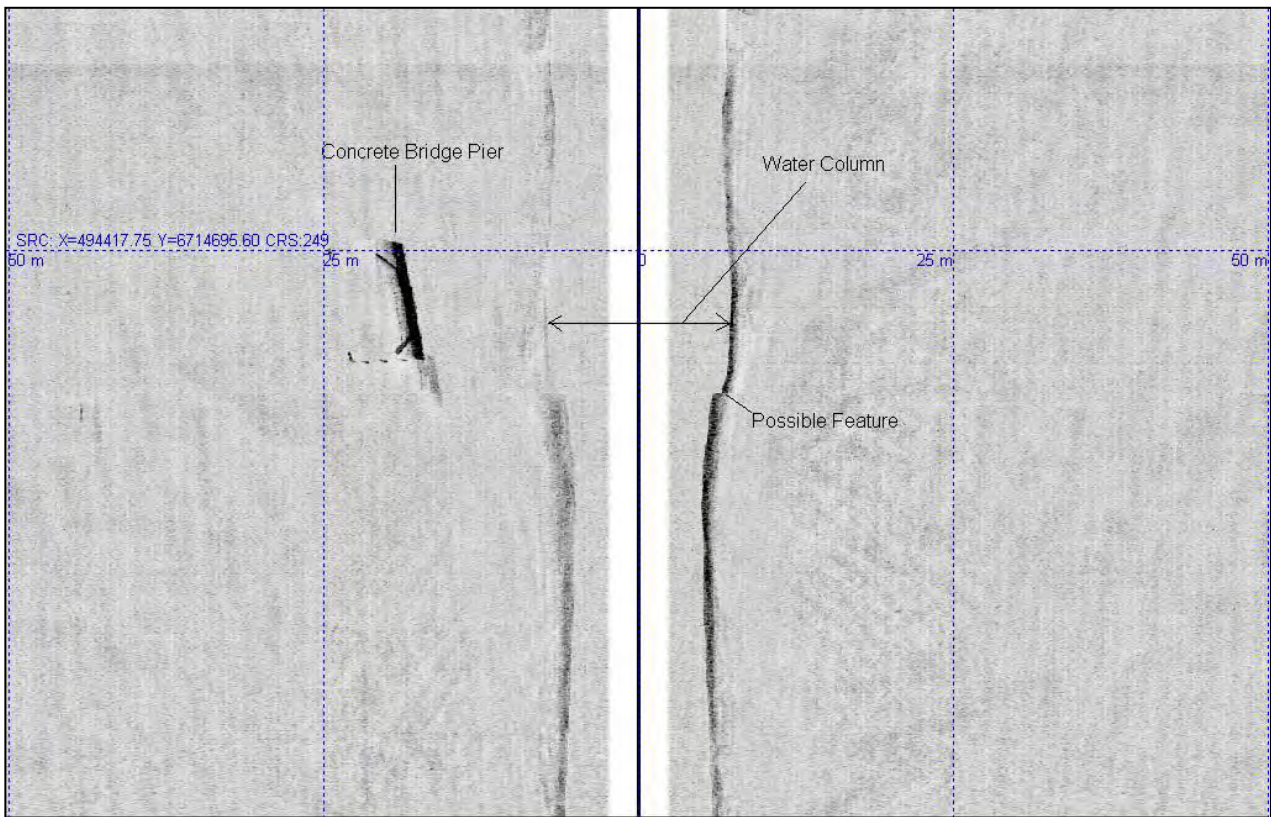


Figure 5: Feature 1 - possibly obtruding into water column in Sidescan Sonar data at same location as Figure 3.

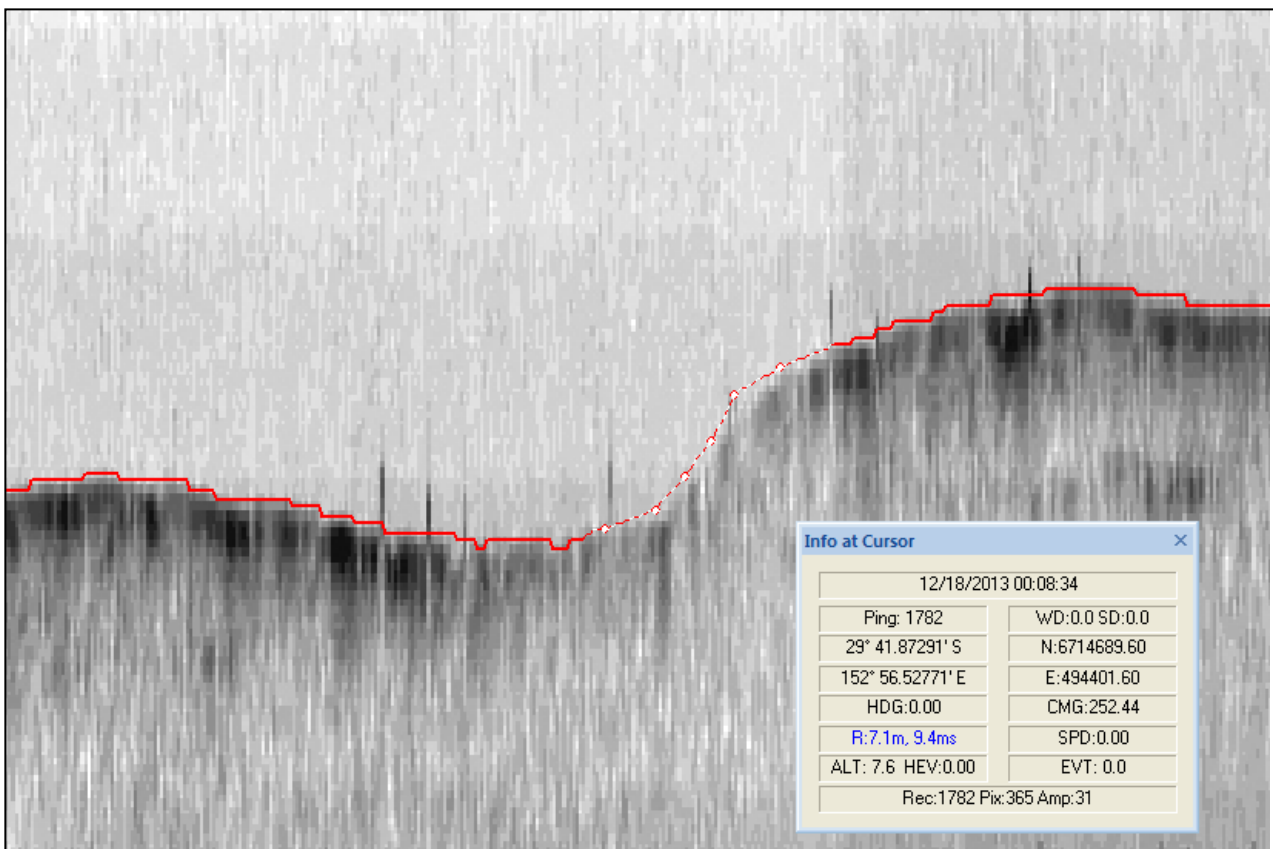


Figure 6: Feature 1 does not appear to be visible in SBP Pinger data at the same location.



5.4.2 Feature 2 - 2.0 E: 494515 N: 6714561

Feature 2 (Figure 7) appears in a rocky section of the southern bank in the vicinity of the derelict wharf (adjacent to AS01 Figure 21) (Figure 8 and Photograph 10). There is a high concentration of debris.

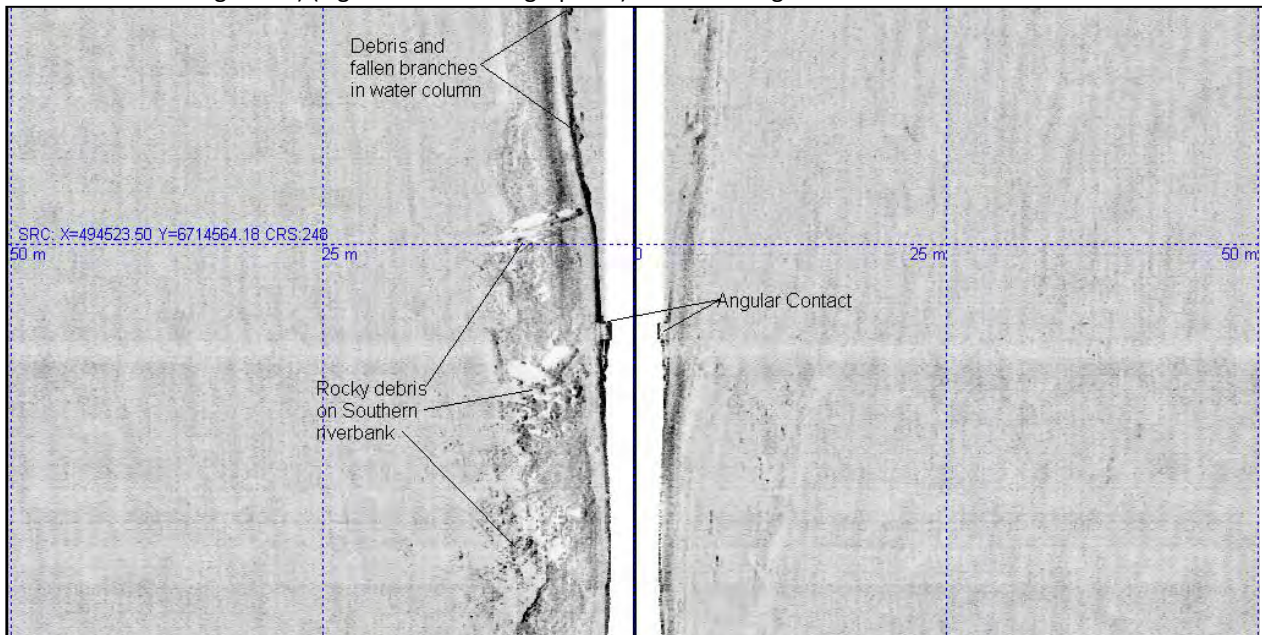


Figure 7: Angular contact 1.5m height 2m length consistent with a concrete block or similar.

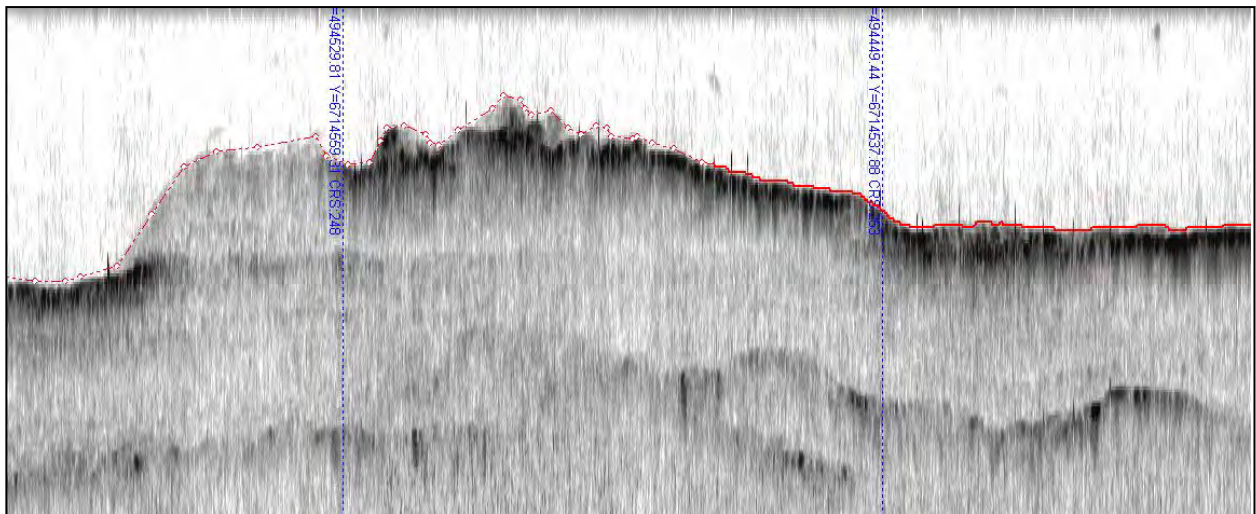


Figure 8: Pinger data showing rocky outcrop around derelict wharf on eastern side of bridge.



Photograph 10: Derelict wharf from aboard *Delta Tauril*. (Photo: Mapping & Hydrographic Surveys)



5.4.3 Feature 3 - E: 494679 N: 6714612

Feature 3 (adjacent to AS02 Figure 21) is an angular contact 1m in height 1m in length and is consistent with a concrete block or similar amongst rocky area of South bank (Figure 9).

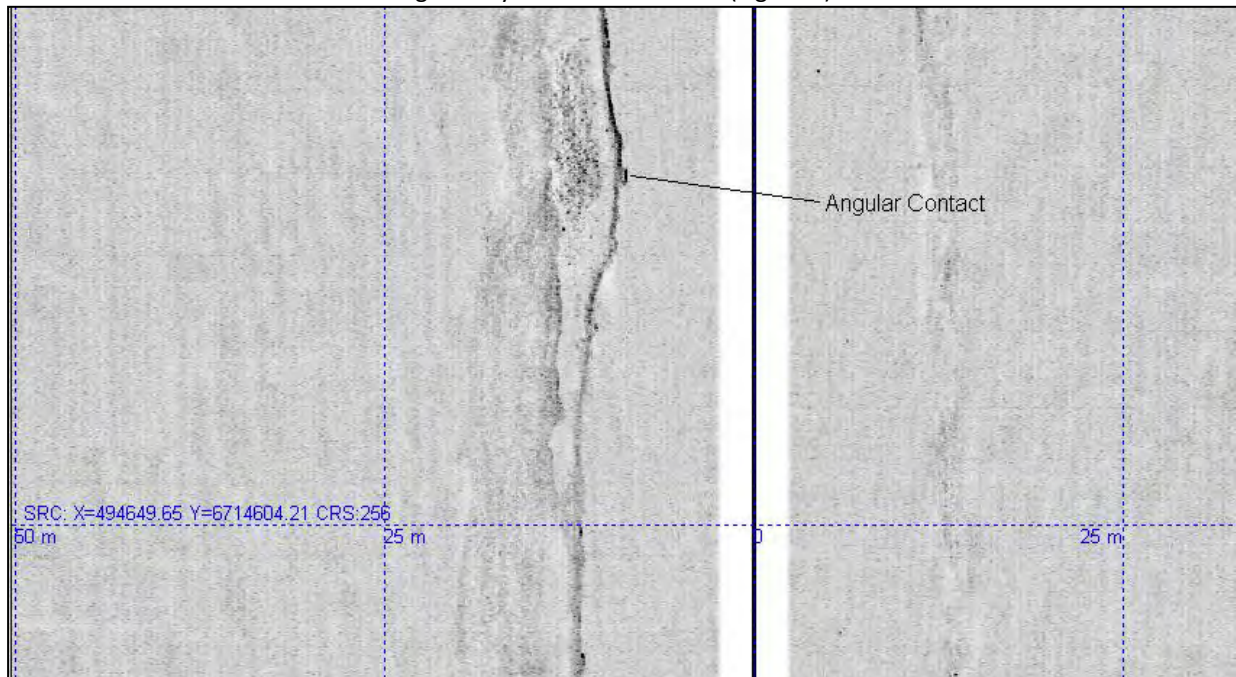


Figure 9: Feature 3 - Angular contact 1m height 1m length

5.4.4 Feature 4 - E: 494267 N: 6714470

Feature 4 (Figures 10, 11, and Photograph 11) is adjacent to the site of the historic shipwreck ss *Induna* on the south bank, west of the present bridge. An adjacent debris field may contain debris from the shipwreck or associated wharf.

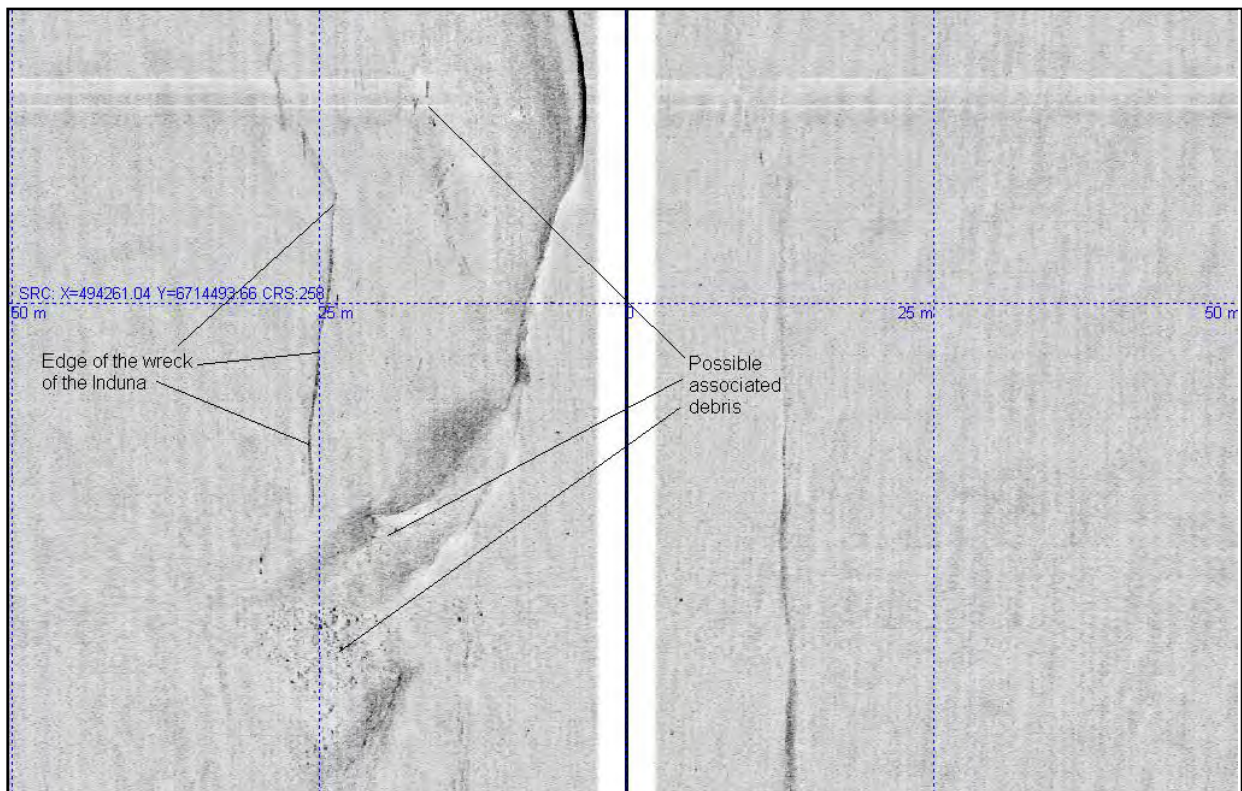


Figure 10: Angular edge of the wreck of the *Induna* and possible associated debris.

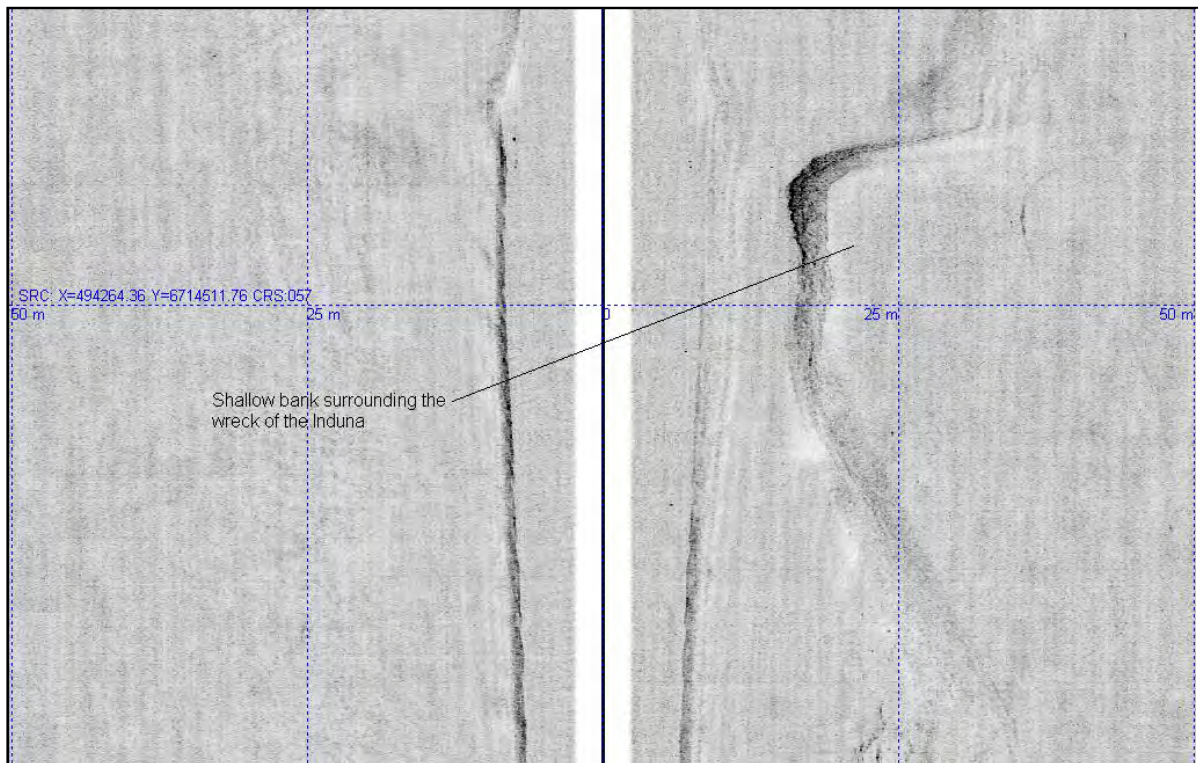


Figure 11: Shallow bank surrounding the wreck of the *Induna*.



Photograph 11: Wreck of the *Induna* between yellow arrows.

5.4.5 Feature 5 - E: 494582 N: 6714575



Feature 5 (at the entrance to Alipou Creek) is a linear object, 1 metre in length and likely to be a metal rod or similar (Figure 12).

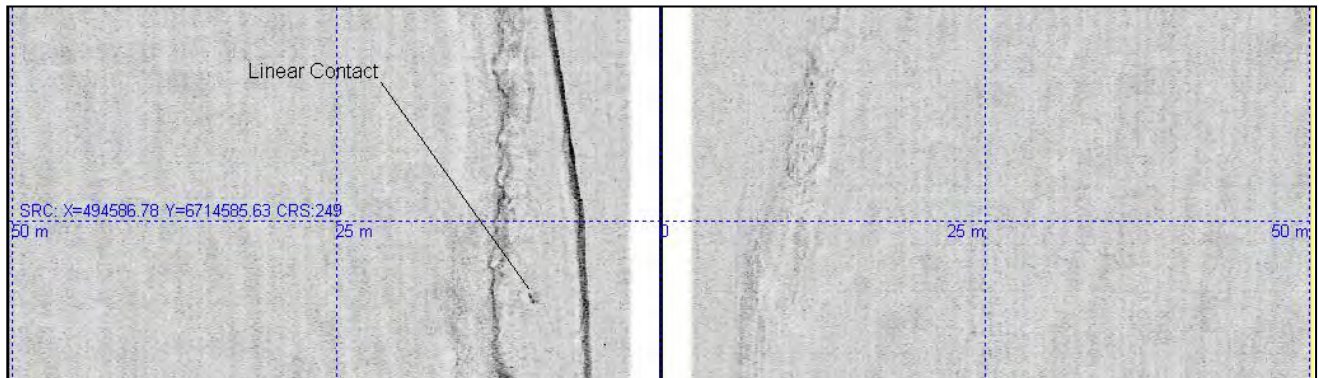


Figure 12: Linear contact 1m length consistent with metal rod or similar.

5.4.6 Feature 6 - E: 494582 N: 6714575

Feature 6 (Figure 13) is a 30 metre long contact near the centre of the existing bridge and is consistent with cable, chain, rope or similar

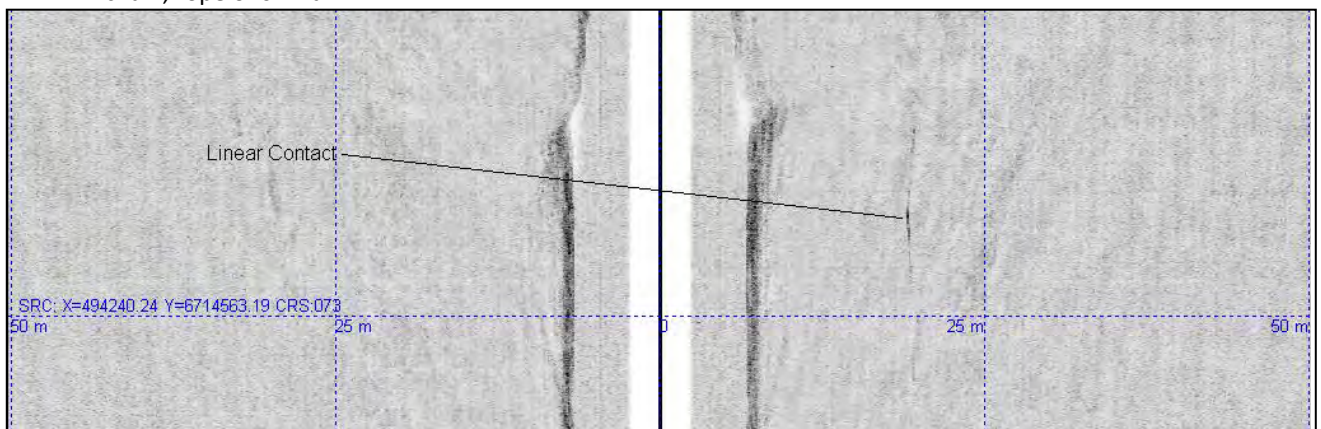


Figure 13: Linear contact 30m length

5.4.7 Feature 7 - E: 494623 N: 6714868

Feature 7, near the north shore and on the eastern side of the existing bridge is a 9 metre object consistent with rope and likely discarded anchor or mooring line from recreational boats in the area (Figure 14).

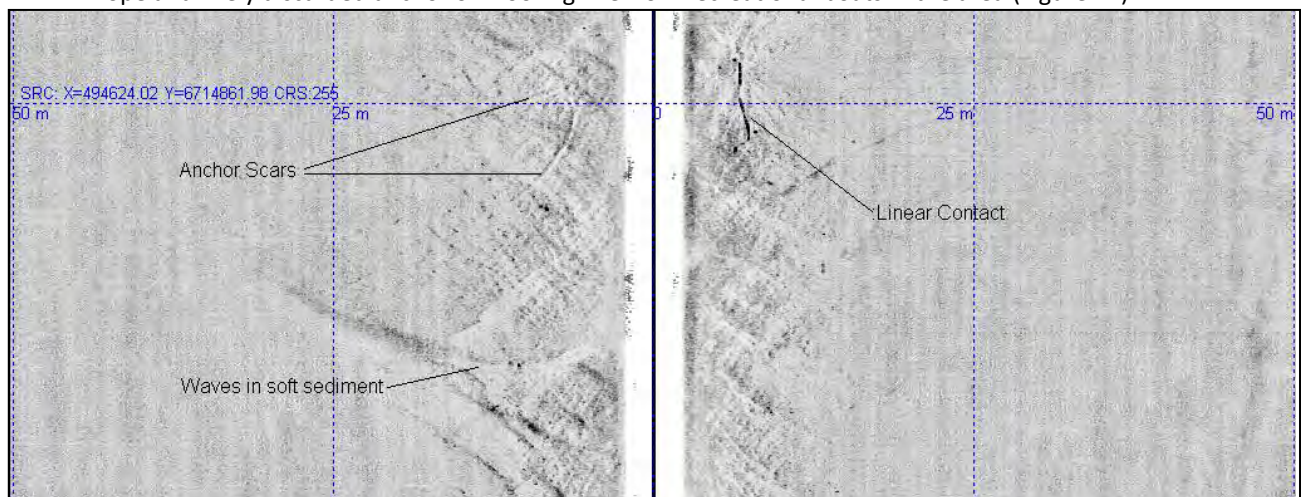


Figure 14: Linear contact 9m length



5.5 Point contacts

Throughout the survey area small point contacts were identified such as stones on the riverbed (Figure 15 and 16). The following is a list of locations and approximate dimensions of several larger observed point contacts which are consistent with single hard objects or clusters of hard objects such as small boulders or pieces of rubble.

E: 494399 N: 6714768 PC1 0.9m x 0.9m x 0.9m
E: 494389 N: 6714786 PC2 0.8m x 0.8m x 0.8m
E: 494386 N: 6714807 PC3 0.9m x 0.9m x 0.9m
E: 494399 N: 6714777 PC4 0.5m x 0.5m x 0.5m
E: 494381 N: 6714786 PC5 0.7m x 0.7m x 0.7m
E: 494392 N: 6714815 PC6 0.8m x 0.8m x 0.8m

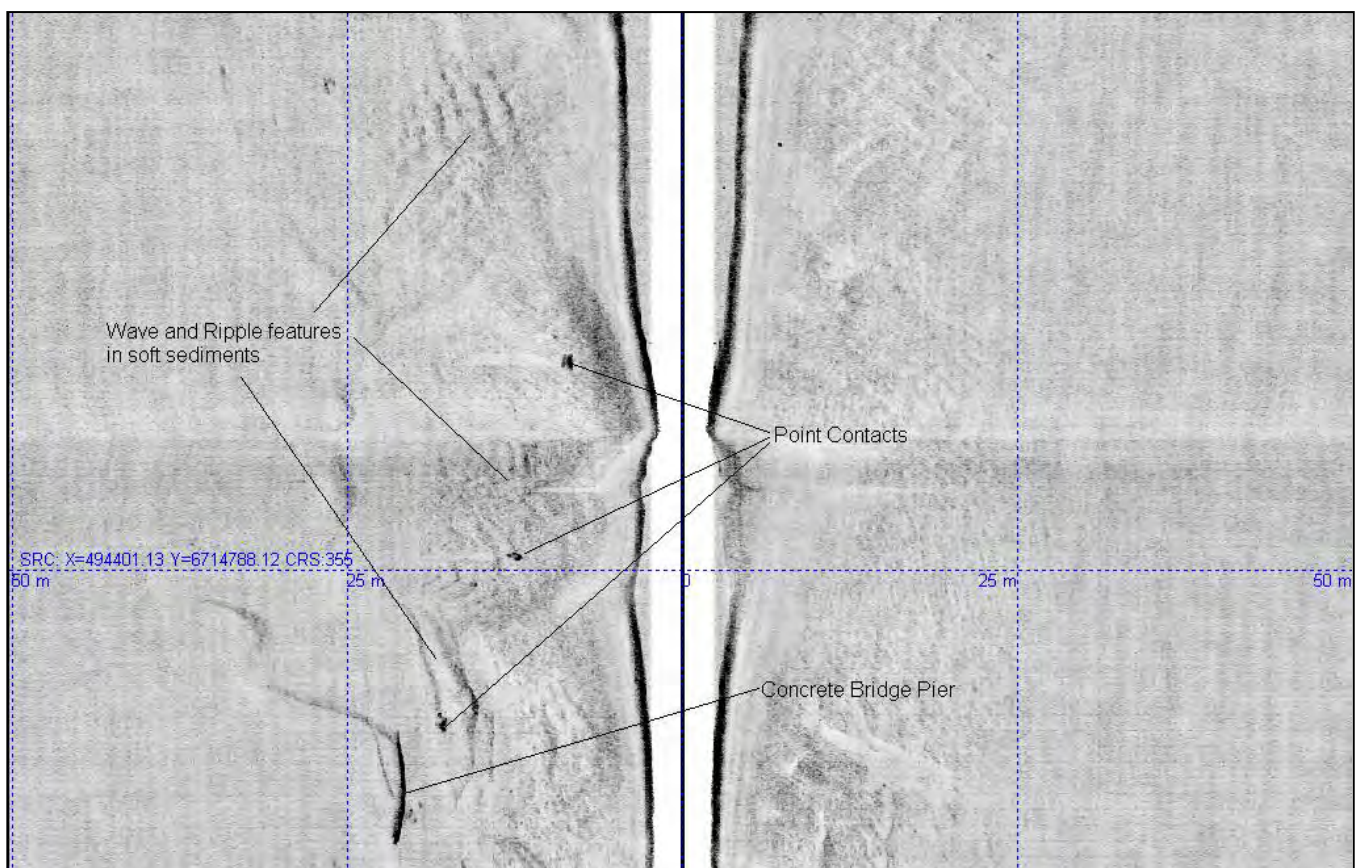


Figure 15: Point Contacts, concrete bridge pier and sedimentary features

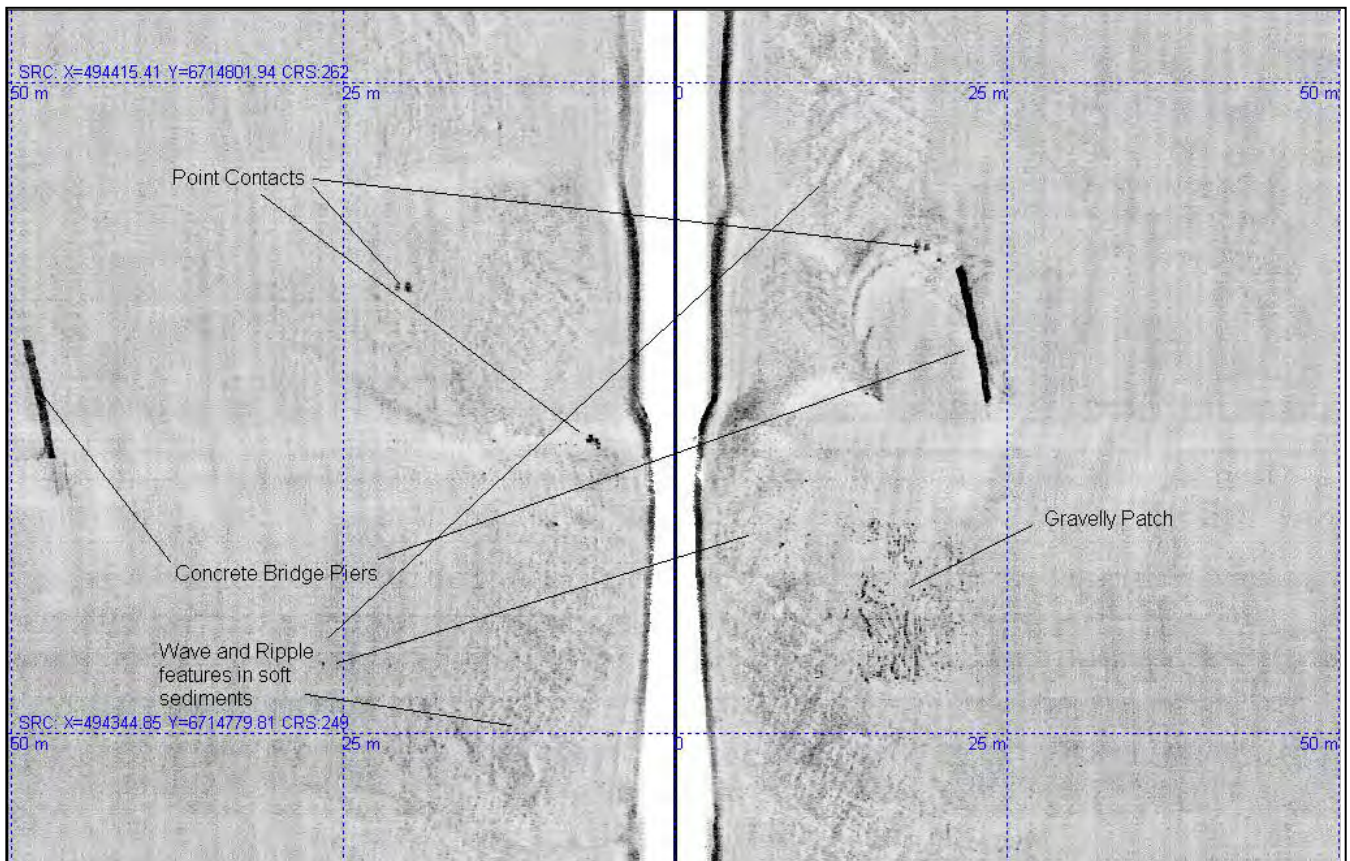


Figure 16:Point Contacts, concrete bridge pier and sedimentary features





5.6 Hydrography

At the current crossing of the bridge between North and South Grafton the Clarence River is approximately 360m wide. The channel runs along the Southern side of the river with a steep gradient running up to the south bank and a gently shoaling slope to the North bank. This is typical as the fastest flow is usually on the outside of river bends, in this case the Southern bank.

Water depths encountered range from 0-17m AHD. Beneath the bridge between the concrete piers there is evidence of scouring and deepened holes. The deepest point in the river is where a scoured hole coincides with the channel between the two most tightly spaced concrete piers which support the (now inactive) bascule section of the bridge.

The river bed is generally featureless with occasional waves and ripples in the soft alluvial top sediments. Small localised patches of gravel are occasionally visible. Small pebbles, stones and cobbles are seen intermittently throughout the survey area.

5.7 Remote Sensing Survey results

Several point contacts were identified as detailed in section 4.5.

Evidence of mooring and anchoring in the north east of the survey area are visible in the soft sediments (see figure 14).

The south bank of the river is rocky in places with fallen branches (Figure 18) and includes some key areas of interest as detailed in section 4.4. These include:

- The wreck of the *Induna* and the surrounding shallow bank which has some small pieces of debris possibly associated with the wreck.
- A derelict wharf where concrete piles can be seen above water level has some associated debris amongst the rocky bank including what appears to be a concrete block.

There are also several fallen tree branches along the rocky south bank. These are not considered of cultural heritage significance but any exposed portions are potential snags and therefore relevant to planning of any diving inspections in this area.

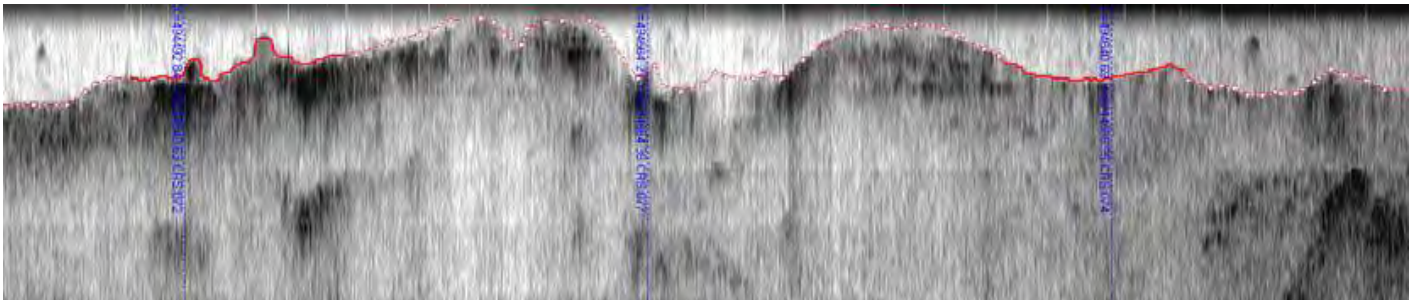


Figure 18: Rocky South bank with fallen branches visible in Sub Bottom data.

The subsurface riverbed was generally featureless with occasional evidence of gravel content and areas of more concentrated gravel. A top layer of softer alluvial sediments sits on top of more consolidated sediments beneath (Figure 19). This layer is intermittently visible across the whole survey area and ranges in thickness from less than half a meter up to a maximum of approximately 4m.

No features of maritime heritage significance were identified beneath the riverbed.

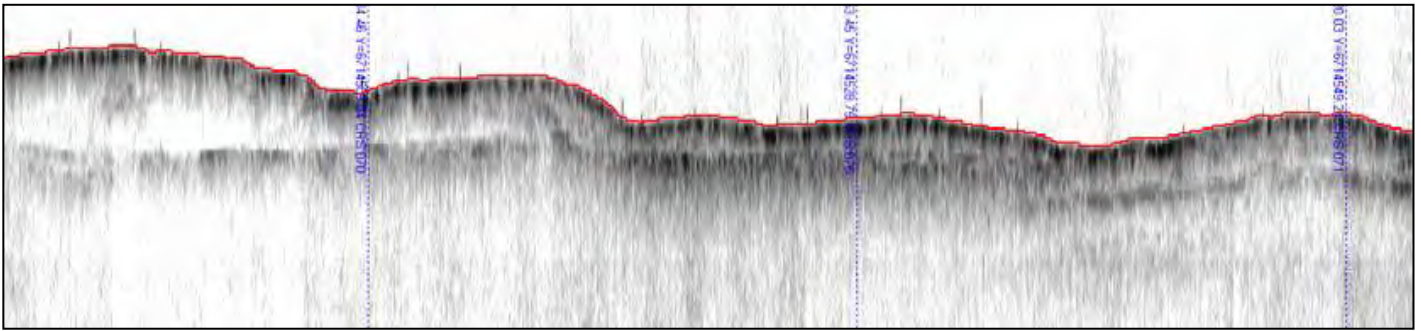


Figure 19: Top layer of soft alluvial sediments above more consolidated sediments beneath visible in Sub Bottom data.

Based on an analysis of the bathymetric, sub-bottom profile and side scan sonar survey data, the identified features in the survey area were prioritised in order of their potential for further archaeological investigation. These were divided into the features 1-7 (including the historic shipwreck *Induna* at feature 4 and the 'point contacts' (section 4.5), and are detailed below.

Key features of interest

The majority of anomalies detected during the remote sensing surveys are located near the southern bank of the river. This is consistent with this area being an active wharfage zone (PAS02, AS01 and AS02 in Figure 21) prior to the building of the bridge crossing. The north side of the river is the inner curve of the river bend and therefore subject to more sedimentation than the southern bank. The shallow water in this area would have been less amenable to shipping and ferry connections.

The anomalies identified during the remote sensing surveys were assessed for their suitability for diver based investigation as follows:



Figure 19: Map showing terrestrial archaeological sites (AS) and potential archaeological sites (PAS) and relationship to the route options for the bridge duplication (adapted from Biosis map)

**Feature 1 - E: 494401 N: 6714690** (Figure 17)

This feature is around 1.2m in length and rises 0.8m from the river bed. It does not appear in the sub-bottom profile imagery, suggesting that it is insubstantial and not attached to additional structure.

Therefore, this feature was not considered to contain any archaeological potential and was not included in the dive survey.

Feature 2 - E: 494515 N: 6714561 (Figure 17)

This is an angular contact 1.5m height 2m length consistent with a concrete block or similar and likely associated with what appears to be pylons from an adjacent derelict wharf immediately north of the railway terminus (Figure 21 - AS01) and west of the entrance to Alipou Creek. There is a high concentration of debris in this area.

The proximity to a former wharf site makes this an area with potential for deposition of wharf infrastructure remains and equipment associated with the transfer of goods and services across the river.

This feature was considered suitable for inclusion in the dive survey to confirm the nature of the object and of the adjacent debris.

Feature 3 - E: 494679 N: 6714612 (Figure 17)

This 1m x 1m angular contact is located adjacent to the former wharves (Figure 21 - AS02) east of Alipou Creek. It is consistent with a concrete block or similar sighted along the shoreline of south bank.

This feature was considered suitable for inclusion in the dive survey due to confirm its identity and relationship to the original wharf structure.

Feature 4 - E: 494267 N: 6714470 (Figure 17)

This is an area associated with the wreck of the historic shipwreck *Induna*. The debris field could include structural remains of the ship and/or remains of the associated wharf (Figure 21 - PAS02).

If these objects are associated with the *Induna* they share that ship's protection under the New South Wales *Heritage Act 1977*. This area was therefore included in the dive survey to determine the nature and extent of the objects and their relationship to the *Induna*. The dive survey also facilitated an inspection and assessment of the condition assessment of the submerged section of the ship's hull.

Feature 5 - E: 494582 N: 6714575 (Figure 17)

This is a linear contact, 1m in length, at the entrance to Alipou Creek. It is consistent with metal rod or similar.

Due to its proximity to the former wharves it was included in a survey of the south bank area east of the bridge in order to assess its archaeological potential.

Feature 6 - E: 494236 N: 6714543 (Figure 17)

This linear contact is 30m in length and consistent with cable, chain, rope or similar. It may be associated with a communication cable or with the construction of the bridge.

Therefore, this feature was not considered to contain any archaeological potential and was not included in the dive survey.

Feature 7 - E: 494623 N: 6714868 (Figure 17)

This linear contact is the only feature identified on the northern side of the river. It is 9m length and consistent with rope. It is believed to be discarded anchor or mooring line from recreational boats in the area.

Therefore, this feature was not considered to contain any archaeological potential and was not included in the dive survey.

Point contacts

None of the small, isolated point contacts (section 4.5 and figures 16 and 17) were considered to be of archaeological potential due to their lack of any structural form or relationship to associated items.

Therefore, these features were not considered to contain any archaeological potential and were not included in the dive survey.



5.8 Conclusions from the remote sensing surveys

Features 2 and 4 were considered to be of potential archaeological significance and warranted further investigation. Features 3 and 5 are in close proximity to feature 2 and were included in the dive survey of the southern bank area.

The dive survey incorporated the debris field associated with the *Induna* shipwreck and a condition assessment was made of the submerged portion of the port side of the hull.

The other located objects were not considered to be of archaeological potential and were not included in the dive survey.

The sub-two metre section of the river along the northern could not be accessed by the remote sensing survey due to the shallow depths in this area. This area was included in the dive survey to determine the presence of any submerged objects.

6.0 DIVING SURVEYS

REMOTE SENSING FEATURE 2

REMOTE SENSING FEATURE 3

REMOTE SENSING FEATURE 4 (SS INDUNA)

REMOTE SENSING FEATURE 5



6.0 DIVING SURVEYS

The dive survey successfully located the targeted features 2, 3, 4 and 5 as identified in section 4.7 above. An inspection was also completed of shallows along the northern shore line which could not be accessed by the remote sensing surveys. Visibility varied from zero to about 0.4 of a metre. Opportunity for photographic documentation was limited and no photography was possible at Feature 3 east of the entrance to Alipou Creek. In this area the level of visibility during the dive was zero.

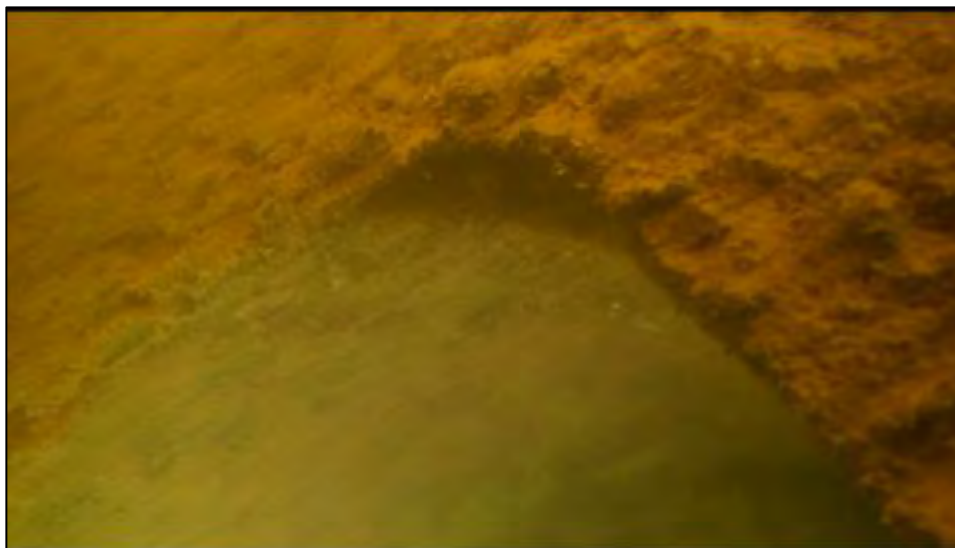
6.1 Remote sensing feature 2: Wharf Remains (Figure 17)

This feature lies between the existing bridge and the entrance to Alipou Creek. It consists of an extensive debris field, in up to 5 metres of water, comprising of wharf remains as well as a quantity of mattocks and picks. The debris field is about 6 to 20 metres from the river bank.

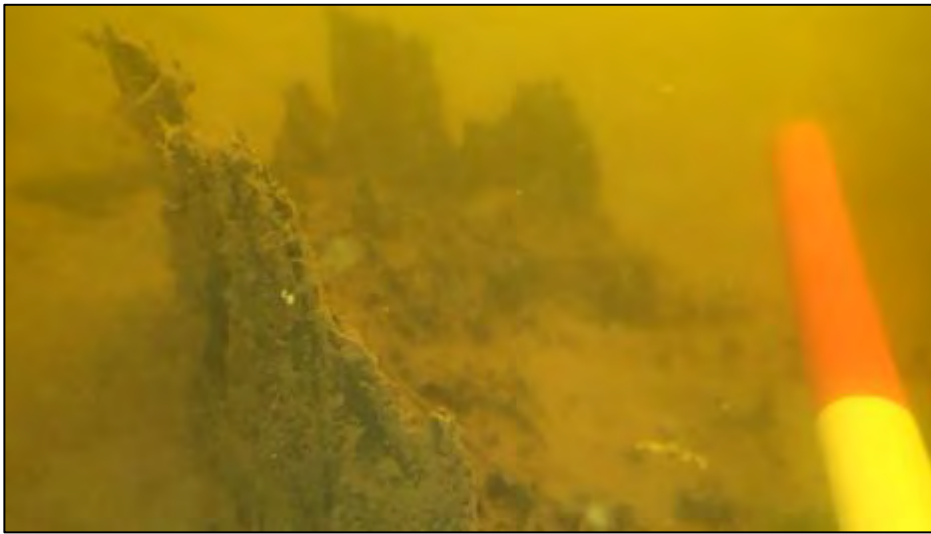
The wharf remains include two hollow concrete pylon sleeves (Photographs 12 & 13) with a corrugated outer surface lying end to end. Half of a third concrete sleeve, split open longitudinally, was also observed. Each concrete sleeve is about 3.15m in length. They are identical in construction to the pylons that are visible above water at the edge of the river (Photograph 14). The concrete formed a sleeve around a central timber pole. This timber has rotted away leaving the hollow centre. An upright piece of one timber post of similar dimension (0.3 metres) was visible on the riverbed (Photograph 14).



Photograph 12: Concrete pillar sleeve with corrugated at remote sensing feature 2 (yellow arrow)



Photograph 13: End of concrete pillar sleeve – hollow centre - at remote sensing feature 2

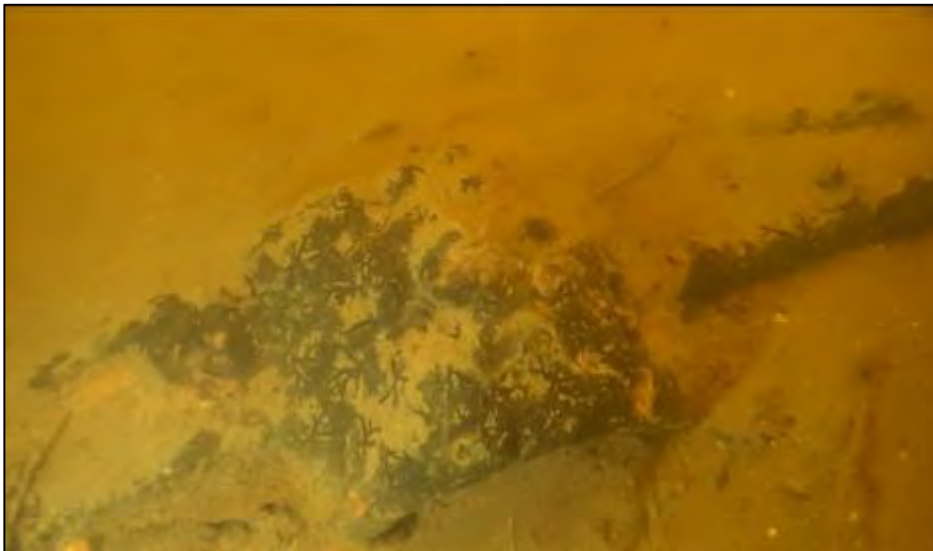


Photograph 14: remains of timber post or pylon

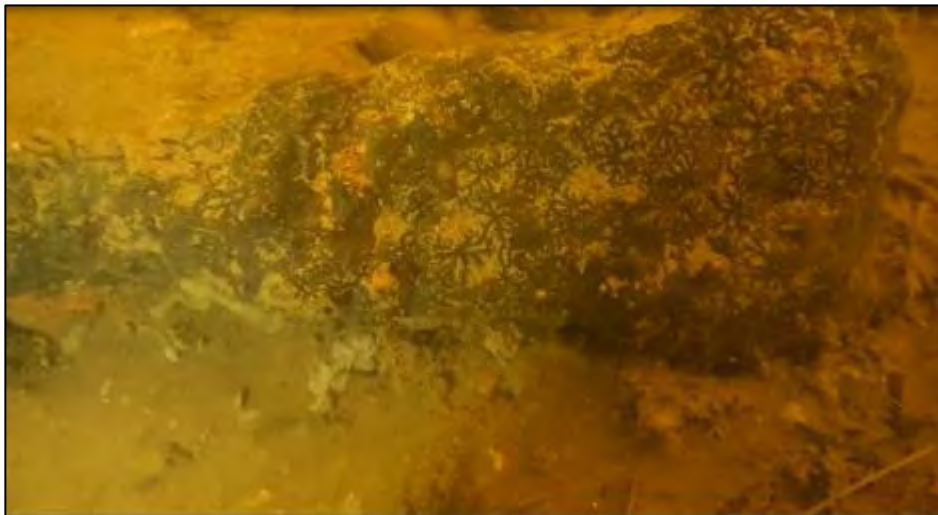


Photograph 15: Exposed remains of timber post with concrete sleeve at base near river bank – showing corrugated outer surface of the sleeve

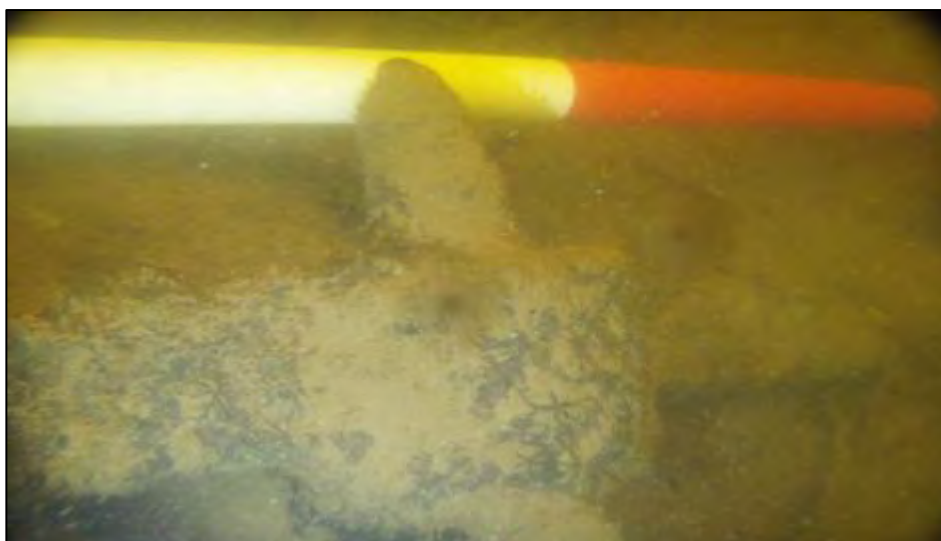
Mattocks and picks (Photographs 16, 17, 18) lie west of the concrete pylons and are massed together in heaps of six or more. The timber handles were occasionally present (Photograph 18). The tools appear to have been dumped as a group.



Photograph 16: Pick head at remote sensing Feature 2



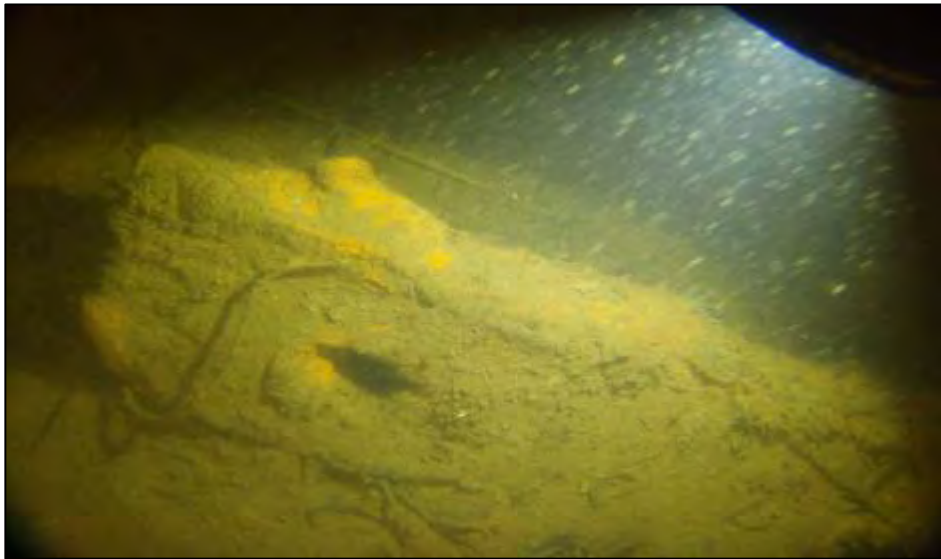
Photograph 17: Mattock blade at remote sensing Feature 2



Photograph 18: Mattock head with remnant timber handle



Elsewhere, also in about 5m of water, are a number of timber beams (Photograph 19) with metal fastenings or bolt holes which appear to be the remains of the wharf. These timbers run parallel to the shore line.



Photograph 19: Wharf timber at remote sensing Feature 2

6.2 Remote sensing feature 3: Concrete block (Figure 17)

This feature is the most eastern of the anomalies located along the south bank during the remote sensing surveys. Visibility was zero and the object could only be identified by feel. It consists of an angular block of concrete about 1.5 x 0.6 x 0.3 metres with smooth faces on all the exposed sides. A five metre radius search was conducted around the slab which is surrounded by 300-400mm sized rocks interspersed with fine silt. No other cultural remains were identified in this area.

6.3 Remote sensing feature 4 - ss *Induna* (Figure 17)

6.3.1 Above water component

The remains of the *Induna* lie 156 metres west of the Grafton Bridge on the southern bank of the Clarence River (Photograph 19).

The bow (Photograph 21) and stern (Photograph 21, 22) are both visible as is most of the upper edge of the port side hull. The majority of the starboard side of the vessel has been claimed by the riverbank and is covered with mown grass. Along the northern side of the vessel (port side), reed growth has become established inside of the hull (Photographs 21 & 24) except for a couple of metres near the port starboard quarter. Weeds entirely fill the space from the tip of the bow to the first bulk head which is 4.1 metres from the bow (Figure 21).



Photograph 20: ss Induna (arrow) on southern bank of river. View west from Grafton Bridge with embankment extending over Induna hull.



Photograph 21: Bow area with arrow to where bow was removed for nearby memorial



Photograph 22: Stern of *Induna* – view to east



Photograph 23: Stern of *Induna* – view to west



Photograph 24: View east along port quarter to bulk head behind bow with intact topside of hull and reed growth inside hull



Immediately in front of the stern post is remnant tar/pitch which lies between the stern post and a 1650mm frame (Figure 20 and photographs 25 & 26). In front of this frame can be seen the rear extremity of the concrete ballast that was introduced for the vessel's rail ferry work (Figure 21 & photograph 25).



Photograph 25: Detail of stern area showing relationship of concrete (yellow arrow) and pitch (red arrow)



Photograph 26: View of black pitch between stern post and rear bulkhead

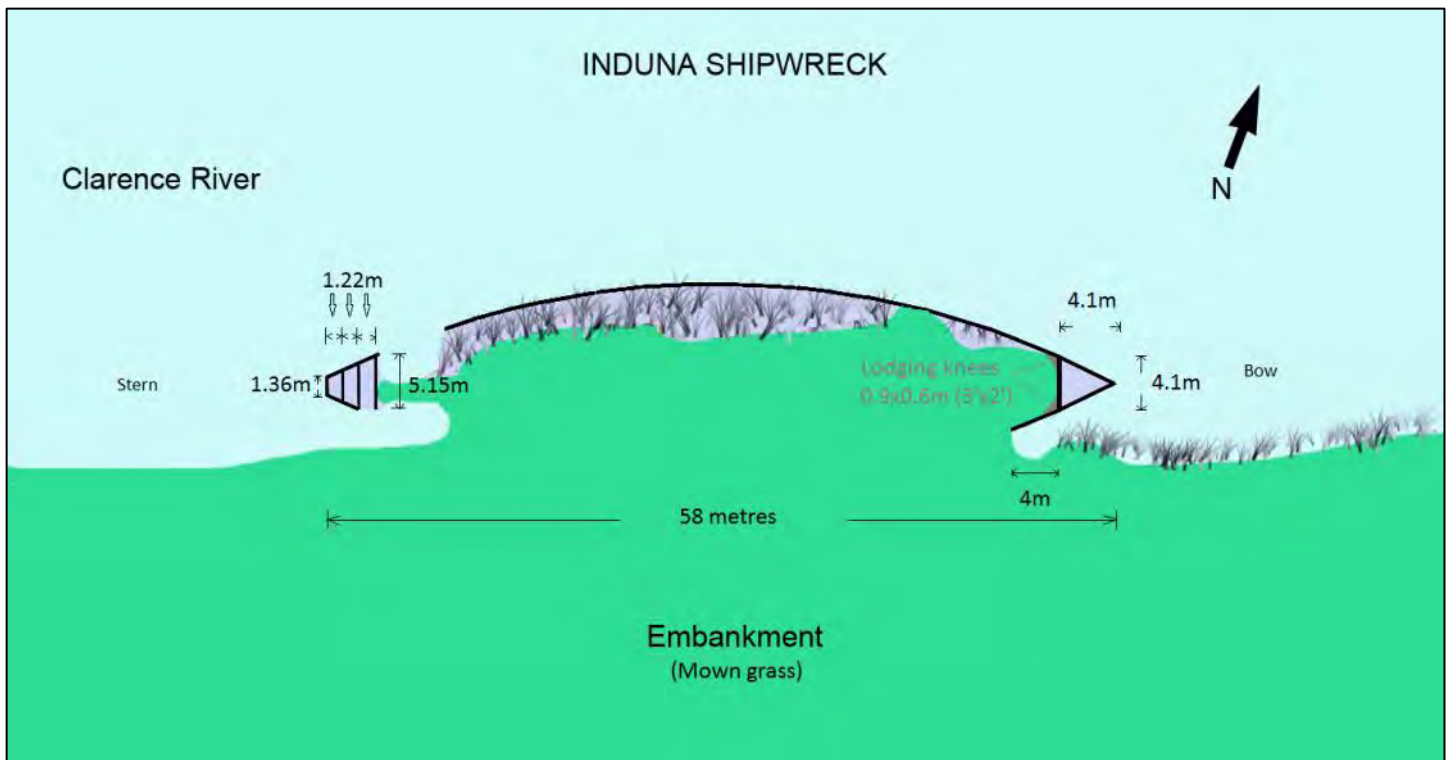


Figure 20: ss *Induna* site plan (Plan by D Nutley 18-12-2013)

The wreckage itself has survived the regular flooding of the river and appears relatively stable. The submerged hull plates and frames remain relatively sound and there are no signs of loose plating or frames that could indicate potential for imminent collapse. At water level, the hull plating and longitudinal frames just forward of the stern assembly are no longer present but the lower frames and keel appear to be intact and the stern remains in alignment with the bow. The underwater survey revealed that almost the entire port side of the hull is supported by water rather than the river bed sediment. Heavy machinery or other works associated with the proposed levee upgrade along the adjacent river bank could destabilise the wreck site if they are located over or adjacent to the shipwreck. Strong propeller wash in the adjacent area of the river could also destabilise the hull structure.

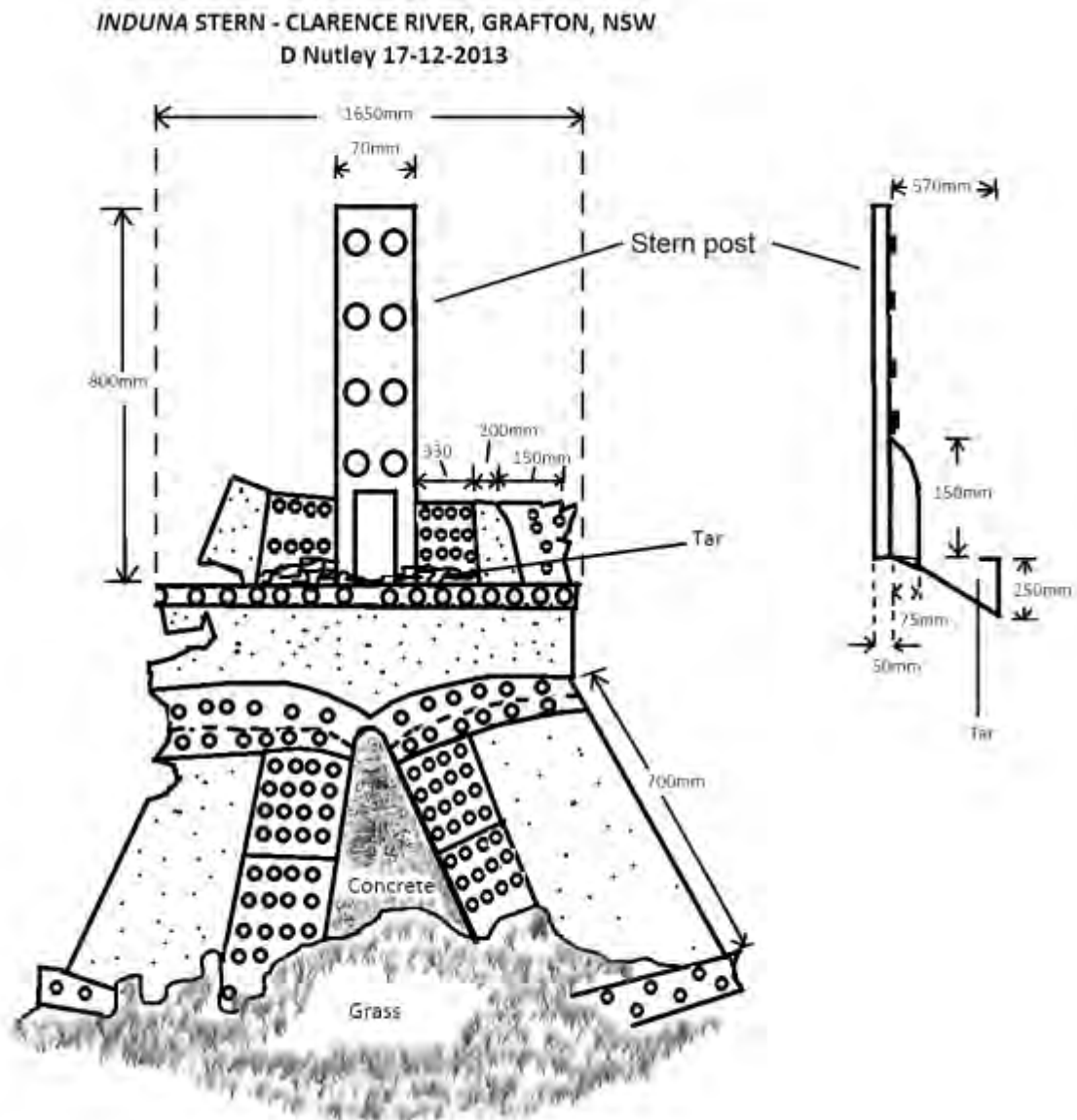


Figure 21: Raised and exposed stern section of the ss *Induna*. View to the west from inside the hull.

At the bow the transverse frames are 610mm (2 feet) apart but at the stern, which required less stiffening, the frame spacing is double at 1219 mm (4 feet) apart.

The overall length of the wreck is 58 metres (about 190 feet). Although the maximum width could not be measured, it is estimated at about 13 metres (42.6 feet).

6.3.2 *Induna* Debris field and submerged hull

Feature 4 is the debris field associated with the *Induna* shipwreck on the western side of the bridge. A slight current was present in this area (less than 1 knot). The survey included an arc search that extended out to 18m radius off the port side of the hull. At 18 metres the river bed dropped off almost vertically to about 17-18 metres depth. The river bed consisted primarily of a hard crust of consolidated sandy sediment. Close to the hull this was overlaid with a thin layer of fine silt.

The archaeological survey included the exposed section of the wreck and an underwater inspection of the hull and debris field.

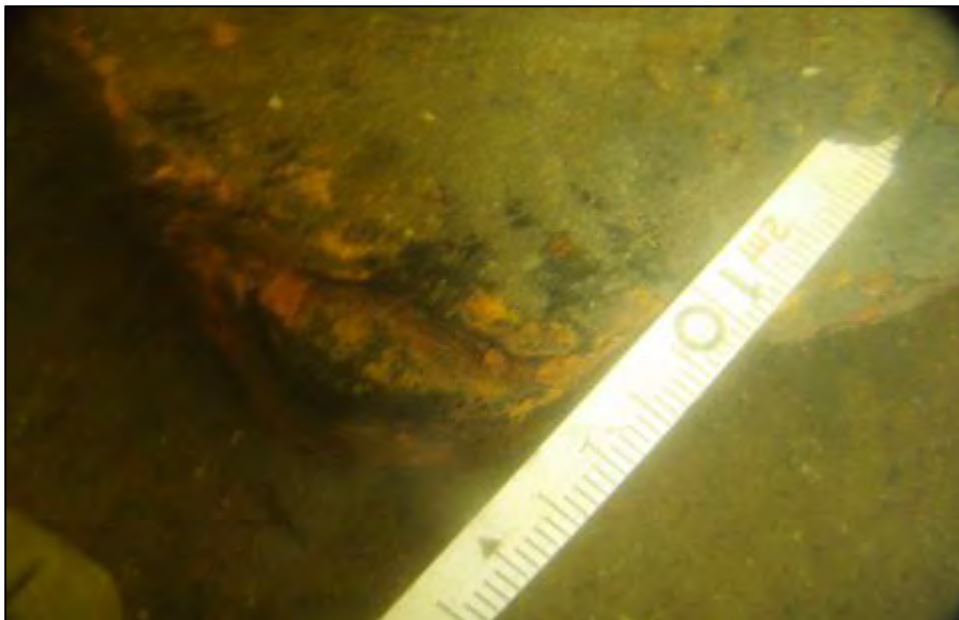
Underwater, the debris field is restricted to the length of the ship (about 58 metres) and about 6 metres northwards from the port side of the hull (Photograph 27). Most of the debris was within 3 metres of the hull. With the exception of one and a half house bricks the debris field consisted entirely of ferrous metal associated with the *Induna* which fell into the river prior to or



during the removal of the ship's superstructure in 1972. This included rectangular sections of iron plate, one of these was 3 metres in length and about 1 metre in width (Photograph 28). A 5 metre section of frame was located near the stern of the *Induna* and frame sections as well as a couple of 1.5m sections of 40-50mm diameter ferrous pipe. A one metre long, 0.3 metre diameter ferrous cylinder with a 50mm diameter pipe running through the centre of the cylinder was also located in this area. A 0.4 x 0.3 metre moulded, oval ferrous cover, possibly off a pressure vessel, was located about 3 metres north of the stern.



Photograph 27: View to the port side of *Induna* from across the debris field



Photograph 28: Corner of 3 x 1m ferrous plate adjacent to *Induna*. Limited visibility prevented greater field of view coverage of the object.



Photograph 29: Ferrous bolt adjacent to the *Induna*

The site also included a single ferrous bolt of about 160mm in length (Photograph 29).

The lower hull of the *Induna* is clear of the seabed. Due to the confined space, safety concerns and limited visibility, the full extent of the hull clearance could not be established but, based on observations at the bow and stern and the limit of torch light penetration at mid-ships, the clearance appears to be about at least as far as the keel.

The submerged bow and stern sections of the port hull were in good condition. Amidships, however, there were 6 large openings between the hull frames and above the turn of the bilge. Each opening is about one metre in height and 0.7 metre in width. This appears to be the result of natural corrosion of the hull plating in an oxygenated area that is periodically exposed the wetting and drying.

6.4 Remote sensing feature 5: Small ferrous objects (Figure 17)

This feature is located between Feature 2 and Feature 3 and is immediately outside the entrance to Alipou Creek. The river bed in this area consists of a 100-150 mm of fine silt overlying a clay substrate.

In addition to various small, decomposing tree branches, a debris field of small ferrous objects was identified. These included numerous steel bolts of various lengths and railway sleeper spikes (Photographs 30-33), metal rings (Photograph 34) and 100 x 100mm squares of steel plate with 35-40mm holes in the centre (Photograph 35). The site also included the remains of a ferrous pole, approximately 1.5 metres in length and with metal plate (about 150mm x 200mm) at one end (Photograph 36).



Photograph 30: Bolt or railway spike



Photograph 31: Bolt or railway spike



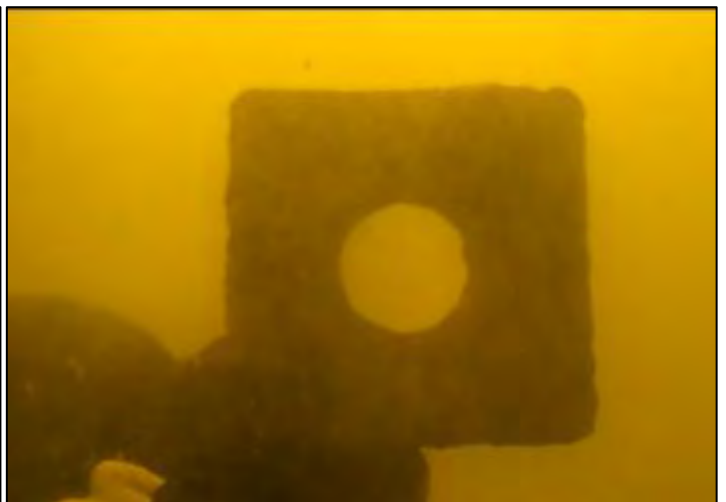
Photograph 32: Ferrous pin



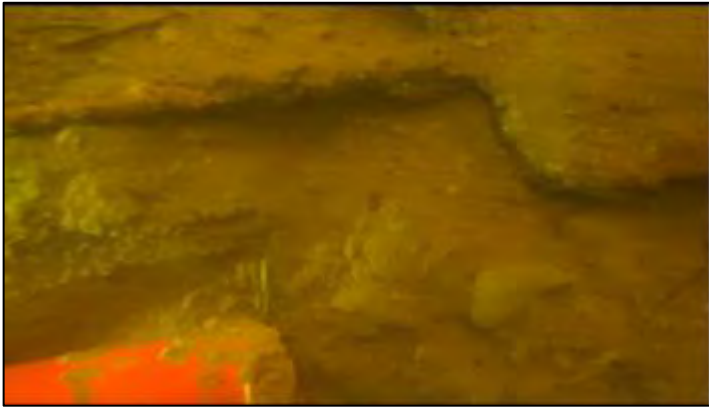
Photograph 33: Ferrous pin



Photograph 34: Ferrous ring



Photograph 35: Ferrous collar for bolt or spike



Photograph 36: One end of ferrous pole, about 1.5 metres in length with metal plate (about 150mm x 200mm) at one end (100mm of ranging pole visible in foreground)

6.5 Northern bank of Clarence River

A visual inspection was made of the 1-2m depth along the northern bank of the Clarence River within the survey area which could not be access by the remote sensing surveys. This area consists of patches of sea grass and bare river silt. There was strong sunlight penetration in the shallow water and visual coverage was good. No sign of cultural material was detected.

6.6 Conclusions of the dive survey

The site of the ss *Induna* is subject to periodic flood events. These range in degree from minor to severe. It is these events that have deposited silt over the wreck and caused the wreck to become incorporated in the embankment. The floods do not appear to have been destabilising the site. It appears essentially unchanged from the condition shown in an earlier photograph that appears in the State Heritage Inventory.

The underwater survey revealed that, although the overall submerged hull structure is relatively stable, almost the entire port side of the hull is supported by water rather than the river bed sediment. Strong propeller wash in the adjacent area of the river, heavy machinery along the adjacent river bank during the river levee upgrade, could destabilise the wreck site. It is necessary that a perimeter is established around the shipwreck site to exclude the entry of vehicles or equipment associated with the levee upgrade or bridge is construction. Much of the starboard side of the ship is buried under river silt and vegetation. Therefore the exclusion perimeter should be placed 25 metres south of the visible post side of the hull at midships and a minimum of 5 metres south of the visible starboard side of the hull at the bow and stern. Any work boats associated with the bridge duplication project or levee upgrade should not operate closer than 50 metres of the shipwreck and should not exceed a speed of 4 knots.

The dive survey also established that, apart from the shipwreck remains directly associated with the *Induna*, other cultural material along the southern bank of the river is primarily east of the current bridge. The objects are associated with the original wharves and wharf activity. These include timber remains from the wharf, tools, ferrous fastenings and equipment associated with the railway service or wharf maintenance.

No cultural material of any form was located in the river along the northern shore of the study area. There was also an almost complete absence of cultural material detected beyond 20-25 metres from the southern shore and none of any archaeological potential.

7.0 SIGNIFICANCE ASSESSMENT

CRITERIA
ASSESSMENT
STATEMENT OF SIGNIFICANCE



7.0 SIGNIFICANCE

7.1 Criteria

Significance assessment is the process whereby buildings, items or landscapes are assessed to determine their value or importance to the community. The NSW Heritage Council has developed a range of criteria for assessing historic sites which embody the values contained in the Burra Charter. These criteria are detailed below.

The ss *Induna* is already protected under the historic shipwreck provisions of the NSW *Heritage Act 1977*. Therefore the following assessments have been completed for the other remote sensing anomalies investigated during this survey.

7.2 Assessment

Due to the similarity between features 3 and five and their relationship to the former wharves, these items have been assessed together.

SHR Criteria

a) Historical significance - *an item is important in the course, or pattern of NSW's cultural or natural history (or the cultural or natural history of the local area)*

Feature 2: Concrete slab

This is an isolated block of concrete with no significant historical value.

Features 3 & 5: Wharf remains, bolts, pins, railway line fastenings and tools

These items along the southern bank of the Clarence River are common to many wharves and railways. They are not in any significant context and have no particular historical value.

Feature 4: ss *Induna*

The *Induna* was an integral link in the northern railway system. It was therefore an important component of the development of public transport networks in New South Wales and to the transport of goods and services along the northern New South Wales and interstate to Queensland.

b) Association - *an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area).*

Feature 2: Concrete slab

This item has no known special association with the life or works of a person, or group of persons and therefore has no significant heritage value.

Feature 3 & 5: Wharf remains, bolts, pins, railway line fastenings and tools

These items have a general association with the workers who designed, built and maintained wharves and railway infrastructure in New South Wales. They have moderate heritage significance.

Feature 4: ss *Induna*

The ss *Induna* is associated with the life of Sir Winston Churchill and his daring escape from capture in South Africa during the Boer War in the 1890s.

The *Induna* also has a strong association with the specialised group of railway workers who ran the rail ferry service across the Clarence River at Grafton in the early twentieth century. Their work was critical to the development of communities and industry in northern New South Wales.

c) Aesthetic significance – *an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area)*

Feature 2: Concrete slab

This item has no aesthetic significance



Feature 3 & 5: Wharf remains, bolts, pins, railway line fastenings and tools

These items are standard fittings with no special aesthetic or technical qualities of heritage value.

Feature 4: ss *Induna*

The *Induna* remains a substantially intact hull that creates a landscape feature visible from both the southern and northern banks of the Clarence River at Grafton.

d) Social – *an item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons*

Feature 2: Concrete slab

This item has no special social values.

Feature 3 & 5: Wharf remains, bolts, pins, railway line fastenings and tools

These items have no special social values.

Feature 4: ss *Induna*

The history of the *Induna* as a rail ferry and its association with Sir Winston Churchill is widely known in the Grafton area.

e) Research – *an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area)*

Feature 2: Concrete slab

This item has no significant research potential.

Feature 3 & 5: Wharf remains, bolts, pins, railway line fastenings and tools

These items have no significant research potential.

Feature 4: ss *Induna*

No detailed plans have been found of this ship and there is also a very limited photographic record. There is also no record of what original internal structures were left *in situ* when the superstructure was removed in the 1970s. There is therefore potential for archaeological excavation and research to record the internal details and to recreate the ship's lines.

f) Rarity – *an item possess uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area)*

Feature 2: Concrete slab

This item has no rarity value.

Feature 3: Wharf remains, bolts, pins, railway line fastenings and tools

These items have not rare.

Feature 4: ss *Induna*

Although rolling stock has been periodically transported by ship from Port Lincoln in South Australia due to the isolation of the area, the *Induna* is the only example of the nineteenth century rail ferry in Australia and one of only two known vessels that filled this role (the other being the ss *Swallow* also at Grafton but for which there are no physical remains).

g) Representative - *an item is important in demonstrating the principal characteristics of a class of NSW's:*

- ◆ Cultural or natural places;
- ◆ Cultural or natural environments (State Significance); OR

An item is important in demonstrating the principal characteristics of a class of the area's:

- ◆ Cultural or natural places; or
- ◆ Cultural or natural environments (local significance)

**Feature 2: Concrete slab**

This item has no particular representative values.

Features 3 & 5: Wharf remains, bolts, pins, railway line fastenings and tools

These items are representative of the typical fastenings used on timber wharves and to secure railway sleepers but have no significant heritage value.

Feature 4: ss *Induna*

The *Induna* is representative of ships specifically designed or adapted to transport railway engines and rolling stock and which facilitate rapid loading and unloading by roll-on/roll-off.

7.3 Statement of significance

The ss *Induna* is an important component of the development of public transport networks in New South Wales. It is an historic shipwreck that contributed to the development of communities and commercial centres in northern New South Wales. The *Induna* is associated with the life of Sir Winston Churchill and his daring escape from capture in South Africa during the Boer War in the 1890s. The vessel is a landscape feature visible on the banks of the Clarence River at Grafton and a reminder of the significant early shipping in the area. The wreck site retains archaeological potential to record the internal details and to recreate the ship's lines. The *Induna* is the only surviving example of the nineteenth century rail ferry in Australia and one of only two known vessels that filled this role.

The ss *Induna* is of State significance due to its unique connection to the expansion of the northern railway system in New South Wales (criterion A), association with Sir Winston Churchill whose role in World War II had immense impacts on the lives of Australia's defence forces (criterion B) and its rarity as a surviving rail ferry (criterion F).

None of the remaining anomalies identified as features through remote sensing and dive surveys of the study area have local or state significance.

8.0 RECOMMENDATIONS



8.0 RECOMMENDATIONS

The following recommendations are made on the basis of:

- The results of the remote sensing and dive surveys as detailed in this report
- The history of the ss *Induna* as detailed in this report
- The *NSW Heritage Act 1977*

IT IS THEREFORE RECOMMENDED THAT:

1. There would be no impact on underwater cultural heritage in the path of the proposed additional crossing over the Clarence River at Grafton.
2. The *Induna* is sufficiently clear of the proposed crossing to be of minimal risk of impact during construction. However, its presence must be considered in the planning and implementation of construction work associated with the bridge duplication as well as the proposed levee upgrade. This includes planning regarding the transport or establishment of any plant or equipment in the vicinity of the shipwreck. This consideration includes movements of water borne or land based plant, vehicles/watercraft. The *Induna* should be fenced on the landward side to protect it from any inadvertent impact during construction work. The exclusion perimeter fence should be placed on the property boundary to the south of the visible port side of the hull at midships and a minimum of 5 metres south of the visible starboard side of the hull at the bow and stern. (This will provide a 5m buffer on the landward side of the hull.) A *maritime* barrier should be placed 15 metres from the shipwreck to remind workboats to not enter this area. Terrestrial works in the vicinity of the wreck should consider the stability of the wreck and be undertaken in a manner which ensures that heavy machinery does not impact upon the river bank or the wreck.
3. The submerged cultural material adjacent to the southern bank consists of wharf remains and early twentieth century tools and fastenings. These are commonly found in other New South Wales railway and wharf contexts and have very limited potential to yield information of archaeological significance. These items are therefore not relics within the meaning of the *NSW Heritage Act 1977*.
4. There are *no other* known submerged cultural heritage impediments to construction of a bridge to the east of the existing bridge over the Clarence River at Grafton.
5. For any previously undetected relics are uncovered during the construction of the bridge, the Roads and Maritime Services management requirements are detailed in the *Standard Management Procedure: Unexpected Heritage Items*, October 2013. (See summary in Figure 1, page 9 and Table 1 page 10 of those procedures).

9.0 REFERENCES



9.0 REFERENCES

Biosis Research (Kottaras, P, Woodley, P, Lennox, J), 2010, Main Road 83 Summerland Way Additional Crossing of the Clarence River at Grafton. Concept Options Development Report Technical Paper:Non-Aboriginal Heritage

Graham, A. 1965. *The Escape and Capture of Winston Churchill during the South African War*.

NSW Heritage Office, 1996. *Shipwreck Atlas of New South Wales*. NSW Heritage Office.



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Appendix C – Significant Tree Assessment

Significant Tree Assessment – Grafton Bridge

The table below outlines an assessment of the significant, heritage listed trees, over 3 meters in height as per the Clarence Valley LEP, that fall within the Grafton Bridge alignment as at October 2013. Note the species comprised *Ficus sp.* and *Jacaranda mimosifolia* there were no *Brachychiton sp.* that fell within the alignment despite there being heritage listed *Brachychiton sp.* in the broader Grafton area.

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494504.9	6716037	Yes	Species: <i>Jacaranda mimosifolia</i> .	Height: 12 m (metres) DBH: 115 cm (centimeters) Crown spread: 10 m Condition: Moderate Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494495.4	6716022	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 10 m DBH: 170 cm Crown spread: 15 m Condition: Good Outstanding features: n/a	
494484.3	6716007	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 12 m DBH: 135 cm Crown spread: 12 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494477.3	6716013	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 10 m DBH: 100 cm Crown spread: 10 m Condition: Good Outstanding features: n/a	
494485.3	6716027	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 12 m DBH: 130 cm Crown spread: 10 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494496	6716041	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 18 m DBH: 200 cm Crown spread: 15 m Condition: Good Outstanding features: n/a	
494503.8	6716056	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 10 m DBH: 130 cm Crown spread: 7 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494500.6	6716112	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 12 m DBH: 280 cm Crown spread: 8 m Condition: Good Outstanding features: n/a	
494482.8	6716126	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 12 m DBH: 240 cm Crown spread: 8 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494475.6	6716146	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 18 m DBH: 240 cm Crown spread: 15 m Condition: Good Outstanding features: n/a	
494488.4	6716135	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 13 m DBH: 290 cm Crown spread: 15 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494520.3	6716119	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 14 m DBH: 325 cm Crown spread: 15 m Condition: Good Outstanding features: n/a	
494560.9	6716134	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 15 m DBH: 150 cm Crown spread: 15 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494568	6716119	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 13 m DBH: 150 cm Crown spread: 15 m Condition: Good Outstanding features: n/a	
494579.2	6716073	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 15 m DBH: 200 cm Crown spread: 20 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494588.3	6716069	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 16 m DBH: 320 cm Crown spread: 12 m Condition: Good Outstanding features: n/a	
494585.5	6716054	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 10 m DBH: 80 cm Crown spread: 7 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494085.8	6715309	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 10 m DBH: 80 cm Crown spread: 5 m Condition: Good Outstanding features: n/a	
494115.2	6715306	Yes	Species: <i>Ficus sp.</i>	Height: 40 m DBH: 540 cm Crown spread: 30 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494113	6715298	Yes	Species: <i>Ficus sp.</i>	Height: 35 m DBH: 900 cm Crown spread: 30 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494151.8	6715268	Yes	Species: <i>Ficus sp.</i>	Height: 35 m DBH: 630 cm Crown spread: 25 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494170.3	6715252	Yes	Species: <i>Ficus sp.</i>	Height: 30 m DBH: 540 cm Crown spread: 25 m Condition: Good Outstanding features: n/a	
494181.5	6715263	Yes	Species: <i>Ficus sp.</i>	Height: 35 m DBH: 500 cm Crown spread: 25 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494385.4	6715076	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 5 m DBH: 110 cm Crown spread: 5 m Condition: Good Outstanding features: n/a	
494377.7	6715071	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 10 m DBH: 135 cm Crown spread: 10 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494364.6	6715049	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 10 m DBH: 350 cm Crown spread: 15 m Condition: Good Outstanding features: forking	
494372.4	6715046	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 10 m DBH: 260 cm Crown spread: 18 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494382.9	6715057	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 10 m DBH: 110 cm Crown spread: 10 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494392.8	6715069	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 10 m DBH: 115 cm Crown spread: 10 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494421.2	6715107	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 12 m DBH: 70 cm Crown spread: 7 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494375.6	6715123	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 5 m DBH: 50 cm Crown spread: 5 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494369.2	6715128	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 12 m DBH: 250 cm Crown spread: 15 m Condition: Moderate Outstanding features: n/a	
494289.2	6715187	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 6 m DBH: 200 cm Crown spread: 7 m Condition: Moderate Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494268.3	6715204	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 6 m DBH: 190 cm Crown spread: 7 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494251.9	6715214	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 8 m DBH: 80cm Crown spread: 6m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494276.1	6715175	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 12 m DBH: 320cm Crown spread: 18 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494284.2	6715172	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 5 m DBH: 30cm Crown spread: 5 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494340.4	6715132	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 7 m DBH: 80cm Crown spread: 7 m Condition: Good Outstanding features: n/a	

Eastings	Northings	Culturally significant tree	Summary of Tree Assessment	Biosis Comments	Photo
494361.6	6715115	Yes	Species: <i>Jacaranda mimosifolia</i>	Height: 15 m DBH: 270cm Crown spread: 10 m Condition: Good Outstanding features: n/a	