6 Maritime archaeological investigations and assessment

A maritime assessment was completed in accordance with the Director General's Requirements (DGRs) for the environmental impact statement (EIS) on the project, and the Heritage Division (OEH ref: 16592 and A 16568) recommendations for the project which included:

- A Maritime Archaeological Survey should be completed by an appropriately qualified and experienced Maritime Archaeologist to identify the scope of relics and assemblages in the Clarence River in the areas of proposed impacts of the additional crossing. This survey should include a remote sensing survey of the riverbed and if visibility permits a visual inspection of the riverbed.
- The Maritime Archaeologist must also be involved in pre-development archaeological salvage excavation if it is determined it is required based on the results of the remote sensing survey.
- Archaeological Assessment and Archaeological Research Designs should be prepared for both terrestrial and maritime archaeology as well as Statements of Heritage Impact for all built items and cultural plantings.
- The Research Design and Methodology proposed for physical archaeological works (either terrestrial or maritime) undertaken as part of the initial assessment for the project should be reviewed by both DP&E and the Heritage Council prior to the commencement of any works to ensure that the strategies being used are appropriate and in accordance with standard archaeological practice for state listed sites and areas.

A research design was prepared to inform the maritime archaeological assessment of the Clarence River located within the Project Area. This research design was presented to Heritage Division and comments on the approach to the investigations incorporated into the assessment (for details of consultation see Table 1).

6.1 Premises of investigation

There are two premises that underlie the program of maritime assessment, which are to:

- Determine the nature, extent and significance of any maritime relics associated with the project area
- Assess any impacts to maritime relics by the project in order to present detailed management and mitigation measures.

6.2 Methodology

Comber Consultants were engaged by Biosis to undertake the maritime assessment, the results presented within this section are summarised as part of the technical paper detailing their findings. The Comber Consultants report is attached in Appendix B.

The following methodology was implemented to assess the maritime archaeological resource.

6.2.1 Remote sensing survey

The remote sensing surveys were conducted from 17 to 19 December 2013 under the supervision of David Nutley (Comber Consultants). The hydrographic and marine geophysical surveys were conducted by Mapping & Hydrographic Surveys from aboard its 4.9 metres survey vessel Delta Tauri. An area of approximately 22 hectares of the Clarence River between North and South Grafton was defined in which to identify any potential features. The survey area extended 100 metres upstream (west) of the historic shipwreck *SS Induna* (FMW29). To the east, the survey area extended approximately 375-400 metres downstream of Alipou Creek.

The hydrographic and marine remote sensing surveys were completed in the following manner:

- 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.
- 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.
- 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.

6.2.2 Visual inspection

The diver based investigation of key anomalies identified during the remote sensing survey was conducted on 29 January 2014 under the direction of David Nutley. The survey was conducted using Gilbert Diving's 5 metres barge 'Junior' 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 four 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.

6.3 Results and assessment

6.3.1 Remote sensing survey

Seven features were identified as a result of the remote sensing survey, these are summarised in Table 25 and displayed in Figure 29.

The results of the remote sensing were used to inform the methodology for the visual inspection. 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. An inspection of the Feature 4 (the debris field associated with the *SS Induna* shipwreck) facilitated a condition assessment of the submerged portion of the port side of the hull. Features 1, 6 and 7 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 bank of the Clarence 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.

Table 25: Results from the maritime assessment remote sensing survey.

Feature	Result	Assessment
1	This feature is around 1.2 metres in length and rises 0.8 metres 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.	This feature was not considered to contain any archaeological potential and was not included in the dive survey.
2	This is an angular contact 1.5 metres height 2 metres 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 South Grafton Rail Precinct (CZB37) and Grafton Bridge construction area (CZB36) 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 (CZB36) 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.
3	This 1 metre x 1 metre angular contact is located adjacent to the former wharves (CZB36) 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.
4	This is an area associated with the wreck of the *SS Induna* (FMW29). The debris field could include structural remains of the ship and/or remains of an associated wharf (FMW28).	If these objects are associated with the *SS Induna* they share that ship's listing status on the SHR. This area was included in the visual inspection to determine the nature and extent of the objects and their relationship to the *SS Induna* (FMW29). An inspection and assessment of the condition of the submerged section of the ship's hull.
5	This is a linear contact, 1 metres in length, at the entrance to Alipou Creek. It is consistent with metal rod or similar.	Due to its proximity to the former wharves (CZB36) it was included in a survey of the south bank area east of the bridge in order to assess its archaeological potential.
6	This linear contact is 30 metres 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.	This feature was not considered to contain any archaeological potential and was not included in the dive survey
7	This linear contact is the only feature identified on the northern side of the river. It is 9 metres length and consistent with rope. It is believed to be discarded anchor or mooring line from recreational boats in the area.	This feature was not considered to contain any archaeological potential and was not included in the dive survey.

Figure 29: Results of the Remote Sensing Survey

Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Melbourne, Sydney, Wangaratta & Wollongong

Acknowledgements: Imagery provided by Arup Pty Ltd

Matter: 16255
Date: 06 May 2014,
Checked by: AJB, Drawn by: JMS, Last edited by: jshepherd
Location:P:\16200s\16255\Mapping\
16255_F29_RemoteSensingResults_20140430

0 30 60 90 120 150

Metres
Scale 1:3,650 @ A3
Coordinate System: GDA 1994 MGA Zone 56

N

6.3.2 Visual inspection

The dive survey successfully located the targeted features 2, 3, 4 and 5 as identified in Table 25. 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 m. 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. A visual inspection was made of the 1-2 metres 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.

A discussion of the results on features 2, 3, 4 and 5 is presented in the following sections.

Feature 2: Wharf Remains

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 wells 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 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 3.15 metres in length. They are identical in construction to the pylons that are visible above water at the edge of the river. The concrete formed a sleeve around a central timber pole, however the timber has rotted away leaving the hollow centre. An upright piece of one timber post of similar dimension (0.3 m) was visible on the riverbed (see Plate 54).

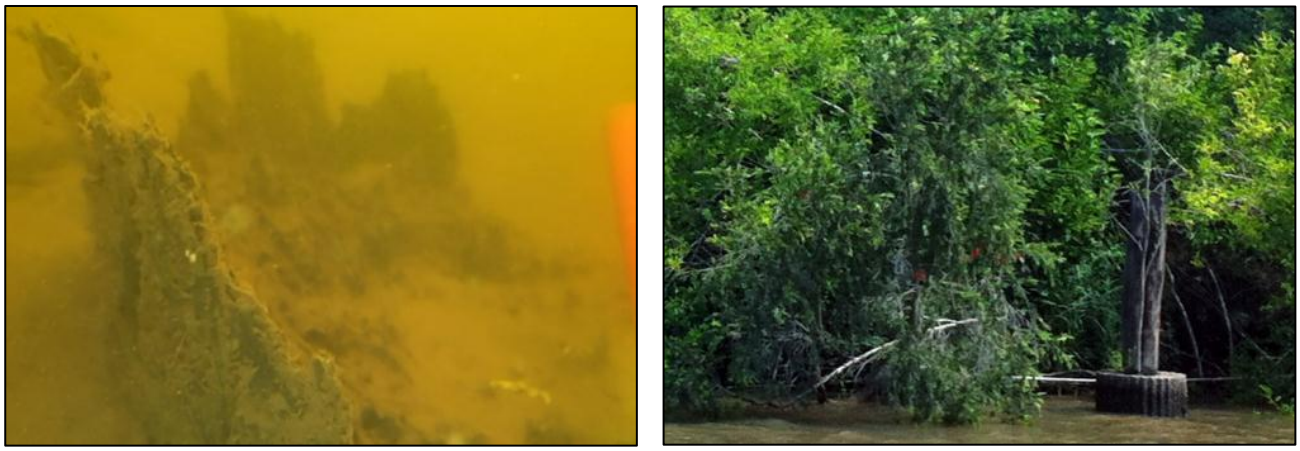

Plate 54: Remains of a timber post (left) and (right) Exposed remains of timber post with concrete sleeve at base near river bank – showing corrugated outer surface of the sleeve (Source: Comber Consultants)

Mattocks and picks lie west of the concrete pylons and are massed together in heaps of six or more. The timber handles were occasionally present (see Plate 55). The tools appeared to have been dumped as a group. Elsewhere, also in about 5 metres of water, are a number of timber beams with metal fastenings or bolt holes which appear to be the remains of the wharf. These timbers run parallel to the shore line (see Plate 56). The items encountered at Feature 2 are common in nature and therefore have been assessed as not being a relics or heritage items.

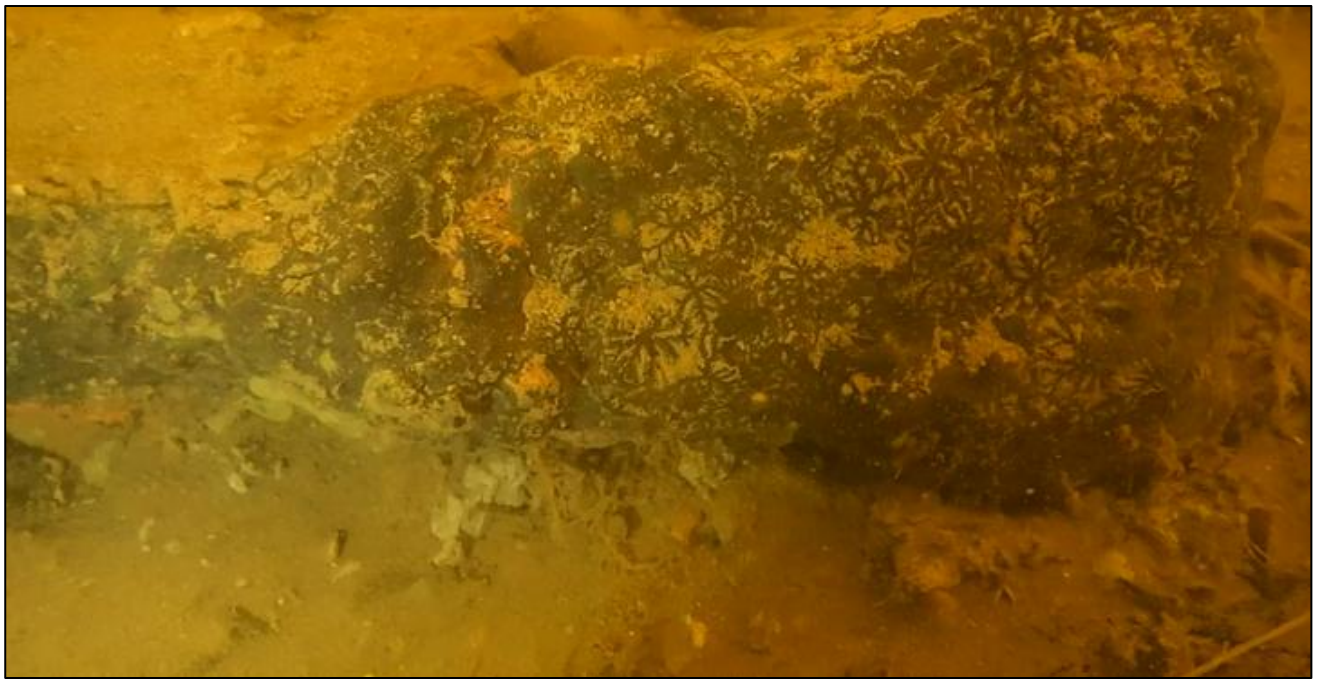

Plate 55: Mattock blade at remote sensing Feature 2 (Source: Comber Associates)

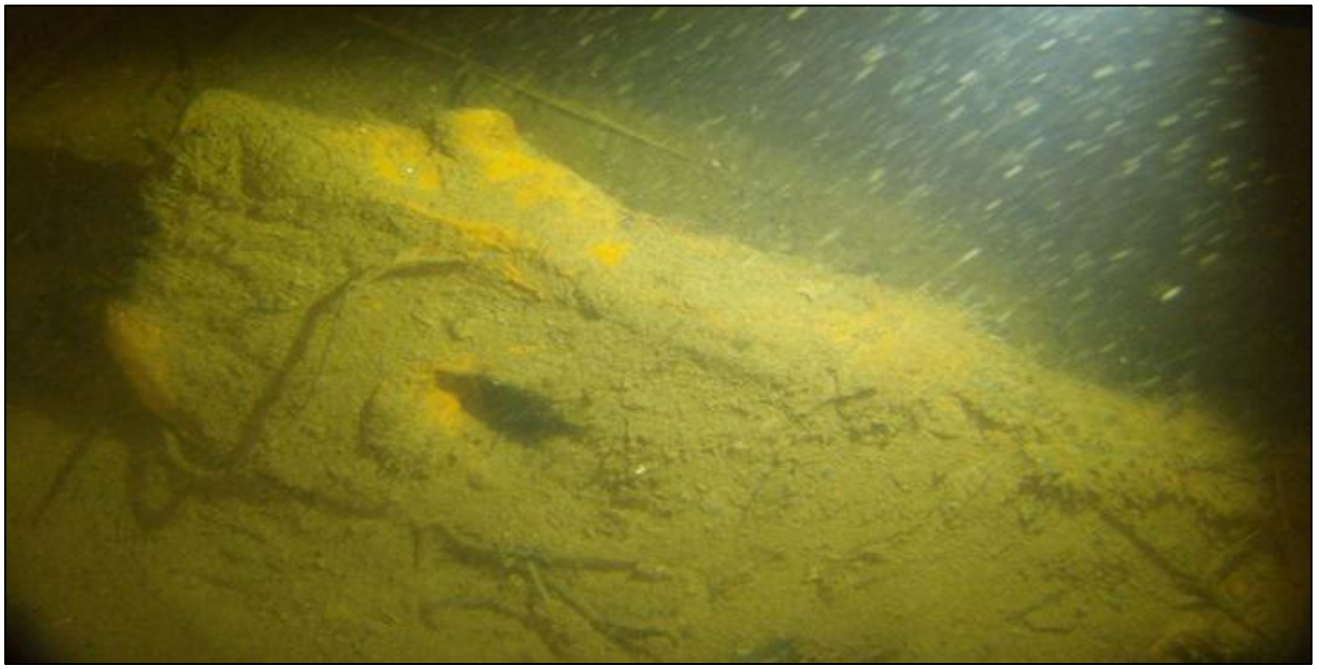

Plate 56: Wharf timber at remote sensing Feature 2 (Source: Comber Associates)

Feature 3: Concrete Block

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 metre x 0.6 metre x 0.3 metre with smooth faces on all the exposed sides. A 5 metre radius search was conducted around the slab which is surrounded by 300-400 mm sized rocks interspersed with fine silt. No other cultural remains were identified in this area.

Feature 4: *SS Induna* (FMW29) debris field and submerged hull

Feature 4 is the debris field associated with the *SS Induna* (FMW29) shipwreck on the western side of the Grafton Road and Rail Bridge (FMW36). The *SS Induna* (FMW29) is a registered heritage item under the CVLEP 2011. A slight current was present in this area (less than 1 knot). The survey included an arc search that extended out to 18 metres 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 (see Plate 57). 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 *SS Induna* which appears to have fallen 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 metres in width. A five metres section of frame was located near the stern of the *SS Induna* (FMW29) and frame sections as well as a couple of 1.5 metres sections of 40-50 milimetres diameter ferrous pipe. A 1 metres long, 0.3 metres diameter ferrous cylinder with a 50 milimetres diameter pipe running through the centre of the cylinder was also located in this area. A 0.4 x 0.3 metres moulded, oval ferrous cover, possibly off a pressure vessel, was located about 3 metres north of the stern. The site also included a single ferrous bolt of about 160 milimetres in length.

The lower hull of the *SS 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 (see Plate 58 and Plate 61). The submerged bow and stern sections of the port hull were in good condition. Amidships, however, there were six large openings between the hull frames and above the turn of the bilge. Each opening is about 1 metres in height and 0.7 metres in width. This appears to be the result of natural corrosion of the hull plating in an oxygenated area that is periodically exposed to wetting and drying.

Immediately in front of the stern post is remnant tar/pitch which lies between the stern post and a 1650 milimetres frame. 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. 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.

Plate 57: Western facing photograph of the *SS Induna* (FMW29) which clearly shows the embankment extending over *SS Induna* hull and the proximity of the existing levee (Source: Comber Consultants).

Plate 58: East facing photograph of the stern of *SS Induna* (FMW29) (left) and (right) bow area where bow was removed for nearby memorial (Source: Comber Consultants).

Plate 59: West facing photography of the stern of the *SS Induna* (FMW29) (Source: Comber Consultants)

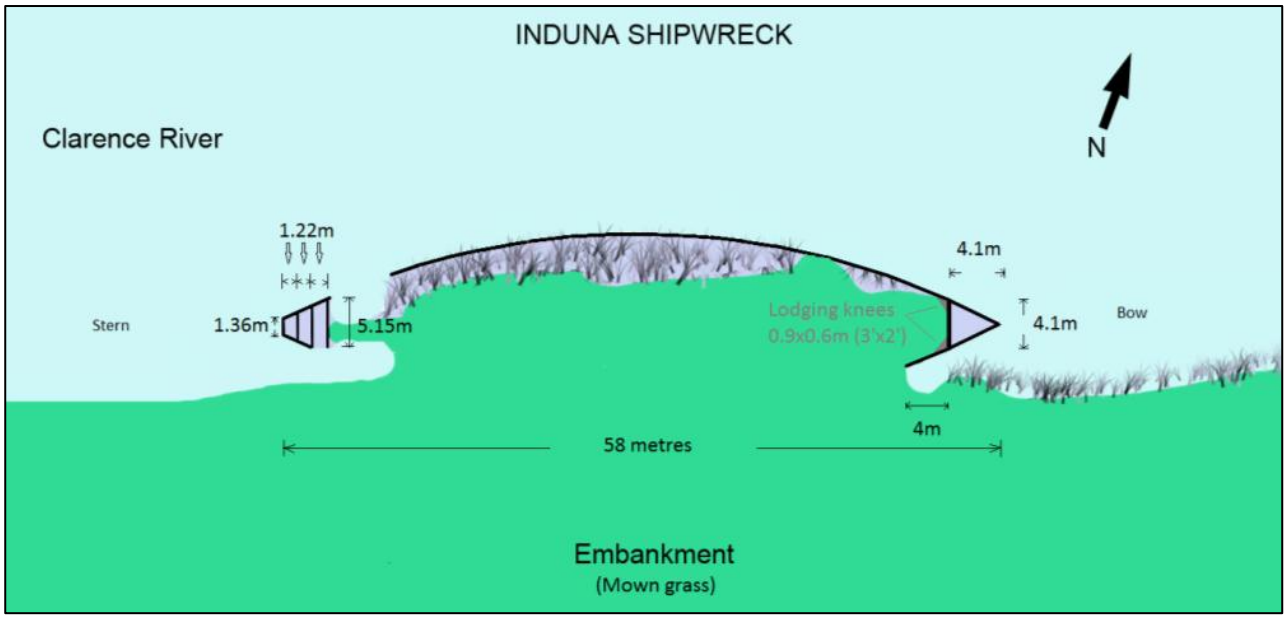

Plate 60: Site Plan of the *SS Induna* (FMW29) (Source: Comber Consultants)

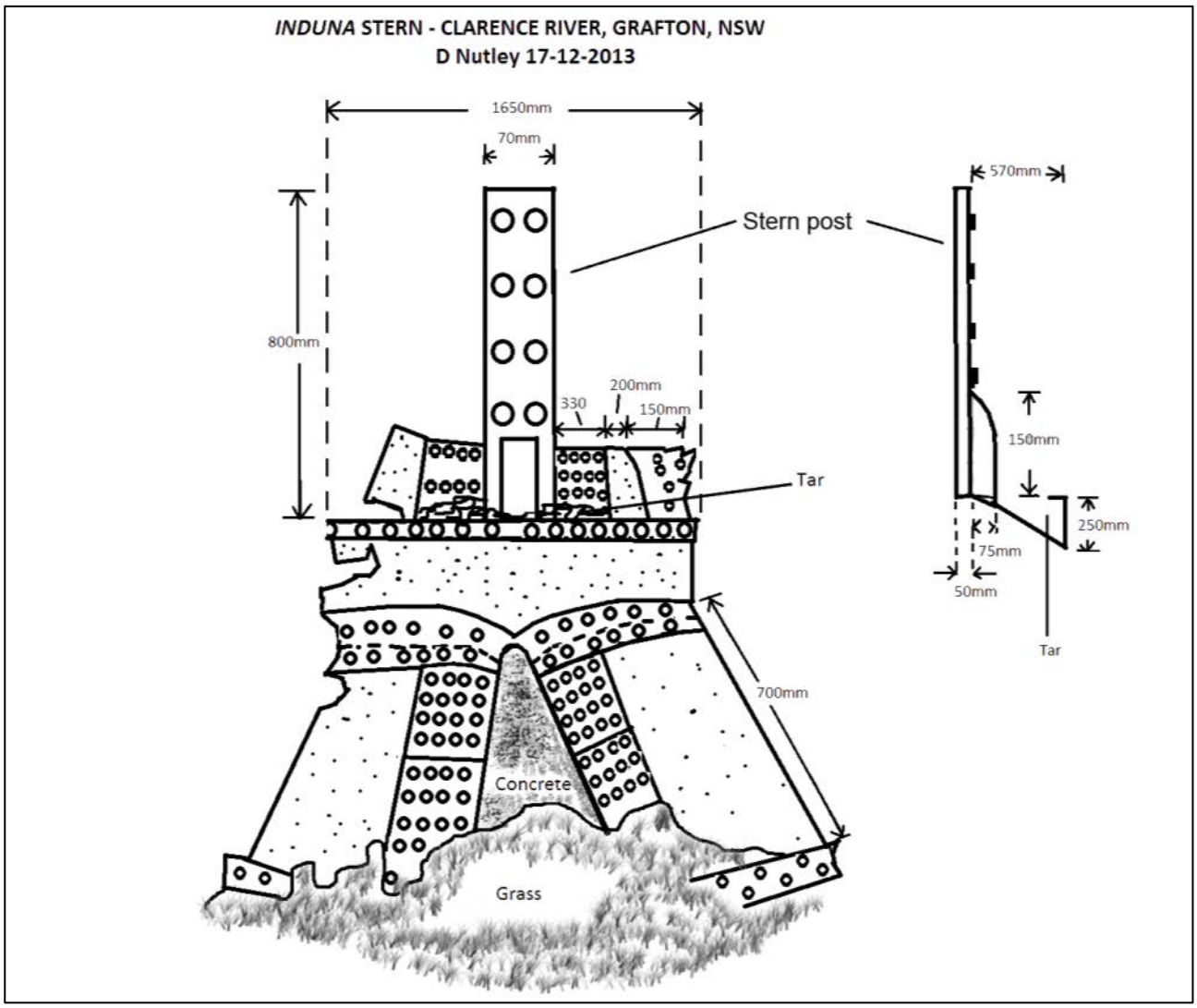

Plate 61: Raised and exposed stern section of the *SS Induna* (FMW29). View to the west from inside the hull (Source: Comber Consultants).

Feature 5: Small ferrous objects

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, metal rings and 100 x 100 mm squares of steel plate with 35-40 mm holes in the centre. The site also included the remains of a ferrous pole, approximately 1.5 metres in length and with metal plate (about 150 mm x 200 mm) at one end. The items encountered at Feature 2 are common in nature and therefore have been assessed as not being a relics or heritage items.

6.4 Conclusions

The site of the *SS Induna* (FMW29) 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. Much of the starboard side of the ship is buried under river silt and vegetation. The dive survey also established that, apart from the shipwreck remains directly associated with the *SS Induna* (FMW29), other cultural material along the southern bank of the river is primarily east of the current bridge. The objects are associated with the Grafton Bridge construction wharves (CZB36). These include timber remains from the wharf, tools, ferrous fastenings and equipment associated with the either the Grafton Bridge construction area (CZB36) or the South Grafton Railway Precinct (CZB37). 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.

With the exception of the *SS Induna*, none of the remaining anomalies identified as features through remote sensing and the visual inspection within the project area were considered relics or heritage items.