Florrie; Inspection and Suggestions
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Summary

Re-location of *Florrie* to undercover storage has been a significant step in assuring the long-term preservation of the vessel; the rate of deterioration of the hull will be slow in comparison to that which was occurring while the vessel was on outdoor display.

Additional work on the vessel hull and covering shelter would further reduce the risk of damage to the remains.

Measurement and documentation of the vessel structure should be completed as a priority before further damage occurs.

Collection and assembly of documentation relating to the vessels history should continue in order to provide a basis for future interpretation; interviews of people associated with *Florrie* during its' working life should be prioritised.

Provision of interpretative material around the hull in it's present location would allow the existing remains to be more easily understood, and assist in maintaining public support for the project.

A long term plan and budget for the preservation and display of *Florrie* should be developed; all works performed on the vessel and its' housing should be consistent with this plan.

The long term cost of preserving and displaying *Florrie* will be very large. However, a project such as this can attract outside funding which in normal circumstances would not be available to the community.

A stabilised, restored, and interpreted vessel, would be a valuable addition to the existing material displayed at the Maritime Museum, and as such would add to the attractiveness of Ballina as a tourist destination.

Present Location and Condition

Florrie is stored under an open sided metal roof attached to the western end of the Ballina Maritime Museum.
Access to vessel from outside of the building is restricted by a steel mesh enclosure.

The hull is well supported in a heavily constructed purpose built cradle of galvanised steel.
The fore and aft centreline of the vessel is lying roughly in a north-south direction, with the bow to the north.
The vessel is lying bow-down in the cradle; the load waterline is not horizontal.

The structure of the vessel is largely as it was when inspected in 2002, in extremely poor condition.

- the timber structure has been extensively damaged by rot; most pieces of timber in the vessel show signs of fungal activity.
- the interior of the vessel contains a large quantity of dirt and rubbish.
- all of the superstructure above the weather deck is missing; this was present in 2002.
- the starboard side main hatch coaming has collapsed into the hull.
- there is a large hole in the hull planking, below the waterline on the port side, aft.
- A quantity of material is currently stored on the deck.
- The vessel is sitting in the cradle with the underside of the keel horizontal, that is, the load waterline is not horizontal.

It was possible to access the area under the foredeck, previously closed off under the fibreglassed over fore-hatch; the structure in this area was found to be in a similar condition to the hull amidships, certainly no worse.

The covering roof effectively protects the hull remains from most direct sunlight and rain under normal conditions, thereby reducing the rate of deterioration due to fungal activity.
The port side of the hull is exposed to the afternoon sun.
Driving rain can wet the hull when blown through the open sides of the enclosure.
The uninsulated roof condenses moisture on the underside of the metal sheeting; drops then fall onto the deck or into the bilge.

Leaves and other wind borne material tend to accumulate under the hull and around the cradle, driven through the open sides of the enclosure.

The construction of the steel cradle and the successful movement of the hull to undercover storage has been a major step in ensuring the future preservation of the vessel.

The design of the cradle allowed the fragile structure to be moved without damage, provides good support for the hull in it's present condition, and makes it comparatively simple to add or remove support points as required. Further re-location of the hull in its' cradle would be fairly straightforward.

The hull is neatly located alongside the Maritime Museum, and being somewhat hidden by the low roof is less likely to attract negative public opinion than when it was prominently decaying on the riverbank.

Although further deterioration in the structure will occur, the rate of deterioration will be minimal compared to that which was occurring while the vessel was exposed to the weather on the river bank.

Threats to the continued preservation of the vessel in its' present location

Exposure to ambient conditions of temperature and humidity

The vessel is stored under a metal roof with open sides.
The vessel is largely protected from rain and sun, but is exposed to all seasonal and daily variations in temperature and relative humidity.

High temperatures will increase the rate of fungal activity, the rate of corrosion of metal parts, and the rate of chemical deterioration of paint finishes.

High humidity will increase the rate of fungal activity, and the rate of corrosion of metal parts.

High temperatures combined with high humidity will increase the rate of fungal activity and the rate of corrosion of metal parts even further.

Variations in relative humidity will result in dimensional changes in the timber structure, stressing fastening connections, and loosening fillers and finishes.

Variations in temperature can result in condensation forming on metal components, and the underside of the uninsulated metal roof; the resulting moisture will increase corrosion of metal surfaces and locally raise the moisture content of affected timber, increasing the possibility of fungal decay.

Continued deterioration of the timber structure

As noted above, and in the 2002 report, the hull structure has been extensively damaged by rot.

The hull interior has provided an ideal environment for fungal decay, essentially from the time the vessel was placed on the riverbank in 1975 until it was re-located to covered storage in 2006, a period of 31 years.
Wet regularly by rain through the leaking decks and warmed daily by the sun, the dark, poorly drained and ventilated hull interior would have provided an almost constantly warm and humid environment perfect for fungal growth.
Consequently, ALL of the existing timber structure is either rot damaged or affected by fungal growth in some way.

All deteriorated timber in the structure, and the accumulation of dirt and debris in the bottom of hull, serves as a reservoir for moisture and fungal spores.
Whenever the moisture content of the timbers rises above ca.20%, fungal attack of the timber can re-commence.

The moisture content of the timber can be raised to this level either by

- local saturation with free water, that is, being wet by rain or condensation, or
- by periods of high ambient humidity which will cause the equilibrium moisture content of the timber to rise to 20% and above.

Based on the climate records for Ballina Airport (records from Ballina Airport AWS attached) and the chart of Equilibrium Moisture Content (attached), it is reasonable to expect that at regular intervals the equilibrium moisture content of the timber structure will be raised to the point that fungal decay could continue.
For much of the year, from January through to June, the average humidity readings suggest that the timber moisture content will be around 14% to 16%. Any extended periods of rainy weather in this part of the year may raise the moisture content of the timber to the point that decay is could continue.

Corrosion of fastenings

Corrosion of the steel fastenings can be expected to continue slowly; there is probably a certain amount of residual chlorine retained in the timbers of the underwater parts of the hull which will promote corrosion of steel components. The rate of corrosion of the steel fastenings will be increased by elevated temperatures and relative humidity.

Continued corrosion of steel fastenings will damage the adjacent timber by chemically, by degradation of the wood fibres, and mechanically due to the increase in volume of the fastening as corrosion product accumulates.

Continued Distortion of the Structure

The hull is well presently well supported.
It will be relatively simple to monitor the hull for changes in shape; the cradle base and the contact points of the support pads serve as a stable references for check measurements, and it would a be comparatively simple job to add additional supports if required.
The additional weight of any material stored on deck will increase the tendency of the hull to compress.

Note that there appears to have been some settling and movement of the hull in the cradle supports since they were fitted;

(supports are counted aft from the bow)

Starboard side
Support 3; settled 6-10mm. at the top of the sheathing.
Support 7; settled ca.10mm., underwater section of hull.
Support 8; settled ca.10mm., underwater section of hull.

There is a gap of ca.15mm. between the hull planking and the starboard side support pad fitted under the counter.

Port side
Support 3; settled 8mm. at the top of the sheathing.
Support 7; settled ca.12mm., underwater section of the hull; there appears to have been similar movement at the sheer.
Support 8; settled 5mm., underwater section of the hull; there appears to be a lot of weight on the support prop jammed under the short broken section of sponson.

The counter appears to have shifted 15mm. to port at the port side support pad.

The keel is not supported on the #14 cradle beam (aft end of the hull).

This movement is probably due to slight flexing of the cradle base when it was re-located to the concrete slab, but gaps should be wedged, and all pad supports marked (trace around the pad with a pencil) to allow checking for any further signs of change in the hull shape.

Fire

There is no fire alarm or sprinkler system installed in the vessel or the storage area.
There are no installed electrical systems in and around the vessel, and there are no obvious sources of ignition.

However, the deteriorated timber structure, now comparatively dry, and containing a quantity of timber fragments and rubbish in the bilge, is essentially highly flammable.

The main fire risk would be probably be from a deliberate attempt to damage the vessel by setting it alight from outside the steel mesh panelling, either by throwing something through the mesh, flooding a flammable liquid under the hull and igniting it, or setting fire to leaves or other flammable material that may have accumulated under the hull.

Vandalism

Access to the hull, apart from via the Maritime Museum, is restricted by the steel mesh panelling.
The risk of malicious damage to the vessel is probably low, apart from possibly an attempt to set fire to it as noted above.

Exposure to sunlight

The port side of the hull is exposed to direct afternoon sunlight.
This will increase the rate of deterioration of paint finishes and fillers on the exposed areas, and will result in daily dimensional change in the exposed planks.
Exposure to intense ultra violet radiation will also slowly degrade the fibres of exposed timber surfaces.

Salt Air

During conditions of heavy swell and onshore winds, the air in this location close to the coast will contain an aerosol of sea water droplets.
Deposition of salt on the hull will increase the rate of corrosion of metal parts.

Attack by insects and borers

Theoretically, the hull in an open sided enclosure is exposed to any insect pests.
Generally, moist timber containing sapwood is most likely to be attacked.
Being under cover, the moisture content of the timbers should mostly be at a level below that which is attractive to insects, and given the earlier poor display conditions, any sapwood in the structure would have rotted long ago.

The fact that the vessel has survived 31 years on open display in this environment suggests that in reality, the risk of insect attack is low.

The concrete pad beneath the hull offers good protection against termite attack if kept clean.
It would be difficult in any case to detect the usual signs of borer activity, frass deposits, because of the extremely dirty state of the hull interior.

Loss of public support

It will be difficult to maintain public support for the vessel while it remains in visibly poor condition with no apparent purpose (no interpretation) and no apparent plan for conservation or restoration; to the uninformed observer the vessel could be perceived as a wreck beyond repair requiring constant input of Council finances to maintain.

Suggested work to stabilise and preserve the existing remains in the present location

1. Remove stored material from the deck

Any additional weight placed on the deck will increase the tendency of the hull to compress and distort.

2. Remove as much as possible of the recently added plywood and fibreglass decking

This decking was apparently added after the vessel was placed on the riverbank, in an attempt to keep rain water out of the hull.
It has no connection with the working history of the vessel or the construction techniques used in this type of vessel.

Removal of this decking will improve lighting and ventilation, and simplify access to the hull interior for cleaning.

It may be worth leaving in place for the time being any sections which appear to serve to strengthen the hull.

3. Remove the galvanised steel hull sheathing

Most of this sheathing appears to have been added after the vessel was placed on the riverbank;

- the sheathing was fitted around the three concrete hull supports.
- the sheet sizes are unusually large and consequently do not fit closely to the hull surface.
- the sheet laps are arranged in many cases opposite to how they would be expected to be for a boat in service (sheets laid from aft to forward so that the water flow would not tend to open the lap joint.)
- there is little sign of salt water corrosion on the sheet material.

It is probable that there is a quantity of debris trapped between the metal sheathing and the hull surface.

The metal sheathing was never well sealed along the upper edge (2002 report).
The underwater plank seams of the hull are open, and given the quantity of dirt and rubbish in the bilge, it is likely that a fair amount has been washed or fallen through the seams to remain trapped under the sheathing.

Removal of the sheathing will;

- allow the hull underwater surfaces to be cleaned and inspected.
- allow access to the plank surfaces for the purpose of repair or re-fastening.
- allow measurement of plank widths and reveal the layout of butt joints to permit the lining out of the planking to be recorded.
- allow any original scribed waterlines to be located and recorded.
- allow sheet layouts of earlier sheathing layers to be deciphered using the tack holes.
- allow accurate measurements of the hull surface to be taken in order to produce a lines plan.
- simplify cleaning of the hull interior and application of fungicide treatments

Note that for the time being, any areas of original sheathing (that is, sheathing fitted while the vessel was in service) should remain undisturbed.
Two areas identified as original sheathing are;

- the rudder; all the rudder sheathing appears to be original.
- under the concrete block supports; heavily corroded remains of an earlier steel sheathing layer remain, with tarred paper beneath.

If, in the course of removing the existing sheathing, any areas are found likely to date from the service life of the vessel, they should be left in place for the moment.

The use of galvanised steel sheathing is unusual in salt water vessels; copper and Muntz metal sheathing was more common.
Additional research is required to determine whether the use of galvanised steel sheathing was common practice for the working craft of the Richmond River or whether it was something that was fitted to *Florrie* as cheaper alternative late in its' life.

4. Secure loose hull planking

The appearance of the hull will probably be very "archaeological" with the sheathing removed, and some temporary fixing arrangement will almost certainly be required to restrain loose planks currently held in place by the sheathing.
The best methods to use at this stage would be the quickest and simplest that caused the least damage to the existing structure; either wire tying, or screwing with light gauge screws into temporary blocking fitted inside the hull. The purpose of the exercise is simply to keep the planks in place and maintain a reasonable appearance to minimise negative public comment.

5. Thoroughly clean the interior of the hull

The lower part of the hull contains a large quantity of rubbish and degraded timber, up to 100mm. deep in places.
The topsides and deck head are dusty, cobwebbed and mould stained.

This material;

- acts as reservoir for moisture and fungal spores
- is a fire hazard
- obscures the technical detail of the hull structure

As a first step, the accumulated debris should be carefully shovelled out, taking care not to damage rotted frame futtock remains and fragile surfaces of the bottom planking; it may be possible to consolidate these damaged areas later on, thereby maintaining the appearance of the hull interior.
If these parts are damaged by careless cleaning, the appearance of the internal hull structure will be diminished and very difficult to restore.

It may be worth sorting through the removed material for any artefacts related to the earlier history of the vessel.

Topside and deckhead surfaces can be cleaned by brushing and vacuuming to remove accumulated dust and mould.

Some care should be taken in cleaning out the hull interior;

- there are several pieces of broken asbestos/cement (or something very similar) in the bilge.
- the diesel exhaust system and steam boiler may have been lagged with asbestos.
- the large quantity of fungal spores present in the hull interior could possibly cause respiratory problems.

6. Measure the moisture content of the hull timbers

Measure the moisture content of the hull timbers at a number of points, and various depths, to get some indication of the likelihood of continuing decay. Investigate the feasibility of installing permanent fixed probes to allow the moisture content to be checked at various times throughout the year; resistance type moisture meters usually require pin-type electrodes to pushed into the timber; repeated measurements at the same spot will soon result in unsightly damage.

7. Treat with fungicide to prevent further decay of the timber structure

As noted in the 2002 report and above, because of the almost ideal conditions for fungal growth that existed inside the hull during the 31 years that the boat

was on the river bank, there is no part of the hull structure that can be considered free of rot, or safe from further attack.
A fundamental step in assuring the preservation of the remains would be to treat the entire structure with a fungicide.
There are a number of products available, but the simplest to use would probably be a borax solution.
Borax is relatively inexpensive, water soluble, essentially non-toxic to mammals, non-corrosive, colourless, and somewhat fire retardant.

Being water soluble, borate treatments will leach out when exposed to the weather, and require periodic re-application; this would not be an issue in the case of *Florrie*, now being under cover.

Assuring penetration of the fungicide deep into large structural members would require that the structure remains completely saturated for some time, which may not be achievable or practical; an alternative treatment in these situations might be to insert borate plugs.

It would be worth doing some further research to determine the detail of the method if this work was contemplated, and to check whether any alternatives treatments have been developed recently (none to my knowledge).

Treatment of the hull would be a major job and would require an arrangement of bunding and pumps to contain run-off and allow re-cycling of the fungicide fluid.

Prior to this treatment it would be worth identifying which parts of the existing structure were added after the vessel was removed from service.
If it can be shown that these parts are of no technical or historical interest, and they are in poor condition and have no structural function, then they should probably be removed, in order to allow better access for the fungicide to the important parts of the hull.

Note that some borate MSDS sheets suggest that the fumes emitted by burning borate treated timber are toxic, and that in the case of fire, firefighters should wear breathing apparatus.

See articles relating to the use of borates attached to the 2002 report;

Boron Wood Preservatives And Their Application To Historic Vessels At San Francisco Maritime N.H.P.
David Casebolt

Borates Offer Effective Protection With Less Hazard to the Environment.
A.B. Curtis & L.H. Williams

Borate Wood Preservatives - Marine Applications?
Richard Jagels

8. Fit a breathable dust proof cover

After the fungicide treatment the hull would be very clean, so provision of a lightweight breathable cover, eg. Tyvek, on a light frame over the deck, would keep it that way, saving a lot of recurring work and minimising the potential for damage to fragile parts of the hull.

9. Install a fire detection system

If possible, install some form of fire detection and alarm system; further research would be required, I am not sure if conventional smoke detectors would be effective in an open sided shed; thermal sensors may be.

10. Modify the shelter

Adding insulation under the metal roof will reduce radiant heat in summer, and prevent condensation from dripping on the hull.
Adding shade cloth along the western mesh panels will reduce the effect of afternoon sun on the port side of the hull.

Alternatively, the sides of the shelter could be closed in; this would keep out wind-blown rain and leaves, protect the hull from sun, reduce the risk of malicious fire damage and would probably simplify the installation of a fire detection system.
If the building were to be closed in, it would be necessary to insulate the roof to keep the temperature to a reasonable level in summer.
If the roof and walls were insulated, a more stable environment would be provided; variations in temperature and humidity would be slower and smaller.
If the building was well sealed, the hull could probably be kept reasonably clean without a cover, allowing it and accompanying interpretation material to be accessible to the viewing public.

11. Record the details of the hull structure with photographs and drawings.

After cleaning, the technical detail of the hull should be recorded with drawings and photographs.
All structural components should be measured and the fastening system described, and an attempt made to separate original or earlier parts of the structure from later repairs or modifications.

Evidence may be found of;

- earlier deck layouts
- the location of previously fitted masts
- earlier engine beds and machinery installations

A shell expansion diagram should be produced to record the layout of planking and framing; this diagram can also be use to record future conservation and repair work.
A naming system should be devised to allow all parts of the structure to be easily identified without confusion.

12. Measure the hull shape and produce lines plan and construction drawings.

The hull should be measured and a number of drawings produced.

- "as lifted" lines
- faired lines
- construction details
- outboard profile and deck plan, prior to the loss of the recent superstructure
- outboard profile and deck plans of earlier configurations, if sufficient evidence and detail can be found.

Some basic measurements of the hull were taken for the purposes of constructing the cradle, but the poorly fitting sheathing was in place at the time and I feel it would be better to start with a new set of measurements.

The measuring process will reveal areas of existing distortion in the hull and assist in planning re-shaping of the hull if structural repairs are contemplated in the future.

The faired lines plan will enable calculations of stability and load carrying to be performed, and will allow the *Florrie* hull to be compared with similar craft for which plans exist.

The drawings listed above would allow an accurate replica of *Florrie* to be constructed.

The completed drawings can be used to illustrate earlier configurations and can be made available for sale to interested parties such as model makers.

I suggest that David Payne (02 9969 1563) is contacted to measure the hull and produce the drawings noted above.
David Payne has measured and drawn a number of historic vessels as a sub-contractor to the Australian National Maritime Museum.

13. Record selected measurements as an ongoing check against distortion

A number of measurement points should be marked at appropriate points on the hull and cradle to allow the hull to be periodically checked for changes in shape.
If any areas of the hull are found to be distorting over time, add external or internal props or supports as required.

14. Arrange interpretation material

If the hull can be stored without a dust cover, that is if the hull shelter can be made reasonably dust proof, or arrangements can be made to regularly clean the vessel, the hull remains, in a stable but unrestored state, could be used as the basis of an exhibition using interpretative material based on the themes outlined in the section following.

Developing an exhibition around the hull remains would be valuable in maintaining public support for the vessel.
In my experience, the general public does not have a good understanding of heritage management issues; many would be inclined to view the uninterpreted *Florrie* remains as a particularly large and foolish waste of limited Council resources, with no apparent benefit.

Setting up interpretation material related to *Florrie* would form a valuable addition to the existing exhibits of the Maritime Museum and would allow the importance of the apparently derelict hull to be explained.

The only means of representing the missing superstructure is with drawings and photographs; the above water parts of the hull are the parts that would normally be seen, and in the case of *Florrie*, with low freeboard, the superstructure represented a significant proportion of what was usually visible.

From an interpretation perspective, the poor condition of the hull does allow technical detail normally hidden, to be easily seen; e.g. the plank thickness and framing arrangement are easily seen through the hole in the underwater hull on the port side, aft, and the absence of large areas of deck planking allows the deck and hull framing to be easily seen.

It may be possible to allow the hull interior and decks and to be viewed, by providing visitor access via ramps alongside the hull.

Suggestions for Additional Repairs

Additional work could be carried out to improve the quality of the exhibit.

Level the hull

At the moment the hull is sitting in the cradle with the underside of the keel parallel to the floor, the load waterline is not horizontal.
The profile of the hull and the inclination of the sheer line are not representative of the vessel's appearance as it would have been while afloat; the unusual aft rake of the stem is disguised by the bow-down attitude of the hull.

Levelling the hull would require careful jacking along the full length of the keel to raise the bow, and possibly some additional blocking under the aft end of the keel as the heel will swing downwards as the bow is raised.

At the moment, the white boot top at the upper edge of the metal sheathing is 503mm. lower at the bow than it is at the stern. Note, however, that the white boot top at the bow is not on the load waterline, but a considerable distance above it, something like another 600mm. to 700mm.
The bow would therefore have to be raised about 1100mm. to 1200mm. in order to have the hull sitting parallel to its' floating waterline.
The clearance between the top of the stem and the underside of the metal roof at the moment is currently 600mm.; it may be possible to fit the top of the stem into a sheet metal housing added around a hole cut in the existing roof.

All the existing support struts would have to be re-built to support the hull in this new position.

Raising the bow would also allow for a better perception of the shape of the hull, as the underwater body is lifted out from between the cradle longitudinal beams.

At this stage it would be worth attempting to remove existing distortion in the hull shape by fitting adjustable supports where necessary to allow the hull to be slowly re-shaped.
The objective here would be to being to bring the hull closer to the "as built " lines, and remove any obvious deformation.
The aft section of the keel is hogged (droops) 130mm. in 3500mm. aft of the #16 cradle beam; the sheer line this area also appears flat; the hull was unlikely to have been built this way.

Structural Repairs to the Hull

At the present time, the hull is structurally unreliable and unpredictable.

The keel and keelsons, the stringers and sheer clamps, the engine bed assembly, the two watertight bulkheads and some of the deck beams, clearly retain some degree of strength; but most of these components show locally severe rot damage.
The planking and framing are generally very badly affected by rot, and the security of the fastenings is doubtful; structurally, the assembly of planks and frames must be considered to be completely unreliable.

In short it is not really clear what is holding the vessel in shape. I suspect that the sheer clamps connected to the two bulkheads, and the stem forward, are doing most of the work of supporting the deck structure.
The hull planking and framing is probably more or less suspended below, fixed in space to some extent by the connection to the bilge stringers.

The objective of work suggested below would be to repair parts of the structure so that the hull could be relied upon to support itself and hold its' shape in the long term, and allow possible future reconstruction of the deck and superstructure.
As strength is built back into the hull, the requirement for external supports will be reduced, which will improve the appearance of the exhibit; it may be possible to allow visitor access to reconstructed areas of the deck.

The repairs below are suggested as a possible means of stabilising the hull structure, without excessive loss of the existing original hull fabric.
Where possible, repair work should be done using materials appropriate to the style of construction of the vessel and arranged so as not to confuse or obscure the original structural detail.

1. Create two structurally sound bands around the bilge of the hull by repairing both bilge stringers as required, and through bolting to repaired original or replacement planks on the outside of the hull; additional packing may be require to separate the stringers and planks where the original frames are badly deteriorated.
Each bolted bilge stringer and plank assembly will form a rigid curved beam.

Connect the forward ends of the stringers to each other and to the stem with steel plate brackets.
Connect the aft end of the upper stringers to the counter framing.

2. Create a structurally sound band around the sheer by repairing or replacing the sheer strake and plank beneath, and the sponsons, and through bolting to the repaired sheer clamp.
Short additional sections of new frame may be required to be fitted either between remaining original sections, or as replacements for deteriorated original sections, in order to connect the sheer strake to the plank below.
Fasten the forward ends of the sheer clamps to the repaired upper section of stem and to each other.
Connect the aft ends of the sheer clamps to the counter framing.

3. Tie the two halves of the sheer together by repairing or replacing deck beams as required; if the beam ends are not dovetailed into the upper edge of the sheer clamp, some additional steel tie-rodding may be required.
Repair the deck beams to a standard that would allow visitor access to a re-constructed deck and would support the weight of a replicated superstructure.
Ideally, the appearance of the structure would be maintained by repairing rotted centres and beam ends in preference to replacement of complete beams.

4. Fit internal steel fabricated trusses, which will support the repaired deck beam and sheer assembly above the keel, and connect to the repaired bilge stringer/plank bands.

The trusses would probably have to be spaced at about 2 metre intervals; the weight of the deck would be transmitted from the truss to the cradle via the keelson and packing blocks fitted between the keelson and the keel.
Anywhere the keelson and keel were not capable of bearing the compression load of the deck, a steel pin or tube support would have to be inserted through a hole bored in the keel and keelson (and the external bronze or copper worm shoe) to transmit the compression loads to the cradle transverse supports, or an additional support point fitted beneath the keel.

These trusses could probably be avoided through the amidships section of the hull; a repaired carline and coaming assembly, and the repaired sheer clamps/sheer strake/sponson assembly would probably be sufficiently rigid to span the length of the hatch opening without distorting in the long term.
This would leave the structure of the amidships section of the hull uncluttered and clear for viewing by visitors.

A few trusses of this type have been fitted to the *Lady Denman* ferry, for local reinforcement only; the *Lady Denman* hull is in much better condition.

5. Secure the planking in place.
The planking and framing are no longer required to support the weight of the deck; they are required only to support their own weight, and remain stable in the correct location, essentially hanging beneath the supported deck structure.
The function of the remaining original planking is to define the hull shape, represent the technology of the original structure, and to provide a means of securing a replica sheathing layer should one be re-fitted.

There are three possible ways to achieve this;

(a) Re-fasten the planking, as required, to original frames with screws.
Where the original frames are deteriorated to the point that screws will not hold, remove the original frames if possible, and repair the frame centres to allow screw fastenings to grip securely; re-fit the repaired frame in it's original location.
Where the original frame sections have been lost, fit replacement timbers shaped as closely as possible to match the missing originals.

(b) Fit light steam bent timbers at ca. 600mm. spacing between the original frame pieces and screw fasten the planking to these.
There may be some difficulty in bending these timbers around the hard turn of the bilge amidships; some alternative method may be required here.
It would be preferable to minimise the amount of added material in order to maintain the original appearance of the structure.

(c) If it is decided to re-fit underwater metal sheathing to the hull for display purposes, it may be possible to secure the planking with thin bands fitted from the upper edge of the sheathing to the keel at ca.300mm. spacing.
These bands would be working in tension, so would need to be connected at the upper ends to the repaired plank below the sheer strake (via a tension strap fitted inside the hull), and at the lower ends, either to each other across the keel, or to securely re-fastened garboards (first plank either side of the keel).
The bands could be either of metal, or an inert material such as glass or carbon fibre; the bands would be screw fastened to each plank.
If the underwater sheathing was re-fitted in the traditional manner over a layer of tarred felt or paper, then 2mm. to 4mm. thickness would be available for the bands outside the plank surfaces.
An advantage of this method is that the original framing system would not be interfered with.

Although much of the internal framing is severely damaged by rot, careful consolidation of the frame remains may allow badly damaged frame sections to be retained in place.
If all the badly rotten frames are discarded, the original framing layout will become increasingly difficult to perceive; the system of framing employed in this vessel is one of the major points of technical interest and should be preserved where possible.

Re-arrange the hull supports

If the hull structure was stabilised, the number of external props could be reduced, which would improve the appearance of the exhibit.
Once all parts of the hull structure are reliably connected, the main purpose of the external props would be to stop the hull falling over.

This could be achieved by;
(a) fitting props in compression between the repaired bilge stringers and the cradle longitudinal beams, or
(b) fitting tension rods penetrating the hull skin and connecting the internal truss frames to the cradle longitudinal beams.

Tension rods could be of much smaller diameter than props fitted under the bilge; the appearance of the hull would be improved.
Some external propping under the counter may still be required to prevent long-term distortion of the repaired structure.

Re-construct the deck and superstructure

If the hull structure was stabilised, re-construction of the deck and missing superstructure could be considered.
Any repair or re-construction should ideally be based on evidence contained in the remains of the hull, or photographic or documentary records.
At the present time, the most clearly documented configuration of the vessel is the most recent one, as the vessel appeared when placed on the river bank in 1975.

A re-constructed deck and awning could be made accessible to visitors and some interpretation material could be placed on board the vessel.

Re-construction of the superstructure would require a higher ceiling over the vessel, and preferably a larger floor area than the current space, to allow the shape and size of the vessel to be better appreciated.

New Housing for the Vessel

If re-housing of the vessel is contemplated to allow the superstructure to be replicated, care should be taken with the detail design of the building in order to ensure that it will provide conditions suitable for the long-term preservation of the vessel.

1. The building should be well insulated to minimise the rate and magnitude of daily and seasonal variations in temperature and humidity.
The building should be able to maintain the basic standard requirements for museum exhibition spaces, 20°C +/- 2° and 50% +/-5% relative humidity, with minimum recurring energy costs, and have the ability to maintain this standard through the normal range of ambient conditions experienced in Ballina.
20° and 50% RH should result in an equilibrium moisture content for the timber structure of around 9%, much further into the safe range as far as fungal decay is concerned, and the rate of corrosion of metal components will be reduced at these more moderate levels of temperature and relative humidity.

2. The building should be fitted with an accurate environmental monitoring system.

3. The building should be fitted with an effective fire detection and extinguishing system.

4. The building should be designed to exclude dust and salt laden air.

5. Any large glazed areas should be arranged so as to minimise added heat load through direct sun entering the building and should be coated with a film to reduce ultra-violet levels within the display area.

6. Internal lighting should be of a low UV type.

7. An area with low and controllable light levels should be provided for the display of light sensitive material; e.g. photographs, charts, plans, works of art.

It has been suggested that by glazing the western side of the current enclosure, the entire vessel could be better viewed from the park.
This is certainly a good idea, except for the issue of afternoon sun.
If however the hull were to be re-aligned east-west, a glazed wall facing south to the river could be employed without receiving any direct sunlight.

The ideal solution would be to construct a purpose designed building on the existing Maritime Museum site to house the Maritime Museum collection, *Florrie*, and *Richmond*, all under cover in a controlled environment, with *Florrie* aligned east-west on the south side of the building.

The design of the *Florrie* cradle makes it a relatively simple job to move the hull around on hard surfaces; re-location of the hull within the existing site would be relatively straightforward.

A building with a controlled environment would allow for the temporary display of exhibition material borrowed from larger Museums, or the return on loan of items that relate to the Richmond River region.

A good example of a large timber vessel housed and displayed in a purpose designed building is the *Lady Denman* ferry at Huskisson N.S.W.
The *Lady Denman*, although never in as poor physical shape as *Florrie*, has been extensively restored, but is not yet complete.
See photographs on the attached CD.

In considering the long term options for *Florrie*, I think it would be valuable for Council to contact the Lady Denman Museum and arrange a visit.
The Director of the Museum is Robin Oliver; ph. 02 4441 5675.; I have mentioned the *Florrie* to her.
Web address is www.ladydenman.asn.au.

The *Lady Denman* exhibition is essentially the end point for the long term static display of a timber vessel on land.

The vessel is;

- Protected from the elements
- Well supported
- Restored to an appropriate configuration

- Displayed in a space sufficiently large to allow a good viewing perspective of the hull
- Supported by the exhibition of relevant interpretative material

To arrive at a similar arrangement would be an appropriate long term objective for the preservation of *Florrie.*

Opportunities for Interpretation

The preserved remains of *Florrie* could be used as the basis for exhibition material relating to a number of themes.

Construction methods used in *Florrie*

The work of the builder of *Florrie*, Rock Davis, and his activities at Blackwall on the Central Coast.

A comparison of the construction methods seen in *Florrie* with the different traditional methods used in Australian and European vessels at different times.
The planking and framing system used in *Florrie* can be demonstrated with a small section of planks and frames constructed from new timbers; other building systems can be demonstrated in the same way.

The types of timber found in parts of *Florrie* and the specific uses of various timber species in wooden shipbuilding.

Metal sheathing techniques; the use of copper, Muntz metal, and galvanised steel.
The life and activity of the teredo worm and examples of damage seen in *Florrie*.

The tools and techniques used by shipwrights in the construction of wooden vessels.

Timber Shipbuilding in the Richmond River region

Timber boat and shipbuilding in the Ballina district, from the early builders to the present day.

Early builders and examples of their craft; (list taken from Windsor Lang).

William Yabsley, Coraki
Coraki
Schoolboy
Examiner
Index
Beagle

Robert McKenzie, Lismore
Lismore

Fred West, Gundurimba
Trition

Robert Armstrong, Wardell
Magnet

Conroy Bros., Woodburn
Messenger

Thomas King, Woodburn
Mabel

Emma Pyers, Irvington

Yabsley, Burns Pt.
Protector

O.R.Jones, Bungawalbyn Creek
Mystery

O.R.Jones, Oakland
Britannia
Araucaria
Australasia
Captain Frederick Davis

In more recent times, Mclaren's and Browns, builders of fishing craft, and Broadwater Yachts builders of yachts, (for example, there are probably others) and numerous amateur builders.

Design Features and Characteristics of the *Florrie* hull shape

An easily driven hull form due to the limited power of engines available at the time of construction.

Ram bow and counter stern, aesthetic features fashionable at the time of construction.

The requirement for moderate draught for use in shallow rivers, and low freeboard to simplify loading; both features related to the prime use of the vessel in sheltered water only.

Calculation of weight and carrying capacity, inches per ton immersion, based on the measured lines plan.

Comparison of *Florrie* with other craft used on the Richmond River and craft used on other Australian inland waterways.

Marine Engines

The development of marine propulsion systems and Australian manufacturers of steam engines.
Florrie was powered initially with an English made steam engine, replaced in 1882 with a single Australian manufactured steam engine.
A steam engine was replaced in 1963 with a diesel.

Examples of, or information relating to, the actual engines fitted to *Florrie.*
Operating principles and differences between the various types of steam and diesel engines.

The working history of *Florrie* and modifications during its' life

The configuration of Florrie was probably altered in accordance with changes in its' activities.

In early days the vessel was apparently schooner rigged with two masts.
Florrie was wrecked on the Richmond River bar in 1882 and subsequently repaired.

Florrie was apparently twice re-fitted, by the B.A.T. company and Grant Bros; these re-fits possibly incorporated alterations or modifications related to the changing uses the vessel.
The arrangement of the superstructure may have been altered several times.

Florrie apparently served as a home for the Grant brothers, and was also occupied from time to time while on display on the river bank.

The commercial activities of *Florrie* and similar craft as part of the economic and social life in the Richmond River basin.

Vessels similar to *Florrie* were involved with;

The transport of;
Local people
Commercial travellers
Livestock
Groceries
Building Materials
Agricultural equipment
Stone barges and log rafts
Timber
Dairy products

The distribution of consumer goods (store boats) and newspapers

The carriage of passengers for social functions and recreation, to race meetings and regattas

N.S.W. Coastal shipping

Coastal cargo vessels carried goods and people to the region, and carried away agricultural produce; *Florrie* and other similar vessels served to distribute goods and people up and down the river.
In the absence of an efficient road network the coastal steamers were the connection between coastal centres and Sydney and Brisbane.

Research and Documentation Required

All possible documentary material relating to *Florrie* should be assembled to assist with future interpretation and repair.
It would be better to begin this task sooner rather than later; as time goes by people with first hand knowledge of the vessel will become older and fewer, and documentary evidence is more likely to be lost.
Assembling the documentary evidence should be treated as an ongoing task. Regular public appeals for information can help.

1. Collect and assemble copies of all available reference material relating to the vessel.

Arrange this material in chronological order, or according to periods of ownership or commercial activity, in an accessible and easily modified format; e.g. ring binder folders.

The ownership of *Florrie* can be divided into the following periods (extracted form Helen Wilson's report);

1. 1880 to 1882; F.G. Crouch, until wrecked on the Richmond River bar. Florrie was apparently schooner rigged, fitted with an awning, funnel and deck house, and powered by a steam engine of English manufacture.

2. 1883 to 1899; T. Fenwick; apparently all above the sheer re-built, fitted with a new steam engine, manufactured in Australia, still schooner rigged, used for passenger carrying.

3. 1899 to 1902; Charles Jacobsen, probably still passenger carrying.

4. 1902 to 1906; Charles Dorrough, activities not clear, possible ceased passenger carrying in April 1904, not re-surveyed.

5. 1906 to 1913 British American Timber Company; probably towing log punts; was apparently re-modelled by B.A.T.

6. 1913 to date unknown Dalgety and Company Ltd.; activities not clear.

7. Date unknown, sold to Grant Bros., in their ownership by 1937, and until 1962 used to tow gravel a gravel dredge; also apparently served as a home to the operators and was re=modelled by them.

8. 1963 sold to S.G. White trading as Ballina Slipway and Engineering; steam engine replaced with a diesel; towed a gravel dredge until 1975.

9. 1975 to 2006; transferred to Ballina Council, engine removed, and placed on display on the river bank; superstructure collapsed and removed early 2006.

10. 2006; hull remains moved to covered storage at the western end of the Maritime Museum.

Separate the collected material into;

Photographs of *Florrie*

- in service
- on the riverbank
- in it's present location

Photographs of similar vessels

Newspaper and other documentary reports concerning *Florrie*
Newspaper and other documentary reports concerning similar vessels.

Records of interviews with people associated with *Florrie*.

Reports and suggestions relating to the history and preservation of *Florrie*.

Technical records relating to *Florrie*
Bills of Sale
MSB Survey Reports
Receipts for repairs and slipping
Council records relating to re-location to the riverbank and repairs carried out 1975 to 2006.
Measurements and drawings produced for the purpose of constructing the cradle.

Create an accurate and easily updateable index of all the above archival material.

The purpose of assembling and arranging this material is to enable easy access all available documentary evidence and to allow the various accounts and evidence to be compared for accuracy.
Copies of all material should be obtained; apparently unimportant items can become significant when combined with other seemingly unimportant details.

Arrangement of photographs and the technical records is of critical importance if any restoration of the vessel is contemplated in the future, or if any attempt is to be made to record the various earlier configurations and details of the vessel with drawings.
Details contained in photos and documents can be a valuable guide for repair work and can assist in separating parts of the structure which may have been added or modified at different times.

Much of the above documentary evidence can be used as part of a display related to the vessel; a comprehensive and complete documentary record will make it easier to produce logical and informative interpretative material.

It will be difficult to produce a coherent history of the vessel with any depth, in the absence of a reasonable documentary record.

Original photographs should be copied and the originals and negatives placed in archival storage.
Good quality copies should be obtained of all published images, e.g. from newspapers.
If photographs are to be scanned to be retained as digital files, scanning should be at the highest possible resolution and the files saved in TIFF format.
All images should be dated and referenced, and any copyright issues clarified.

2. Identify gaps in the documentary record and attempt to fill them.

Helen Wilson appears to have made a fairly thorough search of official documentary records for information about *Florrie*; she may be able to suggest further areas for research.

It would be worth attempting to contact and interview people in the district who were associated with *Florrie* during its' working life; there don't appear to be any such accounts in the existing records for the vessel.

This can often produce valuable information about the day to day operation of the vessel, and details and incidents not normally considered necessary to include in official or written records.
Helen Wilson mentions a Reg Waters, manager of Ballina Slipway from 1943 to 1990; he may be a good source of information regarding the technical details of *Florrie* in the later period of service.
A Mr. Lionel Newman, a former ferry driver for Grant Bros. is mentioned in the letter from E.L.Dann.
James McLean is noted as a *Florrie* crew member 1953-57.

There does not appear to be any record of work carried out after *Florrie* was placed on the river bank, or work that was done specifically to prepare the vessel for removal from the water.
This information would allow recently added parts with no connection to the vessels' working life to be separated from the original structure.

If it can be shown that the vessel was sheathed underwater during its' working life, replication of the in-service sheathing arrangement for display purposes would be an effective and straightforward way of dealing with a large quantity of underwater planking in poor condition.

3. Attempt to locate and obtain any remaining artefacts related to *Florrie*

The small quantity of timber remaining from the collapsed superstructure, currently stored at the Council depot, should be re-packed and clearly

marked; for the present, it would probably be safer if stored alongside or beneath the hull.

A name board from *Florrie* is apparently in the possession of the Richmond River Historical Society.

The steam engine removed in 1963 was apparently installed in the *Kyogle*, the remains of which finished up on the river bank at Coraki.

Any small related artefacts can form part of a supporting display.
Any large items can possibly be re-fitted to a restored hull.

Long Term Plan

A long term plan with clearly defined objectives should be developed for the vessel.
If all work carried out is in accordance with this plan, the desired result will eventually be achieved.

The cost of work required to stabilise, house and interpret *Florrie*, will be enormous.
However, the end result would be of significant ongoing benefit to the local community, and the project can be used to attract outside funding, specifically for heritage projects, which would not normally be available for other uses. $1000 of outside funding, that is, not Council money, is $1000 that has been introduced into the local economy, and whether it is spent on parks, libraries, or pre-school centres is immaterial.
Rather than being seen as a drain on Council resources, the process of preserving and restoring *Florrie* should be presented as an opportunity to add to the attractions of Ballina and in the process assist the local economy.

Michael Staples
21/9/09

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