

Note / Memo

**Haskoning Australia PTY Ltd.
Maritime & Aviation**

To: Paul Busmanis
From: Rick Plain & Gary Blumberg
Date: Friday, 16 March 2018
Copy:
Our reference: M&APA1326N011D03
Classification: Open

Subject: North Creek Boat Ramp Facility - Concept Design Memo

1. Background

The Ballina Shire Council is planning to upgrade seven (7) small craft facilities along Richmond River and North Creek. The maritime infrastructure proposed at these sites comprise boat ramps, associated carpark facilities and pontoons.

A previous concept design and memorandum was prepared by RHDHV in 2017 for proposed maritime works at the North Creek (Lennox Head) boat ramp. There is an existing informal ramp at the site which is currently utilised by the local boating community and it is the only ramp that provides local access to North Creek from the Lennox Head area. Council's intention is to improve safety and functionality of the boating facility. The previous concept design involved the construction of a new boat ramp and associated facilities including:

- formalisation of the existing boat ramp with construction of a Flexmat™ boat ramp at a suitable grade;
- formalisation of parking facilities; and,
- an option for installation of a pontoon.

Council and the Roads and Maritime Services (RMS) reviewed the previous concept designs and provided comment. The comments are summarised below:

- General sentiment is that the boat ramp can be used in its current state and the designs would not provide sufficient improvements to boating experience to justify the anticipated cost. RMS would support minor funding to improve ramp gradient but acknowledge funding may be better used for other facilities.
- Flexmat™ design for the boat ramp is not preferred as past experience indicates that it deteriorates over time leading to rutting and/or differential settlement.
- Water depth upstream and downstream of the site is restricted. Users are primarily small dinghies and runabouts.
- Request to explore options of modifying the former punt ramp.

Council has also advised that a new road bridge over North Creek to connect North Creek Road on the eastern side to North Creek Road on the western side is proposed to alleviate congestion on Angels Beach Drive (major road connection downstream). This project is potentially 10 to 15 years from realisation. However, it would result in significant modification to the North Creek boat ramp site.

The current users are reported to be smaller craft including jet skis, small dinghies/motor craft used primarily for fishing and passive recreational craft (paddle craft). The limited vessel size is primarily due to the shallow water depths and narrow navigation widths that restrict larger vessels from navigating North Creek. Consequently, demand for the facility is limited and this is not envisaged to change in the future.

It is apparent that the site is a low priority for Council as it attracts a minimal number of boating users. Combined with the possibility of demolition of the facility to accommodate construction of a new road bridge, there is minimal incentive or benefit for Council to undertake significant upgrade works in the immediate future.

The previous concept design has been refined and is documented herein. The new concept design has regard for Council and RMS' previous comments. This memo should be read in conjunction with the Basis of Design (BoD) document "*M&APA1326R001D01 – Ballina Maritime Works BoD*" which sets out all key design parameters for the development and "*M&APA1326N100D0.2 – Change of Scope – Brunswick Street and Lennox Head (North Creek)*". The BoD includes a review of all existing site information, environmental conditions, opportunities, constraints and relevant guidelines and standards used to inform the design process.

The concept design and layout of the facility has largely been developed in consideration of the NSW Boat Ramp Facility Guidelines, (referred further simply as the "Guidelines") published by Roads and Maritime Services (RMS) in September 2015, which sets out the general guidance on the design of boat ramp infrastructure facilities for small recreational craft. It is important to consider these Guidelines:

- have been developed over decades of boat ramp and maritime facilities usage;
- are consistent with the relevant Australian Standards;
- have recently been updated to reflect modern day usage and expectations of boat ramp users; and,
- have been prepared in consultation with key representatives from governmental, non-governmental and recreational user groups.

However, the Guidelines are based on a design vessel length of 7.5 m and beam of 2.5 m. The revised design vessel dimensions have been adopted as:

- Length - 4 m (13 feet)
- Beam – 2.5 m
- Draft – 0.5 m

These dimensions reflect the existing small and passive craft users at North Creek and associated navigation constraints. Reducing the design vessel length primarily impacts the dimension and layout of carparks, manoeuvring areas and the like. Further, it may not be possible to meet all the specific requirements of the Guidelines due to site or funding constraints.

All reference to Relative Levels (RLs) herein are in relation to Australian Height Datum (AHD).

2. Existing Boating Infrastructure and Site Constraints

When reviewing the proposed concept design drawings, it is important to note the existing condition of the infrastructures and the constraints of the site.

The site is accessed from North Creek Road, which is a single lane asphalt road in reasonable condition that runs through farming land. The road surface changes to gravel at the bend, immediately north of the boat ramp. North Creek Road is a no through road with one private resident (264 North Creek Road) located between the boat ramp and the end of North Creek Road. The end of North Creek Road and the gate to the resident's property is approximately 75 m south of the boat ramp.

Two manholes are located near the bend at North Creek Road, approximately 25 m from the current boat ramp. It is understood the manholes service two sewer mains that cross in an east-west orientation under North Creek at the site of the former punt crossing. In addition, overhead power lines cross North Creek, immediately upstream of the sewer mains. The powerlines generally follow North Creek Road with deviations to service local residents. Underground telecom lines are located on the south and west side of North Creek Road. These telecom lines are located parallel to the private property boundary.

Informal parking is located near the boat ramp. The car parks are underlain by gravel, dirt and grass. The available parking area is considerably constrained by:

- the overall size of land available at the site, which is bordered by the North Creek to the south and private property to the north;
- North Creek Road which runs through the existing site;
- the overhead power lines and underground utilities including sewer and telecom; and,
- sensitive vegetation (mangroves) which line the banks of the site.

The vast majority of North Creek is lined with mangroves. Mangroves typically colonise tidal flats in sheltered estuaries and bays. Mangroves typically grow in a sandy and silty substrate. They assist in stabilising the foreshore by reducing estuarine currents and absorbing wave energy, which decreases the potential for erosion and leads to suspended sediments dropping out of suspension. Mangroves usually grow between mean sea level and mean high water mark. The width of mangrove stands along the shoreline provides an indication of the foreshore slope and substrate.

Upstream and downstream of the informal boat ramp, the creek is lined with mangroves. As expected, the nearshore substrate comprises unconsolidated fine sand and silt with a high organic content.

However, from the high water mark to approximately RL -1.0, the existing informal boat ramp is founded on gravel and crushed oyster shells. A major constituent of oyster shells is calcium carbonate, which is used in cement. Material with a high calcium carbonate content acts as a binder when mixed with sand and gravel, which results in a 'relatively' firm and compacted substrate suitable for pedestrian and vehicle traffic. Although this substrate and surface is inferior compared to engineered products such as concrete or asphalt, it has been found to be suitable for low trafficked areas. It is assumed that the shells have been deposited by oyster farmers operating nearby commercial leases. Below RL -1.0, the substrate comprises unconsolidated fine sand.

The existing ramp is flat with a ramp slope of approximately 1:14 to 1:15 (vertical: horizontal). The guidelines recommend a slope of 1:7 to 1:9 (vertical: horizontal).

Council has reported that the existing facility requires minimal maintenance. Importantly, the current informal boat ramp does not require cleaning to remove marine growth. It is relatively firm under foot and there are no reported slip issues. It is understood that Council does not intend to introduce features that require significant maintenance.

3. Proposed Carpark and Manoeuvring Areas Concept Design

As part of the current design process, consideration has been made to the operational aspects of the facility, including: general traffic flow, parking arrangements and required manoeuvring areas. It is important these aspects be carefully considered as they govern the operability and efficiency of the facility.

It is proposed to realign the section of North Creek Road running alongside the creek so that the road is parallel to the private property boundary and offset by a distance of approximately 1-3 m. This would provide additional space near the boat ramp for manoeuvring and parking.

The existing road near the boat ramp is at approximately RL 1 to 1.5. This is below the 20 year Average Recurrence Interval (ARI) flood level of RL 1.5. It is proposed to raise the parking area, manoeuvring area and North Creek Road to RL 1.5. In addition to raising the facilities to above the flood level, it would allow the slope at the top of the boat ramp to be increased, which would be beneficial for launching vessels at high tide.

To prevent erosion of the fill material by estuarine processes, geofabric and 2 layers of rock would be placed on the seaward face at a slope of say 1:4 (vertical:horizontal). The rock armour would be approximately 100 mm diameter.

North Creek Road is currently higher than the adjacent paddock (opposite the boat ramp), which is private land forming part of 264 North Creek Road. There is a depression in the north western corner of the paddock where water would pond until it breaches North Creek Road. Raising the road and manoeuvring area would magnify the issue of water ponding. For that reason, a head wall and drainage culvert are proposed to pass under North Creek Road. The culvert would discharge into the drainage channel that is orientated parallel to North Creek Road, on the northern side of the road (approximately under the power lines).

The vehicle manoeuvring distance in front of the ramp crest would be 16 m (reduced from 20 m, in the Guidelines due to a reduction in the design vessel length). The manoeuvring area would need to intersect a portion of North Creek Road. While this is not ideal, it is status quo. Given that this section of North Creek Road only services one property to the south (264 North Creek Road), the 90° bend in the road ensures low passing traffic speeds and the intended usage of the boat ramp site is relatively low, this arrangement it is deemed to be tolerable. Potential options to mitigate the risk imposed by this confliction would be to install a convex traffic mirror at the corner of the North Creek Road turn as well as the inclusion of warning signs at both approaches. It is advised that Council's traffic unit review this potential confliction and provide advice prior to further design development.

As part of the design process, a number of potential carpark and manoeuvring area arrangements were considered. It has been determined that the ideal facility layout comprises of an open manoeuvring area allowing access to the ramp and proposed trailer parking bays. Investigations were made into the potential inclusion of rigging/derigging bays into the design. However, the limited available space at the site rendered this not feasible.

The limited land available at the site has meant only seven (7) car and trailer parking spaces could be provided. The parking bays would be 3 m wide and 9.5 m long. This is less than the parking dimensions in the Guidelines. However, it reflects the reduced design vessel length of 4 m rather than 7.5 m. The number of parking spaces is a notable limitation of the proposed site, as this is well below the number recommended by the Guidelines of 20-30 for a rural single lane boat ramp facility. The absence of

nearby council land suitable for an overflow car parking area means usage of this facility would be limited by parking availability.

Given the proposed road works and realignment of North Creek Road, it is proposed to seal the site, including the car portion of the car and trailer parking spaces with asphalt. This option is relatively cheap and would ensure longevity of the road and parking area.

It is recommended that additional ancillary facilities also be included in the development, namely:

- a lighting pole mounted near the crest of the ramp and holding beach to allow for early morning, evening and night usage. The light pole could be solar powered or connected to the grid, which is feasible given the proximity to powerlines. To save on electricity, the light could be connected to a sensor with a timer;
- a fish cleaning table located near the light pole at the top of the ramp;
- line marking or raised pavement markings (cat's eyes) to delineate individual parking bays;
- log barriers/wheel stops to delineate the rear of the trailer parks from neighbouring vegetation;
- bollards to delineate the parking areas from the drainage channel and to delineate the manoeuvring area and launching area from the adjacent mangroves; and,
- revision of existing signage at the site, to include:
 - legally enforceable signage to advise users of the take in / take out waste policy; and,
 - signage advising of the tidally restricted ramp for larger trailer vessels.

4. Boat Ramp Upgrade Concept Design

The current informal boat ramp surface is relatively compacted and suitable for low traffic volumes. Importantly, the current surface does not require cleaning. It is understood that there have been no complaints from the local boating community regarding the surface of the existing ramp. The ramp surface is deemed to be tolerable for the current users.

However, the grade of the ramp is relatively flat, which limits the functionality and usability of the boat ramp. Rectifying the ramp slope over the full length of the ramp would be costly and require significant earthworks. However, as the level of the carpark and manoeuvring area are proposed to be raised by typically 200 to 500mm to RL 1.5, it would be feasible to increase the slope of the upper portion of the ramp, which would assist with boat launching at higher water levels. It is proposed to raise the current RL 1.0 contour at the top of the ramp to RL 1.5. The upper boat ramp slope could be formed at 1:10 (vertical:horizontal). While this is flatter than the recommended slope in the Guidelines, it is steeper than the current ramp, which is approximately 1:14 (vertical:horizontal). Further, the flatter slope would simplify the structural and surface treatment and reduce issues relating to changes in grade at the crest of the ramp and along the ramp. The reformed surface would intersect the existing informal ramp/seabed at approximately RL -0.25.

The upper portion of the regraded boat ramp would be formed from sand, gravel and cobbles (up to say 100 mm diameter) mixed with a cement binder. The material would be compacted with a roller to mimic the existing ramp surface. This would form a rudimentary ramp surface, similar to the existing informal ramp surface. The sides of the ramp would be battered at a slope of 1:4 (vertical:horizontal). The surface of the ramp may deteriorate over time and require re-rolling or potentially topping up in the future. An alternative to a compacted aggregate and binder mix would be to apply, a flexible asphalt seal over the surface. These surface options would be cheap and rudimentary. They would require minimal cleaning and would be suitable for infrequent use. Asphalt surfacing would cater for higher usage but with higher maintenance effort. However, the design life of both low-level treatments could not be certified.

The slope of the lower boat ramp would not be altered as there would be significant and costly earthworks involved. Further, the boat ramp would potentially behave like a groyne, which could adversely impact estuarine flows and sediment movement in North Creek.

An improved ramp surface could be provided over the full length of the boat ramp if desired by Council and/or the local boating community. However, upgrading the ramp surface without re-grading the entire ramp would not necessarily improve safety or functionality of the boat ramp. The material used for the ramp surface must be carefully considered to ensure they provide adequate traction. Further, any hard material that is introduced into the marine environment is susceptible to marine growth that would result in the ramp becoming slippery and/or compromise safety of the ramp users. Accordingly, Council would be required to maintain and clean the ramp surface.

It is proposed that any ramp surface upgrade would be a single lane, 4.5 m wide in accordance with the Guidelines and would extend from the existing shoreline out into North Creek, to a toe depth of RL -1.4 (approximately 500 mm below ISLW). The toe depth is defined in the Guidelines as 1.0 m below the Design Low Water Level (typically ISLW) or if this cannot be achieved, the ramp should provide safe launching 80% of the time. The 80% water level exceedance in the design has been identified as -0.35 m AHD (based on tidal data obtained from the MHL Missingham Bridge recording station, 2003 – 2016). The proposed toe depth is 1.0 m below this level. It is important to note that the Guidelines are based on a design vessel length of 7.5 m and the toe depth of the ramp would provide safe launching of shallow draft vessels (say 0.4 m) under all expected tidal levels.

It is understood that it is Council's intentions to upgrade the ramp surface through a minimalistic approach with the aim to deliver a lower cost solution. Typically, a minimalistic, low cost solution would comprise a 'flexible' surfacing that would not require engineered foundations and could tolerate some movement without failure. In line with this approach, the following ramp upgrade options are proposed:

- precast reinforced concrete planks (say 4.5 m long, 150 mm high and 300 mm wide) linked by stainless steel chain. The conceptual arrangement would be similar to a board and chain type arrangement over a sand dune with say a 150 mm gap between adjacent concrete planks. The gaps between the planks would be oversized compared to typical details for larger vessels recommended in the Guidelines. Cobbles (say 75 mm diameter) would be tracked into the existing seabed with geotextile fabric (Texcel or equivalent) say 5.5 m wide placed directly on top. The plank and chain arrangement would be placed on the prepared base and the gaps between the planks would be filled with cobbles (say 50-75 mm diameter). Two (2) layers of rock armour comprising say 100 mm rock armour would be placed on all sides of the ramp to reduce the risk of scour and undercutting of the planks. Screw piles would be installed at the top of the ramp and at an intermediate location to prevent the plank and chain arrangement from sliding down the slope. An alternative option to the prepared foundation would be to place the plank and chain arrangement directly on the seabed. However, there is a risk that scour and undercutting around the planks would lead to settlement of the planks. As the plank and chain arrangement is flexible, it could readily be realigned with an excavator if required. The plank and chain solution would not be suitable for a high wave energy or high current environment. While it is acknowledged that this is an unconventional design, it would be considerably cheaper to construct compared to a conventional design. It is envisaged that a design life of 15 to 20 year life could be provided with a design along these lines.
- concrete Flexmat™ deck (or comparable product, see **Figure 1**). This product is regularly used in boat ramp constructions and consists of concrete block patterns precast on permeable geotextile matting. This type of ramp decking allows for a flexible solution which can be easily

and quickly installed, therefore making for a cost effective solution. While concerns were previously raised by RMS, it is our opinion that Flexmat™ is a suitable product provided it is installed correctly in low wave energy and low current environments. RMS previously used Boambee Creek and Camden Haven River as examples of where the product has been used in the past. While we are not familiar with Boambee Creek, we are aware of Camden Haven where the product has been installed on the outer bend of the river and exposed to high estuarine currents. Critical considerations when installing the product include ensuring adequate edge protection to ensure that the Flexmat™ does not become undermined and ensuring sufficient lap between geofabric elements of adjacent Flexmat™ sheets to ensure underlying material is not lost from between the Flexmat™ sheets. A proprietary designed Flexmat™ solution should achieve a design life of at least 20 years.

Both of these options would require some degree of maintenance and cleaning, particularly concrete elements. There is also a risk that oysters would grow in any gaps between concrete members and these may be difficult to remove.



Figure 1. Concrete Flexmat™ (or comparable product) ramp at Tooms Lake, Tasmania (left) and Upper Scamander River, Tasmania (right).

An alternate option considered the potential use of Fibreglass Reinforced Plastic (FRP) mesh as a ramp surface. However, the low density combined with large surface area means that the product would need to be fixed in place. Further, unlike concrete planks, the product cannot span a large distance. While it is flexible and would tolerate high loads, repeated bending would lead to fatigue failure. A concrete frame or steel frame could be designed to support the FRP. However, this defeats the purpose of a minimalistic approach.

5. Boat Holding Opportunities

As part of the concept design development, investigations have been made into the provision of boat holding structures. Pontoons and/or boat holding beaches act to improve both the safety and efficiency of launching and retrieval activities.

The preferred option included in the concept design is to incorporate a boat holding beach by utilising the gently sloping section of river bank adjacent to the upstream side of the proposed ramp. The holding beach provides an area for users to temporarily land vessels during launching and retrieval activities. Formalising this area as a holding beach would primarily include the removal of large rocks (subject to consideration of environmental impacts) which currently present obstacles. Removal of these rocks would aim to reduce the potential for vessel hull damage and trip hazards to users. Provision of a holding

beach also provides added amenity for the soft launching of smaller watercraft such as inflatables and non-powered craft (kayaks, canoes and stand-up paddle boards) which currently use the site.

Since it protects an elevated manoeuvring and carpark area, the associated foreshore rock protection works can be set out so that the rock protection on the northern side of the boat ramp is typically located above Higher High Water Spring Solstice (HHWSS) tide level. This would ensure the holding beach remains usable at high tide. It would be worth considering installation of low timber piles at the toe of the foreshore rock protection to allow users to tie up their vessels if required.

6. Alternate Options Considered

An option to formalise the former punt ramp as a boat launching ramp was considered. The area comprises old timber logs, partially buried, and rock approximately 75 mm in diameter. There are a number of issues regarding utilising this area for boat launching. Two sewer mains cross under the river at this location. There are concerns that a boat ramp at this location would potentially damage the sewer mains. In addition, while the upper slope is a suitable gradient, the river bank drops off steeply below approximately RL -1.0 and is not a suitable grade for boat launching. Further, it is located on the outside bend of North Creek at a location where the creek is relatively narrow and the former punt ramp juts out from the shoreline on either side. These factors combine to result in higher currents. In contrast, the existing site is located immediately downstream of the former punt ramp that provides some protection from currents, particularly on an ebb tide. The former punt ramp is deemed to be unsuitable for modification into a boat ramp.

7. Concept Design Construction Cost Estimate

It is recommended that Council together with the relevant stakeholders consider the proposed concept designs and options herein. It is intended that a construction cost estimate would be developed following consultation with Council and agreement of a final concept design.

1. Attachments

1. North Creek Boat Ramp, Concept Design Drawings.



PROPOSED CULVERT WITH CONCRETE HEADWALL NOM. 300mm TBC.

INSTALL WANRING SIGN AS APPROACHING BEND AND ADVISED SPEED LIMIT

PRIVATE PROPERTY

REALIGN NORTH CREEK ROAD PARALLEL TO PROPERTY BOUNDARY

CONFLICT WITH EXISTING ROAD

DELINEATE PARKING SPACES WITH RAISED PAVEMENT MARKERS (CAT'S EYES).

RAISE ROAD, MANOEUVRING AREA AND PARKING AREA TO MIN 1.5m AHD AND PLACE ASPHALT OR GRAVEL.

EXISTING FENCE

LOG BARRIER

REQUIRED VEGETATION REMOVAL

NORTH CREEK ROAD

GRASSED AREA, TYP.

REMOVE EXOTIC VEGETATION FROM ROAD VERGE.

CAR / TRAILER PARKING SPACE, TYP.

FORESHORE ROCK PROTECTION AT 1V:4H SLOPE

RAMP CREST AT MIN RL 1.50

REGRADE BOAT RAMP AT 1V:10H SLOPE FROM MANOEUVRING AREA TO EXISTING SEA BED

BOAT RAMP, OPTIONS FOR FLEXIBLE RAMP SURFACE.

RAMP TOE RL -1.35

DESIGN VESSEL TRAILER BOAT LOA = 4m BEAM = 2.5m DRAFT = 0.5m

NORTH CREEK

6.0m ROAD WIDTH (ASSUMED FOR RURAL LOCAL ACCESS ROAD)

INSTALLATION OF CONVEX TRAFFIC MIRROR

INSTALL TIMBER BOLLARDS ADJACENT TO DRAINAGE CHANNEL.

OVERHEAD ELECTRICAL LINES (APPROX. LOCATION)

EXISTING DRAINAGE CHANNEL (APPROX. LOCATION)

EXISTING MANHOLE

REVISE EXISTING SIGNAGE

INSTALLATION OF LIGHTING POLE

FISH CLEANING TABLE

BOLLARDS MIN 1.0m HIGH TO PREVENT DAMAGE OF FRINGING VEGETATION.

EXISTING PUNT RAMP

EXISTING HOLDING BEACH TO BE RETAINED

16.0m MANOEUVRING AREA

28.7m

4.5m

DATUMS AND TIDAL DATA

Metres +1.8	
+1.6	+1.5 20/50yr ARI
+1.4	
+1.2	
+1.0	+0.91 HHWSS
+0.8	
+0.6	+0.53 MHS
+0.4	+0.40 MHW
+0.2	+0.27 MHWN
A.H.D. 0.0	-0.06 MSL
-0.2	
-0.4	-0.39 MLWN
-0.6	-0.53 MLW
-0.8	-0.65 MLWS
C.D. -1.0	-0.93 ISLW

ALL LEVELS AUSTRALIAN HEIGHT DATUM (A.H.D)

REV	DATE	DESCRIPTION	BY	CHK	APPD
B	15.03.2018	CONCEPT LAYOUT REVISION	JPC	RP	
A	21.04.2017	ISSUED FOR REVIEW	BAM	JD	



PROJECT: BALLINA BOATRAMP UPGRADE

DRAWING TITLE: NORTH CREEK PROPOSED PLAN OPTION 1



DRAWN BAM	DATE 15/03/2018	JOB No. PA1326
AUTOCAD REF. PA1326-MA-DETAIL DESIGN		
SCALE AT A1 AS SHOWN		
DRAWING No. PA1326/CP/1001	REVISION B	

AUSTRALIAN HEIGHT DATUM

NOT FOR CONSTRUCTION

