

MARINE POLLUTION RESEARCH PTY LTD

Marine, Estuarine and Freshwater Ecology, Sediment and Water Quality Dynamics

A.B.N. 64 003 796 576

25 RICHARD ROAD SCOTLAND ISLAND NSW 2105

PO BOX 279 CHURCH POINT NSW 2105

TELEPHONE (02) 9997 6541 E-MAIL panink@iimetro.com.au

Mr Quinton Lloyd

Project Officer

Northern Beaches Council

PO Box 882

MONA VALE NSW 1660

15 January 2018

AQUATIC ECOLOGY SURVEY FOR PROPOSED BOATING ACCESS

FACILITIES AT ROWLAND RESERVE PUBLIC BOAT RAMP



Figure 1

**Aerial
view
showing
proposed
boating
access
facilities at
Rowland
Reserve**

1. INTRODUCTION

Northern Beaches Council requested Marine Pollution Research Pty Ltd (MPR) to prepare a draft aquatic ecological assessment report for the construction and use of proposed boating access facilities to be located on, or next to the concrete boat-launching ramps at Rowlands Reserve, Bayview. A draft report was submitted on 22 November 2017 and subsequently MPR was requested to provide a final report for the two final preferred options. The location for the proposed ramps is indicated in Figure 1 and copies of the most recent General Layout Plans for the preferred proposals are appended to this report.

The site is located on the eastern shoreline of Winji Jimmi inlet at Bayview and faces east. It is reasonably protected from most winds and is subjected to low boat wash due to the inlet being a no-wash zone.

As shown on Figure 1, the eastern foreshore comprises a public reserve with two concrete boat launching ramps, a public wharf (ramp and pontoon) plus a smaller pontoon wharf for Public Services (Marine Rescue etc.) between the launching ramps. There is a reclamation behind a sandstone seawall running both north and south of the public wharf to the northern launching ramp. This reclamation area has a grassy lawn with public picnic facilities. Figures 2 to 5 provide views of the public ramps and immediate surrounding foreshores.



Figure 2 View south of Southern Ramp showing sandy beach and sandstone seawall plus mangroves in the distant background.



Figure 3 Southern Boat Ramp showing approximate location of central access pontoon structure. Dark patches around the ramp is a solid bed of *Caulerpa* pest algae.



Figure 4 Northern Boat Ramp showing approximate location of north-side access pontoon structure adjacent and offset 1.5m from the northern edge of the ramp. There is also a *Caulerpa* pest algae bed around this ramp.



Figure 5 View of North Ramp and beach area to the north of the ramp.

1.1 Previous Aquatic Ecology Surveys

With respect to expected marine vegetation, mapping by NSW DPI (Fisheries) in 2005 indicated *Zostera* seagrass beds off-shore from the two boat launching ramps (see **Figure 6**). As shown in Figure 6 there are also mangroves and other seagrass beds and patches in the general locality.

MPR undertook an aquatic ecology survey of the seabed at and between the two ramps in October 2011 in relation to the approval process for the Marine Rescue Pontoon facility. There was no *Zostera* seagrass found in the locality and certainly not in the locations noted on Figure 6 around the two ramps. The only marine vegetation found on the seabed was *Caulerpa taxifolia*, an introduced alga listed as a declared pest species under the NSW Fisheries Management Act 1999 (FMA).

1.2 Present Survey

The initial survey for this proposal was undertaken on 13 November. The day was sunny with strong north easterly winds and the survey was undertaken at midday just after the low tide (about 0.4m actual tide). The survey comprised a random zig zag swim to cover the shoreline from south of the south ramp to north of the north ramp and to a distance of 15m off shore from the ramps.

A survey to detail the tidal range along the north edge of the north ramp was undertaken on 1st December 2017, to provide LAT depths for the northern pontoon structure in relation to potential pontoon clearance depths over *Caulerpa taxifolia* beds.



Figure 6 Portion of DPI (Fisheries) Estuarine Marine Vegetation Map 37 (Pittwater) showing the distribution of seagrass and mangroves in 2005.

2. SURVEY RESULTS

The three main aquatic habitats at the site are the sediment seabed ranging from the intertidal sandy beach inshore to the silty-sand seabed offshore, the intertidal sandstone seawall at the beach park edge and the wetted surface areas of the ramps, pontoons and locator piles (Figure 7). Details of the marine ecology of the locality are as follows:

- Whilst there are saltmarsh patches well south of the public launching facilities there are no saltmarsh patches or plants at the site or in the immediate locality.
- Whilst there are mangroves scattered around the inlet, there are no mangroves at or in the immediate vicinity of the site. The closest mangroves are mature *Avecinnia marina* trees on the opposite shore.
- The sandstone seawall supports littorinid snails and a band of oysters along the lower part of the wall. There are no algae attached to the seawall.
- There is a sandy beach extending from south of the southern ramp and north beyond the northern launching ramp. It grades to silty sand with some mixed rock rubble in the lower intertidal. From the lower intertidal offshore the seabed is sandy becoming progressively siltier with depth. There is also a gradient from sandy to siltier from north to south.
- The sub-tidal sediments support a range of benthic (sediment dwelling) fauna such as molluscs, polychaete worms and crustaceans.
- The sub-tidal seabed at the front of and on either side of the two ramps supports a monoculture of *Caulerpa taxifolia* (Figures 8 and 9). As noted in Figure 7 this habitat extended north and south between and beyond the existing ramps.
- There were no seagrass species (*Zostera* or *Posidonia*) in the survey area. A specific search for the last seagrass species previously located between the south ramp and public pontoon wharf existing pontoon in 2011, which was described as “a mix of *Caulerpa* with a very sparse and patchy cover of paddle weed (*Halophila ovalis*)”. No *Halophila* was found for this survey. The seagrass indicated along the opposite shore (Figure 7) is *Halophila ovalis* (MPR survey, November 2015).
- The deeper seabed sediments do not support any marine vegetation.
- The locator and mooring pen piles for the existing public jetty support a fine matrix of silt with filamentous algae but no macroalgae. There are some bryozoa and oysters attached to the piles sub-tidally.
- The existing pontoon wetted surfaces support a mixed biota including fringing green and brown algae, dominated by *Sargassum*, bryozoans and tunicates (Figures 10 and 11).
- The concrete ramps support a thin fringe of tufting brown algae along the subtidal edges and the last one meter width at the toe of the ramps support a scattered cover of *Sargassum* algae.

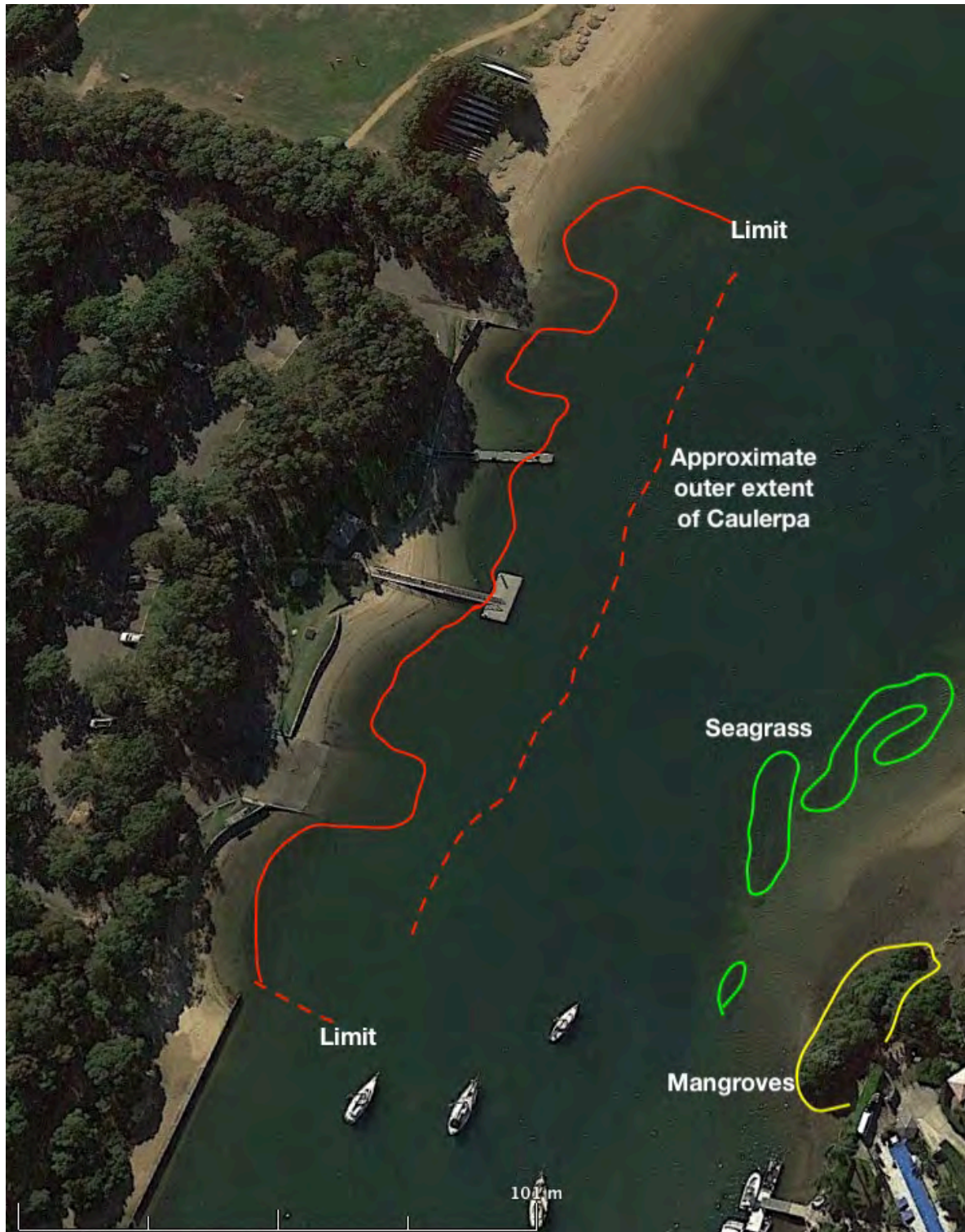


Figure 7 Google Map Aerial Photograph Dated 3 May 2016 with marine vegetation limits shown. “Limit” indicates the south and north extent of the random swim survey. Whilst the outer extent of *Caulerpa taxifolia* infestation is approximate, based on sight lines back to the ramps and pontoon, the *Caulerpa* bed does extend to the outer limits of the proposed pontoons (i.e., at least 12m off-shore from the bottom of the concrete ramps).

With respect to other possible aquatic ecological implication:

- There is no aquaculture or commercial fishing (hauling or meshing) in the locality (EPA 1992).
- With respect to listed endangered species, it is concluded that the existing facilities and the locality do not constitute specific habitat for threatened aquatic species, as currently listed under the Fisheries Management Act 1994, and that there would not be any threatened species located within the area of the existing facilities.



Figure 8

Dense and even bed of *Caulerpa taxifolia* overgrowing debris off-shore from the southern ramp



Figure 9

Patchy *Caulerpa taxifolia* bed in sandy habitat and over debris off-shore from the north ramp



Figure 10 View of Public Wharf pontoon edge showing the thin band of fringing algae and tunicates in the shallow sub-tidal and *Sargassum* algae plus bryozoans on the deeper sub-tidal edges.



Figure 11 View of Marine Rescue Pontoon showing thin band of brown and green fringing algae. There are long-stranded soft bryozoans hanging from underneath the pontoons.

3. IMPACT ASSESSMENT

The two pontoon wharf proposals are shown in the **General Layout Plans** attached to this report. The South Pontoon facility is located over the centre line of the southern ramp and requires the following construction works:

- Installation of a concrete pad plus retaining post on the existing ramp set at the Highest Astronomical Tide (HAT +1.8m).
- Placement of two pontoon locator piles, an inner pile placed into the concrete ramp just above Lowest Astronomical Tide (LAT -0.0m) and a pile at the end of the pontoon structure some 12 m offshore from the end of the concrete ramp (around 2.5m below LAT). Both piles are 450mm diameter (with sleeves).
- Installation of the floating pontoon structure including attachments to locator piles.

The North Pontoon facility will be placed over the seabed immediately adjacent the north side of the northern edge and this facility includes a 10m gangway. Construction requires:

- Installation of a concrete abutment set above HAT and located 1.5m north of the existing launching ramp.
- Placement of three pontoon locator piles, an inner pile placed into the intertidal sand just above LAT, a pile offset from the end of the concrete ramp at a depth of around 1.5m below LAT and a third a pile at the end of the pontoon structure some 12 m offshore from the end of the concrete ramp (around 3 m below LAT). All piles are 450mm diameter (with sleeves).
- Installation of the floating pontoon structure including attachments to the locator piles plus installation of the gangway.

3.1 Construction Impacts

For pontoon wharf construction, the main aquatic impacts arising from these activities at both sites are as follows:

- Transport of riparian construction related sediments and materials into tidal waters and creation of turbidity plumes arising from bottom sediment disturbance.
- Disturbance of bottom sediments and creation of turbidity plumes arising from piling works and arising from construction vessel movements.
- Disturbance and mobilisation of *Caulerpa* algae from construction activities.
- Direct loss of *Caulerpa* to piling activities and shading loss of *Caulerpa* arising from the proposed locations of the two pontoons. As *Caulerpa taxifolia* is a listed pest species these losses are considered a beneficial impact.

- Loss of 3m² of marine algae (*Sargassum*) habitat on the lower part of the southern ramp to shading from the pontoons. This loss would be offset by the creation of some 21m² vertical wetted surface area on the sides of the portions of pontoon structures that are always floating, and these surfaces would support fringing algae similar to that noted on the Marine Rescue pontoons.

3.1.1 Management of Construction Impacts

Management of construction impacts can be achieved in the following manner:

Installation of concrete pads and abutments:

- These works would be undertaken as shore-based works and provided the timing for the works avoids the short seasonal periods of very high spring tides (as predicted in tide tables) the works should be able to be appropriately bunded and protected to prevent sediments and construction materials being mobilised and deposited into Pittwater during storm events.
- Best practice construction erosion and sediment controls would be specified in the Construction Environment Management Plan (CEMP).

Installation of locator piles:

- Installation of the upper pile (at around LAT) into the existing southern ramp could be done from land or water and will require some demolition works on the ramp to make suitable holes through the concrete ramps. The demolition works will require suitable bunding to prevent sediments escaping into tidal waters. Sediment escape could be minimised satisfactorily by the use of appropriate floating silt curtains and manual removal of concrete cuttings and pieces.
- Installation of the two inner piles alongside the northern ramp could also be done from land. As the piles are to be driven into the seabed directly there is no need for any demolition works but the works may still require floating silt curtains to minimise disturbed sediments spreading into adjacent tidal waters.
- Installation of the outer piles for both ramps would most probably be done from the water and may require floating silt curtains to minimise disturbed sediments spreading into adjacent tidal waters. Note that due to the presence of *Caulerpa* throughout the area, floating silt curtains should **not** have a skirt or weights that are able to reach the seabed under any tide/wind-wave combinations.
- Disturbance and fragmentation of *Caulerpa taxifolia* from locator pile driving operations can be minimised by localised pre-treatment (smothering and killing) of the *Caulerpa* at the piling sites using salt as previously used by DPI Fisheries for the control of *Caulerpa taxifolia* outbreaks (Creese et al 2004). This would require the pre-placement of a one cubic metre square enclosure with fine geotech mesh

sides centred around each pile site and filled to at least 6 cm height with commercial pool salt (between 50 and 100 kg per treatment) - as per I&I NSW (2009). Each pile treatment is to be left in place for a minimum of 48 hours prior to piling works to ensure *Caulerpa* death.

Installation of pontoon structures and the northern gangway:

- Pontoon structures could be delivered and constructed from land or sea and provided the works are undertaken in a manner that minimises the potential for disturbance of *Caulerpa* algae off the seabed there are no expected aquatic ecological impact implications.
- The gangway would most probably be delivered and installed by land and there are not expected to be any aquatic ecological impact implications.

Use of Construction Vessels:

- By virtue of the proximity to permanent sub-tidal *Caulerpa* beds beyond the zero tide-line, there is also a potential for disturbance of the *Caulerpa* arising from construction works undertaken from seawards (i.e., using vessels).
- There are two main aims for the management of *Caulerpa* disturbance: (i) to minimise the disturbance, fragmentation and re-distribution of fragments from the existing *Caulerpa* bed to other parts of the bay, and (ii) to prevent the wider spread of *Caulerpa* to other parts of Pittwater or beyond, via fragments carried away from the site on construction vessels or equipment.
- These aims can be achieved by the implementation of the following *Caulerpa* Management Plan to be included in the overall Construction Environment Management Plan (CEMP):
 - There will be no stockpiling of demolition or construction materials on the seabed.
 - No vessel is to be moored with anchor or other bottom tackle located in the inshore *Caulerpa taxifolia* beds, as indicated on Figure 7.
 - Any cables that may be laid across *Caulerpa* patches must be suitably buoyed prior to laying and kept buoyed once laid, to prevent cable drag and cable swing disturbance and fragmentation of *Caulerpa*. Where this is impractical, contractors should use floating rope.
 - In order to minimise wash and to prevent bottom scouring or mobilisation of the pest algae *Caulerpa*, towing or pushing vessels must not use excessive power to manoeuvre barges or pontoons into place over these areas. Scouring damage can also be minimised by 'working the wind and tides', i.e., only moving floating plant into place on high tides and when there are favourable or no winds.

- No vessels will be moored inshore in the area of *Caulerpa* beds unless there is sufficient tidal water to prevent barge or vessel bottoming out at all times.
- All construction related equipment that comes in contact with the seabed (including mooring tackle, cables, ropes and anchors and silt curtains), must be inspected for the declared pest algae species *Caulerpa taxifolia* when recovered and any fragments found must be collected and disposed of into plastic garbage bags then placed into garbage bins on shore.

To aid the contractors in identifying and disposing of *Caulerpa taxifolia*, a *Caulerpa taxifolia* identification chart is attached to this report.

3.2 Operational Impacts

As the use of the southern pontoon ramp is confined to the existing concrete ramp there are no operational impacts arising for the protection of the aquatic ecology of the locality.

There are several potential impacts arising from the operation and use of the north pontoon wharf that is offset north of the north ramp; bottoming out of the pontoons on the seabed and the possibility of bottom sediment disturbance and mobilisation of *Caulerpa* by vessel propeller wash.

3.2.1 Potential Bottoming Impacts

As part of the northern pontoon ramp would rest on the seabed during low to very low tides there is a potential that pontoons that bottom out over *Caulerpa taxifolia* during low tides could then lead to fragmentation of the alga, with fragments potentially carried to other non-infested sites in Pittwater. In order to ascertain whether pontoons would bottom out on algae a tide assessment was undertaken on 1st December 2017. The results of the tide survey are shown in **Table 1** below.

The results are summarised as follows:

- The distances shown in Table 1 are from the top of the ramp at the western edge of the vegetation strip down the ramp (i.e., east). The ramp is 25m long and comprises five concrete sections each 5m long. The last half metre section of the outermost ramp segment has broken off and is lying on the seabed.
- Line 1 is located immediately north of the ramp and Line 2 is offset 2.5m north of Line 1.

- Note that the Line 2 depths are initially more than the Line 1 depths from 13 to 20m offshore, then are less than Line 1 depths from 21m to 24.5m offshore, indicating an uneven bottom profile going north from the ramp.

Table 1 Depth Contours North Ramp							
Time	Distance (m)	Measured Depth (m)*		Habitat	Actual	Reduced Depths (LAT)	
		Line 1	Line 2			Line 1	Line 2
EDST					Tide		
1233	13.6	0.05	0	Sand	0.41	0.46	0.41
1233	14.4	0	-0.05	Sand	0.41	0.41	0.36
1235	18	-0.4	-0.65	Start Caulerpa	0.4	0	-0.25
1237	19	-0.7	-0.75	Start Caulerpa	0.4	-0.3	-0.35
1238	20	-0.9	-0.95	bed	0.4	-0.5	-0.55
1240	21	-1.15	-1.07	bed	0.4	-0.75	-0.67
1245	23	-1.7	-1.6	bed	0.39	-1.31	-1.21
1250	24.5**	-2.35	-1.9	bed	0.37	-1.98	-1.53
Notes:		*Line 1 immediately north of the ramp and Line 2 offset 2.5m to the north of line 1. Distances from top of launching ramp.					
		** End of Unbroken Section of Ramp with the remaining 0.5m section on seabed.					

- Measuring east along the ramp from the west there is intertidal sandy beach down to about 17m.
- The 0m LAT mark is located at 18 m (next to the ramp) and at 16m at the 1.5m north offset. The 0m LAT mark also coincides with the end of the bare sand and start of a 1m wide strip of patchy *Caulerpa*.
- The main *Caulerpa* bed then starts at around -0.3m depth LAT and continues well beyond the end of the ramp.
- Based on the profile drawing of the proposed ramp (M2146-101(D)), one or two pontoon units could be touching the seabed at 0m LAT and at about 3.2 m length per double pontoon unit (length including inter-pontoon gap as estimated from the plan), there is the potential for up to 8.3m² of *Caulerpa taxifolia* habitat to be subjected to pontoons bottoming out (i.e., at a 0m LAT tide).
- Given that the risk of *Caulerpa* disturbance from pontoon bottoming out is only associated with the infrequent very low king tides (4 times per year), it is more likely that the *Caulerpa* that may be impacted will have already died out to shading impact between the time of installation and the first king low tide. Further, as two of these king low tides occur at night when there is a lower risk of wave action - induced bouncing of the pontoons, the overall risk of fragmentation from pontoon bounce is **low** and the consequences (i.e., the possibility that fragments mobilised could be carried to parts of the estuary not infested is **insignificant**).

- Whilst the remaining upper part of the pontoon wharf (4 to 5 units) would be bottoming out on bare intertidal sandy habitat which could affect organisms living in the sand (small crustaceans and marine worms), this portion of the habitat is already disturbed by human and canine traffic, and the impact is likely to be negligible and acceptable on the balance of the public good that this facility is intended to promote.

3.2.2 Potential Vessel Wash Impacts

As the northern side of the north pontoon wharf will be located over *Caulerpa taxifolia* habitat there is the possibility of bottom sediment disturbance and mobilisation of *Caulerpa* by vessel propeller wash or scouring:

- The potential for *Caulerpa* disturbance only arises for the use of the middle shallow portion of the northern pontoon, between the inner and middle locator piles and then only during low tides. However, given that this section of the beach is already frequently used by people launching or retrieving boats, it is considered that there would not be any *increased risk* of *Caulerpa* mobilisation arising from use of the pontoon at this location. In fact, as people utilising the beach at present do so to be able to get ashore, it is more likely that there will be overall less use of this portion of shallows, as boaters are now able to moor safely at the outer parts of the pontoon wharf to access the shore.
- In terms of overall risk of fragments mobilised by vessel scour at the north pontoon wharf reaching areas of Pittwater not currently affected, the risk is judged to be **low** as *Caulerpa taxifolia* is wide-spread throughout the estuary, and particularly so in the southern estuary.
- The risk of spreading *Caulerpa taxifolia* to other estuaries via fragments attached to trailed boats and associated equipment remains **medium** (as per the NSW Control Plan for *Caulerpa taxifolia* (I&I NSW (2009)). Mitigation of this risk includes the use of appropriate signage at both the wash-down area (where it already exists) plus at the north pontoon wharf itself.

4. SUMMARY AND CONCLUSIONS

It is concluded that the proposed boating access facilities for the two public boat ramps at Rowlands Reserve Bayview could be constructed and used with a low risk of impact on the aquatic ecology of the locality provided precautions are implemented to minimise sediment runoff and turbidity plumes during construction and prevent disturbance of the pest alga *Caulerpa taxifolia* during construction and during operation when using the northern facility during low tides

The report provides a set of recommendations for contractors undertaking the construction works which, if applied, would minimise the risk of spreading the pest algae *Caulerpa taxifolia* to other estuaries or to parts of Pittwater not currently affected.

It is concluded that the works could be undertaken in such a way so as to achieve the aims of aquatic ecological conservation of the Fisheries Management Act (1994) (as summarised in DPI Fisheries 2013) and the aims of aquatic ecological conservation of Pittwater 21.

As the proposal does not include dredging or reclamation and as it is considered that the potential non-invasive marine algae habitat loss is insignificant and offset by created algae habitat it is concluded that the project would not require a Section 205 permit under the Fisheries Management Act 1994 (FMA).

5. REFERENCES

Creese R G, A R Davis and T M Glasby (2004)

Eradicating and Preventing the Spread of *Caulerpa taxifolia* in NSW. NSW Fisheries Final Report Series No 64. June 2004.

EPA (1992)

Coastal resource atlas for oil spills in Broken Bay, Pittwater and the Hawkesbury River. NSW EPA. March 1992.

Fisheries NSW (2013)

Policy and Guidelines for Fish Habitat Conservation and Management (2013 update), NSW Department of Primary Industries, June 2013.

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West R J, Thorogood C, Walford T, Williams R J (1985)

An estuarine inventory for New South Wales. Fisheries Bulletin No 2. Dept of Agriculture, NSW Sydney 165 pp.

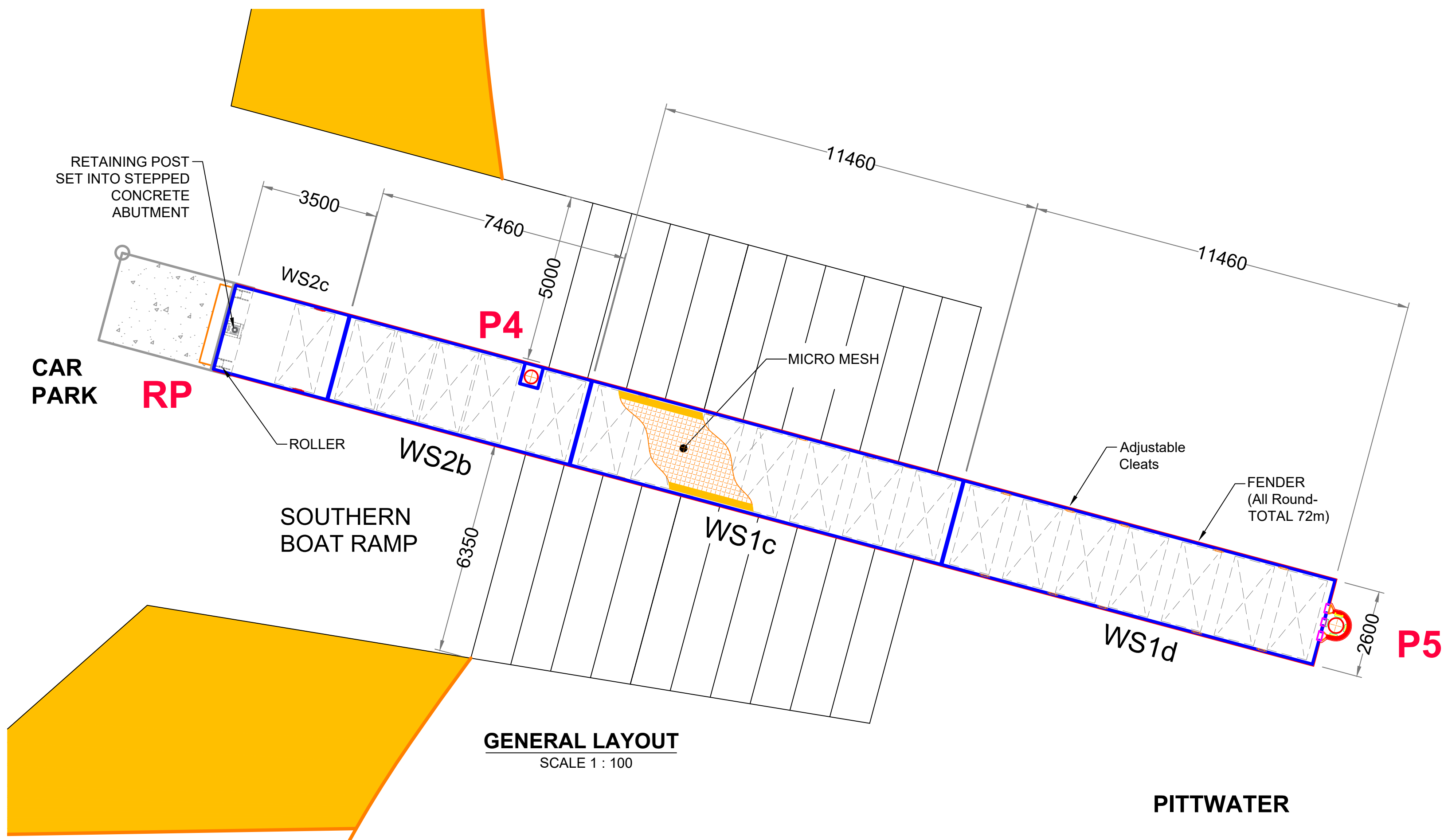
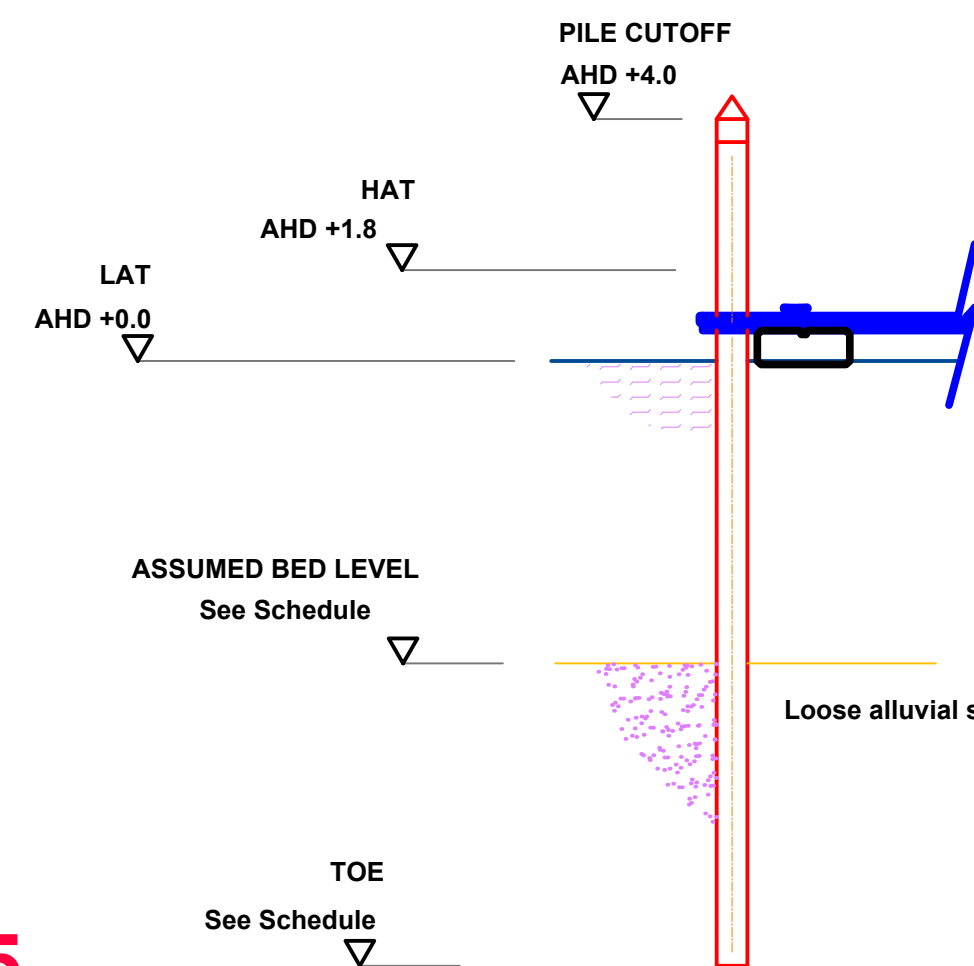


IMAGE 1.

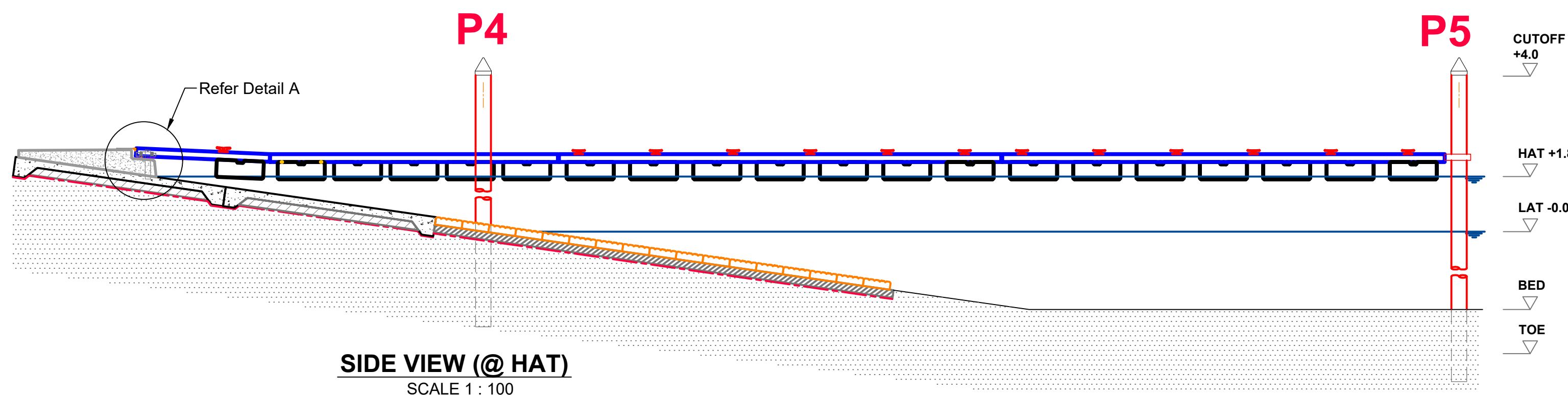


TYPICAL PILE SECTION
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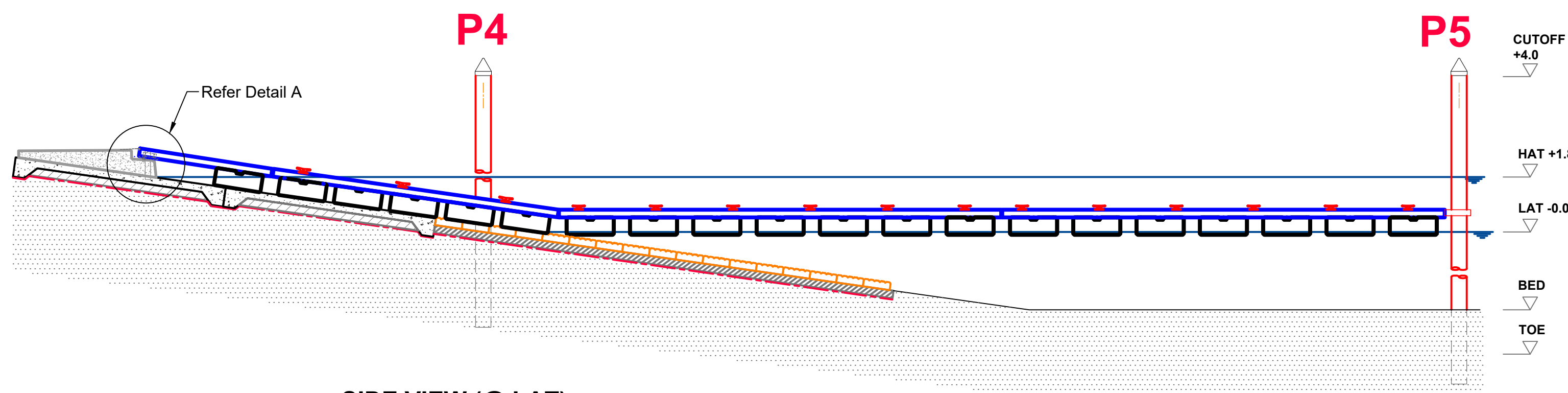


IMAGE 1. Roland Reserve - Northern and Southern Boat Ramps (Google Earth 2017)

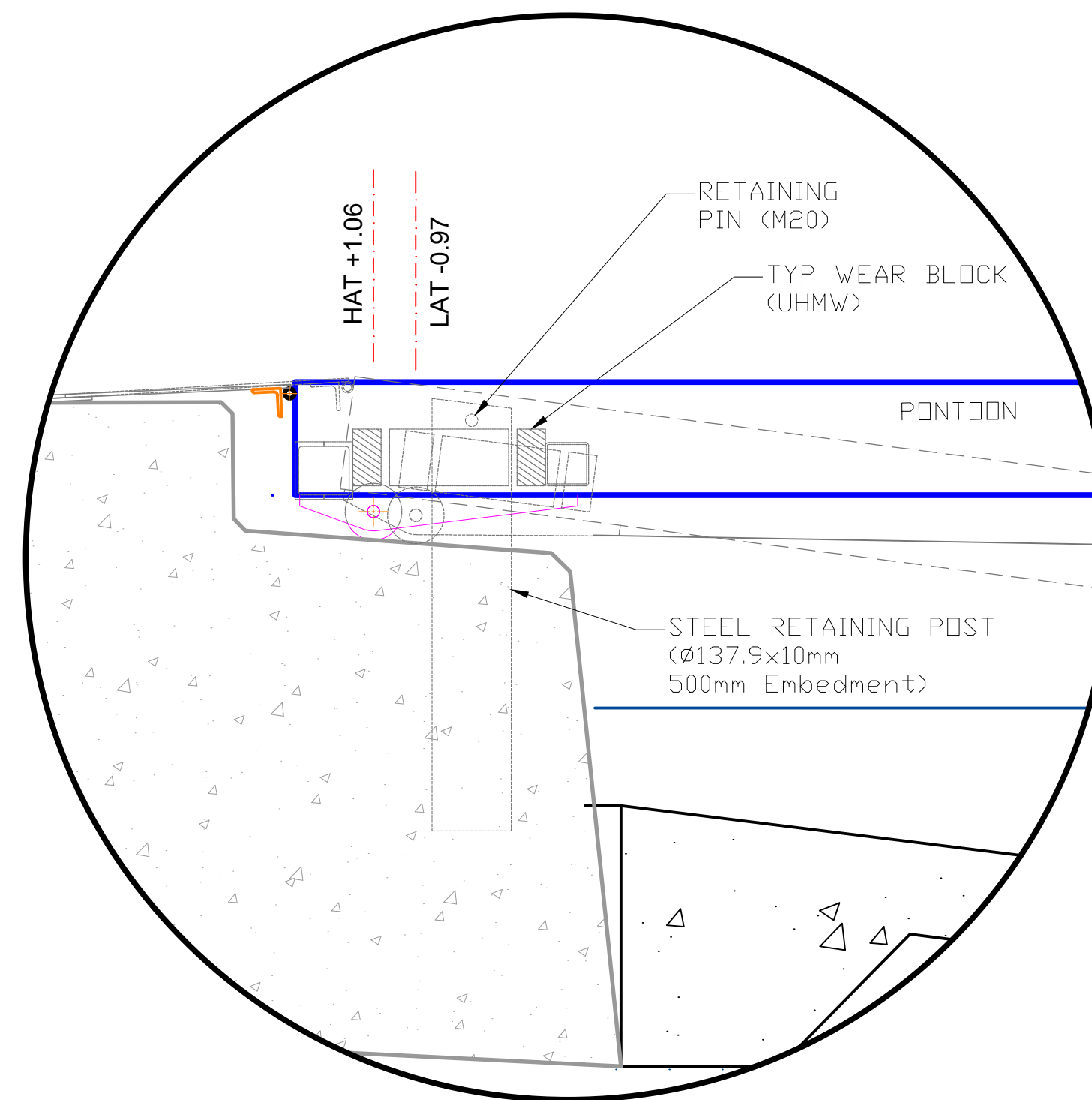
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			Easting	Northing						
RP (316)	137.9	10								
P4	406	12.5			450	12.0	-0.500	8.500	4.000	13.000
P5	406	12.5			450	12.0	-3.500	9.500	4.000	17.000



SIDE VIEW (@ HAT)
SCALE 1 : 100



SIDE VIEW (@ LAT)
SCALE 1 : 100



DETAIL A
SCALE 1 : 10



IMAGE 2.



IMAGE 3.

F	B.Y.	31.10.17	Alternative 3
E	B.Y.	27.10.17	Alternative 2
D	B.Y.	27.10.17	Alternative 1
C	B.Y.	24.10.17	ISSUED FOR RE - APPROVAL
B	B.Y.	9.10.17	ISSUED FOR CONSTRUCTION
A	B.Y.	29.08.17	ISSUED FOR PILE DESIGN

Client	ROLAND RESERVE JETTIES NORTHERN BEACHES COUNCIL
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Title	GENERAL LAYOUT SOUTHERN BOAT RAMP
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Drawn By	Checked	Date	Scale	Sheet	Rev
B.Y.	G.S.	9 Jul 2017	As Shown	1 of 1	F

WALCON

WALCON MARINE AUSTRALASIA PTY LTD
NATIONAL: 1300 MARINA (1300 627 462)
Email: enquires@walconmarine.com.au
Web: www.walconmarine.com.au

Job No.	NBC2146	Rev.	1 of 1
Drawn	B.Y.	Checked	G.S.
Date	9 Jul 2017	Scale	As Shown



TIDE LEVELS (m AHD)				
Cut-Off	HAT	LAT	Sea-Bed	Toe
+4.0	+1.8	-0.0	-	-

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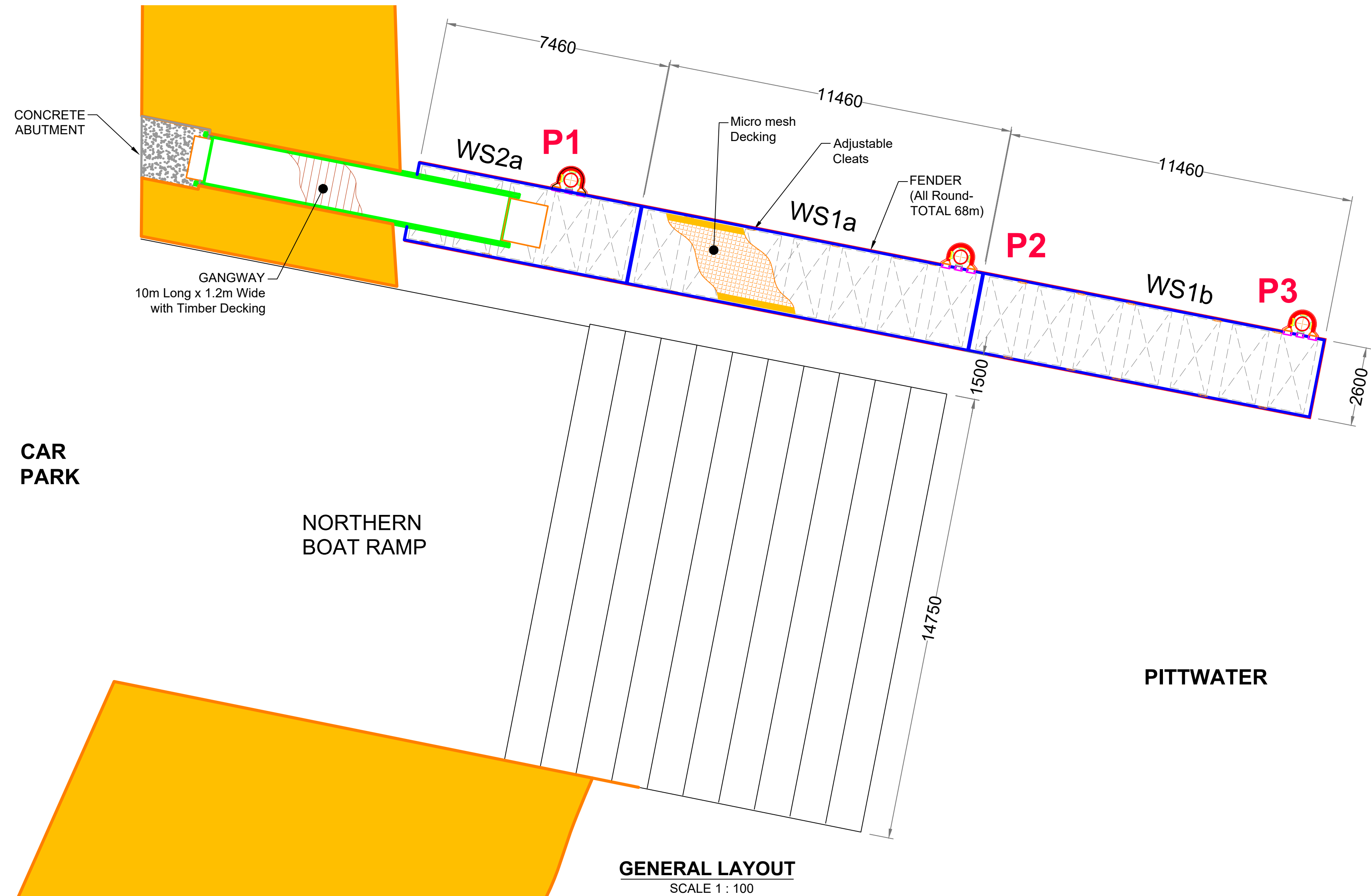
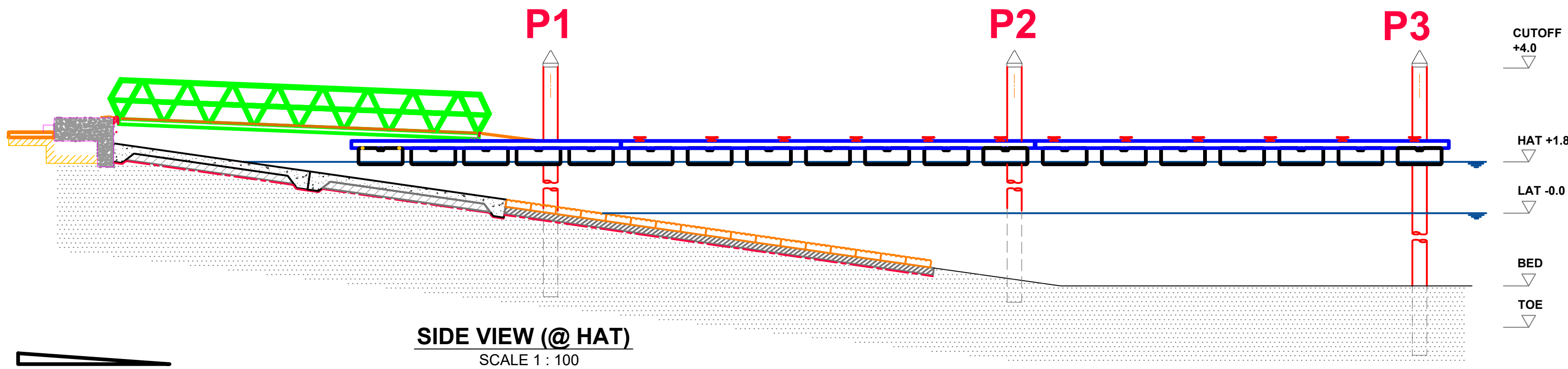
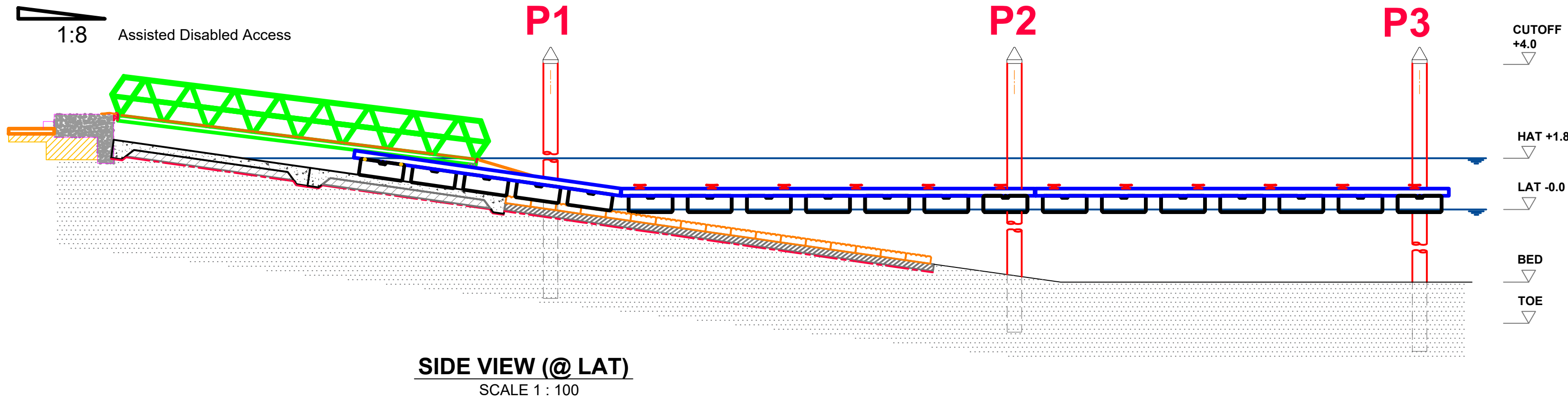


IMAGE 1. Roland Reserve - Northern and Southern Boat Ramps (Google Earth 2017)

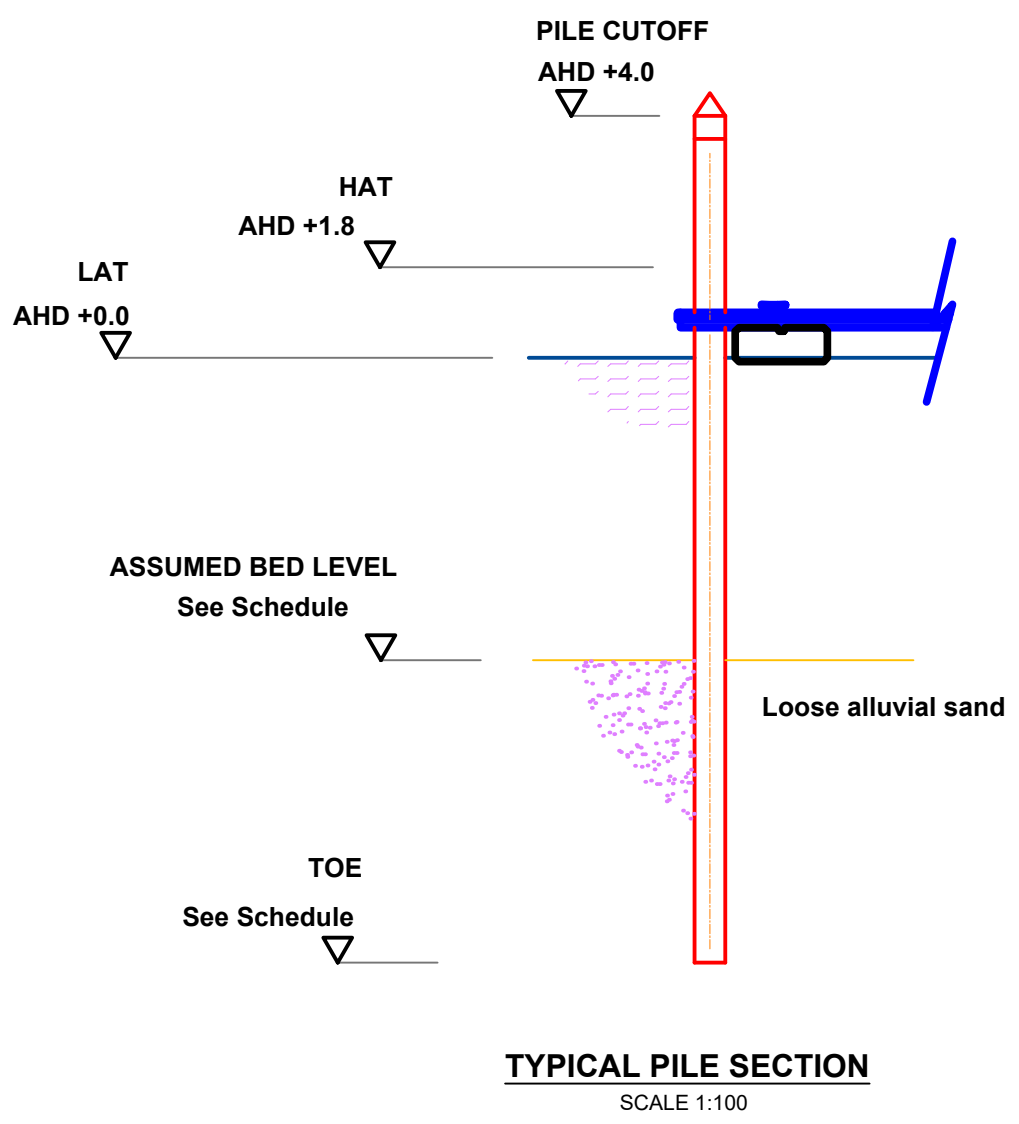
PILE SCHEDULE										
Pile No.	Pile Dia (mm)	Wall (mm)	CO ORDINATES		HDPE Sleeve Dia (mm)	Wall (mm)	Expected Bed Level (mAHD)	Min. Penetration Depth (m)	Cut Off (mAHD)	Pile Length (m)
			DESIGN (m)							
			Easting	Northing						
P1	406	12.5			450	12.0	-0.500	8.500	4.000	13.000
P2	406	12.5			450	12.0	-2.500	8.500	4.000	15.000
P3	406	12.5			450	12.0	-4.000	9.500	4.000	17.500



1:14 Unassisted Disabled Access



1:8 Assisted Disabled Access



F	B.Y.	31.10.17	Alternative 3
E	B.Y.	27.10.17	Alternative 2
D	B.Y.	27.10.17	Alternative 1
C	B.Y.	24.10.17	ISSUED FOR RE - APPROVAL
B	B.Y.	9.10.17	ISSUED FOR CONSTRUCTION
A	B.Y.	29.08.17	ISSUED FOR PILE DESIGN
Rev.	by	Date	Description

Client ROLAND RESERVE JETTIES
NORTHERN BEACHES COUNCIL

Title GENERAL LAYOUT
NORTHERN BOAT RAMP

Project No. Q2146 - 101
Rev. F

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NATIONAL: 1300 MARINA (1300 627 462)
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Job No.	NBC2146	Rev.	1 of 1
Drawn	B.Y.	Checked	I.M.
Date	9 July 2017	Scale	As Shown

TIDE LEVELS (m AHD)				
Cut-Off	HAT	LAT	Sea-Bed	Toe
+4.0	+1.8	-0.0	-	-

HAVE YOU SEEN
THIS MARINE PEST
IN NSW?

Aquarium Caulerpa

Caulerpa taxifolia



Key features

Frond height 3-25cm

Flattened fronds

Bright green colour

Pinnules on fronds
attach directly op-
posite each other,
curve upwards

Pinnules
constricted at base

Habitat:

Sand, mud or rock; sheltered
or moderately wave-exposed
areas

Current locations:

NSW: Lake Macquarie,
Pittwater, Sydney Harbour,
Botany Bay, Port Hacking, St
Georges Basin, Lake Conjola,
Narrawallee Inlet, Burrill
Lake.

Impacts:

May compete with seagrass;
entangles in boat anchors,
fishing nets and trawling
gear; toxic to some
herbivores.



If you see this pest in NSW, report it immediately

1. Note the location and if possible collect a sample (including fronds and stolon)
2. Dry between two sheets of blotting paper
3. Report your sighting by phone to (02) 4916 3877 (24 hour reporting line),
fax (02) 4916 3880, email pests@fisheries.nsw.gov.au
or online at www.fisheries.nsw.gov.au.

Threatened, Protected and Pest Species
Sighting Program

For more information see

www.dpi.nsw.gov.au or call 1300 550 474



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

Similar native species



Caulerpa filiformis

Key Features:
Flattened strap-like fronds

Habitat: Exposed rocky reef, to 6m depth
Common on Sydney's intertidal rock platforms



Caulerpa scalpelliformis

Key Features:
Straight branchlets
Pointed pinnules
Pinnules alternate rather than opposite, straight
(not curved)

Habitat: Exposed rocky reef, to 36m depth



Caulerpa flexilis

Key Features:
Fern like branchlets

Habitat: Exposed rocky reef, to 40m depth
More common in deeper water



Caulerpa cactoides

Key Features:
Short club shaped pinnules

Habitat: Sheltered and less exposed sand, mud
and rock surfaces, to 38m depth