

**Clarence Valley Council
Draft Clarence River Wharves Development Plan
Volume 1 Development Plan**

August 2009



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Executive Summary

GHD Australia Pty Ltd was commissioned by Clarence Valley Council (CVC) to prepare the Clarence River Wharves Development Plan (CRWDP). The CRWDP aims to sustainably increase accessibility to and from the river at Grafton, Ulmarra, Brushgrove, Lawrence, Maclean, Harwood and Yamba, which are to be developed as key tourism and service hubs over time. The CRWDP provides concept recommendations and sketches of upgraded/new wharf or pontoon infrastructure at CVC-specified sites within these towns and will feed into a later detailed design phase.

The CRWDP was developed over several phases. A *Stakeholder Consultation* phase established the following user and agency requirements: a preference for pontoon-style infrastructure with lighting, water supply and disabled access. This phase also revealed that the Department of Lands (DoL) was about to embark on a foreshore masterplanning exercise for the Yamba Bay area. At the request of CVC, CRWDP investigations in Yamba were then ceased. The location and type of infrastructure in Yamba would be expected to be determined as an outcome of the DoL masterplan activity. A strong user preference for an alternate site at Brushgrove – within Island End Park Reserve, was also revealed. Similarly, Grafton-based users, noted that the bridge was an impediment for sailing vessels wishing to utilise the nominated Grafton site.

A preliminary *Environmental Assessment* of the sites revealed no significant constraints, though bank stability works were noted as being

required at Brushgrove, Lawrence and Harwood. Mangroves were found to exist at Harwood, Maclean and Brushgrove (and Yamba) meaning the infrastructure would need to be positioned to avoid disturbance.

Site Planning/Ownership issues were then reviewed. Sites were found to be either Crown Land or CVC land or a combination of both. The bed of the river in which piles will be located is Crown Land. Therefore lease arrangements must be organised with DoL. The only site within the area of the Yaegl People Native Title claim was found to be Yamba. The location and nature of any infrastructure at Yamba will now likely be determined by the DoL. A legislation review confirmed that SEPP Infrastructure, 2007 ensures that all sites will be dealt with under Part 5 of the Environmental Planning and Assessment Act, 1979. A Review of Environmental Factors (REF) undertaken either individually or collectively will be needed for the sites prior to commencement of the project to ensure that the environmental impacts are fully considered.

A *Structural Condition Assessment* confirmed the existing pontoons at Grafton, Maclean and Yamba and timber structure at Lawrence appeared to be in good condition. The existing timber wharves at Harwood and Ulmarra were found to be in fair condition with some immediate maintenance works required. The existing timber wharf at Grafton was found to be in poor condition and thus any augmentation or repair work at this site was considered unwise.

The *Concept Recommendations* were then developed. Pontoon infrastructure with disabled access, solar lighting and potable water supply were found to be feasible at all sites. Bilge pump-out facilities were not seen as being justifiable given their likely up-front and ongoing



expense and the existence of nearby private infrastructure. Similarly site electricity supply was not recommended because of its expense, and because it would encourage long-stay vessels.

Preliminary cost estimates (ex-GST) for the infrastructure identified in the concept recommendations are as follows:

▶ Grafton	\$ 220,800
▶ Ulmarra	\$ 288,650
▶ Brushgrove (Site 2)	\$ 246,100
▶ Lawrence	\$ 239,200
▶ Maclean	\$ 219,650
▶ Harwood	\$ 236,900



1. Introduction

1.1 Background and Context

GHD Australia Pty Ltd (GHD) was commissioned by Clarence Valley Council (CVC) to prepare the Clarence River Wharves Development Plan (CRWDP).

The recently completed Clarence River Way masterplan establishes clear development and infrastructure goals, and provides a vision to maximize economic and community outcomes for the Clarence region. The masterplan nominates several river towns - Grafton, Ulmarra, Brushgrove, Lawrence, Maclean, Harwood and Yamba, which are to be developed as key tourism and service hubs over time. The towns are identified in Figure 1-1.

The CRWDP, which was recommended in the Clarence River Way masterplan, aims to sustainably increase accessibility to and from the river at these locations. The CRWDP will feed a later detailed design phase and provides concept recommendations and sketches of upgraded/new wharf or pontoon infrastructure.

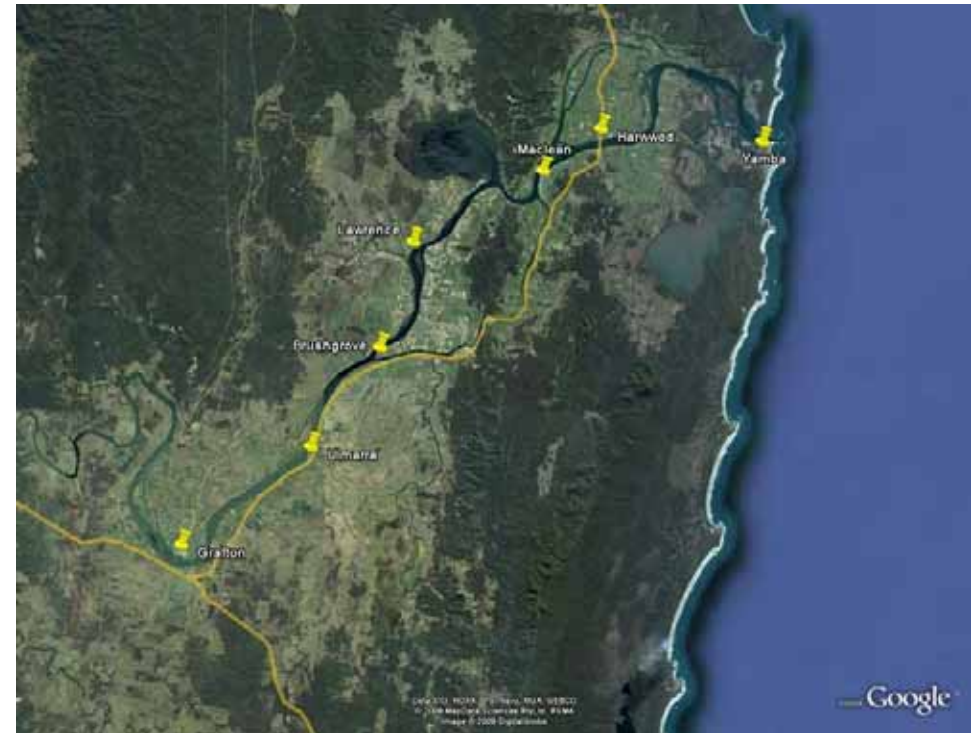


Figure 1-1 Clarence River Wharves Development Plan Towns

The sites identified by CVC within the towns were:

- Grafton - Part Local Road Reserve (Prince Street) and part Lot 7001 DP 1054597, Lot 702 DP 92916, lot 20 DP 879077;



- ▶ Ulmarra - Part Local Road Reserve (Coldstream Street) and part Lot 19 DP 1093396;
- ▶ Brushgrove Site 1 - Local Road Reserve (Inmon Lane);
- ▶ Brushgrove Site 2 - Island End Park Reserve 90732. Covering Lot 7013 DP 92605;
- ▶ Lawrence - Crown Reserve, plus Lots 9 and 12 DP 758604 (Memorial Park);
- ▶ Maclean - Lot 365 DP 751388, Lot 7022 DP 1113908, Lot 429 DP 729433 (McLachlan Park);
- ▶ Harwood - Local Road Reserve (River Street, near boat ramp); and
- ▶ Yamba - Lot 7042 DP 1023322, Lots 203 and 202 DP 727454 (River Street).

1.2 Project Phases

The CRWDP project comprised several phases:

- ▶ Site considerations were firstly examined via a preliminary *Environmental Assessment*;
- ▶ The augmentation potential and integrity of any existing wharf/pontoon infrastructure was considered during a *Condition Assessment*;
- ▶ A *Stakeholder Consultation* phase obtained the infrastructure requirements of government agencies, the local aboriginal land council and key user groups;

- ▶ Preliminary *Conceptual Designs* of the proposed infrastructure were then prepared;
- ▶ A second round of *Stakeholder Consultation* was then undertaken using the preliminary *Conceptual Designs* for discussion; and
- ▶ The draft CRWDP was then prepared for public exhibition.

1.3 Clarence River Wharves Development Plan Structure

The CRWDP is comprised of two volumes:

- ▶ This document, *Volume 1 – Development Plan*, briefly summarises the findings of the *Environmental Assessment*, *Condition Assessment* and *Stakeholder Consultation* phases and presents the *Conceptual Designs* of the proposed infrastructure; and
- ▶ *Volume 2 – Site and Stakeholder Considerations* provides the context and background to Volume 1 by reporting the findings of the *Environmental Assessment*, *Condition Assessment* and *Stakeholder Consultation* phases.



2. Summary of Site and Stakeholder Considerations

A summary of the key outcomes from the Site and Stakeholder Considerations phase of the project are provided below. Refer to CRWDP *Volume 2 - Site and Stakeholder Considerations* for more detail.

For reporting purposes, the Stakeholder Consultation outcomes are presented first as these parameters effectively established the course of the project.

2.1 Stakeholder Consultation

2.1.1 Agency Consultation

The Department of Lands (DoL) advised that it was about to embark on a foreshore masterplanning exercise for the Yamba Bay area. Given this, CVC decided to place CRWDP investigations at Yamba on hold pending the outcome of the DoL's planning process.

The DoL advised that it wanted to discuss a single licence for wharves constructed on their land with all facilities subject to the same licence.

NSW Maritime recommended that, wherever practicable, disabled access should be provided to the new infrastructure and that pump-out facilities would be beneficial near Maclean or Lawrence as well as Grafton/Yamba.

2.1.2 Focus Group Meetings

The major points to arise from the Round 1 Focus Group meetings included:

- All structures should be designed so that they are useable to a majority of watercraft from kayaks through to cruisers and yachts. Piled, floating pontoons were favoured consistently over fixed wharves by all users with the existing Maclean pontoon seen as the model;
- All structures should be accessible to people with disabilities, the aged and those with prams and small children;
- Security lighting (solar), fresh water and garbage bins are key services for all structures (on or nearby). Power, fuel and fire extinguishers are not widely supported. Pump out facilities are acknowledged as needed, but caution about maintenance, abuse and cost;
- Management of boats overstaying at public wharves, provision for multiple boats to access at once, making the space on the inside of pontoons useable, and installing low maintenance facilities were all raised as issues;
- Grafton had limited support for additional facilities because of potential interference with the rowing course; adequacy of existing structures; inability to get yachts under the Grafton Bridge; preference for cruisers to use swing moorings off shore; lack of use of existing major structures in South Grafton;



A preference was expressed for a site at Pound Street that could be accessed by yachts and yet was closer to town than the Kirschener Street jetty. A Fry Street location was also nominated;

- ▶ Yamba was problematic for both focus groups as the existing site is heavily utilised by private operators and Yamba Bay is difficult for yachts and larger boats to manoeuvre in. Focus groups expressed a preference for working in a public /private partnership that would have access to marina facilities and therefore be closer to fuel, the existing pump-out facility and services; and
- ▶ Brushgrove (Site 1) was not supported by either focus group in its current location due to poor public access, steep banks at the preferred location, dangerous overhead powerlines that have caused serious issues in the past with yacht masts, poor anchoring opportunities, and poor condition of boat ramp. A site at the end of Clarence Street (Site 2) that has a large public reserve was nominated and supported as a better location for all types of boats, yet still easily accessible to the village of Brushgrove.

The preliminary concept designs were presented in the Round 2 Focus Group meetings and were generally accepted. Key comments included:

- ▶ Approximately three (3) metres was considered the narrowest the pontoons should be to enable use by disabled persons;
- ▶ The proposed set-down platform on the inside of the pontoons should be at water level or above and should be brightly painted for visibility;

- ▶ Grafton- the Pound Street location was still favoured by yacht users. It was noted that this site may be unfeasible if a second bridge crossing was constructed in the vicinity;
- ▶ Ulmarra - need to be mindful of not extending onto the frontage of the neighbouring property; and
- ▶ Brushgrove - Site 2 was considered inconvenient for some local people who will use it on a regular basis (fishermen and skiers) because it is too far from the boat ramp. It was therefore suggested that the community also needs a smaller pontoon near the Cowper boat ramp. Site 2 at the tip of the Clarence street reserve was still generally supported.

2.1.3 Aboriginal Groups

Letters were written to the local aboriginal land councils, elders groups and contact was made by telephone with the assistance of CVC's Community Development Officer (Aboriginal). There has been no formal response at the time of writing this CRWDP. All groups were invited to attend the focus group meetings but no-one attended. Further contact will be made during the exhibition of the CRWDP including with the native title claimants that relate to the Lower Clarence.



2.2 Environmental Assessment

2.2.1 River Bank Stability

The sites generally displayed stable and/or protected banks. The key exceptions were:

- ▶ Brushgrove Site 2 – where evidence of soil attrition along the bank was observed. It was recommended that protective works along the lower bank be provided;
- ▶ Lawrence - where the existing rock pitched protection is failing in locations. It was recommended that the stability of the current system be reviewed during the detailed design phase; and
- ▶ Harwood - upstream of the existing boat ramp where the bank is steep. Bank protection works were recommended at this location.

2.2.2 Geotechnical

With the exception of Brushgrove and Yamba, existing subsurface information was generally provided to GHD that was within 0.5 km of all proposed sites.

Whilst site specific geotechnical investigators and /or test piling is recommended prior to the detailed design phase, the following recommendations were made for conceptual design purposes:

- ▶ Pile lengths will have a minimum depth below river level (AHD) of approximately 8 m with the range dictated by local conditions (possibly up to 20 m) – generally the estuarine sediments at

locations such as Maclean & Harwood will be softer and less consolidated than further upstream;

- ▶ Piles should be preferably founded in sand (medium dense) rather than clay – due to the densification and cone of resistance of the former material caused during the pile driving;
- ▶ In sand sediments, a general target of medium dense material should be sufficient; and
- ▶ In clay sediments (where unavoidable in the local profile) such as Lawrence, Maclean and possibly Brushgrove – a minimum target of 'stiff' clays should be achieved.

2.2.3 Flooding

Site specific flood levels were obtained from CVC. As expected, all sites were found to be susceptible to flooding.

It was concluded that climate change/sea level rise effects could potentially lead to increased tidal inundation and increased flooding (frequency and depth) at the sites. As per DECC (2009) guidelines it was recommended that a 0.4m allowance for climate change/sea level rise be added to all flood levels for conceptual design purposes.

2.2.4 Ecology

The ecological values vary at each site. Most of the proposed locations have been cleared and now have a mixture of native and introduced aquatic and riparian vegetation species. However, mangroves exist at the proposed sites of Yamba, Harwood, Maclean and Brushgrove (Site 2). It is unlikely that any of the existing vegetation provides habitat for



threatened fauna species. Flora and fauna is therefore not considered to be a limitation to any works, however, any impact on the mangroves will require approval by DPI-Fisheries under the Fisheries Management Act. It was therefore recommended that any structure/works is located away from the mangroves where possible.

2.2.5 Heritage

A search of the AHIMS database and LEP's and North Coast REP (now a SEPP) indicated that there are no known sites or aboriginal objects or places recorded or listed in or near any of the proposed wharf locations. The sites have also been highly disturbed in the past, so it is considered unlikely that any items still exist, however, rivers were a popular gathering and camping place for aboriginals so it is possible that items do exist in some locations.

No non Aboriginal heritage items are listed in the LEP's or North Coast REP at the sites.

2.2.6 Air and Noise

Any increase in the number of visitors has the potential to be a source of noise and air pollution, however, it is expected that this impact would be limited because it is likely to be short term and there are limited sensitive receptors in close proximity to the proposed wharf locations. Air and noise impacts from construction works are also likely to be short term and limited.

2.2.7 Water Quality

Improvements to the wharf facilities have the potential to attract more people and watercraft to the site. This could have an impact on water quality by increasing litter in the area and the potential for fuel spills/leaks from watercraft. It is expected that these impacts would be limited and could be minimised by implementing appropriate controls.

Appropriate controls would also need to be implemented during construction to minimise impacts on water quality.

2.2.8 Contamination

CVC has not listed any of the sites as contaminated or potentially contaminated. The site inspection did not identify any issues of concern either but there is the potential for contamination from previous spills and leaks from vehicles or boats and the use of imported fill.

2.3 Planning/Ownership

The sites are either Crown Land or CVC land or a combination of both. The bed of the river in which the piles will be located is Crown land. It is important that lease arrangements be made with DoL once locations and concepts are finalised.

Any structures proposed within the area affected by the Yaegl People Native Title claim are also required to be notified to them.

SEPP Infrastructure, 2007 ensures that all sites will be dealt with under Part 5 of the Environmental Planning and Assessment Act, 1979. A Review of Environmental Factors (REF) undertaken either individually



or collectively will be needed for the sites prior to commencement of the project to ensure that the environmental impacts are fully considered.

It was recommended that the location and size of the proposed wharf structure for Yamba be resolved through the Yamba Bay Masterplan process being undertaken by the NSW Department of Lands. It is noted that the current owner of the Yamba Marina has indicated support for working with Council and the Department of Lands to find a suitable site for a public wharf.

2.4 Structural Condition Assessment

The existing pontoons at Grafton, Maclean and Yamba and the timber structure at Lawrence appeared to be in good condition and require only routine maintenance to correct some relatively minor issues.

The timber structures at Harwood and Ulmarra were found to be in fair condition. Both structures had moderately weathered and split timbers and corroded fixings. These items will require routine maintenance and/or replacement in the medium term (5-10 years). The spalling of the concrete piers at Ulmarra was significant and requires immediate attention.

The timber structure at Grafton was found to be in poor condition. Most timbers are weathered and split. The hand railing and fixings are corroded. Even with routine maintenance the expected serviceable life of the structure is less than 10 years without major replacement works. Given the nature of the wharf and likely significant expense of the replacement works, this is not considered practicable.

Therefore, assuming that appropriate maintenance and/or repairs are undertaken, all structures with the exception of Grafton timber wharf are considered suitable for augmentation works. The structural capacity to withstand any additional loading will need to be confirmed beforehand via separate calculations.



3. Conceptual Designs

3.1 Scope of Work

After considering site environmental and planning issues, the nature and condition of the existing infrastructure and stakeholder requirements, GHD developed concept recommendations and sketches of the infrastructure. The recommendations, which were to feed a later detailed design phase, address drop off zones, boat tie-up, non-motorised watercraft access and bilge pump-out and waste disposal.

Budget cost estimates were developed for all sites within +/- 30% accuracy.

GHD was not engaged to consider landside works such as footpaths, ramps, landscaping etc. Refueling and boat ramp facilities were also outside of GHD's scope of work.

3.2 Design Criteria and Assumptions

The concepts designs were prepared in accordance with the relevant Australian Standards. The following design criteria were adopted:

- ▶ Design Vessel Displacement: 5T;
- ▶ Design Vessel Berthing Velocity (transverse to pontoon): 0.30 m/s;
- ▶ Design Wind Velocity: 52 m/s (ultimate limit state); and
- ▶ Design Flood Levels and Velocities: as per Table 3-1. A 0.4m climate change/sea level rise allowance was added to these flood levels.

Table 3-1 Design Flood Depths and Velocities

	1/100 year flood level m AHD	1/100 year water velocity m/s	1/20 year flood level m AHD	1/20 year water velocity m/s	1/5 year flood level m AHD	1/5 year water velocity m/s
Grafton	8.2	0.5	8	0.4	6.1	0.5
Ulmarra	6.4	1.1	6.1	1.2	4.9	1.0
Lawrence	5.4	0.1	4.7	0.1	3.6	0.2
Brushgrove Site 2	5.9	0.6	5.3	1.1	4.2	0.9
Maclean	3.8	1.5	3.3	1.5	2.5	1.4
Harwood	3.3	0.7	2.9	0.7	2.1	0.9

The following assumptions were made:

- ▶ Pile fixity below riverbed evaluated for relatively soft estuarine clay as 5 m, allowing 0.6m for erosion; and
- ▶ Normal river current was assumed at 60% of the flood velocity.

3.3 Concept Recommendations

The conceptual designs for the infrastructure are presented in Appendix A. Discussion on each element is below:



3.3.1 Pontoon Structures

Given the outcomes of the Stakeholder Consultation phase in which floating, piled, pontoon structures were overwhelmingly viewed as the preferred type of structure, fixed, wharf-style structures, such as that currently exist at Lawrence, were not investigated. Stakeholders considered the existing Maclean pontoon, approximately 25m in length, as the ideal size and style of structure.

Proprietary floating pontoon structures are available from numerous suppliers on the eastern seaboard and usually comprise of UV-protected polyethylene or similar floatation cells with concrete/carpeted timber decks and aluminium gangways. These suppliers typically design and install complete structures, including piling, with design lives in accordance with the Australian Standard AS 4997- 2005 *Guidelines for the Design of Maritime Structures*. This should be confirmed prior to procuring the pontoons.

With floating pontoons, lateral forces from debris impact, vessel mooring etc. are typically resisted by piles which cantilever vertically from some 'fixity' point under riverbed level which is determined taking into consideration the subsurface geotechnical conditions. Consequently the piles, whilst fewer in number, are generally more substantial than those on fixed structures where multiple raked (angled) piles typically withstand lateral forces.

Preliminary piling calculations were undertaken for 25m pontoon structures to estimate likely diameters and embedment depths. Three, Grade 350 457 x 12.7 CHS steel piles were found to be adequate with embedment depths around 10m to 15m – depending on the location.

Given the substantial frontage on the pontoons there is adequate room for several vessels to tie-up while still maintaining a dedicated drop-off zone. Utilising the overwater survey provided by CVC, the structures were located such that there is a minimum depth of 2m of water at the riverside face.

As floating pontoon decks are around 300 mm higher than water level, a lower deck area, at water level, is proposed toward the rear of each structure to allow for the alightment of non-motorised watercraft. This area would be painted with high visibility paint and would typically exist on the downstream side so that debris would not collect on it.

Gangway lengths vary from 5m to 11m depending on site constraints. As per current CVC practice, it is envisaged that the gangways will be removed during flood events. Alternatively, where they have sufficient length, gangways and gangway footings can be designed to withstand flood loading though it is considered that this would be cost prohibitive.

3.3.2 Landside Access

A key outcome of the Stakeholder Consultation was that disabled access should be provided wherever practicable.

AS 4997-2005 states that gradients of gangways (hinged ramps attached to floating structures, whose gradients varies with the tide) should not exceed 1 in 12 for more than 20% of the time.

During consultation, NSW Maritime encouraged, wherever practicable, the provision of 1:14 gangway access for more than 80% of the tide (time) in accordance with public ferry wharf guidelines and as per



unassisted access provisions of AS 1428.1 - 2001 *Design for access and mobility - General requirements for access - New building work*.

Given this, GHD took a conservative approach when preparing the conceptual designs and allowed for 1:14 gangway access at Mean Low Water (MLW) level. Whilst GHD's commission technically terminated at the riverbank, at steep sites such as Brushgrove, GHD took the liberty of arranging footpaths, ramps etc at 1:14 slopes to show that disabled access was possible up the riverbank.

3.3.3 Bilge Pump Out and Waste Disposal

The existing pump-out facility at the private marina in Yamba is available to the general public for a nominal fee. During the Stakeholder Consultation phase the owner of the marina advised that the pump-out facility is rarely used other than by craft that reside at the marina. Rather than CVC providing additional pump-out infrastructure near the lower Clarence towns at substantial cost, and with ongoing maintenance requirements, the consensus from the stakeholders was for CVC to work with the Yamba marina and establish an arrangement whereby the marina is subsidised or compensated for day visiting vessels that use pump-out facility.

Whilst a development application has not been lodged with Council, a private marina development is mooted just upstream of the Grafton CRWDP site. Given this, it is not considered prudent for CVC to provide a pump-out facility near the upper CRWDP towns, when it may be able to work with this prospective marina to achieve a facility that will also serve day visiting vessels.

NSW Maritime's comment that pump-out facilities are required along the river from an environmental perspective is acknowledged, and as such, it is recommended that the Grafton pump-out facility be reassessed should the Grafton marina development not proceed. Alternative sites that are downstream of the Grafton bridge, such as Kirschner Street or Pound Street, should be investigated so that yachts may also use the facility.

It is recommended that wheelie bins be provided in close proximity to all new pontoons for solid waste disposal. Most sites are within or near public parks and as such are in/close to CVCs existing waste collection system.

3.3.4 Potable Water Supply

Focus Group attendees saw a potable water supply on the pontoon decks as being beneficial for washdown and vessel water supply purposes etc. Investigations undertaken on the CVC water supply system revealed a potable water supply within close proximity to all sites.

The conceptual designs show a hose tap with vacuum breaker on each pontoon deck fed from a pipeline slung under the gangway. A flexible connection within a metered valve pit on the landside would allow for tidal movement and disconnection for gangway removal during flood events.



3.3.5 Electricity Supply and Lighting

Focus Group attendees felt that electrical supply points on the pontoons would encourage long-stay visitors – such as that currently occurs at the existing pontoon at Maclean, effectively reducing the availability of the infrastructure.

It is acknowledged that an electrical supply on each pontoon would be beneficial for washdown purposes (thus enabling the use of a high pressure cleaner). However, as all sites other than Grafton and Lawrence do not have a nearby (within 50m) electrical supply, the cost to provide electrical infrastructure for washdown purposes is considered prohibitive and therefore is not recommended. A low pressure wash will be available via the potable water supply outlet. Note that washdown in these situations is for salt removal and does not imply that detergents or other cleaning agents should be used at the wharf facilities, nor will they be allowed.

The Focus Group attendees felt that the provision of basic security lighting at each pontoon was warranted. High efficiency solar photovoltaic (PV) lighting has been recommended for each site other than Grafton – where an existing streetlight is located in close proximity. It is noted that, apart from the Brushgrove and Maclean sites, the nominal location of the light poles is within the 1 in 5 year flood zone and so is at risk from damage during most flood events.

3.4 Cost Estimates

Summary preliminary cost estimates for each site, inclusive of a 15% contingency, are presented in Table 3-2. Detailed preliminary estimates are presented in Appendix B.

The preliminary cost estimates are based on extrapolation of recent similar project pricing, budget quotes for some equipment items, industry unit rates and GHD experience. The estimates are based on incomplete design and other information and are not warranted by GHD. The accuracy of these estimates is not expected to be better than about $\pm 30\%$ for the scope of work described in this report.

With the exception of PV lighting and bank protection works, GHD has not included any allowance for the investigation, design, or construction of landward works (footpaths, ramps, landscaping, water supply to gangway etc.). Similarly, no allowance has been made for the preparation of REFs or Development Applications for the infrastructure as it is assumed that CVC staff will undertake this work.

GHD has included an allowance for site-specific geotechnical investigations. GHD has assumed that the barge-based geotechnical investigations will occur together to minimise barge mobilisation costs.

The preliminary pontoon pricing is from a supplier and allows for the design, supply and installation of the pontoons, gangways and piling. GHD has assumed that the pontoons will be installed in groups of three to minimise barge mobilisation costs.



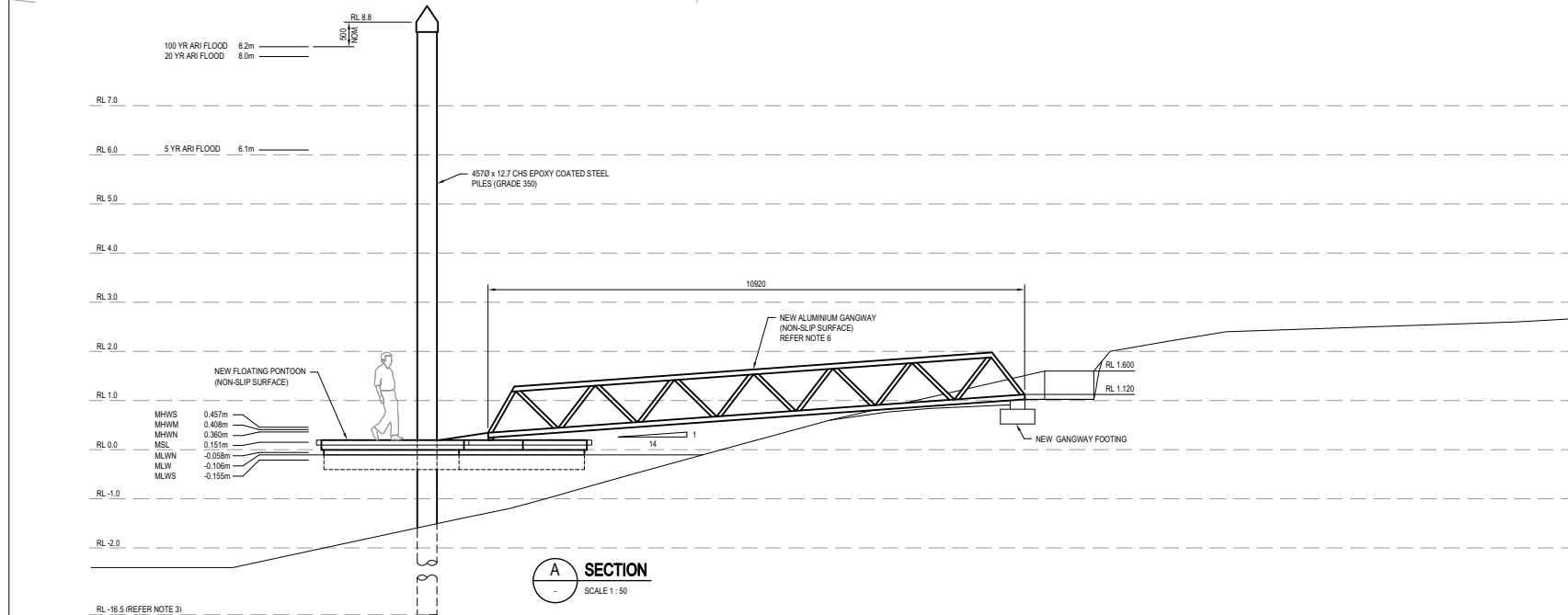
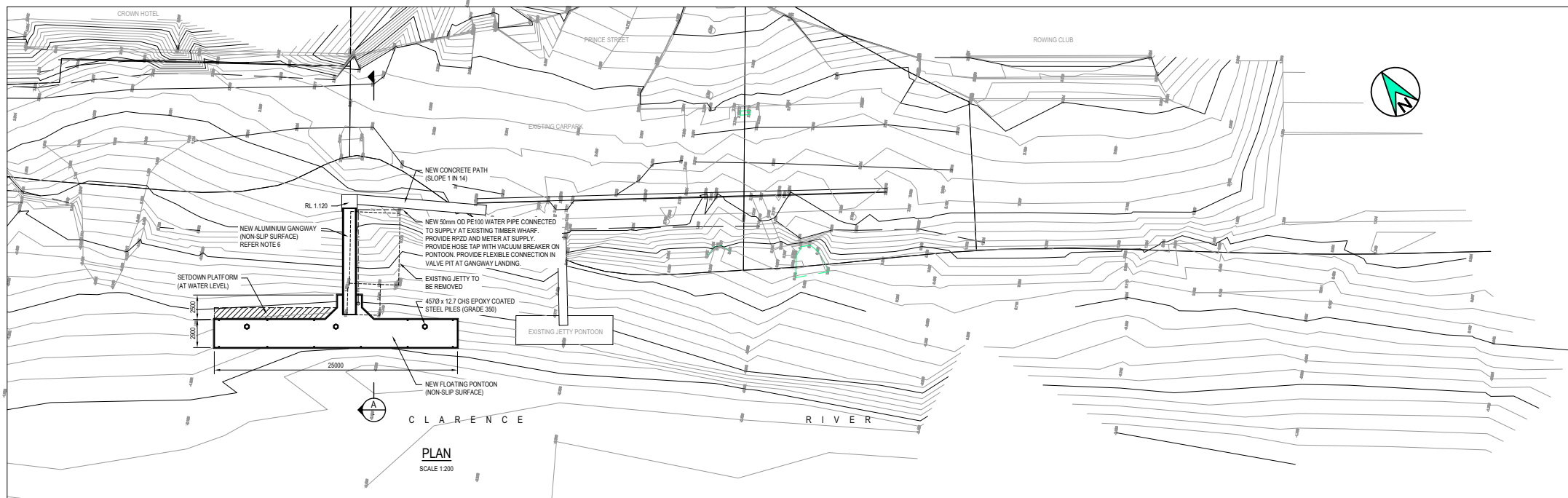
Table 3-2 Preliminary Cost Estimates

Site	Preliminary Cost Estimate (ex-GST)
Grafton	\$ 220,800
Ulmarra	\$ 288,650
Lawrence	\$ 246,100
Brushgrove (Site 2)	\$ 239,200
Maclean	\$ 219,650
Harwood	\$ 236,900



Appendix A

Concept Design Drawings



NOTES:

- THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE CLARENCE RIVER WHARVES DEVELOPMENT PLAN (GHD, AUGUST 2009).
- PONTOONS, GANGWAYS, PILING AND ASSOCIATED WORKS WILL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE RELEVANT AUSTRALIAN STANDARDS. THE FOLLOWING SCENARIOS SHALL BE CONSIDERED AS A MINIMUM FOR THE PONTOON AND PILING DESIGN:

A) DEBRIS IMPACT DURING FLOODING

FLOOD LEVELS AND VELOCITIES

1/100 YEAR FLOOD LEVEL	1/100 YEAR WATER VELOCITY	1/20 YEAR FLOOD LEVEL	1/20 YEAR WATER VELOCITY	1/5 YEAR FLOOD LEVEL	1/5 YEAR WATER VELOCITY
m AHD	m/s	m AHD	m/s	m AHD	m/s
8.2	0.5	8	0.4	6.1	0.5

IN THE ABSENCE OF DEFINITIVE DATA, A 0.4m CLIMATE CHANGE/SEA LEVEL RISE ALLOWANCE WILL BE ADDED TO ALL FLOOD EVENTS FOR PILE DESIGN.

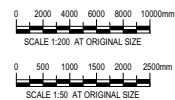
B) BERTHING:

VESSEL DISPLACEMENT = ST. MAXIMUM BERTHING VELOCITY (TRANSVERSE TO PONTOON) = 0.30 m/s. LARGER VESSELS MAY BE ACCOMMODATED WITH A REDUCED BERTHING VELOCITY.

- THIS CONCEPTUAL DESIGN HAS BEEN PREPARED WITH LIMITED GEOTECHNICAL INFORMATION AND THE PILE LENGTHS NOMINATED ARE INDICATIVE ONLY. FOR CONCEPTUAL DESIGN PURPOSES, PILE FIXITY WAS ASSUMED AT 5m BELOW THE RIVER BED. A SITE-SPECIFIC GEOTECHNICAL INVESTIGATION AND/OR TEST PILING SHOULD BE UNDERTAKEN AT EACH SITE PRIOR TO THE DETAILED DESIGN/CONSTRUCTION PHASE.
- TIDAL INFORMATION WAS PROVIDED BY MANLY HYDRAULICS LABORATORY.
- FLOOD LEVELS AND VELOCITIES WERE PROVIDED BY CLARENCE VALLEY COUNCIL. NO ALLOWANCE FOR CLIMATE CHANGE/SEA LEVEL RISE IS INCLUDED IN THESE FIGURES.
- GANGWAYS HAVE BEEN ORIENTATED SUCH THAT 1:14 RAMP ACCESS IS AVAILABLE AT MEAN LOW WATER LEVEL (MLW) (WITHOUT CLIMATE CHANGE/SEA LEVEL RISE ALLOWANCE).

PRELIMINARY

B	GENERAL AMENDMENTS	ICG	GL	PP	18.08.06	
A	ISSUED FOR COMMENT	ICG	GL	PP	08.07.06	
No	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Checked	Approved	Date



GHD CLIENTS | PEOPLE | PERFORMANCE

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DO NOT SCALE

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Drawn	I.GOULD	Designed	P.PIGRAM
Drafting Check		Design Check	
Approved			
Date			
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Client Project	CLARENCE VALLEY COUNCIL CLARENCE RIVER WHARVES DEVELOPMENT PLAN
Title	PROPOSED PONTOON - GRAFTON GENERAL ARRANGEMENT
Original Size	A1
Drawing No:	22-14504-S10
Rev:	B

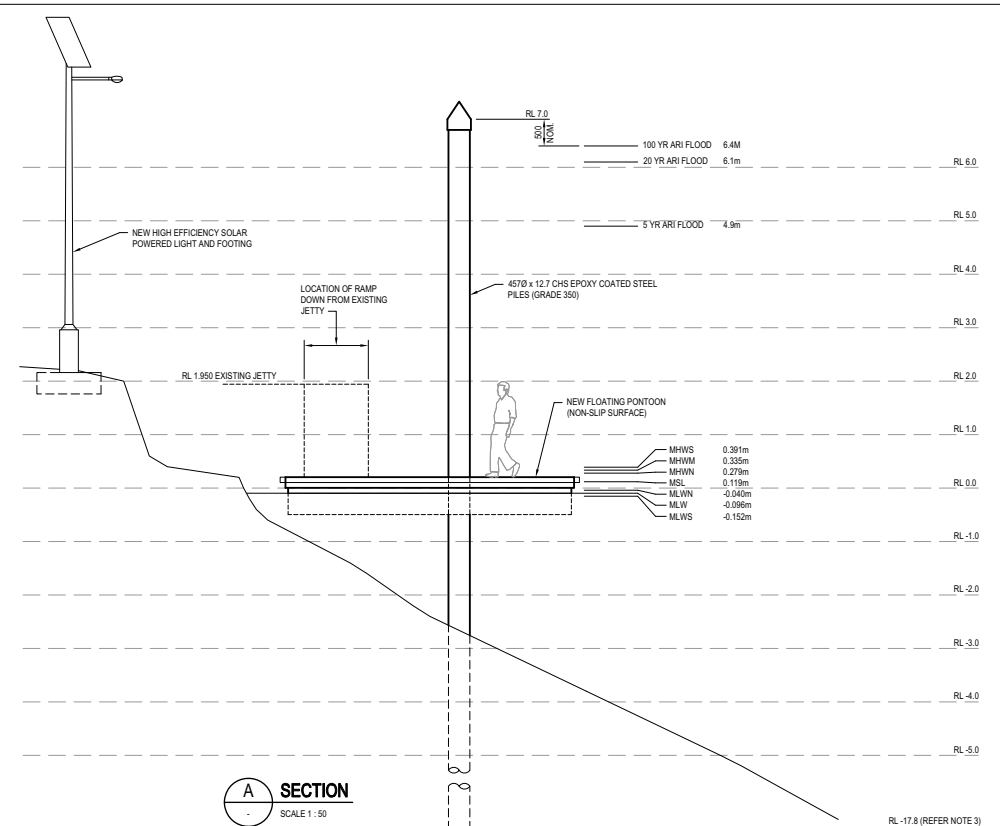


CLIENTS | PEOPLE | PERFORMANCE

CLARENCE VALLEY COUNCIL
CLARENCE RIVER WHARVES
DEVELOPMENT PLAN
PROPOSED PONTOON - GRAFTON
PHOTO PERSPECTIVE VIEW

Job Number | 22-14504
Revision | A
Date | AUG 2009
S11

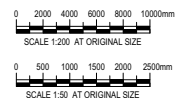
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NEW FLOATING PONTOON
(NON-SLIP SURFACE)

B SECTION
- SCALE 1 : 50

A SECTION
SCALE 1 : 50



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Original Size
A1

Drawing No: 22-14504-S20

Box B

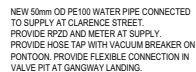
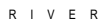


CLIENTS | PEOPLE | PERFORMANCE

CLARENCE VALLEY COUNCIL
CLARENCE RIVER WHARVES
DEVELOPMENT PLAN
PROPOSED PONTOON - ULMARRA
PHOTO PERSPECTIVE VIEW

Job Number | 22-14504
Revision | A
Date | AUG 2009
S21

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PLAN
SCALE 1:200

- NEW HIGH EFFICIENCY SOLAR POWERED LIGHT AND FOOTING

RL 4.700

NEW STAIR WITH
HANDRAIL

RL 1,035

— APPROX. EXISTING GROUND LINE

NEW ALUMINIUM GANG
(NON-SLIP SURFACE)
SEE NOTE 2

NEW FLOATING PONTON
(NON-SLIP SURFACE)

—	MHWM	0.309
—	MHWN	0.269
—	MSL	0.114
—	MLWN	-0.04
—	MLW	-0.08
—	MLWS	-0.12

RI -10

RL-20

RL-3.0

RI 16.9 / REFER NOTE 2

PRELIMINARY

PRELIMINARY

CIL

ES DEVELOPMENT PL

WILSHGROVE

KUSHGROVE

S30

530 Rev

Rev: B



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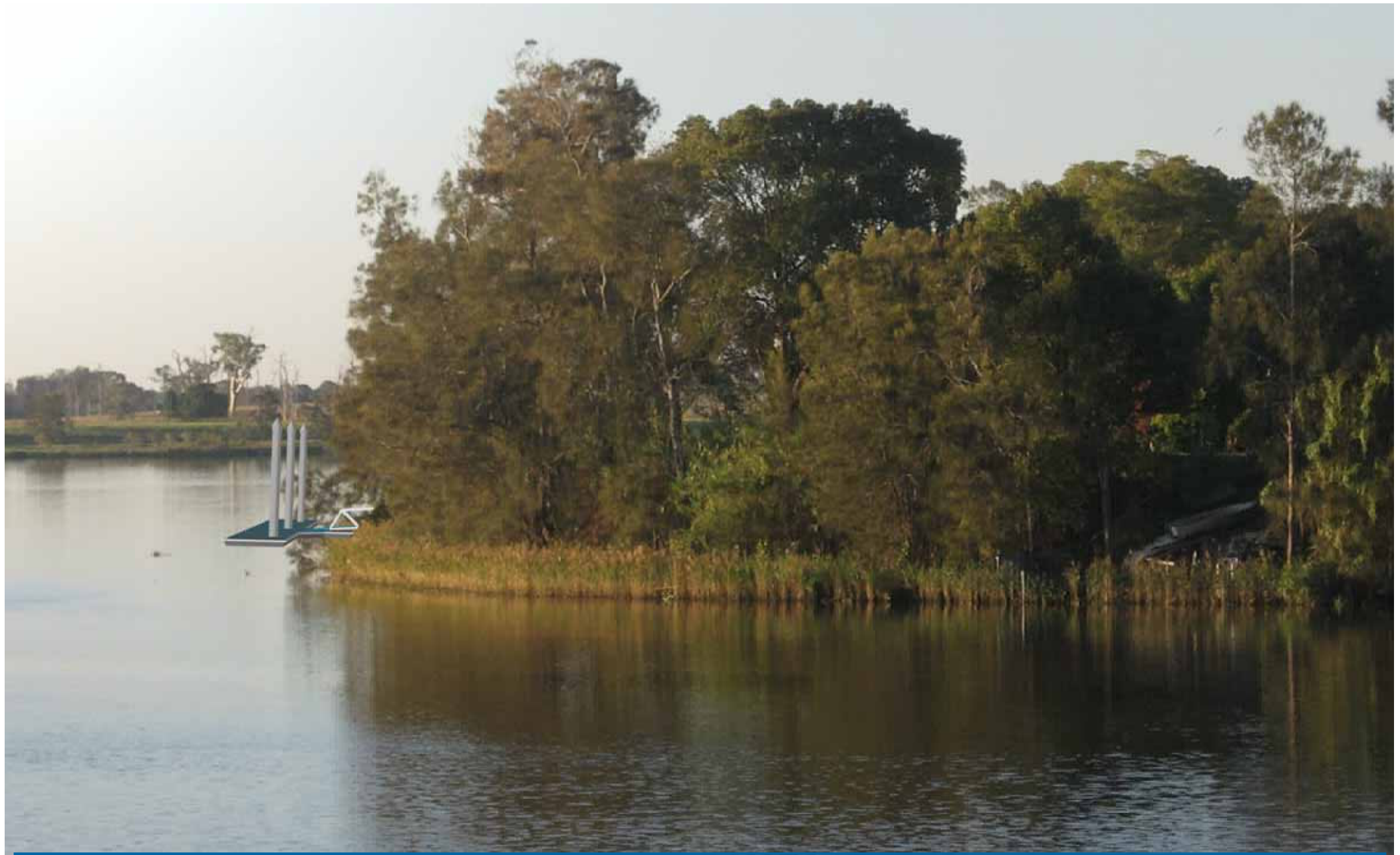
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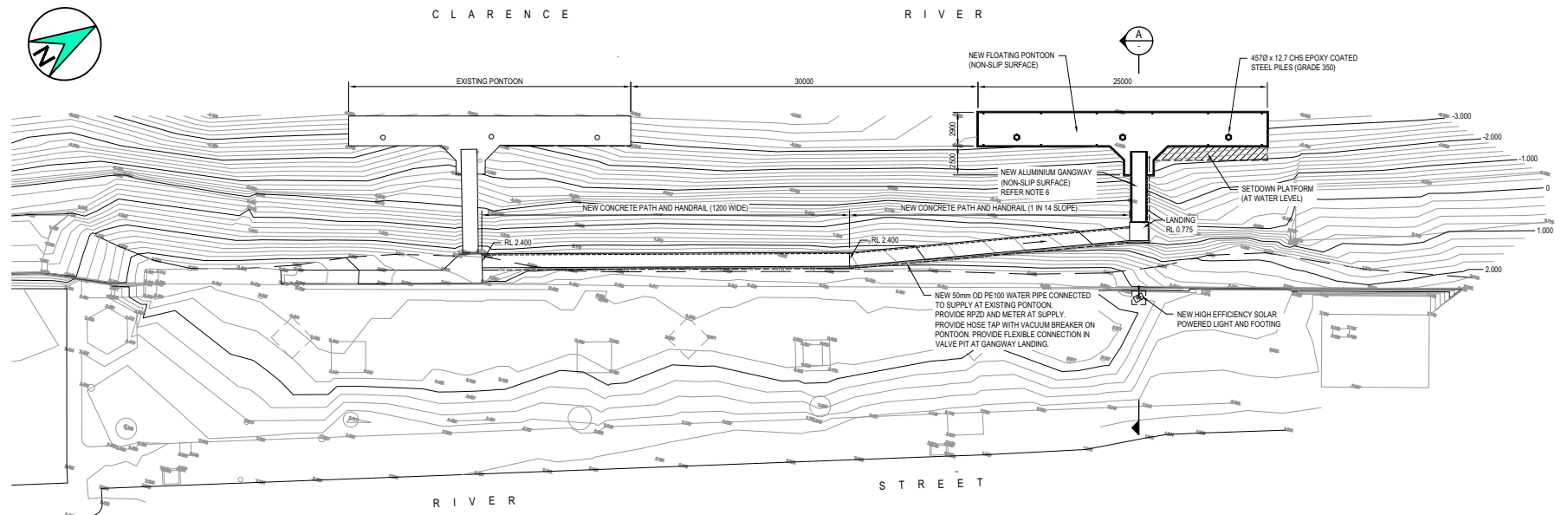
Original

Drawing No: **22-14504-S30**

Rev: B







PLAN
SCALE 1:200

NEW HIGH EFFICIENCY SOLAR POWERED LIGHT AND FOOTING

RL 2.400

RL 0.775

NEW GANGWAY FOOTING

EXISTING PONTOON RAMP BEYOND

NEW ALUMINUM GANGWAY (NON-SLIP SURFACE) REFER NOTE 6

6080

1 14

RL 4.3

500 N.O.D.

100 YR ARI FLOOD 3.8m

20 YR ARI FLOOD 3.3m

5 YR ARI FLOOD 2.5m

NEW FLOATING PONTOON (NON-SLIP SURFACE)

MHWS 0.315m

MHWM 0.270m

MHWN 0.226m

MSL 0.091m

MLWN -0.063m

MLW -0.108m

MLWS -0.152m

RL 3.0

RL 2.0

RL 1.0

RL 0.0

RL -1.0

RL -2.0

RL -3.0

RL -17.8 (REFER NOTE 5)



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Original Size	A1
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Drawing No: 22-14504-S50

lev: B

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