

REPORT

Bank Street, Pyrmont

Navigation Impact Assessment

Client: Urban Growth NSW Development Corporation

Reference: M&APA1665-102R001F5.0

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- Appendix D: Blackwattle Bay Marina Facility Plan
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- Appendix F: Bank Street Commercial Wharf (floating structure)

1 Introduction

UrbanGrowth NSW Development Corporation (UGDC) submitted a Section 75W Modification (Mod 3) application to change the approved use of the marina facility at Bank Street initially proposed to accommodate relocation of the Sydney Heritage Fleet, from community use to a boating and tourist charter use. This proposal would facilitate temporary relocation to Bank Street of the charter vessels currently berthed at Blackwattle Bay Marina (BBM) at the head of Blackwattle Bay, which is the proposed location for construction of the new Sydney Fish Market.

During public exhibition of the application, a number of submissions were received from the local community, passive boating groups and City of Sydney Council that related to potential navigation impacts of the proposal. NSW Department of Planning & Environment has requested that a Navigation and Safety Impact Assessment is undertaken to address these concerns.

UGDC has engaged Royal HaskoningDHV (RHDHV) to undertake a Navigation Impact Assessment for the proposed marina facility. The scope of this study involves:

- review of previous and current marina approval documentation;
- establish existing waterway navigation and usage;
- compare current and previous proposals for a marina facility at the Bank Street site, including the Sydney Heritage Fleet Part 3A Approval, BBM Mod 3 Facility and current proposal for floating marina structure documented on drawings provided by UGNSW, and the existing BBM facility;
- assessment of potential navigation impacts and proposed mitigation measures; and,
- preparation of Navigation Impact Assessment Report.

The subject of this report is the site of the proposed Bank Street marina facility. However, consideration has also been given to waterway use in adjacent areas such as Rozelle Bay as this interacts with vessel activity in Blackwattle Bay, and boating traffic from both areas utilises a common navigation channel beneath the Glebe Island Bridge to access Sydney Harbour.

Appendix A contains maps displaying relevant spatial data and comprise:

- Map 1 – Existing Bathymetric Levels
- Map 2 – Maritime and Navigation Features
- Map 3 – Proposed Marina Detail Plan
- Map 4 – Proposed Marina Existing Bathymetric Levels
- Map 5 – Proposed Marina Berthing Plan

Appendix B contains NSW Boating Information.

Appendix C contains a plan of the original Sydney Heritage Fleet berthing facility proposed at Bank Street, Pyrmont.

Appendix D contains a plan of the existing Blackwattle Bay Marina (BBM) facility.

Appendix E contains plans of the proposed Bank Street Commercial Wharf fixed structure.

Appendix F contains plans of the proposed Bank Street Commercial Wharf floating structure (current project proposal).

2 Existing Waterway Navigation and Usage

2.1 Tidal Water Levels

Tidal water levels in Sydney Harbour are represented by tidal planes at the Fort Denison tide gauge, and are summarised in **Table 1**.

Table 1: Sydney Harbour Tidal Planes (MHL, 2012)

Tidal Plane	Chart Datum (metres)	Australian Height Datum (metres)
Highest Astronomical Tide, HAT	2.1	1.18
Mean High Water Springs, MHWS	1.57	0.65
Mean High Water, MHW	1.45	0.53
Mean High Water Neaps, MHWN	1.33	0.41
Mean Sea Level, MSL	0.95	0.03
Mean Low Water Neaps, MLWN	0.56	-0.37
Mean Low Water, MLW	0.44	-0.49
Mean Low Water Springs, MLWS	0.32	-0.61
Lowest Astronomical Tide, LAT	0	-0.93

2.2 Water Depths

Water depths on navigation charts are typically displayed as depths below Chart Datum, which approximates the Lowest Astronomical Tide (LAT). Water depth information (relative to Chart Datum, CD) has been sourced from the RMS Infrastructure and Geospatial Services division and is displayed on **Map 1** (refer **Appendix A**).

Water depths within Blackwattle Bay are deepest in the middle of the Bay, where depths of up to 7m are found. Water depths adjacent to existing wharf, marina and jetty structures are generally between 2m to 6m.

The shallowest water depths of 0m occur at the shoreline along the eastern side of the Bay and generally deepen to 2m within 10m to 50m of the shoreline. Water depths are around 2m along the shoreline at the head of the Bay and deepen to 4m within 10m of the shoreline. Water depths along the western shoreline of the Bay are generally 2m, with water depths of 3m at the pontoon facilities used by Glebe Rowing Club and Sydney University Boat Club. An anchorage zone exists within the embayment between Sydney University Boat Club and the headland at Bellevue House and has water depths of 2m to 4m.

The maximum water depths in the adjacent area of Rozelle Bay are located along the northern side of the Bay where depths of 6m to 7m are enjoyed by marina facilities including Roads and Maritime Services, Sydney Superyacht Marina and Sydney Boathouse. Water depths at the head of the Bay are shallower and range from 0m along the shoreline to 2m to 4m at the Seawind Catamaran marina facility. Along the southern shoreline water depths are shallower than the northern side of the Bay and range between 2m and 4m in the anchorage zones in the embayments between Bellevue House and Glebe Point and adjacent to Bicentennial Park. A notable shallow water area exists offshore of the entrance to Johnstons Creek, where water depths of less than 2m extending some 150m offshore are indicated by a north cardinal mark.

Water depths within the marked navigation channel beneath Anzac Bridge are between 6m and 8m, and are around 7m within the navigation channel through the Glebe Island Bridge. Beyond the Glebe Island Bridge water depths increase to 12m on the approach to Darling Harbour through Johnstons Bay and similar water depths exist within White Bay.

In summary, the relatively deep water depths within Blackwattle Bay are favourable for a wide range of boating activities. These water depths are also generally available in neighbouring bays (Rozelle Bay, Johnstons Bay and White Bay). This deep water in combination with sheltering from swell and wind waves found elsewhere in the outer Sydney Harbour, and the availability of flat waterfront land makes the Bays Precinct attractive for siting of industrial, commercial and recreational boating facilities and also the use of passive recreational craft.

2.3 Navigation Widths

A relatively wide navigation area exists within Blackwattle Bay for transit of commercial and recreational vessels. At the entry to the Bay, a 250m width exists between the headland at Blackwattle Bay Park and the foreshore beneath the Anzac Bridge and adjacent to Bank Street. Further into the Bay, special marks delineate the anchorage zone on the western side and a 250m wide navigation area exists to the eastern shoreline. The narrowest width for passage of boats of around 180m exists between the rowing club facilities on the western shoreline and the marinas on the eastern shoreline owned by Blackwattle Bay Marine Operatives and the Sydney Fish Market.

Beneath the Anzac Bridge the waterway width is around 250m between the facilities at Sydney City Marine and the opposing foreshore. However, port and starboard markers delineating the navigation channel beneath the bridge indicate that a width of 140m is available for navigation.

The navigation width narrows significantly to 18.8m through the eastern portal of the Glebe Island Bridge. It is noted that the western portal (18.7m clearance) of the Glebe Island Bridge has restricted water access due its proximity to the commercial shipping berths at Glebe Island (Berths 1 & 2) (SMEC, 2016). Beyond this point the waterway width opens out to a maximum of 300m within Johnstons Bay and ranges between 220m to 280m on the approach to Darling Harbour.

2.4 Navigation Rules

The Roads and Maritime Services (RMS) Boating Handbook (RMS, 2016) provides boating information for operating on NSW waters including water traffic rules. The “Safety on the Water” section from the RMS Boating Handbook is provided within **Appendix B** to this report and includes the following sub-sections:

- Know the Rules;
- Navigation Marks and Signs;
- Night Safety;
- Special Areas;
- Big Ships and Small Boats; and,
- Go Easy on the Drink.

The water traffic rules include guidelines on preventing collision and the interaction of vessels, and reference is made to the requirement to comply with the International Regulations for Preventing Collisions at Sea.

The Boating Handbook states the following in relation to Sydney Harbour:

Sydney Harbour is a unique waterway that is used extensively by a diverse range of recreational and commercial boats including large ships, ferries, charter boats, cruisers, yachts, runabouts, sailing skiffs, dinghies, sailboards, rowing shells, kayaks and dragon boats.

The Harbour is an extremely busy waterway that requires you to be aware of your responsibilities and to take care when boating, especially in busy navigational channels, and make allowances for commercial activity.

There is a need to consider paddlers, rowers and sailors as well as accommodating the needs of commercial operators and those wishing to cruise, ski and fish on the Harbour.

The number of vessels on the Harbour is increasing each year, providing a greater challenge in managing the potential for additional conflict and incidents to ensure safety on the waterway.

There is a continuing need for an understanding and commitment to water safety by all people using the Harbour. The different types of boating may not always be compatible and can lead to potential conflicts: for example, people sailing in organised events and commercial vessels operating to timetables.

RMS has launched a safety awareness initiative, aimed at the boating community, called 'You're the Skipper. You're Responsible'. The campaign is designed to encourage all recreational operators to take responsibility for their actions on the water highlighting that boat operators, or skippers, are responsible for the safety of their vessel and the people onboard, and that they should keep a proper lookout for other boats, non-powered vessels (including kayaks and dinghies) and swimmers. The information booklet produced for this campaign is included within **Appendix B**.

The clear message from RMS is that the responsibility for safety rests with the boat users themselves.

2.5 Paddle Safety on Sydney Harbour

In addition to promoting safe operation of motorised vessels, RMS has also launched a safety campaign for passive craft targeted at the use of canoes and kayaks. The Paddle Smart safety campaign (refer brochure in **Appendix B**) outlines requirements for paddle safety on Sydney Harbour, which include:

- paddling on the outside (starboard or right-hand side) of channels or rivers where possible, not in the centre;
- keeping a proper lookout at all times;
- keeping clear of larger vessels and being aware of their wash;
- crossing behind motorised vessels, not in front;
- wearing a lifejacket when more than 100m from shore on enclosed waters or at all times on open waters, with a strong recommendation that a lifejacket is worn at all times in Sydney Harbour;
- a minimum requirement to carry a torch between sunset and sunrise, and a strong recommendation that craft have an all-round white light visible in every direction

A map of Sydney Harbour was included in the campaign brochure. This shows that the central main channel of Sydney Harbour, including the adjacent areas of Darling Harbour, Walsh Bay, White Bay and Johnstons Bay are considered heavy traffic areas that are not recommended for paddlers. Rozelle Bay and Blackwattle Bay were not considered to be heavy or busy traffic areas or areas prohibited to paddlers (e.g. Sydney Cove) on the map.

In addition to the above safety requirements, Rowing NSW has published their own Code of Conduct (effective 19 February 2008) for Rowing and Sculling Shells, which is available on their website. This document outlines additional light requirements (over and above Rule 25 of the Regulations for Preventing Collisions at Sea, adopted in NSW through the Navigation (Collision) Regulations 1983) for rowing and sculling shells over 4m in length. The Code of Conduct states that in restricted visibility conditions and between sunset and sunrise, vessels greater than 4m in length should exhibit:

- two all-round white lights, one attached to the vessel at or near the forward end, and one attached to the vessel at or near the aft end;
- a continuous white light is considered acceptable if it is visible in clear conditions from a distance of 1km;
- a flashing white light is considered acceptable if it flashes at least once per second and is visible in clear conditions from a distance of 1km;
- notwithstanding the above, it is considered acceptable for a light to be masked so as not to interfere with the vision of the vessel's occupants, provided at least one light is visible from any direction.

2.6 Navigation Restrictions

Navigation restrictions are shown on RMS Boating Map 9G – Port Jackson Western Area, Lower Parramatta and Lane Cove Rivers (dated April 2016), which is reproduced below on **Figure 1**. Navigation restrictions are also shown on **Map 2** (refer **Appendix A**).

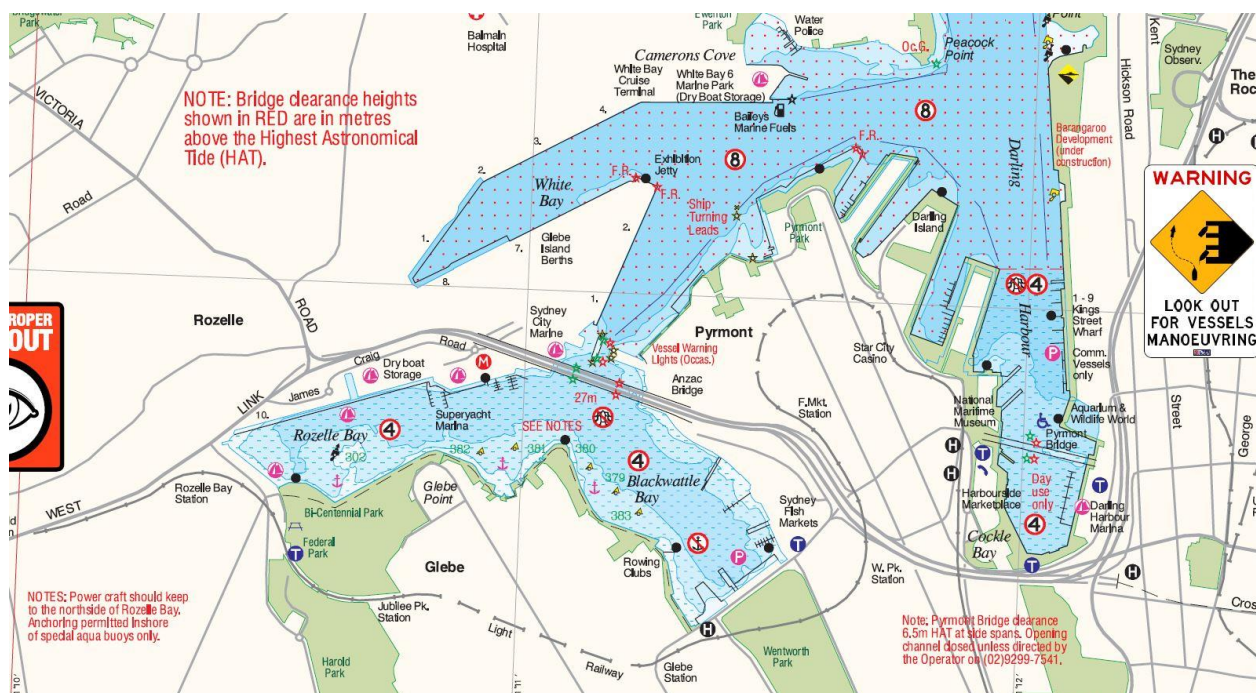


Figure 1: Extract from RMS Boating Map 9G

Navigation restrictions include:

- 4 knot zones within Rozelle Bay and Blackwattle Bay.
Restriction noted by Transport for NSW (2014) to be introduced due to high volume of traffic and interactions between commercial and recreational vessels, including large powered vessels and dragon boats and rowing boats;

- 8 knot zone in Johnstons Bay and White Bay.
Restriction noted by Transport for NSW (2014) to be introduced due to high traffic volume and vessel interactions;
- No wash zone in Blackwattle Bay.
Restriction noted by Transport for NSW (2014) to be introduced due to existence of slipways and commercial vessel operations; and,
- No anchorage zone near the Sydney Fish Market
Restriction noted by Transport for NSW (2014) to be introduced due to high traffic area.

It is noted that Rowing NSW successfully applied for an exemption to the 4 knot speed limit introduced in Rozelle Bay and Blackwattle Bay while rowing supervision is being conducted (i.e. rowing boats accompanied by a tinnie escort to facilitate on-water coaching). This is documented in NSW Maritime letter correspondence dated 9 January 2008 and included within **Appendix B**.

Special marks delineate preferred anchorage zones at the following locations:

- on the southern shoreline of Rozelle Bay adjacent to Bicentennial Park;
- on the southern shoreline of Rozelle Bay in the embayment formed between Glebe Point and the headland adjacent to Bellevue House; and,
- on the western shoreline of Blackwattle Bay in the embayment between the headland at Blackwattle Bay Park and the rowing club facilities.

Navigation aids installed to guide vessels within the waterway include:

- north cardinal mark to indicate shallow water offshore of the entrance to Johnstons Creek;
- lit port and starboard beacons to delineate the navigation channel beneath Anzac Bridge;
- lit port and starboard beacons to delineate the navigation channel through the eastern portal of the Glebe Island Bridge;
- lit special mark beacons to indicate the ends of the Glebe Island Bridge (normally rests in open position); and,
- lit special mark beacons to indicate the end of the eastern (Pymont) road approach to the Glebe Island Bridge.

Notes on the RMS Boating Map advise that power craft should keep on the northside of Rozelle Bay.

Bridge clearances (refer **Figure 2**) relative to Chart Datum are reported by Port Authority of NSW (2015) to be 4.9m (inner end) to 6.8m (outer end) for the swing-span of the Glebe Island Bridge (6m under the side spans) and 29.1m for the Anzac Bridge (and noted on the RMS Boating Map as 27m relative to Highest Astronomical Tide). Further navigation requirements for the Glebe Island Bridge were noted in Acil Allen (2013) and SMEC (2016) to include:

- vessels must give way to outbound traffic;
- vessels must navigate through the Eastern Channel (eastern portal), unless directed otherwise by the Harbour Master (the western channel is closed);
- the Harbour Master periodically issues directions to maritime vessels in the vicinity of Glebe Island Bridge, such as altering the navigation channel if bridge maintenance is occurring; and,
- vessels must give way to traffic lights installed on the bridge when in operation. These traffic lights are controlled by Harbour Control (Vessel Traffic Services) when a large vessel needs to navigate through the channel. Operators of large vessels can inform Harbour Control of their intended transit and RMS also has a secondary control unit.

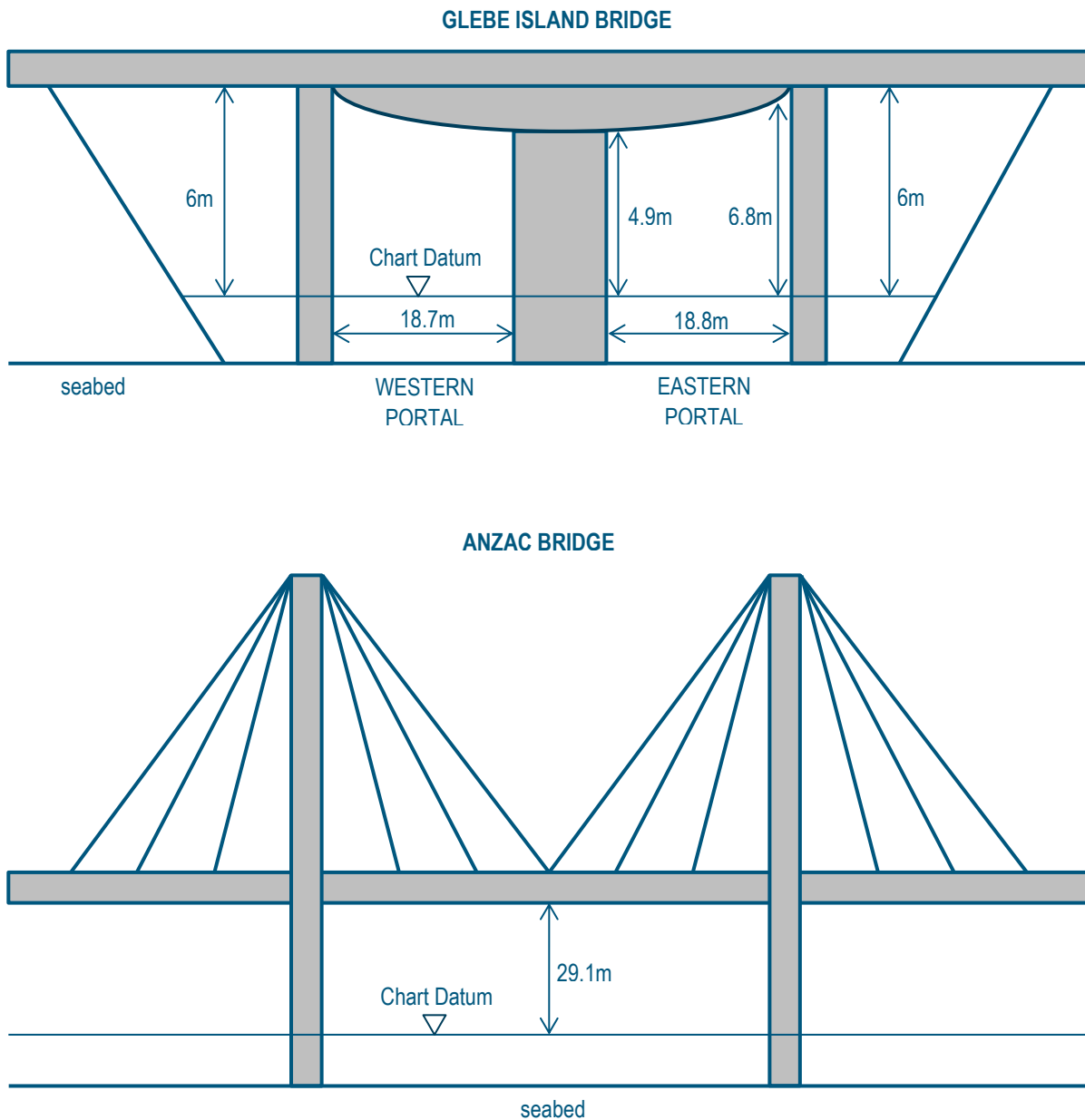


Figure 2: Bridge clearances at Glebe Island Bridge and Anzac Bridge

2.7 Existing Vessel Use

2.7.1 Recreational Power Boats

Recreational power boats are serviced by a number of berthing and boat storage facilities within Rozelle Bay and Blackwattle Bay.

Berthing and boat storage facilities within Rozelle Bay include:

- Sydney City Marine;
- Sydney Superyacht Marina;

- Sydney Boathouse; and,
- Seawind Catamaran Marina.

Berthing facilities within Blackwattle Bay include:

- Blackwattle Bay Marine Operatives; and,
- Sydney Fish Market (northern mooring jetty);

In addition to permanent berths, there are also public wharves available for temporary mooring of visiting recreational vessels. These facilities comprise:

- Rozelle Bay Public Pontoon at Bicentennial Park (refer **Figure 3**) – signage indicates the pontoon is for casual mooring only (pick up and drop off, vessels attended at all times), maximum vessel length of 10m, and maximum draught at low tide of 1.4m;
- Blackwattle Bay Public Pontoon at the headland adjacent to Bellevue House (refer **Figure 4**) – signage indicates the pontoon is for casual mooring only (pick up and drop off, vessels attended at all times), maximum vessel length of 10m, and maximum draught at low tide of 2.4m;
- Glebe Rowing Club pontoon in Blackwattle Bay (refer **Figure 18**) – low freeboard pontoon designed primarily for rowing boat access; and,
- Sydney Fish Market Public Pontoon in Blackwattle Bay (refer **Figure 5**) – provides a drop off/pick up facility for visitors to the Fish Market, accommodates vessels of up to 6m in length, 1.2m water depth is available at low tide.

These facilities cater for a range of motorised vessel sizes including trailable recreational boats (runabouts, motor cruisers), motor yachts, super yachts and larger sized recreational boats less than 11m in length (dry storage at Sydney Boathouse).



Figure 3: Rozelle Bay Public Pontoon



Figure 4: Blackwattle Bay Public Pontoon



Figure 5: Sydney Fish Market Public Pontoon

2.7.2 Sailing Yachts

Facilities that cater for sailing yachts are located in Rozelle Bay and include:

- Sydney City Marine (refer **Figure 6**) – boat repair and refitting of sailing yachts;
- Sydney Heritage Fleet (refer **Figure 7**) – restoration of heritage boats including sailing skiffs; and,
- Seawind Catamaran Marina (**Figure 8**) – marina offering berths specifically for service, repair, chartering and boat management of large ocean going catamarans and tri-marans (only dedicated multihull marina in Sydney), some motor yachts and cruisers are also berthed.



Figure 6: View across Rozelle Bay towards Sydney City Marine repair facility



Figure 7: View across Rozelle Bay towards Sydney Heritage Fleet



Figure 8: Seawind Catamaran marina

2.7.3 Commercial Vessels

Commercial vessels use the waterway to access berths and repair facilities located at a number of waterfront premises occupied by marine contractors. Commercial vessels used by these contractors include tugs, workboats and barges. Marine contractors are primarily located along the northern shoreline of Rozelle Bay (refer **Figure 9**) and include:

- Clement Marine;
- Australian Wharf and Barge;
- Polaris Marine; and,
- Waterway Constructions.



Figure 9: View of marine contractors along northern shoreline of Rozelle Bay

RMS operational vessels are berthed outside the RMS Head Office (Maritime Division) on the northern shoreline of Rozelle Bay, adjacent to the Anzac Bridge (refer **Figure 10**).



Figure 10: View across Rozelle Bay of RMS Head Office and adjacent operational vessel berths

Within Blackwattle Bay, a number of marina berths are provided for charter boat operators. These include:

- Blackwattle Bay Marina (refer **Figure 11**) – provides 18 berths, vessels include All Occasions Cruises vessels and 12 other charter operators;
- Sydney Fish Market (refer **Figure 12**) – the end berths of the northern mooring jetty are used by Manly Fast Ferries and Fusion Cruises; and,
- Blackwattle Bay Marine Operatives (refer **Figure 13**) – provides up to 22 informal berths for use by charter operators, no public access to adjacent foreshore (privately owned Hymix concrete batching plant).



Figure 11: View of Blackwattle Bay Marina looking west across Blackwattle Bay



Figure 12: Sydney Fish Market northern jetty end berths occupied by charter boats



Figure 13: Blackwattle Bay Marine Operatives

Fishing trawlers also access Blackwattle Bay to berth at the Sydney Fish Market facilities, which include:

- dedicated fishing trawler berths at the inner berths of the northern timber mooring jetty (refer **Figure 14**); and,
- main concrete jetty with hardstand area (trawler wharf, refer **Figure 15**) is used for unloading, reprovisioning, refuelling and maintenance of fishing vessels.



Figure 14: Sydney Fish Market northern jetty inner berths occupied by fishing boats



Figure 15: Sydney Fish Market main concrete jetty

The south-western corner of Blackwattle Bay is currently occupied by Hanson Australia (refer **Figure 16**). On the eastern side of the Hanson Australia concrete batching plant, a small marina exists for mooring of workboats and barges owned by HDSA Group (refer **Figure 17**) who offer marine construction and commercial diving services.



Figure 16: Hanson Australia concrete batching plant in Blackwattle Bay



Figure 17: Small marina facility adjacent to Hanson Australia concrete batching plant

2.7.4 Rowing Boats

Rowing is a popular activity in the Bays Precinct with boat houses for rowing clubs occupying waterfront land within Blackwattle Bay and use of the waterway on a regular basis for training purposes. Existing facilities providing waterway access for rowers include:

- beach launching area within Bicentennial Park (Rozelle Bay, refer **Figure 28**);
- Glebe Rowing Club (GRC) boathouse and pontoon (Blackwattle Bay, refer **Figure 18**);
- Sydney University Boat Club (SUBC) boathouse and pontoon (Blackwattle Bay, refer **Figure 19**);
- Dragon Boat ramp at Bank Street, Pyrmont (Blackwattle Bay, refer **Figure 23**); and,
- foreshore access steps adjacent to Sydney Secondary College (Blackwattle Bay Campus).



Figure 18: Glebe Rowing Club Pontoon



Figure 19: Sydney University Boat Club boathouse and pontoon

A voluntary rowing guide has been developed by RMS in consultation with local rowing groups (including Dragon Boating Clubs) and details a recommended rowing course throughout Rozelle and Blackwattle Bays. This rowing course is shown on **Figure 21** and **Map 2** (refer **Appendix A**) and, based on observations during a Saturday morning site visit, is generally adhered to by rowing clubs during training

activities. The course runs in an anti-clockwise direction around the perimeter of both Rozelle and Blackwattle Bay with row boats staying on the starboard side and keeping a distance off of 25m to 40m from berthing structures and moored vessels.

The Glebe Rowing Club (GRC) website notes that training can comprise 2 to 5 laps of the course and the best water conditions for rowing are early morning or late afternoon. The GRC Club Handbook includes a Rowing Map (refer **Figure 22**) that also indicates an extended rowing course through Johnstons Bay and into White Bay. However, it is noted on the GRC website that rowing in White Bay is undertaken on the weekend if water conditions are good and that a tinnie escort (refer **Figure 20**) is required for rowing beyond White Bay.



Figure 20: Row boat with tinnie escort in Blackwattle Bay

From review of information on the GRC and SUBC websites, rowing training occurs on most mornings during the week and over the weekend. Learn to row programs are also held by the clubs and are typically scheduled on Saturday or Sunday mornings at 9am-11am following early morning rowing training.

Sydney Secondary College (Blackwattle Bay Campus) is located on the western shoreline of Blackwattle Bay and offers rowing, kayaking and dragon boating as part of its school sports curriculum.

A J.B. Sharp Series rowing regatta was also held in 2016 with a racing course being set out within Rozelle Bay and Blackwattle Bay. This was attended by a number of Sydney rowing clubs and multiple rowing boat access points were utilised to launch boats onto the water for the event.

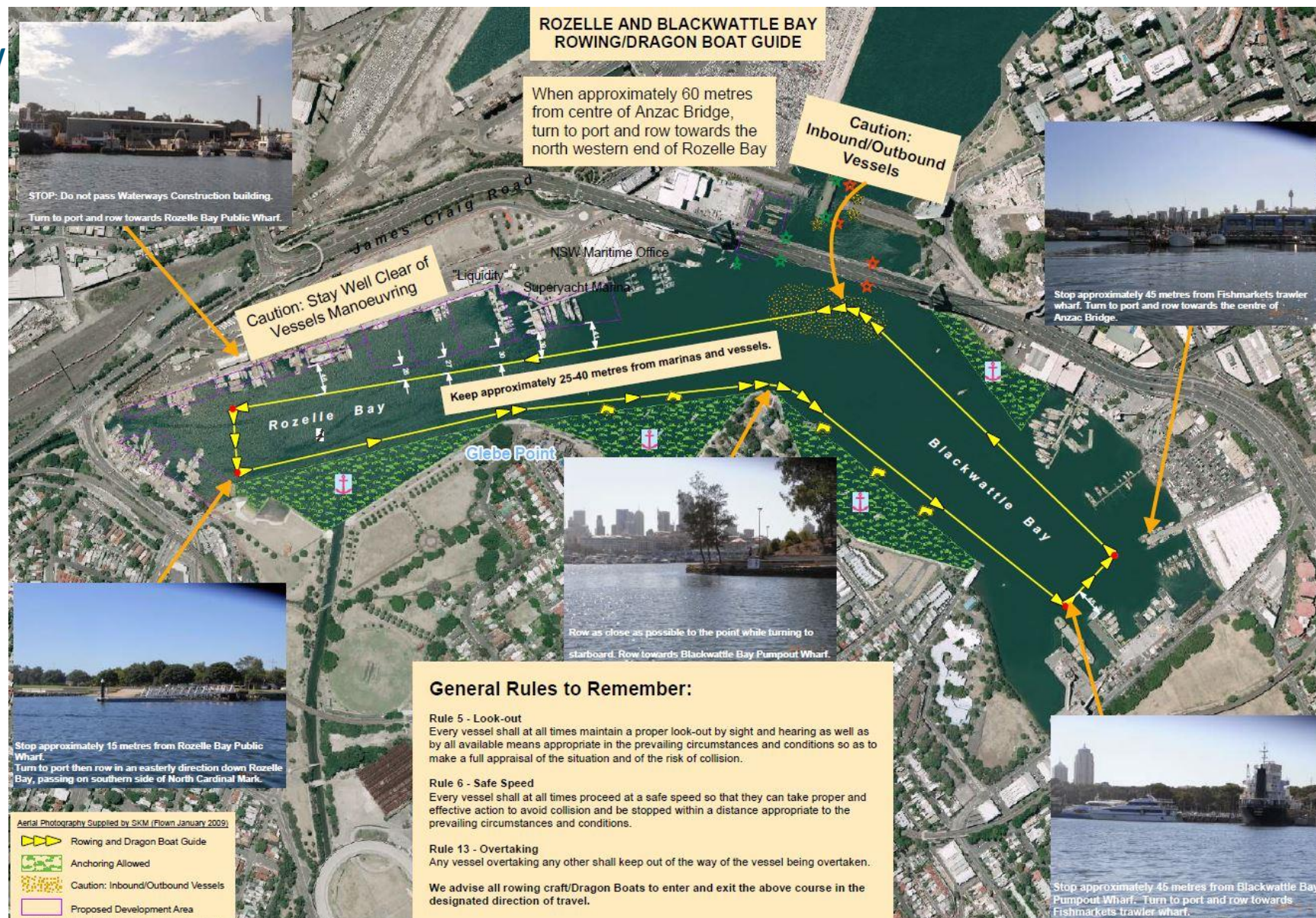
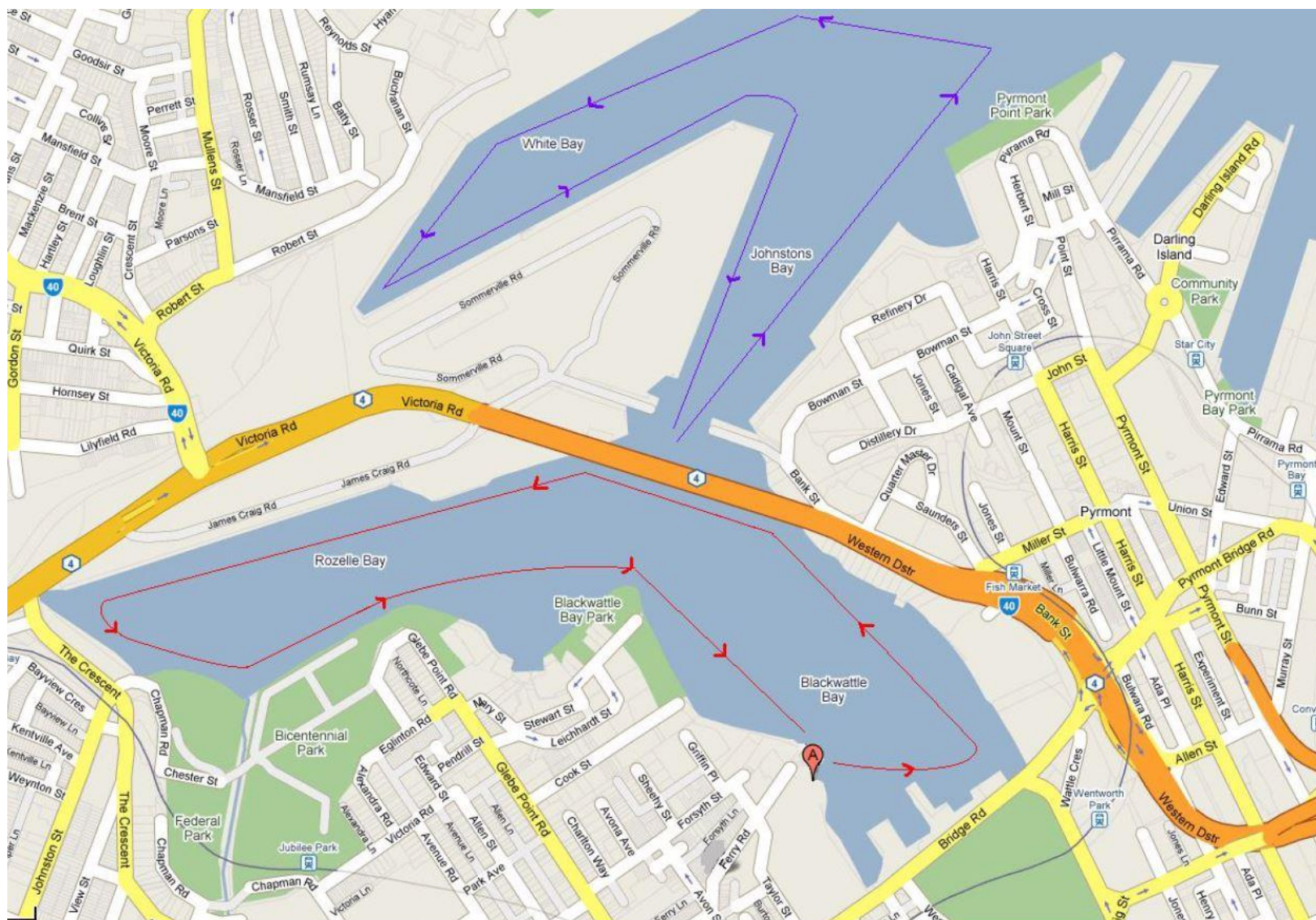


Figure 21: Recommended Rowing Course in Rozelle Bay and Blackwattle Bay (SSM, 2017)



The red line shows the standard Blackwattle Bay and Rozelle Bay course, while the blue line shows the extended White Bay course (note that the direction of rowing is indicated by the arrows).

Figure 22: Glebe Rowing Club Handbook Rowing Map

2.7.5 Dragon Boats

Dragon boating is another popular passive recreation activity enjoyed on the waterway. Dragon Boats NSW Inc. occupy waterfront land used for dragon boat storage and have a dedicated ramp launching facility (including lighting) at Bank Street, Pyrmont (refer **Figure 23** and **Figure 24**). According to the Dragon Boats NSW (DBNSW) website, 15 dragon boating clubs use the Pyrmont facility on a regular basis for training ahead of dragon boating regattas held in regional NSW, interstate and in the Sydney metropolitan area. The Bank Street site is also used as an unsealed parking area for dragon boat club members and is surrounded by a chain wire security fence.



Figure 23: Dragon boat launching ramp at Bank Street, Pyrmont



Figure 24: Onshore dragon boat storage racks and parking area at Bank Street, Pyrmont

The dragon boating clubs follow the same training route around Rozelle Bay and Blackwattle Bay as described above for rowing clubs. This was confirmed by observations during a Saturday morning site visit. It was also observed that dragon boats can row two abreast in pairs (refer **Figure 25**) and that dragon boat clubs also use the Blackwattle Bay Public Pontoon as a marshalling area for crew changes (refer **Figure 26**).



Figure 25: Dragon boats rowing two abreast



Figure 26: Dragon boat clubs using Blackwattle Bay Public Pontoon

Dragon boat club training is generally held in the evenings during weekdays (most popular on Tuesday and Thursday evenings) and on Saturday and Sunday mornings. A summary of the training schedules collated from review of dragon boat club websites is provided in **Table 2**.

DBNSW have advised that additional training by corporate groups takes place from November to January and is scheduled Monday to Friday between 5.30pm and 8.30pm. State crew training is also undertaken from January to March by 6 boats between 1pm and 4pm on Sundays. National crew training is also undertaken during early morning periods.

Outrigger canoeing clubs also use the Bank Street launching ramp facility for training activities.

Table 2: Schedule of Dragon Boat and Outrigger Canoe Club Training at Bank Street, Pyrmont

Club	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Blackwattle Bay Dragon Boat Club	6.30pm-8pm		6.30pm-8pm				8.45am-11am
Naga Spirit Dragon Boat Club						9am-11am	
Pacific Dragons Dragon Boat & Outrigger Canoe Club	6.45pm	6.45pm	6.45pm	6.45pm	Morning	8am	8am
ACCA Dragon Boat Racing Team		6.45pm-8.30pm		6.45pm-8.30pm		8.30am-10.30am	
Bluefins Dragon Boat Racing Team							8.45am
Mavericks Dragon Boat Club		6.30pm-8pm		6.30pm-8pm		8.30am-10.30am	
Chinese Youth League Dragon Boat Club		6.30pm-8.30pm		6.30pm-8.30pm		9.30am-11.30am	
City Dragons Dragon Boat Club							9am-11am
Different Strokes Dragon Boat Club		6.30pm-8pm		6.30pm-8pm		7am-9am	
Dragons Abreast Sydney		6.30pm-8pm		6.30pm-8pm		7.30am-9am	
FFB Dragon Boat Club	6.30pm-8pm		6.30pm-8pm			7.30am-9.30am	
Flying Dragons			7pm				9am
Sydney Tsunami Dragon Boat Club		6.30pm-8pm				8.30am-10.30am	
Sydney Zodiacs		5pm-6.30pm		5pm-6.30pm		7.30am-9am	
The Sloths Dragon Boating Club	6.45pm-8.30pm		6.45pm-8.30pm			7.45am-10am	
Purple Storm Outrigger Club	6.45pm-8.30pm			5.30am-6.30am		6.45am-9.30am	6.45am-9.30am

AM Training

AM Peak Day

PM Training

PM Peak Day

2.7.6 Canoes and Kayaks

Rozelle Bay and Blackwattle Bay are highly regarded waterway areas for calm water kayaking and are listed as top destinations for kayaking within Sydney Harbour on websites of kayak tour operators, travel blogs and passive recreation groups. In addition to the sheltered waters, other attractions of the area for kayaking visitors include paddling beneath the iconic Glebe Island Bridge and Anzac Bridge, extensive foreshore park areas for picnicking, the Glebe Foreshore Walk including canoe storage racks (refer **Figure 27**), surrounding industrial and commercial activities, and dining options at the Sydney Fish Market and The Boathouse (Blackwattle Bay).



Figure 27: Canoe storage racks adjacent to Sydney Secondary College, Blackwattle Bay

A dedicated kayak launching area is also provided at Bicentennial Park on the southern foreshore of Rozelle Bay (refer **Figure 28**). This comprises steps leading down to a 20m wide shallow beach area that has been recessed into the shoreline. A low freeboard pontoon is also provided at the adjacent public wharf (refer **Figure 3**).

Several sets of water access steps (refer **Figure 29**) are provided as part of the Glebe Foreshore Walk along the western shoreline of Blackwattle Bay (two sets of steps) and the southern shoreline of Rozelle Bay (three sets of steps). These steps provide water access from the elevated promenade level and could be used for launching of passive craft.



Figure 28: Steps leading to beach launching area for passive craft at Bicentennial Park, Rozelle Bay



Figure 29: Water access steps along the western shoreline of Blackwattle Bay

Annandale Boat Hire is located at the head of Rozelle Bay (behind Seawind Catamaran marina) and offers hiring of kayaks and stand-up paddleboards.

A range of passive craft were observed on the water during a Saturday morning site visit. These included fishing kayaks, outrigger canoes (refer **Figure 30**) and sea kayaks (refer **Figure 31**).



Figure 30: Outrigger canoe in Blackwattle Bay



Figure 31: Sea kayaks in Rozelle Bay

2.8 Glebe Island Bridge Boat Traffic

An indicator of the level of boating traffic in the area is provided by estimates of the number of vessel movements per day through the Glebe Island Bridge (refer **Figure 32**).

A report assessing options for Glebe Island Bridge (Acil Allen, 2013) contains estimates of 200 to 300 movements per day based on consultation with maritime businesses and RMS. The same report notes that 78% of trips were believed to be business related rather than for leisure. It was estimated that vessel movements were likely to grow by 2 per cent per annum. **Table 3** summarises the estimates of vessel movements obtained from consultation with maritime businesses undertaken by Urbis (2012).

Table 3: Estimated Glebe Island Bridge Vessel Movements (Urbis, 2012)

Business Operator	No. of Vessel Movements
Sydney Superyacht Marina	10-15 per day
Sydney Boathouse	up to 20 per day (excludes dry stack storage traffic)
Seawind Catamarans	4-20 per day depending on low/peak season
Sydney City Marine	up to 10 per day
All Occasion Cruises	10-30 per day depending on low/peak season
Blackwattle Bay Marine Operatives	8-14 per day depending on low/peak season
Sydney Fish Market	20-30 per day

Further consultation was undertaken by SMEC (2016) and estimates of vessel movements contained within this report are summarised in **Table 4**. The report also concluded that several vessel types using the waterway would be limited by the available air draught of 4.9m (above Chart Datum) beneath the Glebe Island Bridge in its closed position. This is demonstrated by the typical dimensions of vessels accessing the Bays Precinct, which were summarised in SMEC (2016) and are reproduced in **Table 5**. It should be noted that the common vessel types accessing or departing Blackwattle Bay would include:

- Charter boats;
- Fishing trawlers;
- Recreational boats (runabouts, motor cruisers); and,
- Passive vessels (rowing/dragon boats).



Figure 32: View of Glebe Island Bridge looking towards Johnstons Bay

Table 4: Estimated Glebe Island Bridge Vessel Movements (SMEC, 2016)

Business Operator	Type of Vessel	No. of Vessel Movements
Sydney City Marine	sailing yachts, charter boats, superyachts, recreational vessels	10 per day
Sydney Superyacht Marina	superyachts	5-15 per day
Sydney Superyacht Marina	smaller motor yachts	5-15 per day
Sydney Boathouse	motor yachts and power boats	10-30 per day
Sydney Boathouse	dry stacked power boat (less than 11m)	120 per day
Seawind Catamarans	multihull vessels	4-24 per day
Blackwattle Bay Marine Operatives	charter boats	8-14 per day
Blackwattle Bay Marina	charter boats	10-30 per day
Sydney Fish Market	charter boats	3-10 per day
Sydney Fish Market	fishing trawlers	3-10 per day
Sydney Heritage Fleet	large heritage boat (John Oxley)	less than 1 per year
Sydney Heritage Fleet	small heritage boats (rowing boats, motor boats, sailing skiffs and historic replica boats)	3-10 per day
RMS Head Office (Maritime Division)	RMS operational vessels	highly variable
Marine Contractors (Rozelle Bay)	tugs, workboats and barges	highly variable

Table 5: Typical Dimensions of Vessels in the Bays Precinct (SMEC, 2016)

Vessel Type	Length (m)	Beam (m)	Draught (m)	Air Draught (m)	Approx. No.
Charter Boat (largest)	42	14	2.4	8.9	41
Fishing Trawler (largest)	17	5	-	10	9
Heritage Fleet – John Oxley (largest vessel)	51	9.8	3.4	22.7	8
Barge (max.) with crane	56	18	3.7	24	18
Tug (max.)	29	9	3.6	15	4
Workboat (max.)	13	5.1	1.4	4	4
RMS Operations vessel	7 to 16	7 max.	2.3	< 5	23
Sailing Yacht – largest that fits under Sydney Harbour Bridge	38	9	4	50	occasional, only to SCM
Superyacht (motor)	24 to 73	7 to 10	2 to 3	10 to 22	24
Yacht (motor)	< 24	< 7	< 2	< 10	56
Boat LOA < 11m (dry storage)	11	3.7	0.9	< 5	570
Seawind Catamaran	12.5	6.8	1.2	20	16
Passive vessels (rowing/dragon boat) - maximum	9	1.5	0.5	< 5	-

3 Proposed Development

3.1 General

An outline of the history and nature of proposed development at the Bank Street, Pyrmont site is provided in the following sections. This includes:

- the original Sydney Heritage Fleet facility, which was approved;
- the existing Blackwattle Bay Marina facility, from which vessels are proposed to be relocated to the proposed Bank Street Commercial Wharf; and,
- the proposed Bank Street Commercial Wharf, including the initial fixed structure proposal that was the subject of a S75W Modification application and the current floating structure proposal.

3.2 Sydney Heritage Fleet Facility Proposal

The overwater component of the approved Sydney Heritage Fleet facility proposal comprised a perimeter fixed wharf structure and an interior floating pontoon structure as shown on the plan provided within **Appendix C**. Berths for nine (9) vessels were provided within the interior of the perimeter fixed wharf structure, berthing of the John Oxley was provided on the exterior northern side of the fixed wharf, and temporary berthing for visiting boats was provided on the exterior western side of the fixed wharf. The facility provided a total of ten (10) permanent berths and a single temporary berth. The entry to the interior of the marina was located on the southern side of the facility, where nine (9) vessels would be berthed. At the request of Sydney Ports, navigation aids were proposed to be provided on three (3) protective dolphins located adjacent to the temporary berth on the western side of the marina and also at the southern ends of the fixed wharf structure.

The waterway lease area proposed to accommodate the marina operations, the public foreshore walk and existing passive craft launching ramp was approximately 10,700m². If the passive craft launching ramp was excluded, this area would reduce to approximately 10,000m². The proposed footprint of marina structures and berthed vessels extended approximately 100m west and 30m south into the waterway from the existing shoreline.

The proposed marine operations at the site¹ included routine operational running maintenance on berthed vessels, vessel movements to service Fleet cruises, and vessel movements to deliver tour groups to the proposed Museum (onshore development). Running maintenance on berthed vessels was proposed to be undertaken during daylight hours, typically between 8am and 6pm. Fleet cruising operations were to be centred around weekends (from Thursday to Monday) and involved departure of Fleet vessels to pick up and disembark passengers elsewhere in Sydney Harbour (e.g. Darling Harbour). Fleet cruises were typically to be undertaken during daylight hours with 2-3 vessels cruising at any one time. An exception to this was special events (e.g. New Years Eve Fireworks) when evening cruises occur and a greater number of Fleet vessels may be in operation. Museum tour groups were proposed to arrive by Fleet launches from a pick-up point elsewhere in Sydney Harbour and were to be held during normal business hours with public visiting hours for the Museum nominated between 9.30am and 5.30pm.

Vessel movements from the existing Sydney Heritage Fleet site in Rozelle Bay were estimated at 3-10 movements per day in SMEC (2016) and were expected to be similar for the relocated Sydney Heritage Fleet facility.

¹ As described in the Environmental Assessment Report (Hamptons Property Services, 2012) and Preferred Project Report (Hamptons Property Services, 2013).

3.3 Existing Blackwattle Bay Marina Facility

The proposed relocation of vessels from the existing Blackwattle Bay Marina facility was the subject of the S75W Modification application for changed use of the Bank Street, Pyrmont site to become a commercial facility for berthing of relocated vessels, which are predominantly charter boats. The existing Blackwattle Bay Marina facility is located at the head of Blackwattle Bay, which is the proposed location for construction of the new Sydney Fish Market.

A total of 22 vessels are currently berthed at Blackwattle Bay Marina (refer **Appendix D**) and comprise a mix of larger (20m to 40m) single and double hull charter vessels and smaller single hull vessels as listed in **Table 6**.

Table 6: Vessels Berthed at Blackwattle Bay Marina

Ref. No.	Vessel Name	Length (m) [^]	Beam (m)	Hull Shape	Draught (m)
1	Bella Vista	40	14	Flat Bottom	1.3
2	Lady Rose	25	11	Double	1.9
3	Aqua Bay	20	5.3	Single	1.5
4	Sydney Harbour Cruise	22	8 [^]	Double	1.2*
5	Sydney Glass Island	25	10 [^]	Barge	1.2*
6	Aussie Magic	26	13	Double	1.8
7	5.5m Vessel	5.5	3 [^]	Single	0.9*
8	Boat 1	7.5	2.8 [^]	Single	0.9*
9	9.3m Vessel	9.3	2.8 [^]	Single	1*
10	Pacific Pearl	16	5 [^]	Single	1.2*
11	13.5m Vessel	13.5	4.5 [^]	Single	1.2*
12	Oskar 1	22	6.5 [^]	Double	1.2*
13	8.6m Vessel	8.6	3.2 [^]	Single	0.9*
14	Hope Diving	15.6	5 [^]	Single	1.2*
15	Oskar 2	25	5.5 [^]	Single	1.8*
16	Lady Audrey	30	7.3 [^]	Single	1.9*
17	Seven Star	30	7.2	Single	2.0
18	5.5m Vessel	5.5	3 [^]	Single	0.9*
19	Sunseeker	18	5.0	Single	1.3
20	Supercat	22	9 [^]	Double	1.2*
21	14.3m Vessel	14.3	5.3 [^]	Single	1.2*
22	Southern Star	20	8.1	Double	1.8

[^] Measured from aerial photograph.

* Assumed draught from AS3962-2001 Table 3.1.

Vessel movements from the existing Blackwattle Bay Marina facility were estimated at 10-30 movements per day (subject to low and peak periods) in SMEC (2016). Marine operations include back-of-house servicing for charter vessels (including cleaning, provisioning, and minor servicing) and vessel movements associated with cruise bookings. There is no passenger pickup or dropoff at the marina site as this is undertaken elsewhere in Sydney Harbour. The marina site is primarily occupied by staff associated with office, vessel servicing and charter activities.

The operation of All Occasion Cruises (AOC) vessels is summarised in **Table 7** and is derived from recent consultation with AOC.

Table 7: All Occasion Cruises Vessel Operations

Vessel Name(s)	Months	Days Per Week	Operating Hours
Bella Vista, Lady Rose, Aussie Magic, Seven Star, Aqua Bay, Sunseeker	January – April	4 days per week (2 trips per day)	5pm – 12am
	May – August	1-2 days per week	5pm – 12am
	September – October	3-4 days per week	5pm – 12am
	November - December	7 days per week	10am – 1am
Southern Star	January – April	2 days per week	5pm – 12am
	April – August	1 day per week	5pm – 12am
	September – October	2 days per week	5pm – 12am
	November – December	5 days per week	12pm – 12am

3.4 Proposed Bank Street Commercial Wharf

3.4.1 Fixed Wharf Facility

The proposed Bank Street Commercial Wharf was the subject of the S75W Modification application for changed use of the approved Sydney Heritage Fleet facility (as described in **Section 3.2**). The proposal comprised the relocation of all of the 22 vessels currently berthed at the Blackwattle Bay Marina to nominated berth locations within the marina layout of the approved Sydney Heritage Fleet facility as shown on the plans provided within **Appendix E**. Due to the perpendicular orientation of vessels berthed along the northern side and south-east corner of the fixed marina structure, the waterway lease area occupied by berthed vessels was slightly greater than that of the original Sydney Heritage Fleet facility. The proposed marine operations and vessel movements were to be similar to that of the existing Blackwattle Bay Marina. The Environmental Assessment (RobertsDay, 2017) submitted to support the S75W Modification Application summarised the proposed hours of operation for the marina to be 7am to 1am, 7 days per week with hours of operation during off peak periods being shorter and requiring reduced staff numbers at the site to service vessel operations. The quiet period of the year for charter vessel operations was noted to be from April to August.

3.4.2 Floating Marina Facility (current proposal)

Subsequent to the submission of the S75W Modification Application and associated public exhibition period, UGDC has developed a marina layout comprised entirely of floating pontoons and connected to shore by a gangway attached to the western shoreline (refer **Appendix F**). The positions of vessels have been amended (as compared to the proposed berthing positions within the S75W Modification Application) to provide a more efficient berthing arrangement and to also reduce interaction with the passive craft

launching ramp to the east. The reduced piling requirement for the floating structure also reduces impacts on the seabed during construction and operation of the marina.

The waterway lease area proposed to accommodate the marina operations is 10,967m², which is similar to the overall waterway lease area of the original Sydney Heritage Fleet Facility proposal. The proposed footprint of marina structures and berthed vessels extends approximately 100m west and 50m south into the waterway from the existing shoreline. As such, the encroachment of the marina to the west is similar to that of the original Sydney Heritage Fleet facility proposal (as described in **Section 3.2**). The marina extends around 20m further south due to the perpendicular orientation of vessels berthed in the south-east corner of the marina. The closest berthed vessel within the marina is approximately 40m from the passive craft launching ramp.

Navigation aids proposed as part of the floating marina facility comprise two navigation lights fixed to each end of the outermost (western) marina arm, a single navigation light fixed to the southern end of the central marina arm, and a single navigation light fixed to the eastern end of the pontoon in the south-east corner of the marina. It is noted that the proposed western extent of the marina would require the existing lit port beacons (on each side of Anzac Bridge) to be relocated approximately 20m to the west (refer **Map 3**).

4 Assessment of Impacts and Mitigation Measures

4.1 Wave Climate

Guidelines for acceptable wave climate within marinas are provided within AS3962-2001 and are based on consideration of the 50 year ARI² and 1 year ARI wave climate and the direction of incident waves relative to the alignment of berthed vessels. AS3962-2001 states that for vessels of less than 20m in length, the most severe wave climate should satisfy 'moderate' conditions. For vessels larger than 20m in length, the wave climate may be more severe.

Vessels berthed within the proposed marina layout are generally aligned approximately in an SSW-NNE direction (orientated approximately 17 degrees clockwise from N). Due to the 4 knot speed limit and no wash zone applied within Blackwattle Bay, and its inner harbour location, the wave climate at the site of the proposed marina would be predominantly influenced by locally generated wind waves. The site is subject to the longest wind fetches from the W-WSW sector across Rozelle Bay and from the SE-SSE sector across Blackwattle Bay. As such, oblique seas would approach from the SE-SSE sector and WSW, and beam seas would approach from the W.

The incident 50 year ARI and 1 year ARI wave climates for SE-SSE and W-WSW fetch directions have been calculated using the procedures for wind wave hindcasting within the Coastal Engineering Manual (USACE, 2006) with input wind data from AS 1170.2 – 2011 Structural Design Actions – Part 2 Wind Action. The resulting incident wave climates are summarised in **Table 8** and **Table 9**.

The wave climate within the interior berths of the proposed marina will generally satisfy the 'moderate' conditions specified within AS3962-2001. Vessels berthed along the outside of the marina pontoons (i.e. Berths B1, B6, B20, B21 and B22, refer **Appendix F**) would not benefit from the wave attenuation provided by the marina pontoons and are subjected to a 50 year ARI wave climate that is more severe than the 'moderate' conditions. However, most of the vessels berthed at these more exposed locations are all greater than or equal to 20m in length and could accommodate a more severe wave climate as noted in AS3962-2001, particularly with the additional stability provided by vessels with a double hull and wider beam. An exception to this is Berth B1 where the 'Sunseeker' is berthed and has a length of 18m. It is recommended that a larger vessel is moored at this berth, which could be readily achieved by substituting with one of the larger vessels that are positioned within the interior berths. A proposed berthing plan, including substitution of the 'Sunseeker' with the 'Southern Star' (20m length, double hull) in Berth B1 is shown on **Map 5** (refer **Appendix A**).

Furthermore, the vessels moored at the three (3) berths in the south-east corner of the marina (i.e. Berths B20, B21 and B22, refer **Appendix F**) are proposed to be secured with mooring piles near the outer end of the berths, which provide additional restraint to vessel movement in more exposed mooring conditions.

² Average Recurrence Interval.

Table 8: 50 year ARI Wave Climate at Proposed Marina Site

Direction	Seas	Fetch	Incident Wave Height	Wave Period	Attenuated Wave Height [^]	'Moderate' Criteria
		(m)	(m)	(secs)	(m)	(m)
W	Beam	1250	0.64	1.96	0.32	0.31*
WSW	Oblique	1050	0.58	1.85	0.29	0.50*
SE	Oblique	700	0.45	1.59	0.23	0.50*
SSE	Oblique	700	0.45	1.59	0.23	0.50*

* Criteria for seas greater than 2 seconds applied, no AS3962-2001 requirement for seas less than 2 seconds.

[^] Approximately 50% wave transmission through typical 2.4m wide floating pontoon.

Table 9: 1 year ARI Wave Climate at Proposed Marina Site

Direction	Seas	Fetch	Incident Wave Height	Wave Period	Attenuated Wave Height [^]	'Moderate' Criteria
		(m)	(m)	(secs)	(m)	(m)
W	Beam	1250	0.46	1.76	0.23	0.38
WSW	Oblique	1050	0.42	1.66	0.21	0.38*
SE	Oblique	700	0.33	1.42	0.17	0.38*
SSE	Oblique	700	0.33	1.42	0.17	0.38*

* Criteria for seas greater than 2 seconds applied, no AS3962-2001 requirement for seas less than 2 seconds.

[^] Approximately 50% wave transmission through typical 2.4m wide floating pontoon.

4.2 Water Depths

The required water depths for permanent vessel berthing and fairway access are specified within AS3962-2001 Guidelines for design of marinas. This document specifies that the water depths available at berths under 0m CD water level conditions shall not be less than the sum of the following:

- draught of the largest vessel to be accommodated;
- half the incident 50 year ARI significant wave height; and,
- a clearance of 0.3m where the seabed consists of soft material and 0.5m for rock.

The addition of the same components is applied to a Mean Low Water Springs water level condition for fairway access.

Based on the above requirements, **Table 10** summarises the water depth requirements for the vessels to be accommodated within the proposed marina. Note that the 50 year ARI wind waves incident at the perimeter of the proposed marina footprint (refer **Section 4.1**) have been attenuated to 50% of their hindcast wave height to reflect the sheltering offered to interior berths (i.e. excluding Berths B1, B6, B20, B21 and B22) by the marina pontoons. The maximum incident wave height of $H_s=0.64\text{m}$ generated across the 1,250m W fetch into Rozelle Bay has been adopted as the 50 year ARI design condition.

Comparison of the required seabed levels for berthing and minimum existing seabed levels available (refer **Table 10** and **Map 4**) demonstrates that existing water depths satisfy the requirements of AS3962-2001. As such, dredging is not required to provide additional water depth for the proposed marina berthing arrangement.

Table 10: Water Depth Requirements at Proposed Marina

Ref. No.	Berth No.	Vessel Name	Draught (m)	$\frac{1}{2} \times H_s$ (50 year ARI)	Clearance (soft bottom)	Depth Required	Required Seabed Level (berth, m CD)	Min. Existing Seabed Level (m CD) [^]
1	B6	Bella Vista	1.3	0.32	0.3	1.92	-1.92	-4.5
2	B4	Lady Rose	1.9	0.16"	0.3	2.36	-2.36	-3.0
3	B22	Aqua Bay	1.5	0.32	0.3	2.12	-2.12	-4.5
4	B21	Sydney Harbour Cruise	1.2*	0.32	0.3	1.82	-1.82	-4.7
5	B3	Sydney Glass Island	1.2*	0.16"	0.3	1.66	-1.66	-3.3
6	B2	Aussie Magic	1.8	0.16"	0.3	2.26	-2.26	-4.7
7	B14	5.5m Vessel	0.9*	0.16"	0.3	1.36	-1.36	-2.7
8	B16	Boat 1	0.9*	0.16"	0.3	1.36	-1.36	-3.3
9	B17	9.3m Vessel	1*	0.16"	0.3	1.46	-1.46	-4.5
10	B12	Pacific Pearl	1.2*	0.16"	0.3	1.66	-1.66	-5.0
11	B18	13.5m Vessel	1.2*	0.16"	0.3	1.66	-1.66	-3.0
12	B20	Oskar 1	1.2*	0.32	0.3	1.82	-1.82	-5.7
13	B13	8.6m Vessel	0.9*	0.16"	0.3	1.36	-1.36	-5.2
14	B11	Hope Diving	1.2*	0.16"	0.3	1.66	-1.66	-4.7
15	B9	Oskar 2	1.8*	0.16"	0.3	2.26	-2.26	-4.8
16	B8	Lady Audrey	1.9*	0.16"	0.3	2.36	-2.36	-4.9
17	B7	Seven Star	2.0	0.16"	0.3	2.46	-2.46	-5.0
18	B15	5.5m Vessel	0.9*	0.16"	0.3	1.36	-1.36	-2.8
19	B10	Sunseeker	1.3	0.16"	0.3	1.76	-1.76	-4.9
20	B5	Supercat	1.2*	0.16"	0.3	1.66	-1.66	-2.7
21	B19	14.3m Vessel	1.2*	0.16"	0.3	1.66	-1.66	-6.0
22	B1	Southern Star	1.8	0.32	0.3	2.42	-2.42	-4.0

* Assumed draught from AS3962-2001 Table 3.1.

" Approximately 50% wave transmission through typical 2.4m wide floating pontoon.

[^] Minimum existing seabed level available within the berth area or approach, determined from bathymetric levels on **Map 4**.

4.3 Seabed Disturbance

4.3.1 Approach

As part of a proposed marina development elsewhere within the Sydney region, RHDHV undertook an extensive field investigation to define the propeller jet currents which occur when vessels manoeuvre around a marina and the mass of sediment which is suspended by these currents. Based on these measurements, existing empirical approaches to calculate propeller jet currents were updated to better represent the short duration bursts of throttle associated with vessels manoeuvring and the associated bed disturbance. We have adopted the updated empirical approach which was developed as part of the previous work for this investigation (for further details of this approach see Symonds et al (2017)).

The updated approach has been used to calculate the resultant propeller wash for the larger vessels, which in turn will be the vessels most likely to result in bed disturbance, currently located at the Blackwattle Bay Marina and which are proposed to be relocated to the Bank Street marina facility. We have been provided with the actual engine specifications for a number of the vessels and the specifications for the other vessels considered in the analysis have been assumed based on these. The vessel specifications are detailed in **Table 11**. This table also details the depths which have been assumed for the assessment; these represent the average depth of the berth at the stern of the vessel as this is the location which is most likely to be impacted by propeller wash erosion. The table shows that in some cases the existing marina berths at Blackwattle Bay are deeper than the proposed berths at the Bank Street marina, while in other cases the existing berths are shallower.

The assessment has considered the potential for bed disturbance due to the use of both forward throttle and reverse throttle as would typically be applied when manoeuvring vessels into and out of berths. The same critical erosion threshold for the bed sediment (0.2 N/m^2) has been applied for the comparison, this is approximately representative of relatively recently deposited sediment and so can be considered a relatively low erosion threshold.

Table 11: Vessel and associated berth details assumed for the comparative bed disturbance assessment

Vessel Name	Details	Engine Specifications (actual and assumed)	Average Depth in Berth at Vessel Stern (m below CD)	
			Blackwattle Bay Marina	Bank Street Marina
Bella Vista	40m Flat Bottom	2 x 315HP	5.0	4.6
Lady Rose	25m Double Hull	2 x 340HP	5.5	4.6
Aqua Bay	20m Single Hull	2 x 1000HP	4.5	6.9
Sydney Harbour Cruise	22m Double Hull	2 x 340HP	5.0	7.0
Aussie Magic	26m Double Hull	2 x 120HP	5.0	5.0
Oskar 1	22m Double Hull	2 x 340HP	6.0	7.4
Oskar 2	25m Single Hull	2 x 1000HP	6.5	5.0
Lady Audrey	30m Single Hull	2 x 2000HP	7.0	5.1
Seven Star	30m Single Hull	2 x 2000HP	7.5	5.0
Sunseeker	18m Single Hull	2 x 450HP	7.0	4.9
Supercat	22m Double Hull	2 x 340HP	7.0	4.2
Southern Star	20m Double Hull	2 x 114HP	6.0	4.2

4.3.2 Results

The bed disturbance in terms of kg of sediment resuspended per vessel movement (assumed to include a single forward throttle and a single reverse throttle short duration burst) is detailed in **Table 12** for vessel movements at low water (LW) and at high water (HW)³. The table shows that out of the 12 vessels considered only four of them resulted in bed disturbance at LW and only three at HW. The assessment shows that the bed disturbance is higher at the proposed Bank Street marina than it is at the existing Blackwattle Bay marina. This is mainly due to the predicted bed disturbance from the two vessels with the most powerful engines (Lady Audrey and Seven Star), which increases at the proposed marina as their berths are approximately 2.1–2.5m shallower than at the existing marina. Due to the berths all being relatively deep compared to the vessel draughts (e.g. the depth required for the Lady Audrey and Seven Star vessels is 2.4–2.5m below CD (refer **Table 10**), while the berth depths at the stern of the vessels at the proposed marina are 5.0–5.1m below CD) the predicted mass of sediment to be disturbed from the bed at both marinas is considered to be relatively low. The process of bed disturbance due to the vessel propeller jets would typically gradually reduce over time as the looser and less consolidated surface layers are eroded the more consolidated sediment, which is harder to erode, reach the surface and would reduce the bed disturbance rates. Furthermore, due to the relatively low tidal currents within Blackwattle Bay disturbed bed material is expected to be deposited in the locality of the marina rather than being transported as suspended sediment to other areas.

³ Low Water was taken as Mean Low Water at 0.44m CD and High Water was taken as Mean High Water at 1.45m CD.

Table 12: Results for the comparative bed disturbance assessment

Vessel Name	Bed Disturbance at LW (kg/movement)		Bed Disturbance at HW (kg/movement)	
	Blackwattle Marina	Bank Street Marina	Blackwattle Marina	Bank Street Marina
Bella Vista	0.00	0.00	0.00	0.00
Lady Rose	0.00	0.00	0.00	0.00
Aqua Bay	1.26	0.00	0.37	0.00
Sydney Harbour Cruise	0.00	0.00	0.00	0.00
Aussie Magic	0.00	0.00	0.00	0.00
Oskar 1	0.00	0.00	0.00	0.00
Oskar 2	0.00	0.30	0.00	0.00
Lady Audrey	0.42	3.45	0.00	0.82
Seven Star	0.18	3.71	0.00	0.97
Sunseeker	0.00	0.00	0.00	0.00
Supercat	0.00	0.00	0.00	0.00
Southern Star	0.00	0.00	0.00	0.00
Total	1.86	7.46	0.37	1.79

4.4 Waterway Encroachment

As noted in **Section 3.4.2**, the proposed footprint of floating marina structures and berthed vessels extends approximately 100m west into the waterway from the existing shoreline. This encroachment is similar to that of the original Sydney Heritage Fleet facility proposal (refer **Section 3.2**), which was approved following consultation with RMS specifically in relation to the western extent of the marina. As such, the proposed Bank Street Commercial Wharf facility does not extend any further west than that considered to be acceptable by RMS for safe navigation of outbound vessels, including manoeuvring of large vessels in adverse weather conditions (Hamptons Property Services, 2012). Harbour Masters Approval was also granted for the extent of the original Sydney Heritage Fleet facility proposal.

It is noted that the proposed western extent of the marina would require the existing lit port beacons (on each side of Anzac Bridge) to be relocated approximately 20m to the west (refer **Map 3**). This would reduce the existing marked navigation width between the starboard and port markers from 140m to approximately 120m. Navigation lights are also proposed to be fixed to each end of the outermost (western) marina arm, a single navigation light fixed to the southern end of the central marina arm, and a single navigation light fixed to the eastern end of the pontoon in the south-east corner of the marina. DBNSW advised that for improved visibility their preference is for the marina pontoon navigation lights to be mounted on poles (as opposed to the pontoon deck).

In addition, Sydney Ports required lit navigation aids to be installed on the mooring piles installed along the western side of the original Sydney Heritage Fleet facility proposal. It is considered that, although mooring piles are not proposed as part of the floating marina at western Berths B1 and B6, Sydney Ports are likely to require installation of markers with navigation lights to be installed to delineate the port side

limit of navigation along the western side of the proposed marina. DBNSW advised that the installation of marker buoys to delineate the waterway lease area would provide visual markers to guide rowing crews and assist in segregation of non-powered and motorised craft.

The above navigation aids would provide night time visibility for the extent of marina structures and facilitate safe navigation in the vicinity of the proposed marina. The final type of navigation aids and their positioning would be subject to the requirements of RMS and the Harbour Master.

The southern encroachment of the proposed marina does not extend beyond the encroachment of other existing structures on the northern shoreline of Blackwattle Bay, including Blackwattle Bay Marine Operatives and the Sydney Fish Market Northern Mooring Jetty. The minimum waterway width for vessel navigation between the proposed marina and the opposing headland at the entrance to Blackwattle Bay is 180m and is similar to the waterway width available throughout the remainder of Blackwattle Bay (e.g. between Blackwattle Bay Marine Operatives marina and Sydney University Boat Club, refer **Map 2**). As such, it is considered that the marina would not cause congestion of vessel traffic within Blackwattle Bay.

The line of sight to the Glebe Island Bridge Eastern Channel for outbound vessels that are rounding the perimeter of the proposed marina would be approximately 120m from the south-west corner of the marina. It is considered that this distance is sufficient for vessels to observe inbound vessels that may be transiting the Eastern Channel and take appropriate action to avoid vessel collisions and adverse interactions as per the RMS water traffic rules. Approaching vessels would also be going at a low speed due to the 4 knot speed limit and no wash zone applied within Blackwattle Bay and skippers would be inherently cautious due to the known navigation constraint imposed by the narrow width of the Eastern Channel. In addition, there is an existing navigation rule in place to manage vessel traffic in this area as vessels transiting the Eastern Channel must give way to outbound traffic from Rozelle Bay/Blackwattle Bay. Traffic lights on the bridge can also be operated by Harbour Control (Vessel Traffic Services) when a large vessel needs to navigate through the channel.

Vessels exiting from the proposed marina would need to exercise similar caution to vessels leaving the opposing Sydney City Marine facility. The Sydney City Marine facility is in a similar position relative to the Eastern Channel entrance and requires the skipper of outbound vessels to maintain proper lookout to gain sight of inbound vessels on a perpendicular approach to the main navigation route. As such, the navigation of vessels from the proposed marina is not considered to be any different from existing vessel operations in the surrounding area.

It is also noted that the proposed floating marina structure is less visually obtrusive than the original Sydney Heritage Fleet facility. The original Sydney Heritage Fleet facility comprised a perimeter fixed wharf structure that had a fixed elevation and required more supporting piles for the wharf deck. The proposed floating marina structures would maintain a low profile with varying water levels and require less piles to restrain the pontoons. As such, it is considered that at times when berths are unoccupied the floating marina facility would provide improved lines of sight through the marina area for vessel navigation when compared to the original approved facility.

4.5 Vessel Interaction

The proposed marina development involves the relocation of existing vessels from Blackwattle Bay Marina and would therefore not increase vessel traffic above existing levels within Blackwattle Bay. The position of the relocated marina is closer to the Eastern Channel and would reduce interaction of marina vessels with other vessels using existing and proposed (e.g. Sydney Fish Market relocation) facilities along the eastern shoreline and at the head of the Bay. Commercial vessels also have an option to use sound signals (horns) as a means to communicate their manoeuvring intentions when in sight of each other, as it

is their responsibility to take sufficient action to avoid a collision. RMS operations staff have advised that it is not envisaged that the proposed marina facility would be an area where significant sound signalling would be required. This situation was noted to be similar to existing marinas in Blackwattle Bay where sound signals are rarely used due to relatively low vessel traffic movement. As such, noise impacts from sound signals on the surrounding residential areas would be insignificant.

It is noted that Sydney's Ferry Future (TfNSW, 2013) identified potential new ferry wharf locations at White Bay, Johnstons Bay (Jacksons Landing), Glebe Point and Sydney Fish Market. The positioning of the marina facility at the entrance to Blackwattle Bay would reduce the interaction of marina vessels with potential future ferry services that may access a public ferry wharf that is positioned inside Blackwattle Bay or at the head of the Bay as part of the Sydney Fish Market relocation. Notwithstanding, consultation with Transport for NSW (TfNSW) has identified that the development could have a potential impact on future ferry vessels and services and, accordingly, TfNSW has advised that a Vessel Traffic Management Plan (VTMP) is needed to:

- Provide guidance to enhance marine safety and navigation when entering, exiting and operating the site; and,
- To mitigate any potential impacts to scheduling and timetables for ferry operations in the Bays Precinct.

The VTMP would be prepared in consultation with TfNSW, Roads and Maritime Services, and the Port Authority of NSW and would be reviewed every 12 months.

Vessels using the existing Blackwattle Bay Marina currently transit alongside the rowing course (refer **Map 2**) for most of its length within Blackwattle Bay and need to cross over the rowing course route at the head of the Bay. Relocating the marina operation to the Bank Street site would reduce the length over which vessel interactions could potentially occur to the area only in the immediate vicinity of the marina berths on the southern side of the proposed marina. The approximate area of potential vessel interaction with the existing rowing route is shown on **Map 6** and is based on application of the minimum fairway width of $1.5L$ (where L is the vessel length) with AS3962-2001. As indicated on **Map 2**, this area is a small proportion of the overall waterway area covered by the rowing route.

In discussions with DBNSW, it was suggested that the rowing route could be potentially modified in this area by relocating the apex of the turn adjacent to the proposed marina at a distance of 25m from a marker buoy positioned at the SW corner of the waterway lease area. This potential rowing route relocation is shown on **Map 3** and was considered to be a workable option by DBNSW as rowers generally follow a similar travel path by taking a shortcut across this turn on their approach to Rozelle Bay. It is recommended that modification of the rowing route is considered to further enhance segregation of non-powered and motorised craft. This will require further consultation with other stakeholders including rowing clubs and RMS.

Notwithstanding the above, rowers, dragon boaters and outrigger canoes would still need to be aware of vessel movements in the vicinity of the marina as they would currently need to do when passing alongside other existing marina operations within Blackwattle Bay.

Based on the understanding of rowing / dragon boating / outrigger canoeing training schedules (refer **Section 2.7.4** and **Section 2.7.5**) and the operating schedule of AOC charter vessels at Blackwattle Bay Marina (refer **Section 3.3**), the most likely times for vessel interaction are over several hours in the early evening (5pm-8.30pm) on weekdays, and over a short time on Saturday and Sunday mornings (10am-11.30am) during peak periods only (November-December). This information is summarised in **Table 13**.

Table 13: Summary of Vessel Interaction Periods

Period	Monday - Friday	Saturday	Sunday
AM	None	None (January – October)	None (January – October)
		10am-11.30am (November-December)	10am-11am (November-December)
PM	5pm – 8.30pm	None	None

The dragon boat launching ramp extends over a distance of approximately 34m from the shoreline into the waterway and the western edge of the ramp is located approximately 40m from the closest berths in the south-east corner of the marina. The current Roads and Maritime Services (RMS) Boating Handbook (RMS, 2016) documents the recently revised safe distance requirements (also known as ‘distance off’) for vessels underway. A summary of relevant RMS requirements is as follows:

- when driving any vessel you must keep the vessel a minimum distance of 60m from people in the water or if that is not possible, a safe distance and speed; and,
- when driving a power-driven vessel at a speed of 6 knots or more you must keep the vessel a minimum distance of 30m from any other vessel, land structures, moored or anchored vessels, or if that is not possible, a safe distance and speed.

The first requirement above relates to people in the water (e.g. designated swimming areas) as opposed to non-powered vessels and would not apply to the boat launching and retrieval activities undertaken on the dragon boat launching ramp. The second requirement applies to vessels underway at a speed of greater than 6 knots, which would not be the case due to the 4 knot speed limit and no wash zone within Blackwattle Bay and the likely low speed of marina vessels approaching and manoeuvring in the vicinity of the marina berths. As such, the position of the marina relative to the dragon boat launching ramp does not conflict with current RMS safe distance requirements. DBNSW advised that installation of several marker buoys alongside the western side of the dragon boat launching ramp would assist to guide their rowing crews away from the SE corner of the marina during launching and retrieval activities.

In addition, there are features of the proposed floating marina facility layout that would reduce the likelihood of vessel interaction with non-powered craft. The two berths that were previously positioned along the eastern perimeter of the fixed wharf facility (refer **Section 3.4.1** and **Appendix E**) were in an approximately E-W orientation such that exiting marina vessels would depart towards the dragon boat launching area. These berths have been relocated to interior berth positions within the currently proposed floating marina facility. The closest berths to the dragon boat launching ramp (south-east corner of marina) are aligned approximately in an SSW-NNE direction (parallel to the launching ramp) such that movement of marina vessels into and out of these 3 berths would not involve manoeuvring in close proximity to the launching ramp. The larger sized vessels with higher powered engines are located in berths that are positioned away from the south-east corner of the marina which would reduce the potential impacts on non-powered craft from localised propeller wash that may be generated during berthing manoeuvres.

Furthermore, as per the current practice within the existing Blackwattle Bay Marina, vessels would be expected to berth with their stern at the face of the marina pontoon to facilitate transfer of staff and provision of back-of-house servicing. This would improve the visibility of passing non-powered craft for skippers of departing marina vessels and would direct localised propeller wash away from the rowing route.

Notwithstanding, approaching and departing marina vessels would need to keep a proper lookout at all times and give way to passive recreational crafts. These navigation requirements should be written into the ‘marina rules’ and/or a Plan of Management and included as part of the berthing agreement and

planning documentation for the marina's use. This approach has been taken by the Sydney Superyacht Marina who have a similar potential for vessel interaction due to the rowing course passing alongside marina berths on the northern side of Rozelle Bay. Safe navigation requirements should also be reinforced and made clearly visible to marina customers with signage installed in prominent locations throughout the marina to outline the following:

- 4 knot speed limit and no wash zone;
- keeping a proper lookout for non-powered craft at all times;
- notification of peak times for passive recreation (e.g. dawn and dusk);
- giving way to passive recreational craft including rowing boats and dragon boats; and,
- exercise caution on approach to Glebe Island Bridge and follow traffic light signals when in operation.

To increase awareness of passive recreational activities on the waterway, DGNSW have requested that prominent signage is installed at the Glebe Island Bridge entrance advising that “non-powered vessels are using this area frequently” or words to this effect.

4.6 Summary of Mitigation Measures

Based on the above assessment, the following measures are considered to minimise and mitigate potential navigation impacts from the proposed floating marina facility:

- wave climate experienced at the marina site complies with guidance for acceptable conditions within AS3962-2001, provided that the ‘Sunseeker’ moored at Berth B1 is substituted with one of the larger vessels that are positioned within the interior berths, such as the ‘Southern Star’;
- comparison of the required seabed levels for berthing with minimum existing seabed levels demonstrates that existing water depths satisfy the requirements of AS3962-2001 and dredging is not required to provide additional water depth for the proposed marina berthing arrangement;
- the proposed floating marina facility does not extend any further west than that considered to be acceptable by RMS for safe navigation of outbound vessels, including manoeuvring of large vessels in adverse weather conditions, in the approved development application for the original Sydney Heritage Fleet facility proposal;
- navigation lights mounted on poles are proposed to be fixed to each end of the outermost (western) marina arm, a single navigation light fixed to the southern end of the central marina arm, and a single navigation light fixed to the eastern end of the pontoon in the south-east corner of the marina;
- the existing lit port beacons on each side of Anzac Bridge would need to be relocated approximately 20m to the west to accommodate the proposed western extent of the marina;
- installation of marker buoys with navigation lights to be installed to delineate the port side limit of navigation along the western side of the proposed marina and the waterway lease area, which would provide visual markers to guide rowing crews and assist in segregation of non-powered and motorised craft;
- the final type of navigation aids and their positioning would be subject to the requirements of RMS and the Harbour Master
- the southern encroachment of the proposed marina into the waterway does not extend beyond the encroachment of other existing structures on the northern shoreline of Blackwattle Bay;

- the proposed floating marina structure is less visually obtrusive at times when berths are unoccupied when compared to the original Sydney Heritage Fleet facility which included a fixed wharf structure;
- existing 4 knot speed limit and no wash zone within Blackwattle Bay / Rozelle Bay;
- further consultation with stakeholders (rowing clubs and RMS) to investigate potential relocation of the rowing route turn in the vicinity of the marina to enhance segregation of non-powered and motorised craft;
- installation of several marker buoys alongside the western side of the dragon boat launching ramp to guide rowing crews away from the SE corner of the marina during launching and retrieval activities;
- the 3 berths in the south-east corner of the marina are aligned approximately in a SSW-NNE direction (parallel to the dragon boat launching ramp) such that movement of marina vessels into and out of these berths would not involve manoeuvring in close proximity to the launching ramp;
- larger sized vessels with higher powered engines, are located in berths that are positioned away from the south-east corner of the marina and hence away from the dragon boat launching ramp;
- navigation requirements should be written into the 'marina rules' and/or a Plan of Management and included as part of the berthing agreement and planning documentation for the marina's use and include:
 - 4 knot speed limit and no wash zone;
 - keeping a proper lookout for non-powered craft at all times;
 - notification of peak times for passive recreation (e.g. dawn and dusk);
 - giving way to passive recreational craft including rowing boats and dragon boats; and,
 - exercise caution on approach to Glebe Island Bridge and follow traffic light signals when in operation.

the above navigation requirements should also be reinforced and made clearly visible to marina customers with signage installed in prominent locations throughout the marina.

- installation of prominent signage at the Glebe Island Bridge entrance advising that "non-powered vessels are using this area frequently" or words to this effect;
- preparation of a Vessel Traffic Management Plan (VTMP) to address potential future impacts on ferry vessels and services in consultation with TfNSW, Roads and Maritime Services, and the Port Authority of NSW. The VTMP would be reviewed every 12 months.

5 References

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Appendix A: Maps

Appendix B: NSW Boating Information

Appendix C: Sydney Heritage Fleet Facility Plan

Appendix D: Blackwattle Bay Marina Facility Plan

Appendix E: Bank Street Commercial Wharf (fixed structure)

Appendix F: Bank Street Commercial Wharf (floating structure)